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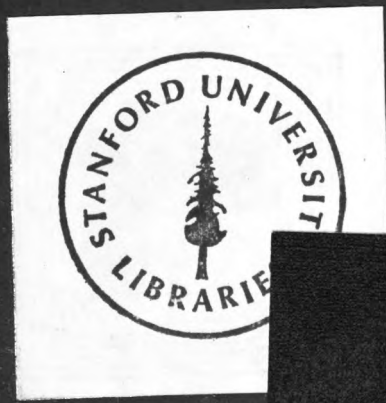


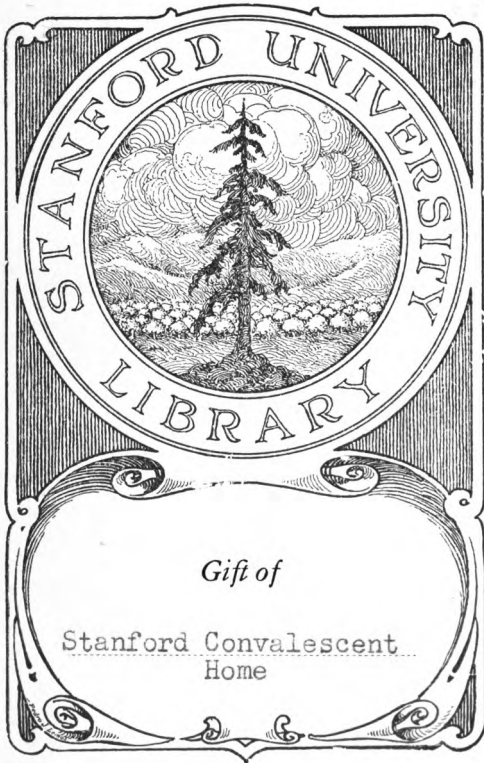
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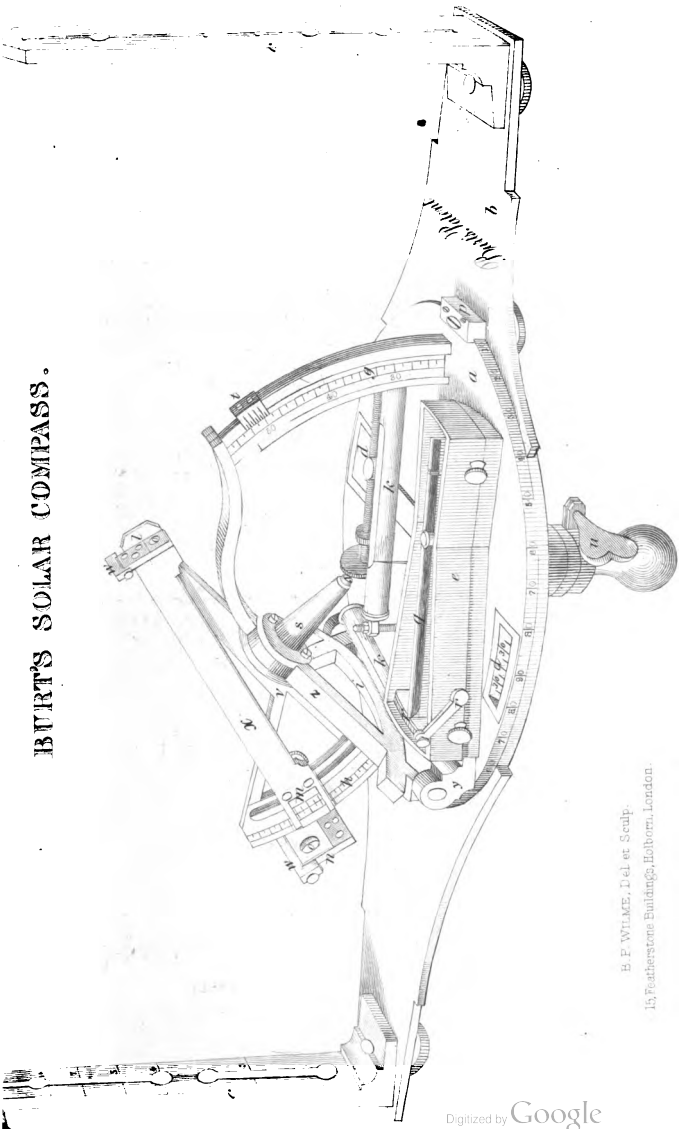
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BURT'S SOLAR COMPASS.



B. P. WILME, Del. et Sculp.
15, Featherstone Buildings, Holborn, London.

A KEY

TO THE

SOLAR COMPASS,

AND

SURVEYOR'S COMPANION;

COMPRISING

All the Rules necessary for Use in the Field.

ALSO,

DESCRIPTION OF THE LINEAR SURVEYS, AND PUBLIC LAND SYSTEM
OF THE UNITED STATES; NOTES ON THE BAROMETER,
SUGGESTIONS FOR AN OUTFIT FOR A SURVEY
OF FOUR MONTHS, ETC., ETC.

BY WILLIAM A. BURT,

U. S. DEPUTY SURVEYOR.

FOURTH EDITION.

NEW YORK:

D. VAN NOSTRAND, PUBLISHER,

23 MURRAY AND 27 WARREN STREET.

1879.

549119

Handwritten text, possibly a signature or title, mostly illegible.

ENTERED, according to act of Congress, in the year 1864, by

WILLIAM A. BURT,

In the Clerk's Office of the District Court of the United States, in and for the
Eastern District of Pennsylvania.

WILLIAM A. BURT

A KEY

TO THE

SOLAR COMPASS, AND SURVEYOR'S COMPANION.

THE SOLAR COMPASS DESCRIBED.

SEE PLATE I.

The Solar Compass works astronomically in determining latitude, and in measuring horizontal angles from the true meridian, and in determining the declination, and hour arcs, of celestial objects within the Zodiac; and is further used as a magnetic compass. This instrument is used on a tripod, with a ball and socket, in order to adjust it readily to an approximate level by the hand, after which it is adjusted to a true level by means of four thumb-screws at the lower end of the socket, by which it is attached to the tripod. No part of these are seen in the plate, except the ball, clamp and screw, at *u*. This clamp fastens the instrument on the tripod in any required position. The Solar Compass has two main plates, seen at *a*. and *b*.—*a*. is the upper and *b*. the under plate, the latter is that on which the compass sights *cc*. are attached by screws and steady pins. This plate revolves underneath the upper plate on a conical centre piece, and may be clamped to it at any required angle by two clamps, one of which is seen at *p*. There is, also, an inlaid silver ring on the under plate, divided into half degrees, which is covered by the upper plate, except at two openings at opposite points, with a vernier attached to each, *d. d*. Upon the upper plate is attached a needle-box, *e*, by a conical centre piece below the cap of the needle *g*. This needle has an arc of about 36°, divided into halves, for its north end only. A lever, *r*, is to raise the needle from its pivot when not in use.

The needle-box has a limb extending at right angles from its centre, which is not seen in the plate. At the end of this limb is a vernier and arc to set off the needle's variation; the tangent screw to this limb and vernier is seen between *k* and *d*. In consequence of the imperfection of magnetic needles, the arc is attached to the upper plate by two screws, and made adjustable, so that all instruments of this kind can be made to read the same magnetic variation. On the upper plate two adjustable spirit levels are placed at right angles to each other, for the purpose of adjusting the instrument to a true level, when an observation is made on any celestial object. The edge of the upper plate is divided to every five degrees of a circle; and in its centre is placed a brass pin, rising a little above the needle-box; by this arrangement, the surveyor can readily see the approximate course of any object in view, without turning the sights in its direction.

Together with the foregoing described parts, on the upper plate is placed the solar apparatus, which is attached to it by two small blocks, fastened by screws and steady pins, one of which is seen at *y*. Into each of these blocks one axis of the latitude arc *g* enters. These axes are connected by the hour arc *i* and two radial arms *z z* from its centre at *s*. From this centre of the hour arc, a curvilinear arm extends to the latitude arc *g*. The latitude arc moves in a grooved arc to which its vernier *t* is attached. The grooved arc is fastened to the compass plate by a flange at its base, and two screws. The latitude arc *g* has a radius of about five inches, and is divided into quarter degrees, and its vernier *t* reads these divisions to minutes. The latitude arc is clamped at any required latitude, by a clamp screw on the back side, not seen on the plate. The hour arc *i*, as above stated, lies between, and connects the axes of the latitude arc: it is only a portion of the hour circle, and is divided to half degrees. This arc gives the hour angle of celestial objects within the Zodiac of about 55° or 60° east and west of the meridian.

The revolving limb *v*, with its declination arc *h*, is mounted on the centre of the hour arc, and has a free motion on its conical spindle or axis, within the conical socket *s*, at the lower end of which is a collar and screw, for the purpose of giving a suitable tenseness to its movement. This is called the polar axis.

In connexion with the revolving limb is another moveable limb *z*, attached to it by a short conical centre at *l*; the other end with its vernier *m*, moves over the declination arc *h*, and is clamped to it at

P R E F A C E .

MUCH perplexity and difficulty has been felt by surveyors in the use of the Magnetic Compass, in consequence of its variations from the true meridian, at various localities or stations, and also its almost constant diurnal changes as well as aberrations, caused by local attraction. A more perfect guide for the surveyor than the Magnetic Needle was, therefore, very desirable. The long continued efforts made by the author to accomplish this object, resulted in the invention of the Solar or Astronomical Compass. A model of this instrument was made in the year 1835, by the inventor, in order to test its principles, and in the latter part of the same year, the first Solar Compass was made, under his direction and supervision, by William J. Young, of Philadelphia, Pa. The instrument was then submitted to a committee of the Franklin Institute, of the State of Pennsylvania, who after a full examination of its principles and merits, awarded the inventor a premium of twenty dollars and a "Scott's Legacy" medal. The Solar Compass as then made, like most newly invented instruments, was soon found susceptible of improvement and of greater usefulness than at first anticipated. Accordingly the inventor made several alterations and improvements suggested by experience, and in December, 1840, again submitted the instrument, as improved, to a committee of the same Institute, who reported a decided improvement, in point of accuracy, and the simplicity of its adjustments and use. The inventor

has since continued to improve this instrument as more experience in the use of it seemed to suggest. And in 1851 exhibited it, as improved, at the World's Fair, in the city of London, where a premium medal was awarded the exhibitor by the jurors on Astronomical Instruments.

Since its invention in 1835, and during its progressive improvements, the inventor has been called upon, personally or by letter, from a large portion of the surveyors of the public lands, for information how to adjust and use it. Such inquiries could be but imperfectly answered by letter, or a few hours' conversation, and the author could not, without being discourteous, avoid replying in some manner to such necessary inquiries, though a serious tax sometimes on his business. To prevent this the inventor published a few pages of instructions, showing how to adjust and use this instrument, and distributed them among the surveyors; but soon after this, new discoveries were made in the construction and adjustments of the Solar Compass, consequently what had been done only supplied their wants in part, and the inventor was solicited by many of the surveyors of the public lands for full instructions on this subject, and a treatise on surveying adapted to their wants in the field of survey. The foregoing remarks constitute the apology of the author for assuming a task so foreign to his habits of life, and to which duty seemed to impel him in the absence of any prospects of this much needed work being soon accomplished by any other person. This treatise contains much original matter, mostly derived from experience in practical surveying. The elements of surveying as published and taught in the schools, are purposely omitted to lessen the size of this work, the object of which is to furnish the practical surveyor with a convenient pocket companion suited to his business while engaged in his field work. The inexperienced surveyor in this branch of the public service has

need of all necessary information to enable him to accomplish his arduous duties in a proper manner. The frequent failures in part, or in whole, by many Deputy Surveyors, have done much injury to the public surveys, and ruined their hopes and reputation.

This is a sufficient reason for introducing into this work the necessary outfit and preparations for a large survey in the wilderness, the want of which has been one of the principal causes of these failures.

The author does not presume that this treatise is without defects; he indulges the hope, however, that it will answer the purpose for which it is designed, until further experience shall furnish a better. The author has availed himself of the experience of several practical surveyors, in preparing this work, and has also consulted the best authorities that appeared to throw light upon the subjects treated of.

The tables of Natural Sines and Tangents, at the end of the work, have been carefully compared with different standard works, and are offered to the surveyor with a confidence that he will find them accurate. The table of chords has been added to supply a want, frequently experienced, in draughting, where a reliable protractor is not at hand. The majority of protractors accompanying draughting instruments are either so small or so inaccurate as to be productive of sensible errors in large draughts.

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any required declination, by a clamp screw on the back side of the arc. This arc has about the same radius, and the same divisions and vernier as the latitude arc.

A small brass plate is attached by screws to each end of the limb x , standing out at right angles from the limb; and into the upper half of one plate, and the lower half of the other, is set a small convex lens, as seen at oo , called the solar lenses; and on the opposite brass plate to each lens, is attached a small adjustable silver plate by means of three screws. On each of these silver plates two sets of parallel lines are drawn, crossing each other at right angles, at a suitable distance apart to embrace the sun's image, which falls between them from the lens.

The set of lines which are parallel to the hour arc are called the equatorial lines, and the set which are vertical to the hour arc are called the hour lines. On the upper edge of each brass plate above named, is placed an equatorial sight ww , which can be attached or detached at pleasure, by means of small thumb screws.

There is also another limb (not seen in the plate) called an adjuster, which can be substituted in the place occupied by the limb x , for the purpose of adjusting to a parallelism with the lenses, the equatorial lines on the silver plates. It is a brass bar about six inches long, and one-fourth of an inch thick, with a plane surface, and three small pins at each end. The pins are for the purpose of keeping the limb x , when on the adjuster, in its place.

The adjuster when used must be attached to the same place occupied by the limb x , with the same centre and screws that held the latter. (See second adjustment.)

PRINCIPLES OF THE SOLAR COMPASS BRIEFLY EXPLAINED.

Where a solar compass is correctly adjusted in all its parts, and also to the latitude and meridian of the place of observation, with its vernier m , of the declination arc clamped at 0, or zero, then the polar axis s , of the instrument, will be parallel to the axis of the earth, and the moveable limb x , with its lenses and equatorial sights, will consequently be at right angles to the polar axis, and will revolve on this axis parallel to the plane of the equator; therefore, it

is clear that this motion coincides with the diurnal motion of any heavenly body that has no declination, and it is equally clear, that this coincidence holds good when a celestial object has north or south declination, if its declination be set off on the declination arc of the instrument; for, the diurnal motion of the heavenly object will be like the motion of the moveable limb x , parallel to the equator and equidistant from it. Now if the instrument be turned horizontally out of the meridian, the polar axis will not be parallel to the axis of the earth, nor will the moveable limb x revolve parallel to the equator; consequently it will not follow the diurnal motion of any heavenly body; therefore, if the sun's declination be set off on the declination arc, the sun's image from the lens will not fall between the equatorial lines on the silver plate, but will fall above or below them, and will not fall between them until the compass is turned again into the true meridian.

It is from these principles of the solar compass that the true meridian is obtained, and the variation of the needle determined, etc.

ADJUSTMENTS OF THE SOLAR COMPASS.

Before using the solar compass it must be correctly adjusted. This consists in bringing its different parts to their proper place, and in determining the index errors of the instrument in its graduated arcs, which is chiefly done by reversals and adjusting screws.

FIRST ADJUSTMENT.

To adjust the two spirit levels kk , to a horizontal movement of the instrument on its lower axis.

Place the compass on the tripod, and level it, or nearly so, with the hand, then by means of the levelling screws at the lower end of the ball and socket, bring the bubble in each level to the middle of its opening. If the bubbles do not move while the compass is turned horizontally around on its lower axis, this adjustment is right; but if they move, the levels must be adjusted by the screws at the end of each for that purpose, until the bubbles will remain stationary while the instrument is turned horizontally around.

SECOND ADJUSTMENT.

To make the solar lenses and the equatorial lines on their opposite plates parallel to each other.

Detach the limb *x*, by taking out its fastening screws, and attach the adjuster in its place, with the same screws that held the limb; then clamp it at the moveable end, to the sun's declination as near as practicable. Now let the compass be placed on the tripod where the sun shines, and level it, with the sights north and south, or nearly so; then place the limb *x* on the adjuster, between the pins, the same side up that was upon the compass, and then bring it to bear on the sun as in other observations, and turn the compass horizontally, if necessary to bring the sun's image precisely between the equatorial lines on the silver plate; now, without moving the compass in the least out of level, or otherwise, take the limb *x* from the adjuster and turn the upper side down, without changing ends, and place it on the adjuster again; then see if the sun's image falls between the equatorial lines as before. If it does, this plate is in adjustment; but if it does not, loosen the three small screws which hold the silver plate, (having oblong holes under their heads,) and move this plate one-half of the observed difference, up or down as the case requires, and lightly tighten the screws again. Repeat these observations and adjustments, as above described, until the sun's image falls precisely between the equatorial lines, either side up. This plate then will be in correct adjustment.

Now reverse the ends of the limb *x*, and adjust the other silver plate in the same manner as the first. When this is done, the parallelism of the lenses and equatorial lines are as perfect as reversals will make them, and the equatorial sights are also parallel to these. The adjuster may now be taken off and the limb *x* returned to its place. It will not be necessary to repeat this adjustment unless the silver plates get moved by accident or otherwise. The best time to make these adjustments, is between the hours of 10 A. M. and 2 P. M.

In making this adjustment the limb *x* should fit accurately on the adjuster, and the brass plates in which the lenses are set must be precisely of the same breadth; if they are not, this adjustment cannot be correctly made. Therefore, these plates should be carefully tried with a gauge, and any difference in size corrected.

THIRD ADJUSTMENT.

To find the index error of the declination arc.

FIRST METHOD.

Set the vernier m of the declination arc h at 0, or zero, place the compass on the tripod, and incline it north or south, as the sun may have north or south declination, until the sun's image falls precisely between the equatorial lines on the silver plate; then reverse the lenses by turning the revolving limb half way around, and see if the sun's image falls precisely between the equatorial lines on the other silver plate; if it does, there is no index error in this arc; but if it does not, move the limb x up or down, as the case requires, on the declination arc one-half of the observed difference, and try the reversals again, and so repeat them, if necessary, until the sun's image falls precisely between the equatorial lines on both silver plates. The amount of index error in this arc can now be read by its vernier m . If the index error is *below* the graduated zero point on the declination arc, its amount must be *subtracted* from the declination of the celestial object, before it is set off on the declination arc; but if *above*, it must be *added*.

SECOND METHOD.

Set the vernier m of the declination arc h at zero, as before, and bring the equatorial sights to bear on some distant object; then, without moving the compass in the least, reverse the revolving limb v , and see if the line of sight is the same as before; if it is, there is no index error; but if not, proceed as described, by reversals on the sun, until the equatorial sights will bear on the same objects when reversed.

FOURTH ADJUSTMENT.

To bring the polar axis to a right angle with the axis of the latitude arc.

This adjustment generally is, and always should be made by the instrument maker, but the surveyor should test his instrument in all of its parts. First detach the solar apparatus from the upper plate, by taking out the clamp screw of the latitude arc, and the screws that fasten its axis and blocks to the upper plate; then take a piece of board about four inches wide and a foot long, with smooth edges, and nail one edge to another board about one foot square, so that

it will be at right angles to its surface. Place this on a stand or table, in a convenient place to view some distant object, then take the blocks that hold the axes of the latitude arc, and place them on their axes, and fasten them by their screws to the upper edge of the narrow board; by this arrangement the polar axis s can be brought to a perpendicular, and then reversed, by giving motion to the axes of the latitude arc of 180° .

The moveable limb x must now be clamped to its true zero point, as found by the third adjustment, and the polar axis s brought to a perpendicular; the revolving limb v must now be turned parallel to the axis of the latitude arc; then observe some distant object through the equatorial sights; now reverse the polar axis as above directed, and see if the equatorial sights bear on the same object as before reversing the polar axis; if they do, the polar axis is at right angles to the axis of the latitude arc; but if not, the face of the flange, or the seat of the conical socket s , must be ground on one side enough to correct this error, so that the equatorial sights will bear on the same object when reversed as above stated. If the error be small, it may be corrected by placing a thin piece of tin foil, or some other firm substance, under one side of the flange of the conical socket s .

FIFTH ADJUSTMENT.

To make the compass sights coincide with the true meridian, when an observation is made with the solar compass.

Place the compass on the tripod, and clamp the sights to an east, west course; then take out the clamp screw to the latitude arc, and raise this arc until the polar axis s is horizontal, or nearly so, and fasten it in this position, which can be easily done by placing a small wedging piece of wood between the edge of the hour arc and the upper plate of the compass, and a small brace of wood between the brass centre pin and the conical centre s of the hour arc. Then clamp the vernier m of the declination arc at its true zero point, as found by the third adjustment. Now bring the equatorial sights to bear on some distant object in or near the horizon; then unclamp the main plates a and b , and bring the compass sights to bear on the same distant object; (it is well to reverse the equatorial sights and make the same observation again;) if both sights still coincide, read at the verniers $d d$, the amount of the index error, if any, between these plates.

This adjustment should always be made by the instrument maker, and cleared of *index error*, by a proper adjustment of the compass sights on the lower plate. But if any index error is found in the instrument, while in the hands of the surveyor, it should be allowed for in all courses run by him, or he may correct it by removing one of the compass sights the required amount so as to make the line of sight to coincide with the meridian. This can be done by enlarging, with a small round file, the holes on one side of the steady pins and screw that hold the compass sight to the lower plate, enough to correct the index error. The vacancy on the side of the steady pins may be filled with tin foil, or some other substance that is not magnetic.

SIXTH ADJUSTMENT.

To find the index error of the latitude arc.

This is most correctly done by determining the latitude of any station by north and south stars, or, determine the latitude by the sun, and again by the pole star; (see article, "Latitude by the Solar Compass;") one-half of the difference of latitude thus found, if any, is the index error of this arc. If the latitude determined by an observation on the sun, or star within the zodiac, be less than the latitude by the north star, the half difference must be added to the zodiacal observation, to obtain the true latitude of the station; but if greater, it must be subtracted. But this index error is not used for any other purpose than to find the true latitude, for the latitude given by an observation on a celestial object within the zodiac, is the latitude to be used for all other purposes.

SEVENTH ADJUSTMENT.

To find the index error of the hour arc.

Adjust and clamp the compass sights to the true meridian, as directed in the remarks to find the meridian, variation of the needle, &c.; also, set a stake in the meridian, four or five chains south of the instrument, and keep the compass sights directed to it. Then at the distance of ten or twelve feet south of the instrument, suspend a plumb line from the top of a suitably inclined pole set in the ground, and firmly supported with crotches, and of a sufficient height to observe, near the top of the line, the meridian passage of the sun. Then with the aid of a suitable dark glass, observe through the north sight vane, the meridian contact of the sun's west limb with

the line, while an assistant has kept the sun's image accurately between the hour lines on the silver plate. At this point, read on the graduated side of the declination arc, at either end of the revolving limb, its distance from the graduated zero point, and the same again with the last contact of the sun's east limb: half the difference on the hour arc, between these two observations, will be its true zero point; from which read the index error.

It should be remarked here, that the principles of the solar compass have been applied in various ways to surveying instruments, to suit the views of mathematical instrument makers, or surveyors for whom they were made; but the solar compass described in the foregoing pages, and for which the adjustments are given, has been found, after much experience in its use, to be the best adapted to surveying the public lands, and for this purpose it is generally used; for the reason that it is more safely and conveniently carried and used through all the exposures which are unavoidable in the wilderness. Some change, however, may be made in its mechanical construction, for the purpose of city surveying, and for running the lines and curves of railroads, etc. But in whatever form they may be made, it is important to a good solar apparatus, that the latitude and declination arcs have a radius not less than five inches, so that their divisions may be sufficiently large to be easily read, and the arcs readily and accurately adjusted for use. The importance of this will be understood by considering the frequency of these adjustments, and the circumstances under which they are made while running lines in the field. So far as known to the author, but few surveyors have qualified themselves to use the solar compass on any other celestial object than the sun; and, perhaps, as few have fully understood its principles and adjustments. The reason of this is found in the fact, that no work has been published before this, sufficiently elucidating its principles, adjustments and use. The sun is the principal celestial object used in surveying lines with this instrument, which only requires a knowledge of the true declination of the sun for each hour of the day, in the longitude where the survey is to be made. Therefore, with the instructions here given, no accomplished surveyor with the magnetic compass, need hesitate to use the solar compass on the sun; and he will soon acquire the further knowledge of using it on other heavenly bodies at night, to determine the variation of the needle, and for other purposes treated of in this work. If the solar compass has been truly adjusted in all of its parts, pre-

vious to its being used in the field, the surveyor may feel the fullest confidence in the true course of his lines run with it.

ASTRONOMY.

Though merely a knowledge of the apparent diurnal motion of the sun in the heavens, will serve for the single purpose of using the solar compass on that luminary; yet, for all the purposes for which this instrument can be employed by night on the planets and fixed stars, a more extended knowledge of astronomy is required.

Therefore, the following brief notice of astronomical facts and phenomena is deemed necessary to be understood by all surveyors, to enable them to use the solar compass to the best advantage.

SOLAR SYSTEM.

The sun is the centre of the solar system, around which all the planets revolve in elliptical orbits, from west to east,* with diminished velocities as their distances increase from the sun: the planes of their orbits are nearly coincident with the plane of the ecliptic; therefore, their greatest declinations will be sometimes more or less than the sun's greatest declination, by the amount of the angle of inclination of each of their orbits to the plane of the ecliptic. See the following table.

Planet's names.	Mean diameter in English miles.	Mean distance in English miles from the Sun.	Mean sidereal period in mean Solar days.	Inclination of orbit to the ecliptic.	Hourly motion in orbit in miles.
The Sun,	883.246				
Mercury,	3.224	37.000.000	87.969.225	7° 0' 9" 1	109.400
Venus,	7.687	68.000.000	224.700.787	3° 23' 28" 5	80.060
The Earth,	7.912	95.000.000	365.256.361		68.080
The Moon,	2.160	95.000.000	27.321.661	5° 8' 47" 9	2.290
Mars,	4.189	142.000.000	686.979.646	1° 51' 6" 2	55.000
Jupiter,	89.170	495.000.000	4.332.584.821	1° 18' 51" 3	28.000
Saturn,	79.042	906.000.000	10.759.219.817	2° 29' 35" 7	20.000
Uranus,	35.112	1.820.000.000	30.686.820.830	0° 46' 28" 4	15.000
Neptune,	35.000	3.600.000.000	60.128.000.000		

* East and west are relative, or local terms. It is meant here, that they move in their orbits around the sun, in the same direction as the opposite side of the earth from the sun moves around its axis.

THE EARTH.

The earth is an oblate spheroid, whose equatorial diameter exceeds its polar diameter about 26 miles; the cause of this difference is supposed to be the centrifugal force of the earth's rotary motion around its axis.

The north and south poles of the earth are two points on its surface, opposite to each other; and a straight line between these two points is called the axis of the earth, around which the earth revolves, from west to east, once in a sidereal day.

The axis of the earth is always inclined from a perpendicular to the plane of its orbit; in other words, the axis of the earth has an angle to the axis of the ecliptic, of about $23^{\circ} 28'$. Therefore, the axis of the earth is always in the same direction in regard to the heavens, in every part of its orbit.

This angle of inclination causes the declination of the sun north and south of the celestial equator, during each revolution of the earth around the sun. It is, also, the principal cause of the declinations of the planets; the different seasons of the year; and the different length of days and nights.

EQUATOR.

The Equator encircles the earth at right angles to the axis, and is equidistant, or 90° from its poles; its plane divides the earth into two equal parts, called northern and southern hemispheres.

The plane of the equator, if extended to the heavens, is called the celestial equator, which has an angle to the plane of the ecliptic, (like the angle between their axes) of about $23^{\circ} 28'$.

The motion of the earth around its axis is uniform; but the velocity of the earth in its orbit around the sun is unequal, the mean of which is $59' 8''$ each day. The sun will therefore return to any given meridian each day in unequal times; hence the difference between apparent and mean time, called the equation of time.

A tropical year is 365 d., 5 h., 48 m., 49 s. A sidereal year, reckoned in mean solar time, is 365 d., 6 h., 9 m., 9. 6s., and reckoned in sidereal time, is 366 d., 6 h., 9 m., 9. 6s.

The reason of this difference is, the earth has moved once around the sun in its orbit the same way the equator moves around its own axis. The earth must therefore complete one revolution and $59' 8''$ on its axis each day, to bring the sun to the same meridian. This is called solar time.

The earth has precisely one revolution on its axis from the transit of a fixed star to the next transit of the same star, which is a sidereal day of 24 hours; but, if reckoned in mean solar time, it is 23 h., 56 m., 4 s., 9'''.

An astronomical day commences at noon, and is reckoned from one to 24 hours successively; the civil day commences at the preceding midnight, and is reckoned from 1 to 12 hours, twice in a civil day: therefore the last 12 hours of the civil day correspond to the first 12 hours of the astronomical day. All astronomical calculations are computed in astronomical time.

LATITUDE.

Latitude on the earth is reckoned north and south of the equator in degrees, etc., of the meridian, to the poles (or 90° .) Difference of latitude is an arc of the meridian, between any two parallels of latitude.

LONGITUDE.

Longitude on the earth is reckoned east and west from any prime meridian, in arc or time to 180° or 12 hours. Difference of longitude is the difference in arc or time, between any two meridians, reckoned on any parallel of latitude.

ECLIPTIC.

The Ecliptic is a great circle of the heavens, and its plane is the extension of the plane of the earth's orbit, indefinitely, into space, or the starry heavens.

The sun is always in the ecliptic, and the orbits of all the planets cut or intersect the ecliptic at opposite points, called their nodes, in which only eclipses occur.

ZODIAC.

The Zodiac is an imaginary belt or circle of the heavens, and occupies a space of 8° on each side of the ecliptic; within which all the planets appear to perform their revolutions around the sun.

DECLINATION.

Declination of a heavenly body is reckoned north and south of the equatorial plane. The complement of the declination of a celestial object is its nearest polar distance.

RIGHT ASCENSION.

The right ascension of heavenly bodies is reckoned in time from the first point of Aries, or the vernal equinox, around in the order of the signs, on the equator, to the same point again. The longitude of heavenly bodies is reckoned from the same point, and in the same order on the ecliptic, in degrees, etc., as right ascension is reckoned in time on the equator.

ALTITUDE AND ZENITH DISTANCE.

The altitude of a celestial object is the angle in which it is observed above the horizon. The zenith distance of a heavenly body is its angular distance from the zenith, or point directly over head of the observer.

HORIZON.

An observer has two horizons, the sensible and rational. The sensible horizon is a circle at the extent of view in all directions, on a horizontal plain, or on the ocean. The plane of the rational horizon divides the earth into two equal parts through its centre, parallel to the sensible horizon; it is, therefore, the semi-diameter of the earth below the sensible horizon.

REFRACTION AND PARALLAX.

The atmospheric refraction causes a heavenly body to appear above its true place in the heavens, except it be in the zenith. The parallax of a celestial object is the difference in altitude that would appear between an observation made from any point on the earth's surface and from its centre. Therefore, parallax causes heavenly bodies to appear below their true place in the heavens, except they are in the zenith; hence the corrections for parallax and refraction of instrumental observations on celestial objects.

AZIMUTH.

The azimuth of a heavenly body is reckoned on the horizon of the observer, between a vertical plane of the meridian, and another vertical plane passing through the centre of the celestial object, to the zenith of the observer. In other words, it is the true bearing of a heavenly body referred to the horizon from the meridian.

Azimuths are generally reckoned from the north in north latitude, and from the south in south latitude.

The amplitude of a heavenly body is its true course or bearing at rising or setting, from the east or west points of the horizon.

NAUTICAL ALMANAC.

Blunt's Nautical Almanac and Astronomical Ephemeris, (on account of its size) is the most convenient that has yet been published for the surveyor to take data from, for the use of the solar compass. The heading of each page and column is a sufficient explanation of its contents and use.

This almanac is adapted to mean noon at Greenwich, England, except the sun's declination, which is more properly given for apparent noon.

It will be seen that the quantities in the columns are continually varying from day to day; therefore some reduction is necessary to adapt them to any other time or longitude, than that for which they were registered. This is accomplished by applying the hourly differences, where they are given, according to their sign or precept; and where the hourly differences are not given, take the required proportional part of the difference between the preceding and succeeding noon at Greenwich, and add to or subtract from the registered quantities, according as they are increasing or decreasing, as the case requires.

FIXED STARS.

The following table of the mean places of 35 fixed stars has been selected from the Nautical Almanac, for January 1st, 1854, for the purpose of night observation with the solar compass. The sign + prefixed to an annual variation is to be *added to*, and the sign — is to be *subtracted from* the right ascension: also, for stars having *north* declination, + signifies *add*, and — *subtract*; but for stars of *south* declination + denotes that the variation is to be *subtracted from*, and — that it is to be *added to* the declination.

FIXED STARS.

MEAN PLACES OF THIRTY-FIVE PRINCIPAL FIXED STARS
FOR JANUARY 1ST, 1854.

STAR'S NAME.	Mag.	RIGHT ASCENSION.		ANNUAL VAR.	DECLINATION.		ANNUAL VAR.
		H. M.	S.		0. 1' "	"	
β Ceti,	2	0 36	15-414	+ 3-0127	S. 18 47	20-28	+ 19-832
α Urs. Min. (Polaris),	2	1 6	11-891	18-0600	N. 83 31	52-32	19-241
θ^1 Ceti,	3	1 16	43-553	2-9997	S. 8 56	17-08	18-740
α Arietis,	2	1 58	57-027	+ 3-3634	N. 22 46	11-30	+ 17-274
α Ceti,	2-3	2 54	39-087	3-1269	N. 3 30	50-23	14-399
η Tauri,	3	3 38	48-759	+ 3-5527	N. 23 38	59-65	+ 11-536
α Tauri (Aldebaran),	1	4 27	32-809	3-4336	N. 16 12	42-11	7-702
β Orionis (Reigel),	1	5 7	31-330	+ 2-8803	S. 8 22	27-30	+ 4-540
δ Orionis,	2	5 24	32-994	3-0663	S. 0 24	40-87	3-048
ϵ Orionis,	2	5 28	48-357	+ 3-0436	S. 1 17	57-31	+ 2-709
α Orionis,	var.	5 47	16-094	3-2469	N. 7 22	31-37	+ 1-112
μ Geminorum,	3	6 14	7-640	3-6357	N. 22 35	1-21	- 1-367
α Canis Maj. (Sirius),	1	6 38	42-914	2-6447	S. 16 31	11-02	4-602
α Can. Min. (Procyon),	1	7 31	39-317	3-1459	N. 5 35	43-82	8-859
α Hydr. \mathcal{A} ,	2	9 20	24-674	+ 2-9490	S. 8 1	41-32	- 15-343
α Leonis (Regulus),	1-2	10 0	35-517	+ 3-2026	N. 12 40	43-82	- 17-380
δ Leonis,	2-3	11 6	20-253	3-2064	N. 21 19	22-28	19-645
β Leonis,	2	11 41	36-517	+ 3-0656	N. 15 23	16-95	- 20-084
α Virginis (Spicæ),	1	13 17	30-330	3-1495	S. 10 23	52-41	18-946
α Bootis (Arcturus),	1	14 9	0-134	2-7332	N. 19 56	40-39	18-919
α^2 Libræ,	2-3	14 42	48-491	+ 3-3070	S. 15 25	55-72	15-234
β Ursæ Minoris,	2	14 51	10-977	- 0-2687	N. 74 45	7-18	14-760
β Libræ,	2	15 9	9-271	+ 3-2202	S. 8 50	27-49	13-601
α Serpentis,	2-3	15 37	4-683	+ 2-9514	N. 6 53	17-13	11-643
β^1 Scorpii,	2	15 56	57-182	+ 3-4784	S. 19 24	6-72	10-275
α Herculis,	var.	17 7	59-418	+ 2-7322	N. 14 33	37-00	4-449
α Ophiuchi,	2	17 28	9-421	+ 2-7796	N. 12 40	11-94	2-967
ζ Aquilæ,	3	18 58	41-894	2-7546	N. 13 39	0-00	+ 5-022
γ Aquilæ,	3	19 39	19-055	+ 2-8553	N. 10 15	38-89	+ 8-434
α Aquilæ (Altair),	1-2	19 43	39-502	2-9286	N. 8 29	10-27	9-154
β Aquarii,	3	21 23	52-159	3-1673	S. 0 12	39-37	15-609
β Cephei,	3	21 26	45-508	0.8045	N. 69 55	12-83	+ 15-686
ϵ Pegasi,	2-3	21 37	0-915	+ 2-9510	N. 9 12	28-01	+ 16-297
α Aquarii,	3	21 58	16-921	3-0826	S. 1 1	38-53	17-300
α Pegasi (Markab.),	2	22 57	29-402	2-9834	N. 14 25	14-62	19-310

LATITUDE BY THE SOLAR COMPASS.

After the solar compass has been correctly adjusted in all of its parts, its future usefulness depends upon finding the latitude as given by the instrument, at the place where it is used.

That it may not be repeated again, hereafter, it should be remarked, that in all observations with the solar compass, it must be placed on the tripod, and accurately levelled, with the latitude arc turned toward the equator; except, that when making an observation on

the pole-star, it must be turned in that direction. This can be done approximately by the magnetic needle.

Thus prepared, set off the sun's declination for noon on the declination arc, allowing for its index error, if any, and the sun's meridional refraction, also, adjust the latitude arc approximately to the latitude of the place, and the revolving limb *v.* at its true zero point on the hour arc *i.*: in other words, for noon.

Commence the observation for latitude about fifteen minutes before the sun culminates, by turning the instrument horizontally on its lower axis, so that the sun's image will fall between the hour lines on the silver plate, and raise or lower the latitude arc, if necessary, to bring the sun's image between the equatorial lines. Then follow the motion of the sun, by turning the compass horizontally, at short intervals of time, and adjust the latitude arc, to keep the sun's image between the equatorial lines, until he culminates. The latitude of the station can then be read at the vernier of the latitude arc.

The same method may be pursued by night to determine the latitude by an observation on any celestial object within the zodiac, viewed through the equatorial sights. In making these observations, it will sometimes be necessary for an assistant to hold a lighted candle a little behind and above the head of the observer, in such a manner that the equatorial sights can be seen; but not so bright as to obscure the star.

LATITUDE BY THE POLE-STAR.

It should be remarked, that the latitude given by an observation on any heavenly body within the zodiac, is read direct on the latitude arc; but when the latitude arc is turned to the north for an observation on the pole-star, or some other star near the pole, the latitude arc will read the co-latitude of the station; it must, therefore, be subtracted from 90° to obtain the true latitude. In these latter observations, the polar distance of the star must be set off on the declination arc instead of its declination, and if the upper meridian passage of the star be observed, the declination *arc* must be turned toward it; but, if the lower meridian passage of the star be observed, the declination arc must be turned from the star.

See sixth adjustment to find the index error of the latitude arc.

EASTERN ELONGATIONS OF POLARIS.

DAYS.	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPT.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	18-18	16-26	14-24	12-20	10-16	8-20
7	17-56	16-03	14-00	11-55	9-53	7-58
13	17-34	15-40	13-35	11-31	9-30	7-36
19	17-12	15-17	13-10	11-07	9-08	7-15
25	16-49	14-53	12-45	10-43	8-45	6-53

WESTERN ELONGATIONS OF POLARIS.

DAYS.	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	18-18	16-22	14-19	12-02	9-50	8-01
7	17-56	15-59	13-53	11-36	9-26	7-38
13	17-34	15-35	13-27	11-10	9-02	7-16
19	17-12	15-10	13-00	10-44	8-39	6-54
25	16-49	14-45	12-34	10-18	8-16	6-33

To find the time of the *meridian passages* of the pole star, add 5 hr. 59 min. to the time of its elongation.

TO FIND THE TRUE MERIDIAN, AND HORIZONTAL ANGLES FROM IT; ALSO, THE VARIATION OF THE NEEDLE.

Clamp the sight of the compass at 0 or zero, and adjust the latitude arc to the latitude of the place; also, set off the sun's declination for the time of day, allowing for index error, if any, and the sun's meridional refraction; then bring the sights of the compass approximately into the meridian by the needle, and the solar lenses into the direction of the sun; if the sun's image does not fall between the equatorial lines, turn the instrument horizontally, and the revolving limb *v.* on its axis, in a manner to bring the sun's image between the equatorial lines, allowing for refraction, if required; then the compass sights will be in the true meridian. Now if the needle *q.* be lowered on to its pivot by the lever *r.*, its variation from the true meridian can be read, and set off on the arc for that purpose; the tangent screw of the vernier limb is seen at *k.* and *d.* (See Plate 1.)

To set the sights of the compass to any other course or angle from the meridian it is only necessary to unclamp the under plate from the upper, and turn the sights to the course required, the angle of which can be read at the verniers *d. d.*

Observations for the same purpose can be made in the night, on any celestial object within the zodiac, by the use of the equatorial sights, instead of the lenses; and by observing two stars, one east,

and the other west of the meridian, the variation of the needle, or the course of a line, may be more accurately defined.

ZENITH DISTANCE AND ALTITUDE.

Clamp the compass sights to 90° , or for an E. and W. course, also, set off on the declination arc 23 degrees, and bring the revolving limb *v* to zero or noon on the hour arc. Then by turning the instrument horizontally on its lower axis, bring the solar lenses and equatorial sights into the direction of the sun or star to be observed, and raise or lower the latitude arc as the case requires, until the sun's image falls between the equatorial lines, or the star is seen through the equatorial sights. If the observation be made with the declination arc turned from the object, 23 degrees must be added to the reading of the latitude arc, to obtain the zenith distance of the object observed; but if the declination arc is turned toward the object, 23 degrees must be subtracted from the reading of the latitude arc, to obtain the zenith distance.

If the zenith distance be subtracted from 90 degrees, the altitude of the object will be had.

TIME OF DAY BY THE SUN.

After an observation is made to determine the variation of the needle, or the course of a line by the sun, bring the revolving limb to one division on the hour arc in advance of the sun, then observe the movement of the sun's image to the instant it arrives between the hour lines, and correct for index error of the hour arc, and the effects of refraction, and the hour angle from the meridian at that time, expressed in degrees will be had, which may be converted into time by allowing 15 degrees for an hour, and for each degree four minutes of time. If mean time is required, add or subtract the equation of time according to its precept, and mean time will be had.

DIURNAL VARIATION OF THE NEEDLE.

It has been found by numerous observations, that the diurnal variation of the needle is more in summer than in winter months, and the amount of these aberrations is more or less on different days of the same season of the year, and is probably caused by heat and cold.

But the order in which these diurnal changes take place, can be a little more clearly defined. The north end of the needle will ar-

rive at its most easterly declination between one and two hours after sunrise. It will soon after gradually decline westerly until one or two o'clock, P. M., soon after which it will decline eastward, and at sunset it will have returned half way back to where it was in the morning. Its daily movement may be better understood by an examination of the following table:—

The following observations were made by the author in latitude 42 degrees 42 minutes North, near Detroit, in July, 1830.

1830.	THERMOMETER.			WEATHER.	WEATHER.	WIND.	MAGNETIC VARIATION.			
	5½ A. M.	1 P. M.	6½ P. M.				5½ A. M.	1 P. M.	6½ P. M.	
July.										
13	60	79	62	clear,	light showers,	W. S. W.	1° 42'	1° 26'	1° 42'	
14	59	72	67	clear,	flying clouds,	N. W.	1 42	1 26	1 33	
15	56	73	64	cloudy,	light showers,	N. W.	1 32	1 28	1 28	
16	55	71	66	cloudy,	some cloudy,	West.	1 38	1 28	1 30	
17	52	80	69	clear,	clear,	W. N. W.	1 30	1 28	1 30	
18	55	85½	83	clear,	clear,	West.	1 41	1 28	1 35	
19	56	89	82	clear,	flying clouds,	S. W.	1 40	1 28	1 35	
20	63	80	74	clear,	cloudy,	S. S. W.	1 40	1 25	1 35	
21	70	82	77	clear,	cloudy,	South.	1 42	1 28	1 30	
22	72	86	75	cloudy,	some cloudy,	West.	1 40	1 28	1 35	
23	65	88	77	clear,	clear,	East.	1 41	1 23	1 36	
24	72	86	77	rain,	clear,	W. S. W.	1 43	1 25	1 35	
25	69	83	80	clear,	clear,	N. W.	1 41	1 15	1 32	
26	66	88	79	clear,	cloudy,	West.	1 40	1 23	1 35	
27	69	80	76	clear,	shower,	West.	1 41	1 30	1 37	
28	64	86	80	clear,	clear,	West.	1 42	1 24	1 30	
29	66	87	78	cloudy,	clear,	West.	1 41	1 21	1 30	
30	69	90	79	clear,	showers,	West.	1 41	1 26	1 33	

It will be seen that the average variation for eighteen days
 at 5 h., 30 m., A. M., is $1^{\circ} 39' 50''$, E.
 at 1 h., 00 m., P. M., is $1^{\circ} 25' 37''$, E.
 at 6 h., 30 m., P. M., is $1^{\circ} 33' 23''$, E.

The difference of these numbers gives the diurnal variation as follows:—

Between morning and evening— $6' 27''$,

Between morning and noon— $14' 13''$,

Between noon and evening— $7' 46''$.

From these facts it may be seen, that the variation of the needle, as found at one time, cannot be safely relied upon in running lines at any length of time subsequently. Hence the importance of finding its variation at the time the line is being run.

To guard against errors occurring on account of the variation, the surveyor should at the end of each line, or at the point where the variation of the needle is found, for the purpose of running a line from it at some future time, take the bearing of some distant object, and make a note of the same. On resuming the work, if the sun should be obscured by clouds so as to prevent finding the variation of the needle, he can observe the course of the same object again, and the difference in its course, if any, is the change of variation, and must be allowed for to correct the variation previously determined.

Local attraction, also, so frequently changes the direction of the needle, that the surveyor cannot safely extend his line far without an observation to find its variation; and it will be frequently found that a little delay for this purpose, will more than compensate for all the supposed advantages of running the line without it.

TO FIND THE MERIDIAN PASSAGE OF A FIXED STAR, AND ITS HOUR ANGLE AT ANY HOUR OF THE DAY.

Subtract the sun's Right Ascension for the day and hour of observation, from the star's Right Ascension, borrowing 24 hours for the latter when necessary, and the difference will give the star's meridian passage in solar time; if mean time be required, add to or subtract from the solar time, the equation of time, according to its precept, and the meridian passage of the star will be given sufficiently near for that purpose. Then, if the hour of observation, (astronomical time) can be subtracted from the time of the star's meridian passage, the star's hour angle, east of the meridian will be

given; but if the meridian passage of the star be subtracted from the hour of observation, it will give its hour angle, west of the meridian. And thus it may be determined what stars are most favourably situated, for the purpose of finding the variation of the needle, at any time of night.

If any one of the fixed stars named in the preceding table are not truly known to the observer by the geography of the heavens, it is necessary to find the time of meridian passage in order to know the star's hour angle at the time of the proposed observation.

This being known, set the instrument to the star's declination and the equatorial sights to the hour angle of the star, on the hour arc, then bring the sights of the compass into the meridian as near as may be by the needle; the equatorial sights will then direct the eye, nearly, to the star sought for, and by a little movement of the instrument horizontally on its lower axis, bring the line of sight to bear directly on the star, and the observation is complete.

THE EFFECT OF REFRACTION AND PARALLAX IN THE USE OF THE SOLAR COMPASS EXPLAINED.

The equatorial and hour lines of the solar compass will vary their angles from the horizon, as the object observed by the instrument recedes from, or approaches to the meridian of the observer; and when at 90° , or six hours from the meridian, the equatorial lines will have an angle to the horizon, equal to the co-latitude, and the hour lines equal to the latitude of the place of observation. Now if the equatorial lines were at all times in a vertical plane, passing through the centre of the celestial object, refraction would not produce any effect in the course of lines run with the solar compass; but as they will have an angle, as above stated, at different hours of the day, a proportion of the whole amount of refraction, according to the angle, must be allowed for, when large enough to produce a sensible effect in the course of the lines. The equatorial lines are parallel to the horizon when observing a celestial object on the meridian; therefore, the whole amount of the meridional refraction must be allowed for, in setting off its declination. The hour lines are only affected by the whole amount of the refraction, or parallax, when on the equator, or latitude 0° .

The effect of parallax of the sun and large planets, is too small to be regarded, except in the most refined observations. But the pa-

rallax of the moon is too large to be neglected in any; for this reason, a table of refraction in altitude is given in this work.

Refraction does not decrease in regular proportion to the altitude of the object. When a celestial object is in the zenith, it has no refraction or parallax; but when it is in the horizon, its refraction is $33' 51''$, and at an altitude of 45° about one minute, (more exactly $58''$;) the natural co-tangent of the altitude of a heavenly body, express nearly its refraction.

For the purpose of determining with facility the whole amount of refraction in altitude of a celestial object, the compass sights have lines drawn across them at various distances from the top; at each of these lines are figures, which indicate, in minutes of a degree, the amount of refraction in altitude of a celestial object, as seen from each line in range with the top of the other sight.

From the amount of refraction thus found, subtract the meridional refraction, then the following table will give the proportion of the remainder, expressed in hundredths, to be added to its declination, when the latitude is of the same name; or subtracted from it, when of a contrary name, from one to six hours in time, east and west of the meridian; also, the proportion of the whole amount of the sun's refraction, to be subtracted in time from his hour arc, in the forenoon, and added to it in the afternoon, to obtain the true apparent time. This table will also be useful in observations on the Moon; for the same proportion of the moon's parallax in altitude, must be allowed for on the declination arc, in a reversed order from that of refraction; in other words, the same proportion of the moon's parallax in altitude, corrected for refraction, (see table for that purpose) must be subtracted from her declination, when the latitude is of the same name, and added to it, when of a contrary name.

For the purpose of making corrections for refraction expeditiously, while running lines by the sun, there are three lines drawn below the equatorial lines, $5'$ apart, by which to estimate the proportion of refraction to be allowed, by bringing the lower limb of the sun's image the number of minutes below the lower equatorial line on the silver plate, instead of setting it off with the sun's declination. When the surveyor becomes familiarly acquainted with making these allowances for refraction, in using the solar compass, he will seldom need to refer to the tables, or to mathematical calculations, to enable him to make a proper allowance for refraction at all hours or

The day, except when the sun is within 5° of the horizon. But for an observation by night on a star, its refraction should be set off with its declination, in the manner before stated.

PROPORTION OF REFRACTION TO BE ALLOWED IN HUNDREDTHS OF THE WHOLE.

ON THE EQUATORIAL LINES.							ON THE HOUR ARC.					
Lat.	HOURS FROM THE MERIDIAN.						HOURS FROM THE MERIDIAN.					
	1 H.	2 H.	3 H.	4 H.	5 H.	6 H.	1 H.	2 H.	3 H.	4 H.	5 H.	6 H.
10°	97	87	72	52	31	17	26	49	70	85	95	98
12°	97	87	72	53	33	21	25	49	69	85	95	98
14°	97	87	73	53	35	24	25	48	69	85	94	97
16°	97	88	73	55	36	28	25	48	68	83	93	96
18°	97	88	74	57	39	31	25	48	67	82	92	95
20°	97	88	75	58	42	34	24	47	67	81	91	94
22°	97	89	75	59	45	37	24	46	66	80	89	93
24°	97	89	76	61	47	41	23	46	65	79	88	91
26°	97	89	77	63	50	44	23	45	64	78	87	90
28°	97	90	78	65	52	47	23	44	62	76	85	88
30°	97	90	79	66	55	50	22	43	61	75	84	87
32°	98	91	80	68	57	53	22	42	60	73	82	85
34°	98	91	81	71	60	56	22	42	59	71	80	83
36°	98	92	82	71	62	59	21	40	57	70	78	81
38°	98	92	83	73	65	62	20	39	56	68	76	79
40°	98	92	84	75	67	64	20	38	54	66	74	77
42°	98	93	85	77	69	67	19	37	53	64	72	74
44°	98	93	86	78	72	69	19	36	51	62	69	72
46°	98	93	87	80	74	72	18	36	49	60	67	70
48°	98	94	89	81	76	74	18	33	46	58	65	67
50°	99	95	89	83	78	77	17	32	45	56	62	64
52°	99	95	90	85	80	79	16	31	43	53	59	62
54°	99	96	91	86	82	81	15	29	42	51	57	59
56°	99	96	92	87	84	83	14	28	39	48	54	56
58°	99	96	93	89	86	85	14	26	37	47	51	53
60°	99	97	94	90	87	87	13	25	35	43	48	50

DR. YOUNG'S REFRACTIONS.

The Barometer being at 30 inches, and the *internal* Thermometer at 50, or the *external* at 47 degrees, with the correction for + 1 inch in the Barometer, and for - 1 degree in the Thermometer of Farenheit.

App. Alt.	Refr. B. 30. Th. 50°.	Diff. for + 1 B.	Diff. for - 1° Fa.	App. Alt.	Refr. B. 30. Th. 50°.	Diff. for + 1 B.	Diff. for - 1° Fa.	App. Alt.	Refr. B. 30. Th. 50°.	Diff. for + 1 B.	Diff. for - 1° Fa.
0 0	33:51	74	8:1	3 0	14:35	30	2:3	8 0	6:35	13:3	.85
5	32:53	71	7:6	5	14:19	29	2:2	10	6:28	13:1	.83
10	31:58	69	7:3	10	14 4	29	2:2	20	6:21	12:8	.82
15	31 5	67	7:0	15	13:50	28	2:1	30	6:14	12:6	.80
20	30:13	65	6:7	20	13:35	28	2:1	40	6 7	12:3	.79
25	29:24	63	6:4	25	13:21	27	2:0	50	6 0	12:1	.77
30	28:37	61	6:1	30	13 7	27	2:0	9 0	5:54	11:9	.76
35	27:51	59	5:9	35	12:53	26	2:0	10	5:47	11:7	.74
40	27 6	58	5:6	40	12:41	26	1:9	20	5:41	11:5	.73
45	26:24	56	5:4	45	12:28	25	1:9	30	5:36	11:3	.72
50	25:43	55	5:1	50	12:16	25	1:9	40	5:30	11:1	.71
55	25 3	53	4:9	55	12 3	25	1:8	50	5:25	11:0	.70
1. 0	24:25	52	4:7	4 0	11:52	24:1	1:70	10 0	5:20	10:8	.69
5	23:48	50	4:6	10	11:30	23:4	1:64	10	5:15	10:6	.67
10	23:13	49	4:6	20	11:10	22:7	1:58	20	5:10	10:4	.65
15	22:40	48	4:4	30	10:50	22:0	1:53	30	5 5	10:2	.64
20	22 8	46	4:2	40	10:32	21:3	1:48	40	5 0	10:1	.63
25	21:37	45	4:0	50	10:15	20:7	1:43	50	4:56	9:9	.62
30	21 7	44	3:9	5 0	9:58	20:1	1:38	11. 0	4:51	9:8	.60
35	20:38	43	3:8	10	9:42	19:6	1:34	10	4:47	9:6	.59
40	20:10	42	3:6	20	9:27	19:1	1:30	20	4:43	9:5	.58
45	19:43	40	3:5	30	9:11	18:6	1:26	30	4:39	9:4	.57
50	19:17	39	3:4	40	8:58	18:1	1:22	40	4:35	9:2	.56
55	18:52	39	3:3	50	8:45	17:6	1:19	50	4:31	9:1	.55
2 0	18:29	38	3:2	6 0	8:32	17:2	1:15	12 0	4:28:1	9:00	.556
5	18 5	37	3:1	10	8:20	16:8	1:11	10	4:24:4	8:86	.548
10	17:43	36	3:0	20	8 9	16:4	1:09	20	4:20:8	8:74	.541
15	17:21	36	2:9	30	7:58	16:0	1:06	30	4:17:3	8:63	.533
20	17 0	35	2:8	40	7:47	15:7	1:03	40	4:13:9	8:51	.524
25	16:40	34	2:8	50	7:37	15:3	1:00	50	4:10:7	8:41	.517
30	16:21	33	2:7	7 0	7:27	15:0	.98	13 0	4 7:5	8:30	.509
35	16 2	33	2:7	10	7:17	14:6	.95	10	4 4:4	8:20	.503
40	15:43	32	2:6	20	7 8	14:3	.93	20	4 1:4	8:10	.496
45	15:25	32	2:5	30	6:59	14:1	.91	30	3:58:4	8:00	.490
50	15 8	31	2:4	40	6:51	13:8	.89	40	3:55:5	7:89	.482
55	14:51	30	3:3	50	6:43	13:5	.87	50	3:52:6	7:79	.476

TABLE OF REFRACTIONS—*continua*.

App. Alt.	Refr. B. 30. Th. 50°.	Dif. for + 1 B.	Dif. for - 1° Fa.	App. Alt.	Refr. B. 30. Th. 50°.	Dif. for + 1 B.	Dif. for - 1° Fa.	App. Alt.	Refr. B. 30. Th. 50°.	Dif. for + 1 B.	Dif. for - 1° Fa.
o	'	"	"	o	'	"	"	o	'	"	"
14-0	3-49-9	7-70	·469	36	1-20-0	2-68	·161	66	25-9	·87	·052
10	3-47-1	7-61	·464	37	1-17-1	2-58	·155	67	24-7	·83	·050
20	3-44-4	7-52	·458	38	1-14-4	2-49	·149	68	23-5	·79	·047
30	3-41-8	7-43	·453	39	1-11-8	2-40	·144	69	22-4	·75	·045
40	3-39-2	7-34	·448	40	1-9-3	2-32	·139	70	21-2	·71	·043
50	3-36-7	7-26	·444	41	1-6-9	2-24	·134	71	19-9	·67	·040
15-0	3-34-3	7-18	·439	42	1-4-6	2-16	·130	72	18-8	·63	·038
30	3-27-3	6-95	·424	43	1-2-4	2-09	·125	73	17-7	·59	·036
16-0	3-20-6	6-73	·411	44	1-0-3	2-02	·120	74	16-6	·56	·033
30	3-14-4	6-51	·399	45	58-1	1-95	·116	75	15-5	·52	·031
17-0	3-8-5	6-31	·386	46	56-1	1-88	·112	76	14-4	·48	·029
30	3-2-9	6-12	·374	47	54-2	1-81	·108	77	13-4	·45	·027
18-0	2-57-6	5-94	·362	48	52-3	1-75	·104	78	12-3	·41	·025
19	2-47-7	5-61	·340	49	50-5	1-69	·101	79	11-2	·38	·023
20	2-38-7	5-31	·322	50	48-8	1-63	·097	80	10-2	·34	·021
21	2-30-5	5-04	·305	51	47-1	1-58	·094	81	9-2	·31	·018
22	2-23-2	4-79	·290	52	45-4	1-52	·090	82	8-2	·27	·016
23	2-16-5	4-57	·276	53	43-8	1-47	·088	83	7-1	·24	·014
24	2-10-1	4-35	·264	54	42-2	1-41	·085	84	6-1	·20	·012
25	2-4-2	4-16	·252	55	40-8	1-36	·082	85	5-1	·17	·010
26	1-58-8	3-97	·241	56	39-3	1-31	·079	86	4-1	·14	·008
27	1-53-8	3-81	·230	57	37-8	1-26	·076	87	3-1	·10	·006
28	1-49-1	3-65	·219	58	36-4	1-22	·073	88	2-0	·07	·004
29	1-44-7	3-50	·209	59	35-0	1-17	·070	89	1-0	·03	·002
30	1-40-5	3-36	·201	60	33-6	1-12	·067	90	0-0	·00	·000
31	1-36-6	3-23	·193	61	32-3	1-08	·065				
32	1-33-0	3-11	·186	62	31-0	1-04	·062				
33	1-29-5	2-99	·179	63	29-7	·99	·060				
34	1-26-1	2-88	·173	64	28-4	·95	·057				
35	1-23-0	2-78	·167	65	27-2	·91	·055				

The correction for an increase of altitude of one inch in the Barometer, or for depression of one degree in the Thermometer, is to be *added* to the tabular refraction; but when the Barometer is lower than *thirty* inches, or the Thermometer higher than 47 degrees, the correction becomes *subtractive*.

When great accuracy is required, 0-003 inch should be deducted from the observed height of the Barometer, for each degree that the Thermometer near it is above *fifty* degrees, and the same quantity added for an equal depression.

CORRECTION OF MOON'S APPARENT ALTITUDE FOR PARALLAX AND
MEAN REFRACTION.

Moon's apparent altitude.		MOON'S HORIZONTAL PARALLAX. BAROM. 30 IN. THERM. 50°.										Moon's apparent altitude.	
		54'	55'	56'	57'	58'	59'	60'	61'				
0	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	' "	0	
8	46 59	47 58	48 58	49 57	50 57	51 56	52 56	53 55	54 55	55 55	56 55	8	
10	47 56	48 55	49 54	50 53	51 52	52 51	53 50	54 49	55 49	56 49	57 49	10	
12	48 26	49 25	50 23	51 22	52 21	53 19	54 18	55 17	56 17	57 17	58 17	12	
15	48 39	49 37	50 35	51 33	52 31	53 29	54 27	55 25	56 25	57 25	58 25	15	
20	48 7	49 3	50 0	50 56	51 53	52 49	53 45	54 42	55 42	56 42	57 42	20	
24	47 9	48 4	48 59	49 54	50 49	51 44	52 38	53 33	54 33	55 33	56 33	24	
27	46 12	47 6	47 59	48 53	49 46	50 40	51 33	52 27	53 27	54 27	55 27	27	
30	45 3	45 55	46 47	47 35	48 31	49 23	50 15	51 7	52 7	53 7	54 7	30	
32	44 12	45 3	45 54	46 45	47 35	48 26	49 17	50 8	51 8	52 8	53 8	32	
34	43 17	44 7	44 56	45 46	46 36	47 25	48 15	49 5	50 5	51 5	52 5	34	
36	42 18	43 6	43 55	44 44	45 32	46 21	47 9	47 58	48 58	49 58	50 58	36	
38	41 14	42 2	42 49	43 36	44 23	45 11	45 58	46 45	47 45	48 45	49 45	38	
40	40 8	40 54	41 40	42 26	43 12	43 58	44 44	45 30	46 30	47 30	48 30	40	
42	38 59	39 43	40 28	41 12	41 57	42 41	43 26	44 11	45 11	46 11	47 11	42	
44	37 44	38 28	39 11	39 54	40 37	41 21	42 4	42 46	43 46	44 46	45 46	44	
45	37 7	37 50	38 32	39 14	39 57	40 39	41 22	42 4	43 4	44 4	45 4	45	
46	36 29	37 10	37 52	38 34	39 15	39 57	40 39	41 20	42 20	43 20	44 20	46	
47	35 50	36 31	37 11	37 52	38 33	39 14	39 55	40 36	41 36	42 36	43 36	47	
48	35 10	35 50	36 30	37 10	37 50	38 30	39 11	39 51	40 51	41 51	42 51	48	
49	34 29	35 8	35 48	36 27	37 6	37 46	38 25	39 5	40 5	41 5	42 5	49	
50	33 45	34 26	35 5	35 44	36 22	37 1	37 39	38 18	39 18	40 18	41 18	50	
51	33 6	33 44	34 21	34 59	35 37	36 15	36 52	37 30	38 30	39 30	40 30	51	
52	32 22	32 59	33 36	34 13	34 50	35 27	36 4	36 41	37 41	38 41	39 41	52	
53	31 39	32 15	32 51	33 27	34 3	34 40	35 16	35 52	36 52	37 52	38 52	53	
54	30 55	31 30	32 5	32 41	33 16	33 51	34 27	35 2	36 2	37 2	38 2	54	
55	30 11	30 45	31 19	31 54	32 28	33 3	33 37	34 11	35 11	36 11	37 11	55	
56	29 25	29 59	30 32	31 6	31 40	32 13	32 47	33 20	34 20	35 20	36 20	56	
57	28 40	29 12	29 45	30 18	30 50	31 23	31 56	32 28	33 28	34 28	35 28	57	
58	27 53	28 25	28 57	29 29	30 10	30 32	31 4	31 36	32 36	33 36	34 36	58	
59	27 7	27 37	28 8	28 39	29 10	29 41	30 12	30 43	31 43	32 43	33 43	59	
60	26 19	26 49	27 19	27 49	28 19	28 49	29 19	29 49	30 49	31 49	32 49	60	

MEASURING LINES.

In the surveys of the United States lands it is required, that the measuring chain should be two poles, or thirty-three feet in length, and containing fifty links, which must be compared with, and adjusted to the length of the *standard chain* in the Surveyor General's Office, and afterwards to be frequently compared with a standard chain kept by the surveyor for that purpose. But all the measurements, and calculations, are kept, and entered in the field book, in four pole chains, of one hundred links.

The surveyor is required to use eleven tally pins; they should be made of steel, and not more than about one foot in length, and large enough near the points, to cause them to drop perpendicularly; at

the top end of each pin, a loop or eye should be made; in which a piece of red cloth may be fixed, that they may be more readily found, when stuck among weeds, grass, &c.

In all measurements the level or horizontal length is to be taken; for this purpose, in ascending hills, banks, &c., the chain-men must let down one end of the chain to the ground, and raise the other end to a level therewith, at the *elevated end* of which a tally pin should be plumb and let fall, to ascertain the spot for setting it; and, when the surface of the ground is very steep, it may be necessary to take so much of the length of the chain as can be raised to a level, so as to obtain the true horizontal measurement.

In measuring lines, one of the eleven tally pins must be set at the starting-point, and when the remaining ten are set, it is called a tally or out, (five chains) and the forward chain-man cries "Tally, and each chain-man registers the distance by slipping a thimble or loop on a tally belt worn for that purpose. The back chain-man then comes up, and having counted, in the presence of his fellow, the tally pins which he had taken up, so that both may be assured that none have been lost, takes the forward end of the chain and proceeds to set them. Thus the chain-men alternately change places, each setting the pins that he had taken up, so that one is forward in all the odd, and the other in all the even tallies; which contributes to the accuracy of the measurement, facilitates the recollection of the distances to notable objects on the line, and renders a mistake almost impossible.

Measurements with the chain and tally-pins are often very imperfectly performed by the chain-men, and much more error is made than is generally supposed. It has been found by many trials, with as good men as can generally be obtained, that with two sets of chain-men, instructed alike in the proper manner of keeping their chain level and straight on the line, and of setting the tally-pins plumb, as well as holding the ends of the chain to them, a difference has sometimes been made of 36 links, and an average difference of 15 or 16 links to a mile, in common timbered land. But repeated measurements over the same mile, by the same chain-men, and near the same time, will generally agree within five links; yet after several months' employment in the field, a measurement of this line may not agree so nearly. Again, the same chain-men will make a different measurement to some extent, over swamps, marshes, wind-

falls and thickets, when there is snow on the ground and when there is none, in cold and in warm weather, effecting a change in the length of the chain, and by measuring fast or slow the amount of error to each would be difficult to estimate. Therefore the surveyor should keep a vigilant watch over his chain-men, and see that their duties are performed in the best manner, to counteract all these sources of error as far as practicable.

TELESCOPIC MEASUREMENT.

This method of measuring, when properly conducted, is more uniformly the same, and therefore correct, than measurements made by the chain by various chainmen. It is well adapted to measure along the shores of lakes and rivers where obstacles are frequently found of a character to prevent a good measurement with a chain, also for measuring short distances over streams, ponds, &c.

The following arrangement and method of measuring with a telescope and rod will be found very convenient for meandering rivers, lakes, &c. A good telescope must be provided, of about 16 or 18 inches in length when adjusted for use, with two parallel lines correctly set in its principal focus, forming between them, in the field view, not less than 45' of a degree. This telescope is attached to the sight of the compass with a suitable fixture for that purpose, when wanted for use. Provide a sliding-rod, such as are commonly used for taking levels for canals, railroads, &c., with two targets, one stationary at the top of the rod, the other moveable, with a vernier for the usual readings, on the lower part.

When measurements with the telescope and rod are to be made, the telescope must be attached to the compass sights and adjusted for an observation; then measure four chains from it very accurately, and place the rod at that point, with the targets facing the compass, then bring the upper line in the telescope to bear correctly on the upper target by means of the levelling screws, and adjust the moveable target to range with the lower line, then by observing accurately the distance the targets are apart on the rod, when they measure the angle formed by the parallel lines in the telescope at the given distance from the compass, the observer will have data from which a table may be readily constructed for all other distances, of which the telescope will enable the observer to view the distance between the targets accurately. It may conduce to the

correctness of this method of measuring to make observations at various distances, to test the accuracy of the table thus formed; after this, the surveyor may feel a confidence in the correctness of his measurements with the telescope and rod.

Lines run and measured by this arrangement along the shores of lakes and navigable streams are most conveniently and expeditiously done with two skiffs or canoes, or even with two light rafts, with the compass in one and the rod in the other, which can be landed at suitable points and distances apart on their shores; then, after the bearing and distance between them has been taken, the compass can be moved, with the skiff or canoe, to the position occupied by the rod, and the latter again stationed at the next suitable point, and its course and distance taken as before, and so on to the close of the survey.

In all observations, care should be taken to hold the rod at right angles to the line between it and the compass; but it is often necessary to lean the rod at right angles to this line, sometimes even to a level with the horizon; in all such cases, the telescope must be rolled in the y's to bring the parallel line at right angles to the rod.

By this method, the shores of lakes and rivers, however difficult to be measured with the chain, may be correctly meandered by course and distance, without encountering the obstacles on shore with the compass and chain.

To prevent confusion or mistake in the locality of the different stations and notable objects on the land or off the shore, a temporary map should be fully kept up with the survey, on which each object must be represented in order to furnish data for the construction of a good and correct map.

No surveyor, however, should presume to meander important surveys by this method, except he has previously made the necessary preparations, and has qualified himself by some practical experience beforehand.

TABLE

CHAINS TO FEET.—FEET TO CHAINS.

Links, 7·92 inches.—Chain, 66 feet, = 792 inches.

CHAINS INTO FEET.				FEET INTO CHAINS.			
Chains. Links.	Feet.	Chains. Links.	Feet.	Feet.	Links.	Feet.	Links.
0·1	0·66	3·0	198	0·10	0·15	10·0	15·1
0·2	1·32	4·0	264	0·20	0·30	15·0	22·7
0·3	1·98	5·0	330	0·25	0·38	20·	30·3
0·4	2·64	6·0	396	0·30	0·45	24·	36·3
0·5	3·30	7·0	462	0·40	0·60	27·	40·9
0·6	3·96	8·0	528	0·50	0·76	30·	45·4
0·7	4·62	9·0	594	0·60	0·91	33·	50·0
0·8	5·28	10·0	660	0·70	1·06	36·	54·5
0·9	5·94	20·	1320	0·75	1·13	39·	59·1
0·10	6·60	30·	1980	0·80	1·21	40·	60·6
0·20	13·20	35·	2310	0·90	1·36	42·	63·3
0·30	19·80	40·	2640	1·00	1·51	45·	68·2
0·40	26·40	45·	2970	2·0	3·0	48·	72·7
0·50	33·00	50·	3300	3·0	4·5	50·	75·7
0·60	39·60	55·	3630	4·0	6·0	51·	77·3
0·70	46·20	60·	3960	5·0	7·5	54·	81·8
0·80	52·80	65·	4290	6·0	9·1	57·	86·3
0·90	59·40	70·	4620	7·0	10·6	60·	90·9
1·00	66·00	75·	4950	8·0	12·1	63·	95·4
2·00	132·	80·	5280	9·0	13·6	66·	100·

CONVENIENT METHODS FOR MEASURING DISTANCES OVER RIVERS, LAKES, MIRY-MARSHES, ETC.; WHICH CANNOT BE MEASURED DIRECTLY WITH THE CHAIN.

It may be remarked here, that in surveying large districts of new country, many obstacles of this kind are to be expected, and are met with sometimes under many difficulties, such as the direction and swampy or thickety character of their shores, also, the annoyance felt by the presence of increasing swarms of blood-thirsty flies and moschetoës, which largely infest such shores in summer; hence the importance of the best management, and correct and expeditious methods of passing such obstacles.

The following illustrations will assist the inexperienced surveyor in the accomplishment of this object. They are given on the principle of reducing the base, whatever may be its course or courses, to

a right-angled base to the course of the line to be measured. This can be readily done if care be taken to run and measure the base, at such angles that their latitude and departure can be taken from the traverse table.

FIGURE 1.

Distance required over lake from *A* to *C*, course East,—right-angled base,—from *A* to *B* 690 links. Angle at *C* $20^{\circ} 20'$

Natural co-tangent of the angle at *C*, = 2.698525

Multiplied by base *A. B.* 690

242867250
16191150

Over lake 1862 links

1861.982250

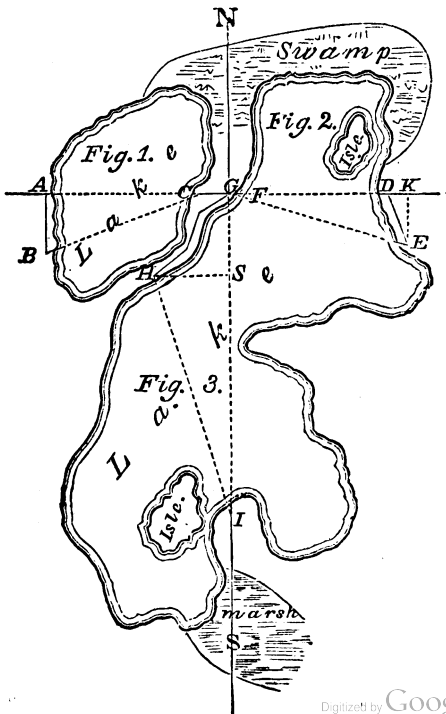


FIGURE 2.

Distance required over lake from *D* to *F*, course West.—From *D* to *E*, S. 20° E 752 links—gives 707 links southing, which is the right-angled base *K G*, and 257 links easting from *D* to *K*. Angle at *F* 15 $\frac{3}{4}$ °.

Natural co-tangent of the angle at <i>F</i>=3.545732
Multiplied by the base <i>K. E</i> ,	707
(Nat. co-tan. <i>F</i> × <i>K E</i> .)— <i>K D</i> = <i>D F</i> .	24820124
(3.545.702 × 707)=2507—257=2250.	24820124
	<hr/>
	2506.832524
Subtract distance from <i>D</i> to <i>K</i> ,	257
	<hr/>
Distance from <i>D</i> to <i>F</i> ,	2250 links nearly

FIGURE 3

Distance required over lake from *G* to *I*, course South.

To obtain a base in this example, we run

	Southing.	Westing.
S. 55 $\frac{3}{4}$ degrees, W. 400	225	331
S. 19 $\frac{1}{4}$ do W. 440	415	145
S. 50 do W. 548	352	420
	<hr/>	<hr/>
Distance from <i>G</i> to <i>S</i>	992	<i>H</i> to <i>S</i> 896 links.
Co-tangent of the angle 16° 38' at <i>I</i> ,		3.347319
Multiply by the base <i>H S</i> ,		896
		<hr/>
		20083914
		30125871
		26778552
		<hr/>
Distance from <i>S</i> to <i>I</i>		2999.197824
Add distance from <i>G</i> to <i>S</i>		992
		<hr/>
Distance over lake from <i>G</i> to <i>I</i>		3991 links.

DISTANCE OVER A RIVER BY "OFF-SET."

EXAMPLE.

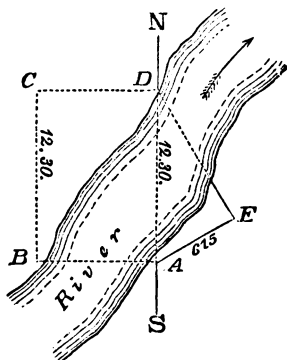


FIGURE 4.

In running a line north, intersect the right bank of a river at *A*, (course N. N. E.,) and erect an object, turn the compass sights to west, to an object at *B*, and pass over the river to it, then run and measure a line north to *C*, and "off-set" east into line at *D*, the distance between *A* and *D* will be equal to the distance between *B* and *C*. Or, if a line be run and measured from *A*, N. 60° E. until an object in line at *D* bears N. 30° W., the distance *A. D.* will be twice that of *A. E.*, for the reason that the triangle thus formed is one-half of an equilateral triangle.

Frequently off-sets are made in passing small lakes, bends of rivers, etc.: sometimes the distances can be advantageously taken over such obstacles, with the telescope and rod, (see article, Telescopic Measurement.) Also, it often happens that a suitable angle can be taken, and the base to that angle measured afterwards; in such cases the distance can be taken from the traverse table; but if no traverse, or other proper tables are at hand, the following angles, on a right angle base, and the multiplier to it, will give the distance. These may be committed to memory.

Angle 11°, 18', multiply the base by 5,

" 14, 2 multiply the base by 4,

D*

- Angle 18, 26, multiply the base by 3,
 " 21, 41, multiply the base by 2.5,
 " 26, 34, multiply the base by 2.

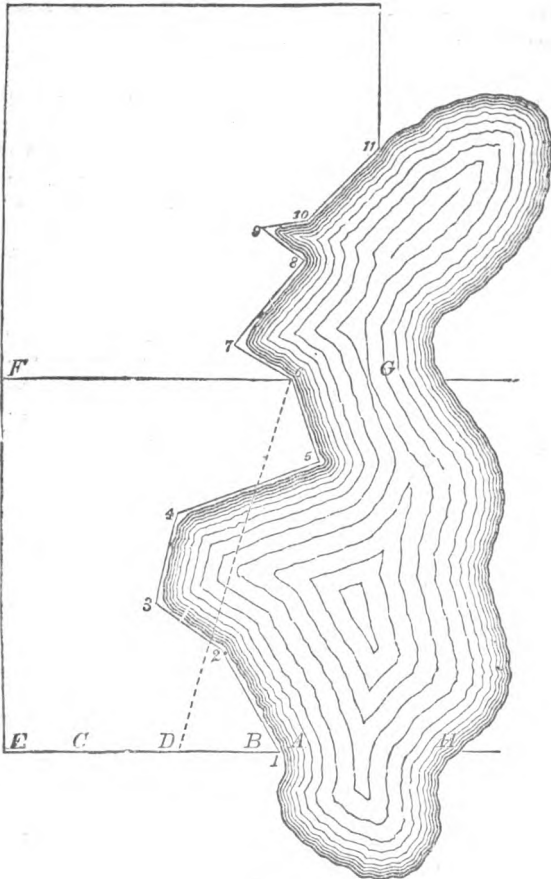


FIGURE 5

SHORT METHOD OF FINDING THE AREA OF A MULTANGULAR FIELD.

EXAMPLE, SHOWING HOW TO REDUCE THE PLOT OF A MULTANGULAR FIELD TO A FIELD OF EQUAL AREA HAVING ONLY THREE OR FOUR SIDES, BY WHICH ITS CONTENTS MAY BE READILY FOUND.

To reduce such a field the only instruments required, after the meanders are properly laid down, are a good parallel-rule,* and a fine protracting point.

In the preceding figure first extend the base EH to an indefinite length; then placing the rule on the angles 1 and 3, move it parallel from the angles 1 and 3 to the angle 2, and mark the exact point of intersection at A , on the base EH . Now place the rule on A and the angle 4, then move it parallel to the angle 3, finding the point B on the base EH ; place the rule on B and the angle 5, and move, parallel, to the angle 4, finding the point C on the base EH . Now place the rule on the point C , and the terminating point 6 on the line FG , and move the rule, parallel, to the angle 5, finding the point D on the base EH , from which point draw a line to 6, the process then being complete. The line $D6$ thus drawn leaves the same area of lake to the left, that there is of land to the right.

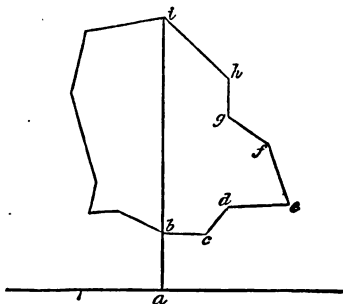


FIGURE 6.

Any figure may be calculated upon the same principle by drawing a base and erecting a perpendicular line from it, passing through

*The triangle and the rule are the best.

the figure. Place the rule at *a* and *c*, then move, parallel, back to *b*, marking the point 1 on the base; then from 1 to *d*, and move forward to *c* and so on to the angle at *i*, leaving a triangle to the right of the perpendicular. Proceed in like manner with that portion of the figure to the left of the perpendicular line, throwing it into two triangles.

CROSSING RIVERS AND LAKES.

In connexion with convenient methods of measuring distances over lakes and rivers, it is proper to take notice of the means employed, by the most experienced surveyors, for the transit of the surveying party over such waters, when fording them, or travelling around their shores, is impracticable, or causes too much delay.

For this purpose floats or rafts made of logs, of the most dry and buoyant timber at hand is used, and when formed into a raft, its length should be about four times its breadth; with this proportion the raft will steer better, and pass through the water with more ease and expedition, than broad and short rafts.

The following is a safe and expeditious method of constructing these floats:—At a convenient place lay two skids, at a suitable distance apart, parallel to the shore, and near to the water, place on these two logs, twenty feet long and one foot diameter, which are to be the outside logs of the raft, and at about two or three feet from the ends of these, make with an axe a *dovetail* notch three or four inches deep, and about as wide on their upper sides; then fit into these notches a cross piece, or tie of a suitable size, and wedge them there firmly, so that these logs will not be separated on the water; then before or after launching this into the water, as convenience may suggest, fill in underneath the cross pieces, between the outside logs, with smaller timber of the same length, and tie them to these pieces, or fasten them by means of a dovetail notch. For crossing deep water, where poles cannot be used, paddles, or oars will be needed; they can be split out of a log and hewn into the proper shape in a few minutes.

With the whole force of the surveying party, it will require from one to two hours to construct a raft of a sufficient size to pass them all over a lake or river at one time.

RUNNING LINES WITH THE SOLAR COMPASS.

In commencing a survey where the latitude, as given by the instrument with which the survey is to be made, is unknown, the surveyor should first determine the latitude of his commencing point. He should remember, that in running any other than an east and west line, he is continually changing his latitude, so that every ninety-two chains and thirty links, of northing, or southing, will change his latitude one minute of a degree, or $5' 12''$ for six miles, and a corresponding change of latitude must be set off on the latitude arc. During the progress of a large survey, the surveyor should determine his latitude daily, if practicable, by the meridian passage of the sun, to test the correctness of the adjustments of the latitude and declination arcs.

It is equally important that the sun's declination be truly set off on the declination arc, for the time and longitude of the station, as it is that the latitude arc be truly adjusted to the latitude of the place of observation.

The following method of preparing the sun's declination, as taken from the Nautical Almanac, for daily use, in any longitude, will be found useful in practice:

EXAMPLE.

To calculate the sun's declination for all hours of the daytime for May 11th, 1854, in latitude 42° N., longitude 120° W., or eight hours before noon, local time, corresponding to Greenwich noon.

12 h. — 8 h. = 4 h. A. M., at the place of observation.

Sun's declination,	$17^\circ 52' 11''$	at Greenwich noon, as per Nautical Almanac.
Meridional refraction +	26	
	17 52 37	4 h. A. M., $17^\circ 57' 41''$ at noon.
Hourly difference +	38	38
	17 53 15	5 h. A. M., 17 58 19 1 h. P. M.
	38	38
	17 53 53	6 h. A. M., 17 58 57 2 h. P. M.
	38	38
	17 54 31	7 h. A. M., 17 59 35 3 h. P. M.
	38	38
	17 55 9	8 h. A. M., 18 0 13 4 h. P. M.
	38	38
	17 55 47	9 h. A. M., 18 0 51 5 h. P. M.
	38	38
	17 56 25	10 h. A. M., 18 1 29 6 h. P. M.
	38	38
	17 57 3 11 h. A. M.,	18 2 7 7 h. P. M.
	38	38
	17 57 41 12 h. M.,	18 2 45 8 h. P. M.

To calculate the sun's declination for August 25th, 1854, for all hours of the daytime, in latitude 45° N., longitude 90° W., or six hours before noon, local time, corresponding to Greenwich noon.

12 h.—6=6 h A. M., at the place of observation.

Sun's declination N.,	$10^{\circ} 48' 12''$		$10^{\circ} 44' 31''$	11 h. A. M.
*Meridional refraction+	39		52	
	10 48 51	6 h. A. M.,	10 43 39	12 h. M.
*Hourly difference—	52		52	
	10 47 59	7 h. A. M.,	10 42 47	1 h. P. M.
	52		52	
	10 47 7	8 h. A. M.,	10 41 55	2 h. P. M.
	52		52	
	10 46 15	9 h. A. M.,	10 41 3	3 h. P. M.
	52		52	
	10 45 23	10 h. A. M.,	10 40 11	4 h. P. M.
	52		52	
	10 44 31	11 h. A. M.,	10 39 19	5 h. P. M.

The calculations for the sun's declination for each hour of the day can be made after the preceding forms, on blank leaves placed in the field book, where they would be required through the day.

In the following table the hourly difference of the sun's declination, as given for the day, in the Nautical Almanac, will be found to the nearest second in the left hand column, and the change of declination for any number of hours to twelve, will be found against it, under the hour at the head of the columns.

This table is useful when the sun's declination is required for any number of hours up to twelve, before or in advance of Greenwich noon.

EXAMPLE.

Suppose the sun's declination is required for September 6, 1854, at 2 h. P. M., in longitude 120° W., or 8 h. in time W. of Greenwich, then $8+2=10$ hours. The sun's declination at Greenwich noon is $6^{\circ} 28' 52''$ N.; hourly difference $56''$, against this, in the above table, and under 10 hours, we find $9' 20''$, which subtract from $6^{\circ} 28' 52''=6^{\circ} 19' 32''$ for the sun's declination at the time and place required.

* The hourly difference of the sun's declination must be added when his declination is increasing, and subtracted when it is decreasing; and the meridional refraction must be added to the declination when the latitude is of the same name, and subtracted when of a contrary name. See method of finding Meridional Refraction.

TABLE OF THE INCREASE OR DECREASE OF THE SUN'S DECLINATION FOR HOURLY DIFFERENCES FROM 5'' TO 60'', AND FROM THREE TO TWELVE HOURS OF TIME.

DIFF.	3 H.	4 H.	5 H.	6 H.	7 H.	8 H.	9 H.	10 H.	11 H.	12 H.
5	15	20	25	30	35	40	45	50	55	1 00
6	18	24	30	36	42	48	54	1 00	1 06	1 12
7	21	28	35	42	49	56	1 03	1 10	1 17	1 24
8	24	32	40	48	56	1 4	1 12	1 20	1 28	1 36
9	27	36	45	54	1 3	1 12	1 21	1 30	1 39	1 48
10	30	40	50	1 00	1 10	1 20	1 30	1 40	1 50	2 00
11	33	44	55	1 6	1 17	1 28	1 39	1 50	2 1	2 12
12	36	48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24
13	39	52	1 5	1 18	1 31	1 44	1 57	2 10	2 23	2 36
14	42	56	1 10	1 24	1 38	1 52	2 6	2 20	2 34	2 48
15	45	1 0	1 15	1 30	1 45	2 00	2 15	2 30	2 45	3 00
16	48	1 4	1 20	1 36	1 52	2 8	2 24	2 40	2 56	3 12
17	51	1 8	1 25	1 42	1 59	2 16	2 33	2 50	3 7	3 24
18	54	1 12	1 30	1 48	2 6	2 24	2 42	3 00	3 18	3 36
19	57	1 16	1 35	1 54	2 13	2 32	2 51	3 10	3 29	3 48
20	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00
21	1 3	1 24	1 45	2 6	2 27	2 48	3 9	3 30	3 51	4 12
22	1 6	1 28	1 50	2 12	2 34	2 56	3 18	3 40	4 2	4 24
23	1 9	1 32	1 55	2 18	2 41	3 4	3 27	3 50	4 13	4 36
24	1 12	1 36	2 00	2 24	2 48	3 12	3 36	4 00	4 24	4 48
25	1 15	1 40	2 5	2 30	2 55	3 20	3 45	4 10	4 35	5 00
26	1 18	1 44	2 10	2 36	3 2	3 28	3 54	4 20	4 46	5 12
27	1 21	1 48	2 15	2 42	3 9	3 36	4 3	4 30	4 57	5 24
28	1 24	1 52	2 20	2 48	3 16	3 44	4 12	4 40	5 8	5 36
29	1 27	1 56	2 25	2 54	3 23	3 52	4 21	4 50	5 19	5 48
30	1 30	2 00	2 30	3 00	3 30	4 00	4 30	5 00	5 30	6 00
31	1 33	2 4	2 35	3 6	3 37	4 8	4 39	5 10	5 41	6 12
32	1 36	2 8	2 40	3 12	3 44	4 16	4 48	5 20	5 52	6 24
33	1 39	2 12	2 45	3 18	3 51	4 24	4 57	5 30	6 3	6 36
34	1 42	2 16	2 50	3 24	3 58	4 32	5 6	5 40	6 14	6 48
35	1 45	2 20	2 55	3 30	4 5	4 40	5 15	5 50	6 25	7 00
36	1 48	2 24	3 00	3 36	4 12	4 48	5 24	6 00	6 36	7 12
37	1 51	2 28	3 5	3 42	4 19	4 56	5 33	6 10	6 47	7 24
38	1 54	2 32	3 10	3 48	4 26	5 4	5 42	6 20	6 58	7 36
39	1 57	2 36	3 15	3 54	4 33	5 12	5 51	6 30	7 9	7 48
40	2 00	2 40	3 20	4 00	4 40	5 20	6 00	6 40	7 20	8 00
41	2 3	2 44	3 25	4 6	4 47	5 28	6 9	6 53	7 31	8 12
42	2 6	2 48	3 30	4 12	4 54	5 36	6 18	7 00	7 42	8 24
43	2 9	2 52	3 35	4 18	5 1	5 41	6 27	7 10	7 53	8 36
44	2 12	2 56	3 40	4 24	5 8	5 52	6 36	7 20	8 4	8 48
45	2 15	3 0	3 45	4 30	5 15	6 00	6 45	7 30	8 15	9 00
46	2 18	3 4	3 50	4 36	5 22	6 8	6 54	7 40	8 26	9 12
47	2 21	3 8	3 55	4 42	5 29	6 16	7 3	7 50	8 37	9 24
48	2 24	3 12	4 00	4 48	5 36	6 24	7 12	8 00	8 48	9 36
49	2 27	3 16	4 5	4 54	5 43	6 32	7 21	8 10	8 59	9 48
50	2 30	3 20	4 10	5 00	5 50	6 40	7 30	8 20	9 10	10 00
51	2 33	3 24	4 15	5 6	5 57	6 48	7 39	8 30	9 21	10 12
52	2 36	3 28	4 20	5 12	6 4	6 56	7 48	8 40	9 32	10 24
53	2 39	3 32	4 25	5 18	6 11	7 4	7 57	8 50	9 43	10 36
54	2 42	3 36	4 30	5 24	6 18	7 12	8 6	9 00	9 54	10 48
55	2 45	3 40	4 35	5 30	6 25	7 20	8 15	9 10	10 5	11 00
56	2 48	3 44	4 40	5 36	6 32	7 28	8 24	9 20	10 16	11 12
57	2 51	3 48	4 45	5 42	6 39	7 36	8 33	9 30	10 27	11 24
58	2 54	3 52	4 50	5 48	6 46	7 44	8 42	9 40	10 38	11 36
59	2 57	3 56	4 55	5 54	6 53	7 52	8 51	9 50	10 49	11 48
60	3 0	4 0	5 0	6 0	7 0	8 0	9 0	10 0	11 0	12 00

Observations with the solar compass for the purpose of running lines, or to determine the variation of the needle, should not be made when the sun or other celestial object is nearer than 8° , or thirty-two minutes of time from the meridian: nearer than this, the observations may not give the course required sufficiently correct for the ordinary purpose of running lines.

The best part of the year for running lines with the solar compass is the summer season, or when the latitude and the declination of the sun are both of the same name. During this portion of the year there is usually the most fair weather for work of this kind, and the sun's altitude being generally higher through most of the day, affords more frequent opportunities in the forest to adjust the instrument by the sun, to the course of the line. There are, also, more hours of the day in which the solar compass can be used; the advantages of this will be fully realized when running lines in thickly timbered land, or in hilly or mountainous districts, when their summits intervene between the instrument and the sun, until a late hour in the morning and early in the afternoon.

From the principles already given in regard to the use of the solar compass, it will be perceived, that it requires more skill to use it with facility, than it does to use the magnetic compass; therefore, the surveyor should acquire this skill, before entering upon any important survey.

More line can be run with the solar compass in a day, than with the magnetic compass in the same time, if both instruments are properly used; for the reason that it requires less time to adjust the solar compass to the course by the sun, than it does the magnetic compass by the needle.

Much experience has established the fact, that a continual line can be run independently of the needle, through heavy timbered land, without cutting away any timber, except lopping a bush occasionally, between the instrument and the sun. Therefore, lines can be correctly run through any mineral region or other country, however great the local attractions or variations may be on the magnetic needle, with an accuracy not attainable with the magnetic compass. In making the survey of new districts of country, especially where there is considerable local attraction, it is important to determine the variation of the needle frequently, and make a record of the same for future reference.

During the surveys of the mineral region of Lake Superior, it was discovered that all mineral veins in that country had an influence, more or less, on the direction of the magnetic needle, its North end being generally attracted towards the metallic vein. These indications led (and no doubt will to a greater extent in future) to the discovery of mineral veins of various kinds in that and other regions; but the influence of metallic deposits on the magnetic needle, according to their various qualities, courses, distances, depths, &c., from the instrument, are as yet imperfectly understood.

It is to be hoped that this subject *will receive, in future*, that attention which its importance requires.

These aberrations in proximity to metallic deposits, suggest to the mind that they may be caused by galvanic currents, which circulate around the earth, and become deflected out of their general course by the metallic veins being a better conductor than the surrounding medium.

Galvanic currents conducted by any metallic substance always influence the direction of the magnetic needle, and incline it toward a right angle to its course; metallic deposits may also, in connexion with the various rocks and other substances in which they are immediately enclosed, form in themselves, local galvanic batteries, of greater galvanic intensity than is generally circulating in their vicinity, and thus diffuse an influence around them at considerable distances.

If these suggestions are correct, they seem to point to metallic deposits, in connexion with other substances in which they are enclosed, as the producing cause of the galvanic currents which circulate continually around the earth, nearly at right angles to its axis.

CONVENIENT RULES FOR CORRECTING THE COURSE OF RANDOM LINES, WHEN THE CORRECTION DOES NOT EXCEED 200 LINKS TO EACH MILE.

Rule for half a mile, or forty chains.

From the number of links to be corrected in that distance, subtract one-seventh; the difference will be the number of minutes of a degree required for the correction of the course.

EXAMPLE.

Number of links to be corrected, $42 - 6 = 36'$ answer.

Rule for one mile, or eighty chains.

From half of the number of links to be corrected in that distance, subtract one seventh; the difference will be the number of minutes of a degree required for the correction of the course.

EXAMPLE.

Number of links to be corrected, $70 \div 2 = 35 - 5 = 30'$ answer.

Rule for three miles.

Divide the whole number of links to be corrected by seven; the quotient will be the number of minutes of a degree required for the correction of the course.

EXAMPLE.

Number of links to be corrected, $297 \div 7 = 42\frac{3}{7}'$ answer.

Rule for six miles.

Divide one half of the number of links to be corrected by seven; the quotient will be the number of minutes required for the correction of the course.

EXAMPLE.

Number of links to be corrected, $370 \div 2 = 185 \div 7 = 26\frac{3}{7}'$ ans.*

The distances given for corrections, in the above examples, are those for which corrections are generally made in the surveys of the public lands, and the calculation for the course of the corrected line, can generally be mentally made by the surveyor, while he is occupied in adjusting his instrument.

For other distances, when the correction does not exceed $1^\circ 45'$, divide the distance run, by the number of links to be corrected in the length of the line; the quotient will be the natural co-tangent of the correction to be applied to the random course.

In the following table, the angle of correction is given in the first column from $1'$ to $1^\circ 40'$; and against each angle the departure is given for distances *one, forty, eighty, and two hundred and forty chains, or three miles*. These distances may be reckoned as *tens, hundreds, thousands*, if the position of the decimal point in each departure be changed accordingly.

The departure under distance one chain is of course the *natural*

* The above rules are close approximations.

size of the angle; therefore, if it be multiplied by the distance run on any angle, the product is the departure.

TABLE, SHOWING THE ANGLE OF CORRECTION FOR RANDOM LINES.

Angle.	Number of links in 1 ch.	Links in 40 ch.	Links in 80 chains.	Links in 3 miles.	Angle.	Number of links in 1 ch.	Links in 40 chains.	Links in 80 chains.	Links in 3 miles.
1'	000291	1.16	2.33	6.90	51'	014835	59.34	118.68	356.04
2	000582	2.33	4.66	13.97	52	015128	60.50	121.01	363.02
3	000873	3.49	6.98	20.95	53	015417	61.67	123.34	370.01
4	001164	4.66	9.31	27.94	54	015707	62.83	125.66	376.97
5	001454	5.82	11.63	34.90	55	015998	63.99	127.98	383.95
6	001745	6.98	13.96	41.88	56	016289	65.16	130.31	390.94
7	002036	8.14	16.29	48.86	57	016580	66.32	132.64	397.92
8	002327	9.31	18.62	55.85	58	016871	67.48	134.97	404.90
9	002618	10.47	20.94	62.83	59	017162	68.65	137.30	411.89
10	002909	11.64	23.27	69.82	1. 0	017452	69.81	139.62	418.85
11	003200	12.80	25.60	76.80	1. 1	017743	70.97	141.94	425.83
12	003491	13.96	27.93	83.78	1. 2	018034	72.14	144.27	432.82
13	003782	15.13	30.26	90.77	1. 3	018325	73.30	146.60	439.80
14	004072	16.29	32.58	97.73	1. 4	018616	74.46	148.93	446.78
15	004363	17.45	34.90	104.71	1. 5	018907	75.63	151.26	453.77
16	004654	18.62	37.23	111.70	1. 6	019197	76.79	153.58	460.73
17	004945	19.78	39.56	118.68	1. 7	019488	77.95	155.90	467.71
18	005236	20.94	41.89	125.66	1. 8	019779	79.12	158.23	474.70
19	005527	22.11	44.22	132.65	1. 9	020070	80.28	160.56	481.68
20	005818	23.27	46.54	139.63	1.10	020361	81.44	162.89	488.66
21	006109	24.44	48.87	146.62	1.11	020652	82.61	165.22	495.65
22	006400	25.60	51.20	153.60	1.12	020942	83.77	167.54	502.61
23	006690	26.76	53.52	160.56	1.13	021233	84.93	169.86	509.59
24	006981	27.92	55.85	167.54	1.14	021524	86.10	172.19	516.58
25	007272	29.09	58.18	174.53	1.15	021815	87.26	174.52	523.56
26	007563	30.25	60.50	181.51	1.16	022106	88.42	176.85	530.54
27	007854	31.42	62.83	188.50	1.17	022397	89.59	179.18	537.53
28	008145	32.58	65.16	195.48	1.18	022687	90.75	181.50	544.49
29	008436	33.74	67.49	202.46	1.19	022978	91.91	183.82	551.47
30	008726	34.90	69.81	209.42	1.20	023269	93.08	186.15	558.46
31	009017	36.07	72.14	216.41	1.21	023560	94.24	188.48	565.44
32	009308	37.23	74.46	223.39	1.22	023851	95.40	190.81	572.42
33	009599	38.40	76.79	230.38	1.23	024141	96.56	193.13	579.38
34	009890	39.56	79.12	237.36	1.24	024432	97.73	195.46	586.37
35	010181	40.72	81.45	244.34	1.25	024723	98.89	197.78	593.35
36	010472	41.89	83.78	251.33	1.26	025014	100.06	200.11	600.34
37	010763	43.05	86.10	258.31	1.27	025305	101.22	202.44	607.32
38	011054	44.22	88.43	265.30	1.28	025596	102.38	204.76	614.28
39	011344	45.38	90.75	272.28	1.29	025886	103.54	207.09	621.26
40	011635	46.54	93.08	279.24	1.30	026177	104.71	209.42	628.25
41	011926	47.70	95.41	286.22	1.31	026468	105.87	211.74	635.23
42	012217	48.87	97.74	293.21	1.32	026759	107.04	214.07	642.22
43	012508	50.03	100.06	300.19	1.33	027049	108.20	216.39	649.18
44	012799	51.20	102.39	307.18	1.34	027340	109.36	218.72	656.16
45	013090	52.36	104.72	313.16	1.35	027631	110.52	221.05	663.13
46	013381	53.52	107.05	321.14	1.36	027922	111.69	223.38	670.13
47	013671	54.68	109.37	328.10	1.37	028212	112.85	225.70	677.09
48	013962	55.85	111.70	335.09	1.38	028503	114.01	228.02	684.07
49	014253	57.01	114.02	342.07	1.39	028794	115.18	230.35	691.06
50	014544	58.18	116.35	349.06	1.40	029085	116.34	232.68	698.04

TABLE OF LATITUDES AND LONGITUDES.

In the use of the Solar Compass, it is necessary to know approximately at least, the Longitude of the place where the instrument is used, for the purpose of taking out of the Nautical Almanac, the Sun's declination, &c., and reducing them to a time, and Longitude of the place of observation.

For this purpose, the following tabular statement of the latitude, and longitude from the meridian of Greenwich, of some of the most important places, in North America, are given.

PLACES.	LATITUDE NORTH.			LONGITUDE WEST.			
				In Degrees.		In Time.	
	°	'	"	°	'	"	H. M. S.
Acapulco, Mex.,	16	50	19	99	49	9	6 39 16
Albany, (Capitol.) N. Y.,	42	39	3	73	44	49	4 54 59
Amherst, (College.) Mass.,	42	22	15	72	31	28	4 50 6
Apostle Islands, (Lake Superior,)	47	00		91	00		6 4
Augusta, (State House,) Me.,	44	18	43	69	50	4	4 39 20
Baltimore, (Monument,) Md.,	39	17	48	76	36	39	5 6 26
Bellevue, (Am. Fur. Cos.' Trading Post, Missouri River,)	38	8	24	95	47	46	6 23 11
Boston, (State House,) Mass.,	42	21	27	71	3	30	4 44 14
Brazos Santiago, Texas,	26	6	0	97	12		6 28 48
Brent's Fort,	38	2	38	103	33	15	6 54 13
Burlington, N. J.,	40	4	51	74	52	37	4 59 30
Burlington, Vt.,	44	27		73	10		4 52 40
Cape Hancock, (Mouth of Columbia River,) Oregon,	46	16	35	124	1	45	8 16 7
Charleston, (St. Mich.'s Ch.,) S. C.,	32	46	33	79	55	38	5 19 42
Chicago, Ill.,	42	00	00	87	35		5 50 2
Columbus, Ohio,	39	57	00	83	3		5 32 12
Concord, (State House,) N. H.,	43	12	29	71	29		4 45 56
Dalles of the Columbia Missionary Station, O. T.,	45	35	55	120	55		8 3 40
Detroit, (St. Paul's Church,) Mich.,	42	19	45	83	2	30	5 32 10
Dover, Del.,	39	10		75	30		5 2 0
Ewing Harbour, O. T.,	42	44	22	124	28	52	8 33 55
Falls of St. Anthony, U. S. Cottage, Wash. Ter.,	44	58	40	93	10	30	6 12 42
False Dungeness Bay, Oregon,	48	7	52	123	27	21	8 13 49
Fort Boise,	43	49	22	116	47	3	7 47 8
Fort Gibson, (Old Block House,)	35	47	35	95	15	10	6 21
Fort Hall,	43	1	30	112	29	54	7 29 59
Fort Laramie,	42	12	10	104	47	43	6 59 11
Fort Leavenworth, (Landing,)	39	21	14	94	44		6 18 56
Fort Nez Perce, O. T.,	46	3	46				
Frankfort, Ky.,	38	14		84	40		5 33 40
Frederickton, N. B.,	46	3		66	45		4 27
Galveston, (Court House,) Texas,	29	18	14	94	46	34	6 19 6
Granite Island, (Lake Superior,)	46	40		87	30		5 50
Great Salt Lake, Island in,	41	10	42	112	21		7 29

PLACES.	LATITUDE NORTH.	LONGITUDE WEST.		
		In Degrees.		In Time.
	° ' "	° ' "	H. M. S.	
Halifax, N. S., . . .	44 39 20	63 36 40	4 14 26	
Harrisburg, Pa., . . .	40 16	76 50	5 7 20	
Indianapolis, Ind., . . .	39 55	86 5	5 44 20	
Jackson, Miss., . . .	32 23	90 8	6 00 32	
Jefferson, Mo., . . .	38 36	92 8	6 8 32	
Kansas River, Mouth of,	39 6 3	94 33	6 18 11	
Key West Light, Fla., . . .	24 33	81 48	5 27 12	
Keweenau Point, Lake Superior,)	47 30	88 30	5 54	
Kingston, C. W., . . .	44 8	76 40	5 6 40	
Little Rock, Ark., . . .	34 40	92 12	6 8 48	
Mexico, (City of), Mex., . . .	19 25 45	99 5 6	6 36 20	
Milledgeville, Ga., . . .	33 7 20	83 19 45	5 33 19	
Milwaukee, Wisc., . . .	43 3 45	87 57	5 51 48	
Mouth of Missouri River,	38 51 36	90 00 40	6 00 3	
Mobile, Ala., . . .	30 41 26	88 1 29	5 56 2	
Monterey, Mex., . . .	25 40 13	100 25 36	6 41 42	
Montpellier, Vt., . . .	44 17	72 36	4 50 24	
Montreal, C. E., . . .	45 31	73 35	4 54 20	
Nebraska, or Platte River, Junction of North and South Forks,	41 5 5	101 21 24	6 45 25	
New Orleans, (City Hall,) La., . . .	29 57 30	90	6	
Pittsburg, Pa., . . .	40 32	80 2	5 20 8	
Point Conception, Cal., . . .	34 26 56	120 25 39	8 1 42	
Point Hudson, Wash. T., . . .	48 7 3	122 44 33	8 10 58	
Prairie du Chien, Am. Fur Co.'s House,	43 3 6	91 9 19	6 4 37	
Quebec, (Citadel,) C. E., . . .	46 49 12	71 16	4 45 4	
Richmond, (Capitol,) Va., . . .	37 32 17	77 27 28	5 9 50	
Sacramento City, Cal., . . .	38 34 42	120 nearly.	8	
Sackett's Harbour, N. Y., . . .	43 55	75 57	5 3 48	
St. Paul's, Min., . . .	44 52 46	93 4 54	6 12 19	
St. Vrain's Fort, Indian Ter., . . .	40 16 52	105 12 23	7 48 1	
Sau Francisco, (Presidio,) Cal., . . .	37 47 35	122 26 15	8 9 45	
Santa Fe, N. M., . . .	35 41 6	106 1 22	7 4 5	
Scarboro Harbour, Wash T., . . .	48 21 49	124 37 12	8 18 29	
Snake River, above Amer. Falls,	42 47 5	112 40 13	7 30 41	
Springfield, Ill., . . .	39 48	89 33	5 58 12	
Tallahassee, Fla., . . .	30 23	84 36	5 38 24	
Toronto or York, (Observ.,) C. W., . . .	43 39 35	79 21 30	5 17 26	
Tuscaloosa, Ala., . . .	33 12	87 42	5 50 45	
Washington, (Capitol,) D. C., . . .	38 53 34	77 1 30	5 8 6	
York, Me., . . .	43 10 0	70 40	4 42 40	

The latest and best maps of North America show the longitude of all places within its boundary sufficiently near for the purpose of reducing the sun's declination to their meridians.

E *

LENGTHS IN NAUTICAL MILES AND STATUTE MILES OF DEGREES OF
LATITUDE AND LONGITUDE IN DIFFERENT LATITUDES.

DEGREE OF THE PARALLEL.			DEGREE OF THE MERIDIAN.		
Latitude of Parallel.	Nautical miles.	Statute miles.	Latitude of middle point.	Nautical miles.	Statute miles.
20°	56-404	65-018	20°	59-664	68-777
21	56-039	64-598			
22	55-657	64-158			
23	55-258	63-698			
24	54-843	63-219			
25	54-411	62-721	25	59-706	68-825
26	53-962	62-204			
27	53-497	61-668			
28	53-016	61-113			
29	52-518	60-540			
30	52-005	59-948	30	59-749	68-875
31	51-476	59-338			
32	50-931	58-709			
33	50-370	58-063			
34	49-794	57-399			
35	49-203	56-718	35	59-796	68-929
36	48-597	56-019			
37	47-976	55-304			
38	47-341	54-571			
39	46-690	53-822			
40	46-026	53-056	40	59-847	68-987
41	45-348	52-274			
42	44-654	51-476			
43	43-949	50-662			
44	43-230	49-833			
45	42-497	48-988	45	59-890	69-048
46	41-752	48-128			
47	40-993	47-254			
48	40-222	46-365			
49	39-439	45-462			
50	38-643	44-545	50	59-951	69-108

A degree of longitude at the equator = 69-163 statute miles.

A second of time at the equator = 1521-6 feet.

RUNNING PARALLELS OF LATITUDE.

Parallels of latitude are curved lines, and they increase in curvature from the equator to the poles, and cross all meridians at right angles. All lines run at any angle from the meridian, by courses taken at short intervals, partake more or less (according to the angle) of the curvature of parallels of latitude.

When the compass is set to a true east and west course, in any latitude, the line of sight is at right angles to the meridian, and in consequence of the spheroidal figure of the earth, which causes the curvature of the parallels of latitude, this line of sight will converge

or the equator. Some correction is therefore due to each course taken between stations, to keep the line on the same parallel of latitude. This correction, however, is too small to make any material error in tracing the parallel, if the stations are not more than 30'' of longitude apart; but if larger than this, the convergency on the equator should be computed for the distance, and allowed on the side towards the pole. But a more convenient and practical method of running parallels of latitude, or lines at any angle from the meridian, is to back sight on each forward sight, and take half the difference between their courses, when large enough to be perceptible. Thus, the forward and back sights, give double the amount of curvature between the two stations, the one half of which must be set off at the end of the forward sight toward the pole, to keep the line on the same parallel of latitude. Any unusual difference between two equal stations, must be re-examined, and errors corrected if any, as the line advances.

A line run west six miles, or more, with long stations between sights, cannot be retraced by running east in the same manner, for the east line will fall towards the equator; therefore attention should be given to this subject in running the east and west lines of the public lands, when long distances are taken between stations over water, prairies, or open lands.

When running a parallel of latitude, if an object be observed due east or west from any station, the correction of the course to touch the same parallel on the meridian of the object, is equal to one half of the angle of convergency between the two meridians, which pass through the station and the object.

The following table will show the convergency of *six miles apart* on the parallel of each degree of latitude, and *six miles* from them towards the poles of the earth.

TABLE.

Parallel of Latitude.	Links of Convergency.	Angle of Convergency.	Parallel of Latitude.	Links of Convergency.	Angle of Convergency.	Parallel of Latitude.	Links of Convergency.	Angle of Convergency.
0		/' "	0		/' "	0		/' "
10	15.0	1.4	27	36.9	2.38	44	70.1	5.01
11	15.7	1.7	28	38.6	2.46	45	72.6	5.12
12	16.5	1.11	29	40.2	2.53	46	75.2	5.23
13	17.3	1.14	30	41.9	3.0	47	77.8	5.34
14	18.2	1.18	31	43.6	3.7	48	80.6	5.46
15	19.4	1.23	32	45.4	3.15	49	83.5	5.59
16	20.7	1.29	33	47.2	3.23	50	86.5	6.12
17	22.0	1.34	34	49.1	3.31	51	89.7	6.25
18	23.4	1.40	35	50.9	3.39	52	93.0	6.40
19	24.9	1.47	36	52.7	3.46	53	96.4	6.55
20	26.5	1.54	37	54.7	3.55	54	100.0	7.10
21	27.8	1.59	38	56.8	4.4	55	103.7	7.26
22	29.3	2.6	39	58.8	4.13	56	107.6	7.43
23	30.8	2.12	40	60.9	4.22	57	111.8	8.00
24	32.3	2.19	41	63.1	4.31	58	116.2	8.19
25	33.8	2.25	42	65.4	4.41	59	120.9	8.40
26	35.4	2.32	43	67.7	4.51	60	125.7	9.00

EXPLANATION AND USE OF THE ABOVE TABLE.

To find the convergency and angle for the fractional parts of each degree of latitude, increase the convergency and angle, in proportion to the fractional part required. The convergency of equal lengths of meridians with same latitude are in proportion to their distance apart.

The convergency between any two meridians, whose lengths are equal to their mean distance apart, is in proportion to the square of the distance given in the table (six miles) to the square of the length required.

EXAMPLE.

Suppose it is required to find the convergency of two meridians three miles in length and three miles apart, in latitude 42° (6^2): $65.4 :: 3^2 : 16.35$ links.

Suppose a station in latitude 42° N. an object is observed due east eight miles distant; how far north of the object is the same parallel of latitude, of the station from which the observation is made? Proceed as in the above example. $36 : 65.4 :: 64 : 116.27$. One half of which is 58,14 links nearly, answer. (See rule preceding the above table.) If the angle be required that would touch the same parallel

north of the object, it will be given by the following proportion; $6 : 4' 41'' :: 8 : 6' 14''$. One half of which is $3' 7''$ or N. $89^\circ 56' 53''$ E.*

CONVERGENCY OF MERIDIANS.

RULE.—As the cosine of any given latitude is to a given distance of longitude, in that latitude, so is the cosine of any other latitude, to the distance of a corresponding longitude; the difference of these numbers will be the convergency.

EXAMPLE.

Required the convergency of two range lines that are 6 miles or 480 chains apart, in latitude $42^\circ 30'$ north, and extending north ten townships, or to latitude $43^\circ 21' 48''$.

As cosine of lat. $42^\circ 30'$ = 9.867631
 : Longitude 480 chains, = 2.681241
 :: Cosine of lat. $43^\circ 21', 48''$ = 9.801543

—————
 12.542784
 9.867631
 —————

: Log. - - 2.675153 = 473.32 subtract
 from 480. chains = 6.68 chains. The convergency.

TO RUN A LINE PARALLEL TO A GIVEN MERIDIAN, AT ANY DISTANCE EAST OR WEST OF IT.

Find the angle of convergency between the meridians for the distance required, then run the line at the angle thus found, east or west of the meridian as the case requires.

AMPLITUDE OF CELESTIAL OBJECTS.

All heavenly bodies will rise and set to the north, or to the south of the east and west points of the horizon, as their declination may be north or south.

In consequence of the horizontal refraction of celestial objects, the proper time of taking their amplitude is when their centers appear about $33'$ above the horizon.

TO FIND THE AMPLITUDE.

To the Log, secant of the latitude (rejecting its index,) add the Log-sine of the sun's or star's declination; the sum will be the Log-

* The preceding rules are close approximations to the truth.

sine of the course, the sun or star will rise or set from the east or west point.

EXAMPLE.

Latitude $42^{\circ} 45'$ Log. secant,	.134113
Declination $15^{\circ} 10'$ Log. sine,	9.417684
	<hr/>
Log sine of Amplitude,	9.551797 = $20^{\circ} 52'$.

PROBLEMS.

TO FIND THE TIME OF THE SUN RISING OR SETTING.

RULE.—To the tangent of the latitude, add the tangent of the sun's or star's declination, and subtract radius from their sum; the remainder is the cosine of the semi-diurnal arc, when the latitude and declination are of different names; and of the semi-nocturnal arc, when both are of the same name.

EXAMPLE.

Sun's decl. $18^{\circ} 20'$ Tangent =	9.520305
Latitude $41^{\circ} 50'$ Tangent =	9.951896
	<hr/>
	19.472201
Subtract radius	10.000000
	<hr/>
Cosine	9.472201 = $72^{\circ} 45'$ or 4h. 51min.

Apparent time of sunrise when the latitude and declination are of the same name, or sunset when they are of different names.

TO FIND THE ANGLE THAT THE EQUATORIAL LINES OF THE SOLAR COMPASS, MAKE WITH THE HORIZON IN ANY LATITUDE, WHEN OBSERVING A CELESTIAL OBJECT, AT ANY HOUR ANGLE FROM THE MERIDIAN.

RULE.—As radius is to the cosine of the latitude, so is the sine of the hour angle of the celestial object, to the sine of the angle of the equatorial lines with the horizon.

EXAMPLE.

As radius,	10.000000
: Cosine of lat. $42^{\circ} 30'$	= 9.867631
:: Sine of H'r angle $30^{\circ} 00'$	= 9.698970
	<hr/>
: Sine of angle	= 9.566601 = $21^{\circ} 38'$ nearly.

TO FIND THE AZIMUTH OF THE POLE STAR AT THE TIME OF ITS GREATEST ELONGATION.

RULE.—As cosine of the latitude, is to radius, so is the cosine of the declination, to the sign of the azimuth or elongation.

EXAMPLE.

Latitude $40^{\circ} 20'$, declination of the pole star, January 1st, 1854, $88^{\circ} 82' 7''$.

As cosine of lat. $40^{\circ} 20'$	=	9.882121
: Radius		10.000000
:: Cosine of Decl. $88^{\circ} 32' 7''$	=	8.407727
		18.407727
		9.882121
: Sine of azimuth		$8.525606 = 1^{\circ}, 55', 20''$.

TO FIND THE MOON'S PARALLAX IN ALTITUDE, AND TO REDUCE IT TO THE QUANTITY TO BE SUBTRACTED FROM HER DECLINATION WHEN HER LATITUDE IS OF THE SAME NAME, AND ADDED TO IT, WHEN OF A CONTRARY NAME.

RULE.—As radius is to the sine of horizontal parallax, so is the cosine of altitude to the sine of parallax in altitude: subtract the refraction in altitude and the meridional refraction; take the proportional part of this difference from table of proportional parts of refraction, and apply it to her declination as above named.

EXAMPLE.

As Radius,	=	10.000000
: Sine horizontal parallax $58'$	=	8.227134
:: Cos. altitude 36°	=	9.907958
		8.135092
: Sine parallax in altitude,	=	$46', 55''$
Refraction in altitude, $1' 20''$		$-2' 8''$
Meridional refraction, $48''$		$44' 47''$
$2' 8''$		proportional part in latitude
		36° at 3h. from the meridian,
		$82 = 36', 43''$ to be applied
		to the Moon's declination

HOW TO FIND THE MERIDIONAL REFRACTION OF CELESTIAL OBJECTS
IN ANY LATITUDE.

EXAMPLE.

In latitude 42° N., $90^{\circ} - 42 = 48^{\circ}$,
Sun or star's declination north, $+ 15^{\circ} 30'$

The meridional altitude is $63^{\circ} 30'$.

The refraction of which is $29''$, (see table of refraction.)

SECOND EXAMPLE.

In latitude 38° N., $90^{\circ} - 38 = 52^{\circ} 00'$.
Declination south, $- 10^{\circ} 15'$.

The meridional altitude is $41^{\circ} 45'$.
the refraction of which is $1' 5''$

BAROMETER.

In view of the many hilly and mountainous districts yet to be surveyed, and their chorographical and geological characters defined, as well as for other purposes, the following table and theorems as given by Sir George Shuckburgh, will show in what manner the barometer is used for ascertaining the height of Mountains, Hills, &c.*

Thermometer.	Factor.	Thermometer.	Factor.	Thermometer.	Factor.
30	864.4	47	900.2	64	936.1
31	866.5	48	902.3	65	938.2
32	868.5	49	904.5	66	940.3
33	870.6	50	906.6	67	942.4
34	872.7	51	908.7	68	944.5
35	874.9	52	910.8	69	946.7
36	877.0	53	913.0	70	948.8
37	879.1	54	915.1	71	950.9
38	881.3	55	917.2	72	953.0
39	883.4	56	919.3	73	955.1
40	885.4	57	921.4	74	957.2
41	887.5	58	923.5	75	959.3
42	889.6	59	925.6	76	961.4
43	891.7	60	927.7	77	963.5
44	893.8	61	929.8	78	965.6
45	896.0	62	931.9	79	967.7
46	898.1	63	934.0	80	969.9

DEPRESSION OF MERCURY IN GLASS TUBES, OR CORRECTIONS TO BE ADDED FOR CAPILLARY ATTRACTION.

Diameter of Tube,	INCHES.				
	0. 25	0. 30	0. 40	0. 45	0. 60
Correction, . . .	0.020	0.015	0.007	0.005	0.002

* To perform this operation accurately, two persons should take contemporary observations with two barometers and thermometers, the one at the bottom of the hill, and the other at the top.

RULE.—The difference between the two barometers at the bottom and top of the mountain, multiplied by the height of the barometer at the bottom of the mountain; and that product by the tabular difference corresponding to the mean of the thermometers, and divided by the mean between the readings of the barometers, will equal the amount of elevation in feet.

EXAMPLE.

Suppose the barometer at the bottom of the mountain to stand at 30 inches, thermometer 60°; and the barometer at the top 26.36 inches, thermometer 46°; required the height of the mountain.

As per rule the mean of the two barometers = 28.18 inches, their difference = 3.64 inches; and the mean of the two thermometers = 53°. The number corresponding to 53° in the table is 913.0, hence $(3.64 \times 30 \times 913.0) \div 28.18 = 3537.92$ +. The height of the mountain.

The following are extracts from the remarks of the late eminent Dr. Halley:—

“In calm weather, when the air is inclined to rain, the mercury is commonly low.

“In serene, good weather, the mercury is generally high. Upon very great winds, though they be not accompanied with rain, the mercury sinks lowest of all, with relation to the point of compass the wind blows upon.

“In calm frosty weather, the mercury generally stands high.

“Within the tropics, and near them, there is very little or no variation of the height of mercury in all weathers.

“The greater height of the barometer, is occasioned by two contrary winds blowing towards the place of observation, whereby the air of other places is brought thither and accumulated.”

In regard to the course of winds, and their effect on the barometer and weather, they are variable in different countries, and therefore omitted here.

Extracts from a Manual published by J. H. Belville of the Royal Observatory of Greenwich.

“Heat and moisture are the principal causes of the variations in the weight of the atmosphere, and necessarily in the variations in the barometer at the same station.”

“The variations of the barometer, are less within the tropics, than in the temperate and polar regions; they vary in different

countries in the same latitude, and they are greater in mountainous countries, and islands. In Peru, the range of the mercury is about one-third of an inch—in London two and a half inches, and in St. Petersburg, it exceeds three inches.”

“It is not so much the *absolute* height, as the actual rising and falling of the mercury, which determines the kind of weather likely to follow.”

“Great depressions at all seasons are followed by change of wind, and by much rain.”

“Rain in some quantity may fall with a high pressure, provided the wind be in any of the northerly points.”

“No great storm ever sets in with a steady rising barometer.”

“The variations of the barometer, are always greater in the winter than in the summer.”

“Sudden depressions of the barometer, sometimes occur in weather apparently calm. It is almost an established fact, that storms have a circular motion; and, if when an exhaustion, or sudden diminution of the atmosphere takes place, the mercurial column happens to be in the partial vacuum or centre of motion, the air will be at rest; while the surrounding air at a greater distance from the centre, will be violently agitated with a less fall of the barometer.”

N. B.—In all observations for this purpose, the rise and fall of the mercury should be reckoned from its mean height at whatever elevation the station may be above the sea level.

ANEROID BAROMETER.

The Aneroid Barometer is a new instrument for ascertaining the variations of the atmosphere: its action depends on the effect produced by the pressure of the atmosphere on a metallic box, from which the air has been exhausted and then hermetically sealed: the hand of the Aneroid can be set to correspond with the mercurial barometer, by which it should be compared by turning a screw on its back-side. This screw when turned with, or against the sun, alters the position of the hand, *and is not to be touched for any other purpose.*

There is another gilt hand, called the register or index, which moves above the other by a nut or thumb piece which projects through the centre of the glass, to enable the observer to register the barometer hand, by which to refer its movement for another time, or in ascending or descending hills, &c.

The Aneroid Barometer can be carried and used through any country

with about the same safety as a watch, and is, therefore, the most suitable barometer of any now in use, for measuring the height of hills and mountains, in new countries.

The corrections for temperature for the Aneroid, are seldom precisely the same as for the mercurial barometer; but the quantity necessary for thermometrical correction can be readily found, by exposing the instrument to the temperature of the external air for twenty or thirty minutes, and set the hands coincident, then place it near the fire until the thermometer is at ninety or a hundred degrees; the variation of the hand, divided by the variation in degrees of the thermometer, will give the quantity for each degree.

MEASUREMENTS OF HEIGHTS WITH THE BAROMETER.

The following table, being an extract from the elaborate table of W. Galbraith, A. M., furnishes another expeditious method for this purpose.

In this table, the third column exhibits numbers in English feet, corresponding to the height of the barometer (shown on its left,) in inches, tenths, and hundredths, the proportional parts to thousandths are given in column headed A.

BAROMETRIC TABLE.

A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.
+	28-00	27425-3	+	28-20	27611-3	+	28-40	27795-8
0-9	1	27434-6	0-9	1	27620-6	0-9	1	27805-0
1-9	2	27444-0	1-9	2	27629-8	1-8	2	27814-2
2-8	3	27453-3	2-8	3	27639-1	2-8	3	27823-4
3-7	4	27462-6	3-7	5	27648-3	3-7	4	27832-6
4-7	5	27471-9	4-6	5	27657-6	4-6	5	27841-8
5-6	6	27481-3	5-6	6	27666-8	5-5	6	27851-0
6-5	7	27490-6	6-5	7	27676-1	6-4	7	27860-2
7-5	8	27499-9	7-4	8	27685-3	7-4	8	27869-3
8-4	9	27509-2	8-3	9	27694-6	8-3	9	27878-5
+	28-10	27518-4	+	28-30	27703-7	+	28-50	27887-7
0-9	1	27527-7	0-9	1	27712-9	0-9	1	27896-9
1-9	2	27537-0	1-8	2	27722-2	1-8	2	27906-0
2-8	3	27546-3	2-8	3	27731-4	2-7	3	27915-2
3-7	4	27555-6	3-7	4	27740-6	3-7	4	27924-3
4-6	5	27564-9	4-6	5	27749-8	4-6	5	27933-5
5-6	6	27574-2	5-5	6	27759-1	5-5	6	27942-6
6-5	7	27583-5	6-5	7	27768-3	6-4	7	27951-8
7-4	8	27592-7	7-4	8	27777-5	7-3	8	27960-9
8-4	9	27602-0	8-3	9	27786-7	8-2	9	27970-1

A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.
+	28-60	27979.2	+	29-20	28521.7	+	29-80	29053.1
0.9	1	27988.3	0.9	1	28530.6	0.9	1	29061.9
1.8	2	27997.5	1.8	2	28539.6	1.8	2	29070.6
2.7	3	28006.6	2.7	3	28548.5	2.6	3	29079.4
3.7	4	28015.7	3.6	4	28557.5	3.5	4	29088.1
4.6	5	28024.8	4.5	5	28566.4	4.4	5	29096.9
5.5	6	28034.0	5.4	6	28575.4	5.3	6	29105.6
6.4	7	28043.1	6.3	7	28584.3	6.1	7	29114.4
7.3	8	28052.2	7.2	8	28593.2	7.0	8	29123.1
8.2	9	28061.3	8.0	9	28602.2	7.9	9	29131.9
+	28-70	28070.5	+	29-30	28611.1	+	29-90	29140.6
0.9	1	28079.6	0.9	1	28620.0	0.9	1	29149.3
1.8	2	28088.7	1.8	2	28628.9	1.7	2	29158.1
2.7	3	28097.8	2.7	3	28637.8	2.6	3	29166.8
3.6	4	28106.9	3.6	4	28646.7	3.5	4	29175.5
4.5	5	28115.9	4.5	5	28655.6	4.4	5	29184.2
5.5	6	28125.0	5.3	6	28664.5	5.2	6	29193.0
6.4	7	28134.1	6.2	7	28673.4	6.1	7	29201.7
7.3	8	28143.2	7.1	8	28682.3	7.0	8	29210.4
8.2	9	28152.2	8.0	9	28691.2	7.8	9	29219.1
+	28-80	28161.3	+	29-40	28700.0	+	30-00	29227.8
0.9	1	28170.4	0.9	1	28708.9	0.9	1	29236.5
1.8	2	28179.4	1.8	2	28717.8	1.7	2	29245.2
2.7	3	28188.5	2.7	3	28726.6	2.6	3	29253.9
3.6	4	28197.5	3.6	4	28735.5	3.5	4	29262.6
4.5	5	28206.6	4.4	5	28744.4	4.3	5	29271.3
5.4	6	28215.6	5.3	6	28753.3	5.2	6	29280.0
6.3	7	28224.7	6.2	7	28762.1	6.1	7	29288.7
7.2	8	28233.7	7.1	8	28771.0	7.0	8	29297.3
8.1	9	28242.8	8.0	9	28779.9	7.8	9	29306.0
+	28-90	28251.8	+	29-50	28788.7	+	30-10	29314.7
0.9	1	28260.8	0.9	1	28797.5	0.9	1	29323.4
1.8	2	28269.9	1.8	2	28806.4	1.7	2	29332.0
2.7	3	28278.9	2.7	3	28815.2	2.6	3	29340.7
3.6	4	28287.9	3.5	4	28824.1	3.5	4	29349.2
4.5	5	28296.9	4.4	5	28832.9	4.3	5	29357.8
5.4	6	28306.0	5.3	6	28841.8	5.2	6	29366.7
6.3	7	28315.0	6.2	7	28850.6	6.1	7	29375.3
7.2	8	28324.0	7.1	8	28859.4	6.9	8	29384.0
8.1	9	28333.0	8.0	9	28868.2	7.8	9	29392.6
+	29-00	28342.1	+	29-60	28877.1	+	30-20	29401.3
0.9	1	28351.1	0.9	1	28885.9	0.9	1	29409.9
1.8	2	28360.1	1.8	2	28894.7	1.7	2	29418.6
2.7	3	28369.1	2.6	3	28903.6	2.6	3	29427.2
3.6	4	28378.1	3.5	4	28912.4	3.5	4	29435.9
4.5	5	28387.1	4.4	5	28921.2	4.3	5	29444.5
5.4	6	28396.1	5.3	6	28930.0	5.2	6	29453.2
6.3	7	28405.0	6.2	7	28938.8	6.1	7	29461.8
7.2	8	28414.0	7.0	8	28947.6	6.9	8	29470.4
8.1	9	28423.0	7.9	9	28956.4	7.8	9	29479.1
+	29-10	28432.0	+	29-70	28965.2	+	30-30	29487.7
0.9	1	28441.0	0.9	1	28974.0	0.9	1	29496.3
1.8	2	28450.0	1.8	2	28982.8	1.7	2	29504.9
2.7	3	28458.9	2.6	3	28991.6	2.6	3	29513.6
3.6	4	28467.9	3.5	4	29000.4	3.4	4	29522.2
4.5	5	28476.9	4.4	5	29009.1	4.3	5	29530.8
5.4	6	28485.8	5.3	6	29017.9	5.2	6	29539.4
6.3	7	28494.8	6.1	7	29026.7	6.0	7	29548.0
7.2	8	28503.8	7.0	8	29035.5	6.9	8	29556.6
8.1	9	28512.7	7.9	9	29044.2	7.7	9	29565.2

A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.	A.	Bar. Inch.	English Feet.
+	30.40	29573.8	+	30.60	29745.0	+	30.80	29915.2
0.9	1	29582.4	0.9	1	29753.5	0.8	1	29923.7
1.7	2	29591.0	1.7	2	29762.1	1.7	2	29932.2
2.6	3	29599.6	2.6	3	29770.6	2.5	3	29940.7
3.4	4	29608.2	3.4	4	29779.1	3.4	4	29949.2
4.3	5	29616.7	4.3	5	29787.6	4.2	5	29957.6
5.2	6	29625.3	5.1	6	29796.2	5.1	6	29966.1
6.0	7	29633.9	6.0	7	29804.7	5.9	7	29974.6
6.9	8	29642.5	6.8	8	29813.2	6.8	8	29983.1
7.7	9	29651.0	7.7	9	29821.7	7.6	9	29991.5
+	30.50	29659.6	+	30.70	29830.2	+	30.90	30000.0
0.9	1	29668.1	0.9	1	29838.7	0.8	1	30008.5
1.7	2	29676.7	1.7	2	29847.2	1.7	2	30016.9
2.6	3	29685.2	2.5	3	29855.7	2.5	3	30025.4
3.4	4	29693.8	3.4	4	29864.2	3.4	4	30033.8
4.3	5	29702.3	4.3	5	29872.7	4.2	5	30042.3
5.1	6	29710.9	5.1	6	29881.2	5.1	6	30050.7
6.0	7	29719.4	6.0	7	29889.7	5.9	7	30059.2
6.8	8	29727.9	6.8	8	29898.2	6.8	8	30067.6
7.7	9	29736.5	7.7	9	29906.7	7.6	9	30076.1

EXAMPLE.

At the foot of a hill the barometer indicates 29.54 inches, then carried immediately to the top of the hill reads 28.70 inches. In the table at 29.54 we find 28824.1 feet,
at 28.70 we find —28070.5 feet,

Height of hill 753.6 feet.

To perform this operation accurately, when the interval of time exceeds ten minutes between the two *observations*, two persons should take contemporary observations, with two Aneroid Barometers, one at the foot, and the other at the top of the hill, and correct each for temperature.

SYSTEM OF SURVEYS OF THE U. S. LANDS.

The public lands of the United States are surveyed in a uniform mode established by law, by lines run by the cardinal points of the compass; the north and south lines coinciding with the true meridian, and the east and west lines intersecting them at right angles, giving to the tracts thus surveyed the rectangular form.

The public lands are laid off and surveyed, primarily, into tracts of six miles square as near as practicable, called *townships*, containing 23040 acres each. The townships are subdivided into thirty-six tracts, called *sections*, each of which is one mile square, as near as may be, and contains 640 acres. Any number, or series, of contiguous townships, situated north or south of each other, constitute a *Range*.

To obtain and preserve a convenient and uniform mode of numbering the ranges and townships, it is usual in commencing the survey of an insulated body of public lands to run, or assume two *standard lines*, as the basis of the survey to be made therein. One of these standard lines is run due north and south, and is called the *principal meridian*, to which the ranges are parallel, and from which they are numbered eastward and westward. The other standard line is run due east and west, and is called the *base line*, from which the townships are numbered, northward and southward.

To distinguish from each other, the systems, or series of surveys thus formed, the several principal meridians are designated by progressive numbers. Thus the meridian running north from the mouth of the Great Miami river, is called the *first* principal meridian: the meridian running north through the centre of the State of Indiana, is called the *second* principal meridian: that running north from the mouth of the Ohio river, through the State of Illinois, is called the *third* principal meridian: that running north from the mouth of the Illinois river, through the States of Illinois and Wisconsin, is called the *fourth* principal meridian: and that running north from the mouth of the Arkansas river, through the states of Missouri and Iowa, is called the *fifth* principal meridian.

CORRECTION LINES correct the error that would otherwise arise from the convergency of meridians, and arrest that proceeding from the inaccuracies of measurement. They are run due east and west at stated distances, generally at the end of every tenth township, and each forms a base for the townships north of it. Each range of townships should be made as much over six miles in width on each base and correction line as it will fall short of the same width where it closes, on the next correction line north, the excess or deficiency of width being always thrown into the last half mile, on all of the lines closing out to the west boundary of each township.

This mode of executing the public surveys, conduces more, perhaps, than any other which could be devised, to the simplicity, regularity, and symmetry of the work, and to the ease and certainty with which any tract may be identified.

The public lands are surveyed by Deputy Surveyors, appointed by the Surveyor General of the State or Territory, in which the district assigned to each deputy may be situated; their duties are prescribed by general and special instructions.

OF SUBDIVIDING TOWNSHIPS.

Each township is laid off and surveyed into thirty-six sections as near as may be of one mile square, by lines running north and south, crossed by others running east and west. The sections are known and designated by progressive numbers, beginning at the north-east corner of the township, and numbering westward and eastward alternately, as shown in the following diagram.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Quarter section corners are established equidistant between the section corners, except on the section lines closing on the north and west boundaries of townships, on which they are set at forty chains from the last section corner, and the excess or deficiency of measure (if any) is carried out into the last half mile, and cast upon the north and west sides of the township, as required by law. Various instructions have been given by Surveyors General, to Deputy Surveyors, for the purpose of accomplishing an equitable and lawful subdivision of townships into sections, none of which, it is believed, will effect this object better than the system adopted in 1850, by the surveyor general of Ohio, Indiana, and Michigan; by which the true course and measurement of every line is given, and the inequalities of measurement proportionally carried to every sectional line. This, together with the closing of the section lines at post on the north and west boundaries of the townships, (which were formerly closed at the intersection of the lines run to them, whether at post or not,) has much improved the symmetry and equality of the subdivision of townships.

An act of Congress of the 24th May, 1824, authorizes a departure from the ordinary mode of surveying the public land, on any river, lake, or bayou, whenever, in the opinion of the President of the United States, the public interest would be promoted thereby, so as to survey such lands, in tracts of two acres in width fronting on such river, lake, or bayou, and running back to the depth of forty acres.

ON SUBDIVIDING SECTIONS, AND RE-ESTABLISHING OF EXTINGUISHED LINES AND CORNERS: DEDUCED FROM THE ACTS OF CONGRESS, IN REGARD TO THE SURVEYS OF THE PUBLIC LANDS; AND THE CONSTRUCTIONS AND USAGES THEREON.

The general principles on which the public lands are surveyed, have already been given; but the county surveyors and purchasers of these lands, are more immediately interested in the proper method of subdividing sections into such tracts as are sold to purchasers from the United States land offices; and the re-establishing of extinct lines and corners, when from any cause they are lost or cannot be found.

In the regular surveys of the public lands, no other lines are actually run and marked by the Deputy Surveyors of the United States, than township lines, and sections, or subdivisional lines of

townships, into sections; on all of these lines, no other than section and quarter section corners are established; except meander corners at the end of all fractional section lines which close on rivers, lakes, &c.

All sections in a full township, except those which are bounded by its north and west sides, are treated as full sections in their sales and subdivisions; and also, the south half of sections on the north boundary, and the east half of sections on the west boundary of each full township, are sold and subdivided as full half sections. Section sixteen in each township is reserved for *school purposes*, and is not, therefore, subject to private entry.

From various causes (elsewhere treated of in this work) section lines do not always correctly coincide with the cardinal points; nor will their measurement in all cases be found exactly eighty chains or one mile in length. (See article on measurement with the chain.) Quarter section corners, especially in the older surveys, may not always be found equidistant between the section corners. This defect arises in most cases, it is believed, from difficult or careless measurement with the chain.

Notwithstanding such errors, all corners that can be identified by the original field notes, or other unquestionable testimony, must be regarded as the original corners, and for that purpose should be perpetuated with new posts and bearings when the old ones decay.

EXTINCT LINES AND CORNERS.

When a *Section corner* cannot be identified by the original field notes, or by clear and unquestionable testimony, run a right line between the nearest noted station trees, north and south, and east and west of the lost section corner, if there be any such trees within the distance of the nearest quarter section, or section corners; but if no station trees be found, then between the nearest quarter section or section corners, and at the point of intersection of these two lines re-establish the section corner, with new bearings from it to the nearest and most durable objects; which of course should be recorded with the survey.

Extinct Quarter Section corners, except on *fractional section lines*, if not identified as above stated for *section corners*, must be re-established equidistant between the section corners, in a right line between the nearest noted station trees each side of it, if there be

any; but if none are found, then in right line between the section corners.

Extinct Quarter Section corners, on section line, which close on the north and west boundaries of townships, must be re-established according to the original measurement thereof, at forty chains from the last interior section corner towards the township line. For an example, suppose the line between sections 3 and 4, or 18 and 19, to be 81.30 chains, according to the original survey, and by the measurement of the county survey, 80.90 chains. Then say as 81.30: 80.90:: 40.00 to = 39.81½. Thus 39 chains and 81½ links is the distance the quarter section corner must be established from the last interior section corner, according to the measure of the county surveyor.

Lost or extinct Township corners, except on correction lines, should be restored in the same manner as already given for section corners; and extinct quarter section corners on township lines, should be restored in the same manner as those on interior section lines.

In subdividing townships into sections, the section lines which close on the north and west boundaries of townships, have not always been closed at the section corners which were established on the survey of the township lines; but at such points on their boundaries, as the first lines run to them may have intersected.

Wherever this has been done on the north and west boundaries of townships, a new quarter section corner must be established, equidistant between the corners of all such irregular closing lines; for, the section and quarter section corners established on the survey of these boundaries, belong exclusively to the adjoining township. Consequently, to restore lost or extinct section corners, that were established on the north and west boundaries of townships, during their subdivisions into sections as above mentioned, the section lines closing at these corners, must be retraced to them. But to restore lost section, or quarter section corners, that were established on the original survey of the township lines, these boundaries should be carefully retraced and measured, and the lost section and quarter section corners should be re-established at their proportional distance from each other, between known corners. The only exception to this rule is, when it is clear that the section lines have been regularly run according to instructions, and can be correctly retraced to the township line. The section corners should then be re-established at such intersections.

Extinct or obliterated lines may be restored by running right lines between re-established and other known corners; except noted station trees be found between them, when the lines between corners must conform to the noted station trees.

It may be remarked here that no surveyor can legally alter or correct the original surveys. It is his duty to restore them as far as practicable to their original condition.—In making resurveys of the public lands, such directions and absolute length must be given to each line as were given to them by the original surveyor, whether the retracing, courses and measurements, agree with the original survey or not; except otherwise directed by the Surveyor General, or the Commissioner of the general Land Office.

BEARING TREES, &c.

Bearing trees, to corners, have a blaze with a notch in them near the ground and facing the corner; sometimes the letters B T are found in the blaze above or below the notch, which are the initials of Bearing Tree. Their size, kind of timber, course and distance from the corner post, is given in the field notes of the survey.

Section, and quarter section trees are "faced off" on the side towards the corner, four or five feet from the ground. The quarter section trees are marked thus $\frac{1}{4}$ S. At section corners these trees are marked with the number of the Range, Township and Section, thus, R. 24 W. T. 45 N. S. 15.* There is no note made of these trees in the field books, unless they are bearing trees also; they are marked for the purpose of giving information at the corner, of the number of the *sections* which corner there, and also, the number of the *township* and *range*. Station trees on the lines, are notched with two notches on each side in the direction of the line, and their size, kind of timber, and distance from the last section corner are given in the field notes.

SUBDIVISION LINES OF SECTIONS.

The subdivisions of whole sections into such tracts as are sold by the land officers of the United States, to purchasers of public lands, are made by running right lines between the quarter section corners, on the north and south, and east and west sides of the section; and at the intersection of these lines is established the common corner for

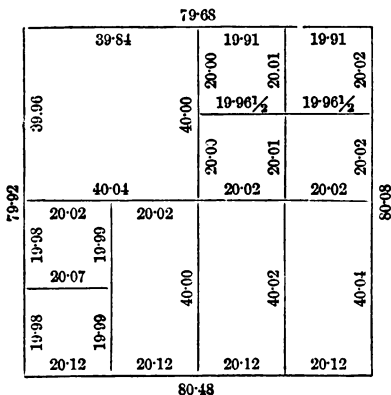
* In prairies, the posts set in mounds for corners are marked in like manner.

its four quarters, without regard to the quantity of land contained in each of them. These quarter sections are sold as containing 160 acres each, and are designated as the N. E., N. W., S. E. and S. W. quarters.

Quarter sections are divided into halves, by a north and south line, equidistant by measurement between its east and west corners. These tracts of land are supposed to contain eighty acres each, and are designated as the east and west half of the quarter section.

Furthermore a quarter section is, also, divided into quarters by lines run north and south, and east and west, equidistant between its four corners, and at the intersection of these lines at the centre of the quarter section, is established the common corner to its four quarters. These quarters of a quarter section are supposed to contain forty acres each, and are described as the N. E., N. W., S. E. and S. W. quarters of the quarter section.

The following diagram of the subdivision of a whole section, will more clearly show the method of subdividing such section.



Quarter sections adjoining the north and west boundaries of townships, are deemed to be fractional, and therefore, may contain more or less land, than is given to other quarter sections within the townships; they are sold or surveyed according to their plats in the land offices.

ON SUBDIVIDING FRACTIONAL SECTIONS.

Fractional section lines which close on meandered rivers and lakes, or on reservations, &c., are required by law to be run north and south, or east and west, as the case requires. These lines like those before mentioned in the subdivisions of townships into sections, may not precisely agree with the cardinal points of the compass.—Therefore, in subdividing fractional sections embraced by fractional section lines, which close on meandered streams, lakes, &c.; the quarter section line should be run with an intermediate course between the section lines; and the fractional quarter sections thereof, should be divided in like manner.

The subdivisions of fractional sections, are indicated on the maps of surveys, in the land offices.

AN ACT CONCERNING THE MODE OF SURVEYING THE
PUBLIC LANDS OF THE UNITED STATES.

§ I. *Be it enacted, &c.* That the Surveyor General shall cause all those lands north of the river Ohio, which, by virtue of the act entitled, "An act providing for the sale of the lands of the United States in the territory northwest of the river Ohio, and above the mouth of the Kentucky river," were subdivided, by running through the townships parallel lines, each way, at the end of every two miles, and by marking a corner on each of the said lines, at the end of every mile, to be subdivided into sections, by running straight lines, from the mile corners thus marked to the opposite corresponding corners, and by marking, on each of the said lines, intermediate corners, as near as possible equidistant from the corners of the sections of the same. And the said Surveyor General shall also cause the boundaries of all the half section, which had been purchased previous to the first day of July last, and on which the surveying fees had been paid according to law by the purchaser, to be surveyed and marked, by running straight lines from the half mile corners heretofore marked, to the opposite corresponding corners; and intermediate corners shall at the same time, be marked on each of the said dividing lines, as nearly as possible equidistant from the corners of the half section on the same line: *Provided*, That the whole expense of surveying and marking the lines, shall not exceed three dollars for every mile which has not yet been surveyed, and which shall be actually run, sur-

veyed and marked, by virtue of this section. And the expense of making the subdivisions directed by this section, shall be defrayed out of the moneys appropriated, or which may be hereafter appropriated, for completing the surveys of the public lands of the United States.

§ II. That the boundaries and contents of the several sections, half sections, and quarter sections, of the public lands of the United States, shall be ascertained in conformity with the following principles, any act or acts to the contrary notwithstanding:—1st. All the corners marked in the surveys returned by the Surveyor General, or by the surveyor of the land south of the state of Tennessee respectively, shall be established as the proper corners of sections, or subdivisions of sections, which they were intended to designate; and the corners of half and quarter sections, not marked on said surveys, shall be placed as nearly as possible equidistant from those two corners which stand on the same line. 2d. The boundary lines, actually run and marked in the surveys returned by the Surveyor General, or by the surveyor of the land south of the state of Tennessee, respectively, shall be established as the proper boundary lines of the sections, or subdivisions for which they were intended; and the length of such lines, as returned by either of the surveyors aforesaid, shall be held and considered as the true length thereof. And the boundary lines which shall not have been actually run and marked as aforesaid, shall be ascertained by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, when no such opposite corresponding corners have been or can be fixed, the said boundary lines shall be ascertained by running from the established corners, due north and south or east and west lines, as the case may be, to the water course, Indian boundary line, or other external boundary of such fractional township. 3d. Each section, or subdivision of section, the contents whereof shall have been, or by virtue of the first section of this act, shall be returned by the Surveyor General, or by the surveyor of the public lands south of the state of Tennessee, respectively, shall be held and considered as containing the exact quantity expressed in such return or returns; and the half sections and quarter sections, the contents whereof shall not have been thus returned, shall be held and considered as containing the one half, or the one fourth part, respectively, of the returned contents of the section of which they make part.

§ III. That so much of the act, entitled "An act making provision for the disposal of the lands of Indiana territory, and for other purposes," as provides the mode of ascertaining the true contents of sections, or subdivisions of sections, and prevents the issue of final certificates, unless the said contents shall have been ascertained, and a plot certified by the District Surveyor, lodged with the register, be, and the same is hereby repealed. [Approved, February 11, 1805.]

GEOLOGICAL AND TOPOGRAPHICAL IN CONNEXION WITH LINEAR SURVEYS.

GEOLOGICAL SURVEYS.

In connexion with the linear surveys of new districts of country, the surveyors have good opportunities to make geological examinations, and to collect specimens of minerals that may be discovered in the course of their work. Such specimens, when submitted to a scientific and practical geologist, will enable him to determine the true character of such new districts, and what kinds of products may be expected to be derived from them.

It is, therefore, of much importance, that surveyors of the public land should possess or acquire, at least a sufficient knowledge of geology, to enable them to make a proper collection of geological specimens; and also, to observe the character, stratifications, dip, &c., of any rocks in place, or other mineral deposits.

Such services afford pleasure and profit to the surveyors, while they contribute to the public interest, and to science. A system of surveys for this purpose has been partly tested; but while in successful progress, it was interrupted by the death of the geologist, the lamented Dr. Douglass Houghton, while he was engaged in prosecuting a geological, in connexion with the linear survey, of the south coast of Lake Superior.

This system possesses many advantages over any other that has been adopted, for obtaining a general geological knowledge of new and unsettled countries, the expense of which is trifling compared with an independent geological survey; also, such surveys are of great value when known, in directing emigrants to the country suitable for their occupation or enterprise, and thus effect an early and judicious development of its resources.

A system of linear and geological surveys may be satisfactorily prosecuted, by the appointment of a competent geologist to a clerkship in each Surveyor General's office: the Deputy Surveyors being made assistant geologists to execute the field work, under a well digested system for that purpose, who should make their report, and return their specimens to the Surveyor General, when the geologist under him can investigate such reports, and embody the whole in one connected geological report, so far as such surveys extend.

By this system, it will be seen that the position of all mineral deposits from which specimens are taken, may be precisely located by measure on the survey, and be as easily found as the various section, quarter section, and other subdivisions themselves, a consideration of much importance, which any independent geological or other system yet adopted fails to do.

TOPOGRAPHICAL SURVEYS.

The general topographical features of new districts of country are of much interest to the public, and especially to emigrants. Such surveys can be made with but little expenditure of time while the linear surveys are in progress, by a proper use of the Aneroid Barometer, for the purpose of determining on the lines, the height of hills, ledges, &c., above the valleys; (see article on the use of the Aneroid Barometer) and by observing also, the course and angle of elevation or depression of distant noticeable objects, on the summits of hills, mountains, ledges, &c., and in the valleys below them; which can be seen from two or more stations on the lines at the time they are being run. And further, when running the meanderings of the shores of rivers or lakes, bearings and angles of elevation may be also taken to conspicuous objects on islands, rocks, sand-bars, &c., which can be seen from their shores. To these observations should be added, sketches of landscapes, ledges, and whatever else may interest the inquiring mind.

Such bearings, and angles of elevation and depression, form triangles with a given base to each, which are good data for mapping, or trigonometrical calculations, to establish the course, distance, elevation or depression, from a fixed point within the survey of every object with which they are connected.*

* In making calculations for the heights of distant objects, the table for corrections for curvature and refraction, will give the number of feet to be added to their height; on the account of the difference of the apparent and true level from the point of observation.

TABLE OF CORRECTIONS FOR CURVATURE AND REFRACTION, SHOWING THE DIFFERENCE OF THE APPARENT AND TRUE LEVEL, IN FEET AND DECIMALS OF A FOOT, FOR DISTANCES IN FEET AND MILES.

Distances in Feet.	CORRECTION IN FEET.			Distances in Miles.	CORRECTION IN FEET.		
	For Curvature.	For Refraction.	For Curvature and Refraction.		For Curvature.	For Refraction.	For Curvature and Refraction.
100	·00024	·00004	·00020	1/4	·0417	·0060	·0357
150	·00054	·00008	·00046	1 1/2	·1668	·0233	·1430
200	·00094	·00013	·00083	1 3/4	·3752	·0536	·3216
250	·00149	·00021	·00128	1 3/4	·670	·0953	·5717
300	·00215	·00031	·00184	1 1/2	1·5008	·2144	1·2864
350	·00293	·00042	·00251	2	2·6680	·3811	2·2869
400	·00383	·00055	·00328	2 1/2	4·1688	·5955	3·5733
450	·00484	·00069	·00415	3	6·0030	·8561	5·1469
500	·00598	·00085	·00513	3 1/2	8·1708	1·1673	7·0035
550	·00724	·00103	·00621	4	10·6720	1·5246	9·1474
600	·00861	·00123	·00738	4 1/2	13·5468	1·9295	11·5773
650	·01010	·00144	·00866	5	16·6750	2·3821	14·2929
700	·01172	·00167	·01005	5 1/2	20·1769	2·8824	17·2945
750	·01345	·00192	·01153	6	24·0120	3·4303	20·5817
800	·01531	·00219	·01312	6 1/2	28·1809	4·0258	24·1551
850	·01728	·00247	·01481	7	32·6830	4·6690	28·0143
900	·01938	·00277	·01661	7 1/2	37·5190	5·3599	32·1591
950	·02159	·00308	·01851	8	42·6880	6·0997	36·5883
1000	·02392	·00333	·02059	8 1/2	48·1910	6·8844	41·3066
1050	·02638	·00377	·02261	9	54·0270	7·7181	46·3089
1100	·02895	·00414	·02481	9 1/2	60·1971	8·5906	51·5975
1150	·03164	·00452	·02712	10	66·7000	9·5286	57·1714
1200	·03445	·00492	·02953	11	80·7070	11·5296	69·1774
1250	·03738	·00534	·03204	12	96·0480	13·7211	82·3269
1300	·04043	·00578	·03465	13	112·7230	16·1033	96·6197
1350	·04361	·00623	·03738	14	130·7320	18·6760	112·0560
1400	·04689	·00670	·04019	15	150·0750	21·4393	128·6357
1450	·05030	·00719	·04311	16	170·7520	24·3931	146·3589
1500	·05383	·00769	·04614	17	192·7630	27·5376	165·2254
1550	·05748	·00821	·04927	18	216·1086	30·8727	185·2359
1600	·06125	·00875	·05250	19	240·7870	34·3981	206·3889
1650	·06514	·00931	·05583	20	266·8000	38·1143	228·6857
1700	·06914	·00988	·05926				
1750	·07327	·01047	·06280				
1800	·07752	·01107	·06645				
1850	·08188	·01170	·07018				
1900	·08637	·01234	·07403				
1950	·09098	·01300	·07798				
2000	·09570	·01367	·08203				

For a very close approximation.

Correction for Curvature in feet = $\frac{2 D^2}{3}$

D being distance in miles.

A useful application of a series of triangles can be made across lakes, bays, harbours, &c., commencing from a correctly measured base on or near their coasts, so connected with every point or object on their shores or within their waters, that the meanderings of their shores, and position of islands, sand-bars, soundings or other objects can be correctly delineated on a map, by course and distance from any known point of survey. A full description of the above principles with proper examples, would occupy too much space to be admitted here, but it is believed that the well qualified practical surveyor, will find but little, if any difficulty in applying these principles to any survey that may require their use.

OUTFIT FOR A SURVEYING COMPANY OF SIX MEN FOR FOUR MONTHS IN THE PUBLIC SURVEYS.

SUPPLIES OF PROVISION.

The following quantity and kinds, or a substitute for them, is generally required.

- 8 barrels of flour.
- 2½ do. of clear pork.
- 3 bushels of beans.
- 2 do. of dried apples.
- 120 lbs. of good dry sugar.
- 70 lbs. of ground coffee, or a substitute for it.
- 10 lbs. of saleratus, or its substitute.
- 1 lb. of ground pepper.
- 1 small bag of table salt.
- 25 lbs. of rice.
- 4 lbs. of Castile soap.

CAMP FURNITURE.

- 1 large tent for the surveying company.
- 1 small tent for the packmen.
- 6 Mackinaw blankets.
- 3 common blankets to spread underneath them.
- 2 dozen boxes of matches. (best kind.)
- 1 good chopping axe.
- 4 tin pails, made to fit into each other.
- 14 tin basins.
- 1 set of knives and forks. (Small size.)
- 1 butcher, or meat knife.

- 7 spoons.
- 3 light frying pans.
- 2 half round cans, made to fit inside of the pails,—for lard and saleratus.
- 2 tin pepper boxes, with covers to fit closely over the sieve.
- 6 "soldiers' drinking cups," also needles, awls, thread, twine, small cord, &c.
- 2 mixing cloths, made of heavy cotton drilling, one yard square each.
- 4 papers of 3 oz. tacks for nailing boots.

FOR PACKING, ETC.*

- 1 or 2 good horses, or mules, as circumstances require; one pack saddle; a bell and spencil for each.
- 20 stout bags, that hold one and a half bushels each.
- 4 linen bags, for pork.
- 6 small bags, for beans, dried apples, knives and forks, &c.
- 3 India Rubber bags for sugar and coffee. (Should be lined.)
- 2 strong drilling cloths, two or two and one half, yards square, to do up the camp equipage into packs; also, strap and cords, to secure the packs to the horse and saddle.

SURVEYING INSTRUMENTS, ETC.

- 1 solar compass.
- 1 case of drawing instruments.
- 1 measuring chain.
- 1 standard chain.
- 11 tally pins.
- 1 tape measure.
- 1 Telescope 16 or 18 inches in length.
- 2 marking tools.
- 2 pocket compasses.
- 2 marking axes, weighing three and a half pounds each.
- 1 hatchet, and two whetstones.
- 2 three-cornered files, for sharpening axes, &c.
- 2 small round files for sharpening marking tools. Also, field books, mapping and writing paper, ink, pens, pencils, India rubber, mouth glue, and a small valise (or box) to carry them in.

* "Packing." This word is used by surveyors of the public lands, both for making up and conveying packs.

Remarks.

Camp pails, or kettles, should be made of heavy tin, and the covers and ears riveted, where they would be likely to separate when exposed to the fire.

The most approved form of a camp pail is an elliptical, or oblong bottom, with upright sides. The largest pail should be made about nine inches in depth, and to hold twelve quarts, or more; the other three of a less size, so as to fit inside of the largest one.

The basins are made six or seven inches in diameter, and one and a half inch in depth; they serve in the place of plates, cups, soup and meat dishes, &c. The knives, forks, and spoons, should be of a small size, except one large spoon for mixing bread, &c.

Flour is mixed for bread on a cloth of cotton drilling, of about one yard square. It is done as follows:—

Spread the cloth on a blanket, folded and laid on the ground; pour enough flour upon it for a mixing, and make a hollow in it; then pour in some lard from the can, and add saleratus and salt dissolved in warm water, stirring the flour with a spoon to a proper consistency for kneading with the hand, taking care not to reach the bottom of the flour so as to wet the cloth.—Bake the loaves in the frying pans before the fire, and when done, fold the cloth, and lay it aside for future use.

TENTS.

The soldiers' tent made of good firm cotton drilling, will answer the purpose very well, in any country. The *Marquée*, however, is better in a prairie country. Another tent, much approved by some surveyors, for a timbered country, is made of good cotton drilling: when pitched, nearly resembles a little more than one half of a steep roofed building, with its share of the ends. It can be quickly pitched with poles, and crotches, by having suitable eyelets, and strings at the bottom, and at the ridge, and front. It has four or five breadths of cloth, about four and one third yards in length; the end may be made of cotton sheeting, of the form above indicated. This tent possesses the advantage of being less in weight and bulk, than any other in use among surveyors: therefore, very suitable to be used when the carrying is done by men.

CONVEYING PACKS WITH HORSES OR MULES.

The man who manages the pack horse, should be an experienced woodsman, capable of finding his way with the help of a pocket compass, to any point within the district to be surveyed, that may be designated by the surveyor.

The "sack Indian saddle" is the best in use for the purpose of packing, but pack saddles may be made in the form of those used by most of the Indian tribes. They should have attached to them a stout girt, breast strap, and breeching, and be well padded, or have a folded blanket under it, when in use.

Suitable straps with buckles should be provided, to tightly buckle around near the ends of each bag, or articles done up with a wrapper and cord, which are intended for side packs. Before buckling these straps, a loop made of strong cord about ten inches long, should be slipped on to each; after buckling the straps, these loops will be hitched over the horns of the saddle, and wound around them if too long: thus each side pack lies lengthwise of the horse, suspended by the loops from the horns of the saddle.

Between the side packs other loose articles may be placed, such as tin pails, frying pans, &c. These bags and other loading, should be well balanced, and bound to the horse and saddle, with a cord of suitable length. That the horse may be easily found when not at work, a small bell should be fastened to his neck, with a strap and buckle. A "spancil" should also be provided, made of leather with two buckles, for fastening the forefeet of the animal nearly together, that he may not go astray.

CONVEYING PACKS WITH MEN.

When packs cannot be carried on horses, or mules, men are employed for that purpose, and should be provided with suitable pack straps. The "portage strap" is sometimes used: it is made of leather, and is ten or twelve feet in length; the middle part is two feet long, and three inches broad in the middle, and tapers each way; at each end of this broad part is secured a thong of leather, sufficiently strong to support the pack. Each end of the portage strap is tied around the pack to be carried: the broad part passes over the forehead, or chest of the person who conveys it.

Another "pack strap" in common use, is made of five straps;

two of them are buckled around the pack near each end, and two are slipped under them and sewed together, in such a manner, as when buckled, to form shoulder straps; the fifth strap is about three inches broad at the middle, and tapers each way, and is buckled at each end to the other straps, in such a manner as to pass over the forehead when in use; the pack is put on in a similar manner to that of a peddler's pack.

Packs which are carried by men, to supply a surveying company in the field, usually weigh from seventy-five to a hundred and twenty pounds each.

SURVEYORS' WEARING APPAREL.

The common wool hat is best for any season of the year, especially in timbered land.

Trowsers should be made large, and of strong cloth.

A light coat, or frock, should be provided, well supplied with water-proof pockets, to keep books and papers dry in wet weather, and a light India rubber, or water proof cape should also be provided to keep the compass dry, when travelling in wet weather.

Flannel for under clothes, is preferable to cotton, for all seasons and kinds of weather.

Boots may be made of good kip skin, and rather larger than for ordinary use; the fronts of the legs should be cut narrower, and the backs wider, than is usual to cut them. A thick single sole projecting about one quarter of an inch from under the upper leather, and well nailed over the bottoms with sparables, or tacks, are the most durable. The nails keep the feet from slipping, and the broad sole protects the upper leather from wearing against bushes, grass, &c. A large silk handkerchief, of any colour but red, to tie over the ears and neck, is a good protection from flies and mosquitoes.

DEPOTS IN ADVANCE OF A SURVEY.

Much difficulty has sometimes been experienced by surveyors in new and unsettled countries, in providing an ample supply of provisions for their parties while engaged in large surveys of exterior township lines. This difficulty can be overcome in a great measure by the use of the solar compass. The latitude of the township corner, which is to be the commencing point of the survey, must be determined with the instrument to be used in executing the work;

then convey the supplies by the most feasible route, to the desired position within the district to be surveyed, and deposit it securely from storms and wild animals, on or near some stream, lake, Indian trail, or other conspicuous object that can be recognised, in the latitude of any east and west township line; which may be determined by allowing 5' 12'' of latitude for each township of six miles north or south of the commencing corner of the survey. If the township line, when run, should pass a few chains to the right or left of the depot thus made, it can be found in a few minutes.

This method of depositing supplies of provisions in advance of the surveyed lines, has been successfully practised by the author

TRAVERSE TABLE,

SHOWING THE DIFFERENCE OF

LATITUDE AND DEPARTURE

FOR

DISTANCES BETWEEN 1 AND 100;

AND FOR

ANGLES TO QUARTER DEGREES BETWEEN 1° AND 90°,

AND

NATURAL SIGNS AND TANGENTS

TO EVERY DEGREE AND MINUTE OF THE QUADRANT

TRAVERSE TABLE.

Distance.	$\frac{1}{4}$ Deg.		$\frac{1}{2}$ Deg.		$\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-00	1-00	0-01	1-00	0-01	1
2	2-00	0-01	2-00	0-02	2-00	0-03	2
3	3-00	0-01	3-00	0-03	3-00	0-04	3
4	4-00	0-02	4-00	0-03	4-00	0-05	4
5	5-00	0-02	5-00	0-04	5-00	0-07	5
6	6-00	0-03	6-00	0-05	6-00	0-08	6
7	7-00	0-03	7-00	0-06	7-00	0-09	7
8	8-00	0-03	8-00	0-07	8-00	0-10	8
9	9-00	0-04	9-00	0-08	9-00	0-12	9
10	10-00	0-04	10-00	0-09	10-00	0-13	10
11	11-00	0-05	11-00	0-10	11-00	0-14	11
12	12-00	0-05	12-00	0-10	12-00	0-16	12
13	13-00	0-05	13-00	0-11	13-00	0-17	13
14	14-00	0-06	14-00	0-12	14-00	0-18	14
15	15-00	0-07	15-00	0-13	15-00	0-20	15
16	16-00	0-07	16-00	0-14	16-00	0-21	16
17	17-00	0-07	17-00	0-15	17-00	0-22	17
18	18-00	0-08	18-00	0-16	18-00	0-24	18
19	19-00	0-08	19-00	0-17	19-00	0-25	19
20	20-00	0-09	20-00	0-17	20-00	0-26	20
21	21-00	0-09	21-00	0-18	21-00	0-27	21
22	22-00	0-10	22-00	0-19	22-00	0-29	22
23	23-00	0-10	23-00	0-20	23-00	0-30	23
24	24-00	0-10	24-00	0-21	24-00	0-31	24
25	25-00	0-11	25-00	0-22	25-00	0-33	25
26	26-00	0-11	26-00	0-23	26-00	0-34	26
27	27-00	0-12	27-00	0-24	27-00	0-35	27
28	28-00	0-12	28-00	0-24	28-00	0-37	28
29	29-00	0-13	29-00	0-25	29-00	0-38	29
30	30-00	0-13	30-00	0-26	30-00	0-39	30
31	31-00	0-14	31-00	0-27	31-00	0-41	31
32	32-00	0-14	32-00	0-28	32-00	0-42	32
33	33-00	0-14	33-00	0-29	33-00	0-43	33
34	34-00	0-15	34-00	0-30	34-00	0-45	34
35	35-00	0-15	35-00	0-31	35-00	0-46	35
36	36-00	0-16	36-00	0-31	36-00	0-47	36
37	37-00	0-16	37-00	0-32	37-00	0-48	37
38	38-00	0-17	38-00	0-33	38-00	0-50	38
39	39-00	0-17	39-00	0-34	39-00	0-51	39
40	40-00	0-17	40-00	0-35	40-00	0-52	40
41	41-00	0-18	41-00	0-36	41-00	0-54	41
42	42-00	0-18	42-00	0-37	42-00	0-55	42
43	43-00	0-19	43-00	0-38	43-00	0-56	43
44	44-00	0-19	44-00	0-38	44-00	0-58	44
45	45-00	0-20	45-00	0-39	45-00	0-59	45
46	46-00	0-20	46-00	0-40	46-00	0-60	46
47	47-00	0-21	47-00	0-41	47-00	0-62	47
48	48-00	0-21	48-00	0-42	48-00	0-63	48
49	49-00	0-21	49-00	0-43	49-00	0-64	49
50	50-00	0-22	50-00	0-44	50-00	0-65	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	$89\frac{3}{4}$ Deg.		$89\frac{1}{2}$ Deg.		$89\frac{1}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	$\frac{1}{4}$ Deg.		$\frac{1}{2}$ Deg.		$\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	51-00	0-22	51-00	0-45	51-00	0-67	51
52	52-00	0-23	52-00	0-45	52-00	0-68	52
53	53-00	0-23	53-00	0-46	53-00	0-69	53
54	54-00	0-24	54-00	0-47	54-00	0-71	54
55	55-00	0-24	55-00	0-48	55-00	0-72	55
56	56-00	0-24	56-00	0-49	56-00	0-73	56
57	57-00	0-25	57-00	0-50	57-00	0-75	57
58	58-00	0-25	58-00	0-51	57-99	0-76	58
59	59-00	0-26	59-00	0-51	58-99	0-77	59
60	60-00	0-26	60-00	0-52	59-99	0-79	60
61	61-00	0-27	61-00	0-53	60-99	0-80	61
62	62-00	0-27	62-00	0-54	61-99	0-81	62
63	63-00	0-27	63-00	0-55	62-99	0-82	63
64	64-00	0-28	64-00	0-56	63-99	0-84	64
65	65-00	0-28	65-00	0-57	64-99	0-85	65
66	66-00	0-29	66-00	0-58	65-99	0-86	66
67	67-00	0-29	67-00	0-58	66-99	0-88	67
68	68-00	0-30	68-00	0-59	67-99	0-89	68
69	69-00	0-30	69-00	0-60	68-99	0-90	69
70	70-00	0-31	70-00	0-61	69-99	0-92	70
71	71-00	0-31	71-00	0-62	70-99	0-93	71
72	72-00	0-31	72-00	0-63	71-99	0-94	72
73	73-00	0-32	73-00	0-64	72-99	0-96	73
74	74-00	0-32	74-00	0-65	73-99	0-97	74
75	75-00	0-33	75-00	0-65	74-99	0-98	75
76	76-00	0-33	76-00	0-66	75-99	0-99	76
77	77-00	0-34	77-00	0-67	76-99	1-01	77
78	78-00	0-34	78-00	0-68	77-99	1-02	78
79	79-00	0-34	79-00	0-69	78-99	1-03	79
80	80-00	0-35	80-00	0-70	79-99	1-05	80
81	81-00	0-35	81-00	0-71	80-99	1-06	81
82	82-00	0-36	82-00	0-72	81-99	1-07	82
83	83-00	0-36	83-00	0-72	82-99	1-09	83
84	84-00	0-37	84-00	0-73	83-99	1-10	84
85	85-00	0-37	85-00	0-74	84-99	1-11	85
86	86-00	0-38	86-00	0-75	85-99	1-13	86
87	87-00	0-38	87-00	0-76	86-99	1-14	87
88	88-00	0-38	88-00	0-77	87-99	1-15	88
89	89-00	0-39	89-00	0-78	88-99	1-16	89
90	90-00	0-39	90-00	0-79	89-99	1-18	90
91	91-00	0-40	91-00	0-79	90-99	1-19	91
92	92-00	0-40	92-00	0-80	91-99	1-20	92
93	93-00	0-41	93-00	0-81	92-99	1-22	93
94	94-00	0-41	94-00	0-82	93-99	1-23	94
95	95-00	0-41	95-00	0-83	94-99	1-24	95
96	96-00	0-42	96-00	0-84	95-99	1-26	96
97	97-00	0-42	97-00	0-85	96-99	1-27	97
98	98-00	0-43	98-00	0-86	97-99	1-28	98
99	99-00	0-43	99-00	0-86	98-99	1-30	99
100	100-00	0-44	100-00	0-87	99-99	1-31	100

Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	$89\frac{3}{4}$ Deg.		$89\frac{1}{2}$ Deg.		$89\frac{1}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	1 Deg.		1¼ Deg.		1½ Deg.		1¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-02	1-00	0-02	1-00	0-03	1-00	0-03	1
2	2-00	0-03	2-00	0-04	2-00	0-05	2-00	0-06	2
3	3-00	0-05	3-00	0-07	3-00	0-08	3-00	0-09	3
4	4-00	0-07	4-00	0-09	4-00	0-10	4-00	0-12	4
5	5-00	0-09	5-00	0-11	5-00	0-13	5-00	0-15	5
6	6-00	0-10	6-00	0-13	6-00	0-16	6-00	0-18	6
7	7-00	0-12	7-00	0-15	7-00	0-18	7-00	0-21	7
8	8-00	0-14	8-00	0-17	8-00	0-21	8-00	0-25	8
9	9-00	0-16	9-00	0-20	9-00	0-24	9-00	0-28	9
10	10-00	0-17	10-00	0-22	10-00	0-26	10-00	0-31	10
11	11-00	0-19	11-00	0-24	11-00	0-28	10-99	0-34	11
12	12-00	0-21	12-00	0-26	12-00	0-31	11-99	0-37	12
13	13-00	0-23	13-00	0-28	13-00	0-34	12-99	0-40	13
14	14-00	0-24	14-00	0-31	14-00	0-37	13-99	0-43	14
15	15-00	0-26	15-00	0-33	14-99	0-39	14-99	0-46	15
16	16-00	0-28	16-00	0-35	15-99	0-42	15-99	0-49	16
17	17-00	0-30	17-00	0-37	16-99	0-45	16-99	0-52	17
18	18-00	0-31	18-00	0-39	17-99	0-47	17-99	0-55	18
19	19-00	0-33	19-00	0-41	18-99	0-50	18-99	0-58	19
20	20-00	0-35	20-00	0-44	19-99	0-52	19-99	0-61	20
21	21-00	0-37	21-00	0-46	20-99	0-55	20-99	0-64	21
22	22-00	0-38	21-99	0-48	21-99	0-58	21-99	0-67	22
23	23-00	0-40	22-99	0-50	22-99	0-60	22-99	0-70	23
24	24-00	0-42	23-99	0-52	23-99	0-63	23-99	0-73	24
25	25-00	0-44	24-99	0-55	24-99	0-65	24-99	0-76	25
26	26-00	0-45	25-99	0-57	25-99	0-68	25-99	0-79	26
27	27-00	0-47	26-99	0-59	26-99	0-71	26-99	0-83	27
28	28-00	0-49	27-99	0-61	27-99	0-73	27-99	0-86	28
29	29-00	0-51	28-99	0-63	28-99	0-76	28-99	0-89	29
30	30-00	0-52	29-99	0-65	29-99	0-79	29-99	0-92	30
31	31-00	0-54	30-99	0-68	30-99	0-81	30-99	0-95	31
32	32-00	0-56	31-99	0-70	31-99	0-84	31-99	0-98	32
33	32-99	0-58	32-99	0-72	32-99	0-86	32-98	1-01	33
34	33-99	0-59	33-99	0-74	33-99	0-89	33-98	1-04	34
35	34-99	0-61	34-99	0-76	34-99	0-92	34-98	1-07	35
36	35-99	0-63	35-99	0-79	35-99	0-94	35-98	1-10	36
37	36-99	0-65	36-99	0-81	36-99	0-97	36-98	1-13	37
38	37-99	0-66	37-99	0-83	37-99	0-99	37-98	1-16	38
39	38-99	0-68	38-99	0-85	38-99	1-02	38-98	1-19	39
40	39-99	0-70	39-99	0-87	39-99	1-05	39-98	1-22	40
41	40-99	0-72	40-99	0-89	40-99	1-07	40-98	1-25	41
42	41-99	0-73	41-99	0-92	41-99	1-10	41-98	1-28	42
43	42-99	0-75	42-99	0-94	42-99	1-13	42-98	1-31	43
44	43-99	0-77	43-99	0-96	43-99	1-15	43-98	1-34	44
45	44-99	0-79	44-99	0-98	44-99	1-18	44-98	1-37	45
46	45-99	0-80	45-99	1-00	45-99	1-20	45-98	1-40	46
47	46-99	0-82	46-99	1-03	46-99	1-23	46-98	1-44	47
48	47-99	0-84	47-99	1-05	47-99	1-26	47-98	1-47	48
49	48-99	0-86	48-99	1-07	48-99	1-28	48-98	1-50	49
50	49-99	0-87	49-99	1-09	49-99	1-31	49-98	1-53	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	89 Deg.		88¾ Deg.		88½ Deg.		88¼ Deg.		

TRAVERSE TABLE.

Distance.	1 Deg.		1¼ Deg.		1½ Deg.		1¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-99	0-89	50-99	1-11	50-98	1-34	50-98	1-56	51
52	51-99	0-91	51-99	1-13	51-98	1-36	51-98	1-59	52
53	52-99	0-92	52-99	1-16	52-98	1-39	52-98	1-62	53
54	53-99	0-94	53-99	1-18	53-98	1-41	53-97	1-65	54
55	54-99	0-96	54-99	1-20	54-98	1-44	54-97	1-68	55
56	55-99	0-98	55-99	1-22	55-98	1-47	55-97	1-71	56
57	56-99	0-99	56-99	1-24	56-98	1-49	56-97	1-74	57
58	57-99	1-01	57-99	1-27	57-98	1-52	57-97	1-77	58
59	58-99	1-03	58-99	1-29	58-98	1-54	58-97	1-80	59
60	59-99	1-05	59-99	1-31	59-98	1-57	59-97	1-83	60
61	60-99	1-06	60-99	1-33	60-98	1-60	60-97	1-86	61
62	61-99	1-08	61-99	1-35	61-98	1-62	61-97	1-89	62
63	62-99	1-10	62-99	1-37	62-98	1-65	62-97	1-92	63
64	63-99	1-12	63-98	1-40	63-98	1-68	63-97	1-95	64
65	64-99	1-13	64-98	1-42	64-98	1-70	64-97	1-99	65
66	65-99	1-15	65-98	1-44	65-98	1-73	65-97	2-02	66
67	66-99	1-17	66-98	1-46	66-98	1-75	66-97	2-05	67
68	67-99	1-19	67-98	1-48	67-98	1-78	67-97	2-08	68
69	68-99	1-20	68-98	1-51	68-98	1-81	68-97	2-11	69
70	69-99	1-22	69-98	1-53	69-98	1-83	69-97	2-14	70
71	70-99	1-24	70-98	1-55	70-98	1-86	70-97	2-17	71
72	71-99	1-26	71-98	1-57	71-98	1-88	71-97	2-20	72
73	72-99	1-27	72-98	1-59	72-97	1-91	72-97	2-23	73
74	73-99	1-29	73-98	1-61	73-97	1-94	73-97	2-26	74
75	74-99	1-31	74-98	1-64	74-97	1-96	74-97	2-29	75
76	75-99	1-33	75-98	1-66	75-97	1-99	75-96	2-32	76
77	76-99	1-34	76-98	1-68	76-97	2-02	76-96	2-35	77
78	77-99	1-36	77-98	1-70	77-97	2-04	77-96	2-38	78
79	78-99	1-38	78-98	1-72	78-97	2-07	78-96	2-41	79
80	79-99	1-40	79-98	1-75	79-97	2-09	79-96	2-44	80
81	80-99	1-41	80-98	1-77	80-97	2-12	80-96	2-47	81
82	81-99	1-43	81-98	1-79	81-97	2-15	81-96	2-50	82
83	82-99	1-45	82-98	1-81	82-97	2-17	82-96	2-53	83
84	83-99	1-47	83-98	1-83	83-97	2-20	83-96	2-57	84
85	84-99	1-48	84-98	1-85	84-97	2-23	84-96	2-60	85
86	85-99	1-50	85-98	1-88	85-97	2-25	85-96	2-63	86
87	86-99	1-52	86-98	1-90	86-97	2-28	86-96	2-66	87
88	87-99	1-54	87-98	1-92	87-97	2-30	87-96	2-69	88
89	88-99	1-55	88-98	1-94	88-97	2-33	88-96	2-72	89
90	89-99	1-57	89-98	1-96	89-97	2-36	89-96	2-75	90
91	90-99	1-59	90-98	1-99	90-97	2-38	90-96	2-78	91
92	91-99	1-61	91-98	2-01	91-97	2-41	91-96	2-81	92
93	92-99	1-62	92-98	2-03	92-97	2-43	92-96	2-84	93
94	93-99	1-64	93-98	2-05	93-97	2-46	93-96	2-87	94
95	94-99	1-66	94-98	2-07	94-97	2-49	94-96	2-90	95
96	95-99	1-68	95-98	2-09	95-97	2-51	95-96	2-94	96
97	96-99	1-69	96-98	2-12	96-97	2-54	96-96	2-96	97
98	97-99	1-71	97-98	2-14	97-97	2-57	97-96	2-99	98
99	98-98	1-73	98-98	2-16	98-97	2-59	98-96	3-02	99
100	99-98	1-75	99-98	2-18	99-97	2-62	99-96	3-05	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	89 Deg.		88¾ Deg.		88½ Deg.		88¼ Deg.		

TRAVERSE TABLE.

Distance.	2 Deg.		2¼ Deg.		2½ Deg.		2¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-03	1-00	0-04	1-00	0-04	1-00	0-05	1
2	2-00	0-07	2-00	0-08	2-00	0-09	2-00	0-10	2
3	3-00	0-10	3-00	0-12	3-00	0-13	3-00	0-14	3
4	4-00	0-14	4-00	0-16	4-00	0-17	4-00	0-19	4
5	5-00	0-17	5-00	0-20	5-00	0-22	4-99	0-24	5
6	6-00	0-21	6-00	0-24	5-99	0-26	5-99	0-29	6
7	7-00	0-24	6-99	0-27	6-99	0-31	6-99	0-34	7
8	7-99	0-28	7-99	0-31	7-99	0-35	7-99	0-38	8
9	8-99	0-31	8-99	0-35	8-99	0-39	8-99	0-43	9
10	9-99	0-35	9-99	0-39	9-99	0-44	9-99	0-48	10
11	10-99	0-38	10-99	0-43	10-99	0-48	10-99	0-53	11
12	11-99	0-42	11-99	0-47	11-99	0-52	11-99	0-58	12
13	12-99	0-45	12-99	0-51	12-99	0-57	12-99	0-62	13
14	13-99	0-49	13-99	0-55	13-99	0-61	13-98	0-67	14
15	14-99	0-52	14-99	0-59	14-99	0-65	14-98	0-72	15
16	15-99	0-56	15-99	0-63	15-99	0-70	15-98	0-77	16
17	16-99	0-59	16-99	0-67	16-98	0-74	16-98	0-82	17
18	17-99	0-63	17-99	0-71	17-98	0-79	17-98	0-86	18
19	18-99	0-66	18-99	0-75	18-98	0-83	18-98	0-91	19
20	19-99	0-70	19-98	0-79	19-98	0-87	19-98	0-96	20
21	20-99	0-73	20-98	0-82	20-98	0-92	20-98	1-01	21
22	21-99	0-77	21-98	0-86	21-98	0-96	21-97	1-06	22
23	22-99	0-80	22-98	0-90	22-98	1-00	22-97	1-10	23
24	23-99	0-84	23-98	0-94	23-98	1-05	23-97	1-15	24
25	24-98	0-87	24-98	0-98	24-98	1-09	24-97	1-20	25
26	25-98	0-91	25-98	1-02	25-98	1-13	25-97	1-25	26
27	26-98	0-94	26-98	1-06	26-97	1-18	26-97	1-30	27
28	27-98	0-98	27-98	1-10	27-97	1-22	27-97	1-34	28
29	28-98	1-01	28-98	1-14	28-97	1-26	28-97	1-39	29
30	29-98	1-05	29-98	1-18	29-97	1-31	29-97	1-44	30
31	30-98	1-08	30-98	1-22	30-97	1-35	30-96	1-49	31
32	31-98	1-12	31-98	1-26	31-97	1-40	31-96	1-54	32
33	32-98	1-15	32-97	1-30	32-97	1-44	32-96	1-58	33
34	33-98	1-19	33-97	1-33	33-97	1-48	33-96	1-63	34
35	34-98	1-22	34-97	1-37	34-97	1-53	34-96	1-68	35
36	35-98	1-26	35-97	1-41	35-97	1-57	35-96	1-73	36
37	36-98	1-29	36-97	1-45	36-96	1-61	36-96	1-78	37
38	37-98	1-33	37-97	1-49	37-96	1-66	37-96	1-82	38
39	38-98	1-36	38-97	1-53	38-96	1-70	38-96	1-87	39
40	39-98	1-40	39-97	1-57	39-96	1-75	39-95	1-92	40
41	40-98	1-43	40-97	1-61	40-96	1-77	40-95	1-97	41
42	41-97	1-47	41-97	1-65	41-96	1-83	41-95	2-02	42
43	42-97	1-50	42-97	1-69	42-96	1-88	42-95	2-06	43
44	43-97	1-54	43-97	1-73	43-96	1-92	43-95	2-11	44
45	44-97	1-57	44-97	1-77	44-96	1-96	44-95	2-16	45
46	45-97	1-61	45-96	1-81	45-96	2-01	45-95	2-21	46
47	46-97	1-64	46-96	1-85	46-96	2-05	46-95	2-25	47
48	47-97	1-68	47-96	1-88	47-95	2-09	47-95	2-30	48
49	48-97	1-71	48-96	1-92	48-95	2-14	48-94	2-35	49
50	49-97	1-74	49-96	1-96	49-95	2-18	49-94	2-40	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	88 Deg.		87¾ Deg.		87½ Deg.		87¼ Deg.		

TRAVERSE TABLE.

Distance.	2 Deg.		2¼ Deg.		2½ Deg.		2¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-97	1-78	50-96	2-00	50-95	2-22	50-94	2-45	51
52	51-97	1-81	51-96	2-04	51-95	2-27	51-94	2-50	52
53	52-97	1-85	52-96	2-08	52-95	2-31	52-94	2-54	53
54	53-97	1-88	53-96	2-12	53-95	2-36	53-94	2-59	54
55	54-97	1-92	54-96	2-16	54-95	2-40	54-94	2-64	55
56	55-97	1-95	55-96	2-20	55-95	2-44	55-94	2-69	56
57	56-97	1-99	56-96	2-24	56-95	2-49	56-94	2-73	57
58	57-96	2-02	57-96	2-28	57-94	2-53	57-93	2-78	58
59	58-96	2-06	58-95	2-32	58-94	2-57	58-93	2-83	59
60	59-96	2-09	59-95	2-36	59-94	2-62	59-93	2-88	60
61	60-96	2-13	60-95	2-39	60-94	2-66	60-93	2-93	61
62	61-96	2-16	61-95	2-43	61-94	2-70	61-93	2-97	62
63	62-96	2-20	62-95	2-47	62-94	2-75	62-93	3-02	63
64	63-96	2-23	63-95	2-51	63-94	2-79	63-93	3-07	64
65	64-96	2-27	64-95	2-55	64-94	2-84	64-93	3-12	65
66	65-96	2-30	65-95	2-59	65-94	2-88	65-92	3-17	66
67	66-96	2-34	66-95	2-63	66-94	2-92	66-92	3-21	67
68	67-96	2-37	67-95	2-67	67-94	2-97	67-92	3-26	68
69	68-96	2-41	68-95	2-71	68-93	3-01	68-92	3-31	69
70	69-96	2-44	69-95	2-75	69-93	3-05	69-92	3-36	70
71	70-96	2-48	70-95	2-79	70-93	3-10	70-92	3-41	71
72	71-96	2-51	71-94	2-83	71-93	3-14	71-92	3-45	72
73	72-96	2-55	72-94	2-87	72-93	3-18	72-92	3-50	73
74	73-95	2-58	73-94	2-91	73-93	3-23	73-91	3-55	74
75	74-95	2-62	74-94	2-94	74-93	3-27	74-91	3-60	75
76	75-95	2-65	75-94	2-98	75-93	3-31	75-91	3-65	76
77	76-95	2-69	76-94	3-02	76-93	3-36	76-91	3-70	77
78	77-95	2-72	77-94	3-06	77-93	3-40	77-91	3-74	78
79	78-95	2-76	78-94	3-10	78-92	3-45	78-91	3-79	79
80	79-95	2-79	79-94	3-14	79-92	3-49	79-91	3-84	80
81	80-95	2-83	80-94	3-18	80-92	3-53	80-91	3-89	81
82	81-95	2-86	81-94	3-22	81-92	3-58	81-91	3-93	82
83	82-95	2-90	82-94	3-26	82-92	3-62	82-90	3-98	83
84	83-95	2-93	83-94	3-30	83-92	3-66	83-90	4-03	84
85	84-95	2-97	84-93	3-34	84-92	3-71	84-90	4-08	85
86	85-95	3-00	85-93	3-38	85-92	3-75	85-90	4-13	86
87	86-95	3-04	86-93	3-42	86-92	3-79	86-90	4-17	87
88	87-95	3-07	87-93	3-45	87-92	3-84	87-90	4-22	88
89	88-95	3-11	88-93	3-49	88-92	3-88	88-90	4-27	89
90	89-95	3-14	89-93	3-53	89-91	3-93	89-90	4-32	90
91	90-95	3-18	90-93	3-57	90-91	3-97	90-90	4-37	91
92	91-94	3-21	91-93	3-61	91-91	4-01	91-89	4-41	92
93	92-94	3-25	92-93	3-65	92-91	4-06	92-89	4-46	93
94	93-94	3-28	93-93	3-69	93-91	4-10	93-89	4-51	94
95	94-94	3-32	94-93	3-73	94-91	4-14	94-89	4-56	95
96	95-94	3-35	95-93	3-77	95-91	4-19	95-89	4-61	96
97	96-94	3-39	96-93	3-81	96-91	4-23	96-89	4-65	97
98	97-94	3-42	97-92	3-85	97-91	4-27	97-89	4-70	98
99	98-94	3-46	98-92	3-89	98-91	4-32	98-89	4-75	99
100	99-94	3-49	99-92	3-93	99-91	4-36	99-88	4-80	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	88 Deg.		87¾ Deg.		87½ Deg.		87¼ Deg.		

TRAVERSE TABLE.

Distance.	3 Deg.		3¼ Deg.		3½ Deg.		3¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-05	1-00	0-06	1-00	0-06	1-00	0-06	1
2	2-00	0-10	2-00	0-11	2-00	0-12	2-00	0-13	2
3	3-00	0-16	3-00	0-17	2-99	0-18	2-99	0-20	3
4	3-99	0-21	3-99	0-23	3-99	0-24	3-99	0-26	4
5	4-99	0-26	4-99	0-28	4-99	0-31	4-99	0-33	5
6	5-99	0-31	5-99	0-34	5-99	0-37	5-99	0-39	6
7	6-99	0-37	6-99	0-40	6-99	0-43	6-99	0-46	7
8	7-99	0-42	7-99	0-45	7-99	0-49	7-98	0-52	8
9	8-99	0-47	8-99	0-51	8-98	0-55	8-98	0-59	9
10	9-99	0-52	9-98	0-57	9-98	0-61	9-98	0-65	10
11	10-98	0-58	10-98	0-62	10-98	0-67	10-98	0-72	11
12	11-98	0-63	11-98	0-68	11-98	0-73	11-97	0-78	12
13	12-98	0-68	12-98	0-73	12-98	0-79	12-97	0-85	13
14	13-98	0-73	13-98	0-79	13-97	0-85	13-97	0-92	14
15	14-98	0-79	14-98	0-85	14-97	0-92	14-97	0-98	15
16	15-98	0-84	15-97	0-91	15-97	0-98	15-97	1-05	16
17	16-98	0-89	16-97	0-96	16-97	1-04	16-96	1-11	17
18	17-98	0-94	17-97	1-02	17-97	1-10	17-96	1-18	18
19	18-98	0-99	18-97	1-08	18-96	1-16	18-96	1-24	19
20	19-97	1-05	19-97	1-13	19-96	1-22	19-96	1-31	20
21	20-97	1-10	20-97	1-19	20-96	1-28	20-96	1-37	21
22	21-97	1-15	21-96	1-25	21-96	1-34	21-95	1-44	22
23	22-97	1-20	22-96	1-30	22-96	1-40	22-95	1-50	23
24	23-97	1-26	23-96	1-36	23-96	1-47	23-95	1-57	24
25	24-97	1-31	24-96	1-42	24-95	1-53	24-95	1-64	25
26	25-96	1-36	25-96	1-47	25-95	1-59	25-94	1-70	26
27	26-96	1-41	26-96	1-53	26-95	1-65	26-94	1-77	27
28	27-96	1-47	27-95	1-59	27-95	1-71	27-94	1-83	28
29	28-96	1-52	28-95	1-64	28-95	1-77	28-94	1-90	29
30	29-96	1-57	29-95	1-70	29-94	1-83	29-94	1-96	30
31	30-96	1-62	30-95	1-76	30-94	1-89	30-93	2-03	31
32	31-96	1-67	31-95	1-81	31-94	1-95	31-93	2-09	32
33	32-95	1-73	32-95	1-87	32-94	2-01	32-93	2-16	33
34	33-95	1-78	33-95	1-93	33-94	2-08	33-93	2-22	34
35	34-95	1-83	34-94	1-98	34-93	2-14	34-92	2-29	35
36	35-95	1-88	35-94	2-04	35-93	2-20	35-92	2-35	36
37	36-95	1-94	36-94	2-10	36-93	2-26	36-92	2-42	37
38	37-95	1-99	37-94	2-15	37-93	2-32	37-92	2-49	38
39	38-95	2-04	38-94	2-21	38-93	2-38	38-92	2-55	39
40	39-95	2-00	39-94	2-27	39-93	2-44	39-91	2-62	40
41	40-94	2-15	40-93	2-32	40-92	2-50	40-91	2-68	41
42	41-94	2-20	41-93	2-38	41-92	2-56	41-91	2-75	42
43	42-94	2-25	42-93	2-44	42-92	2-63	42-91	2-81	43
44	43-94	2-30	43-93	2-49	43-92	2-69	43-91	2-88	44
45	44-94	2-36	44-93	2-55	44-92	2-75	44-90	2-94	45
46	45-94	2-41	45-93	2-61	45-91	2-81	45-90	3-01	46
47	46-94	2-46	46-92	2-66	46-91	2-87	46-90	3-07	47
48	47-93	2-51	47-92	2-72	47-91	2-93	47-90	3-14	48
49	48-93	2-56	48-92	2-78	48-91	2-99	48-90	3-20	49
50	49-93	2-62	49-92	2-83	49-91	3-05	49-89	3-27	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	87 Deg.		86¾ Deg.		86½ Deg.		86¼ Deg.		

TRAVERSE TABLE.

Distance.	3 Deg.		3¼ Deg.		3½ Deg.		3¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-93	2-67	50-92	2-89	50-90	3-11	50-89	3-34	51
52	51-93	2-72	51-92	2-95	51-90	3-17	51-89	3-40	52
53	52-93	2-77	52-91	3-00	52-90	3-24	52-89	3-47	53
54	53-93	2-83	53-91	3-06	53-90	3-30	53-88	3-53	54
55	54-92	2-88	54-91	3-12	54-90	3-36	54-88	3-60	55
56	55-92	2-93	55-91	3-17	55-90	3-42	55-88	3-66	56
57	56-92	2-98	56-91	3-23	56-89	3-48	56-88	3-73	57
58	57-92	3-04	57-91	3-29	57-89	3-54	57-88	3-79	58
59	58-92	3-09	58-91	3-34	58-89	3-60	58-87	3-86	59
60	59-92	3-14	59-90	3-40	59-89	3-66	59-87	3-92	60
61	60-92	3-19	60-90	3-46	60-89	3-72	60-87	3-99	61
62	61-92	3-24	61-90	3-51	61-88	3-79	61-87	4-05	62
63	62-91	3-30	62-90	3-57	62-88	3-85	62-87	4-12	63
64	63-91	3-35	63-90	3-63	63-88	3-91	63-86	4-19	64
65	64-91	3-40	64-90	3-69	64-88	3-97	64-86	4-25	65
66	65-91	3-45	65-89	3-74	65-88	4-03	65-86	4-32	66
67	66-91	3-51	66-89	3-80	66-88	4-09	66-86	4-38	67
68	67-91	3-56	67-89	3-86	67-87	4-15	67-85	4-45	68
69	68-91	3-61	68-89	3-91	68-87	4-21	68-85	4-51	69
70	69-90	3-66	69-89	3-97	69-87	4-27	69-85	4-56	70
71	70-90	3-72	70-89	4-03	70-87	4-33	70-85	4-64	71
72	71-90	3-77	71-88	4-08	71-87	4-40	71-85	4-71	72
73	72-90	3-82	72-88	4-14	72-86	4-46	72-84	4-77	73
74	73-90	3-87	73-88	4-20	73-86	4-52	73-84	4-84	74
75	74-90	3-93	74-88	4-25	74-86	4-58	74-84	4-91	75
76	75-90	3-98	75-88	4-31	75-86	4-64	75-84	4-97	76
77	76-89	4-03	76-88	4-37	76-86	4-70	76-84	5-04	77
78	77-89	4-08	77-87	4-42	77-85	4-76	77-83	5-10	78
79	78-89	4-13	78-87	4-48	78-85	4-82	78-83	5-17	79
80	79-89	4-19	79-87	4-54	79-85	4-88	79-83	5-23	80
81	80-89	4-24	80-87	4-59	80-85	4-94	80-83	5-30	81
82	81-89	4-29	81-87	4-65	81-85	5-01	81-82	5-36	82
83	82-89	4-34	82-87	4-71	82-85	5-07	82-82	5-43	83
84	83-88	4-40	83-86	4-76	83-84	5-13	83-82	5-49	84
85	84-88	4-45	84-86	4-82	84-84	5-19	84-82	5-56	85
86	85-88	4-50	85-86	4-88	85-84	5-25	85-82	5-62	86
87	86-88	4-55	86-86	4-93	86-84	5-31	86-81	5-69	87
88	87-88	4-61	87-86	4-99	87-84	5-37	87-81	5-76	88
89	88-88	4-66	88-86	5-05	88-83	5-43	88-81	5-82	89
90	89-88	4-71	89-86	5-10	89-83	5-49	89-81	5-89	90
91	90-88	4-76	90-85	5-16	90-83	5-56	90-81	5-95	91
92	91-87	4-81	91-85	5-22	91-83	5-62	91-80	6-02	92
93	92-87	4-87	92-85	5-27	92-83	5-68	92-80	6-08	93
94	93-87	4-92	93-85	5-33	93-82	5-74	93-80	6-15	94
95	94-87	4-97	94-85	5-39	94-82	5-80	94-80	6-21	95
96	95-87	5-02	95-85	5-44	95-82	5-86	95-79	6-28	96
97	96-87	5-08	96-84	5-50	96-82	5-92	96-79	6-34	97
98	97-87	5-13	97-84	5-56	97-82	5-98	97-79	6-41	98
99	98-86	5-18	98-84	5-61	98-82	6-04	98-79	6-47	99
100	99-86	5-23	99-84	5-67	99-81	6-10	99-79	6-54	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	87 Deg.		86¾ Deg.		86½ Deg.		86¼ Deg.		

TRAVERSE TABLE

Distance.	4 Deg.		4¼ Deg.		4½ Deg.		4¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-07	1-00	0-07	1-00	0-08	1-00	0-08	1
2	2-00	0-14	1-99	0-15	1-99	0-16	1-99	0-17	2
3	2-99	0-21	2-99	0-22	2-99	0-24	2-99	0-25	3
4	3-99	0-28	3-99	0-30	3-98	0-31	3-98	0-33	4
5	4-99	0-35	4-99	0-37	4-98	0-39	4-98	0-41	5
6	5-99	0-42	5-98	0-44	5-98	0-47	5-98	0-50	6
7	6-98	0-49	6-98	0-52	6-98	0-55	6-97	0-58	7
8	7-98	0-56	7-98	0-59	7-98	0-63	7-97	0-66	8
9	8-98	0-63	8-98	0-67	8-97	0-71	8-97	0-75	9
10	9-98	0-70	9-97	0-74	9-97	0-78	9-97	0-83	10
11	10-97	0-77	10-97	0-82	10-97	0-86	10-96	0-91	11
12	11-97	0-84	11-97	0-89	11-96	0-94	11-96	0-99	12
13	12-97	0-91	12-96	0-96	12-96	1-02	12-96	1-08	13
14	13-97	0-98	13-96	1-04	13-96	1-10	13-95	1-16	14
15	14-96	1-05	14-96	1-11	14-95	1-18	14-95	1-24	15
16	15-96	1-12	15-96	1-19	15-95	1-26	15-95	1-32	16
17	16-96	1-19	16-95	1-26	16-95	1-33	16-94	1-41	17
18	17-96	1-26	17-95	1-33	17-94	1-41	17-94	1-49	18
19	18-95	1-33	18-95	1-40	18-94	1-49	18-93	1-57	19
20	19-95	1-40	19-95	1-48	19-94	1-57	19-93	1-66	20
21	20-95	1-46	20-94	1-56	20-94	1-65	20-93	1-74	21
22	21-95	1-53	21-94	1-63	21-93	1-73	21-92	1-82	22
23	22-94	1-60	22-94	1-70	22-93	1-80	22-92	1-90	23
24	23-94	1-67	23-93	1-78	23-93	1-88	23-92	1-99	24
25	24-94	1-74	24-93	1-85	24-92	1-96	24-91	2-07	25
26	25-94	1-81	25-93	1-93	25-92	2-04	25-91	2-15	26
27	26-93	1-88	26-93	2-00	26-92	2-12	26-91	2-24	27
28	27-93	1-95	27-92	2-08	27-91	2-20	27-90	2-32	28
29	28-93	2-02	28-92	2-15	28-91	2-28	28-90	2-40	29
30	29-93	2-09	29-92	2-22	29-91	2-35	29-90	2-48	30
31	30-92	2-16	30-91	2-30	30-90	2-43	30-89	2-57	31
32	31-92	2-23	31-91	2-37	31-90	2-51	31-89	2-65	32
33	32-92	2-30	32-91	2-45	32-90	2-59	32-89	2-73	33
34	33-92	2-37	33-91	2-52	33-90	2-67	33-88	2-82	34
35	34-91	2-44	34-90	2-59	34-89	2-75	34-88	2-90	35
36	35-91	2-51	35-90	2-67	35-89	2-82	35-88	2-98	36
37	36-91	2-58	36-90	2-74	36-89	2-90	36-87	3-06	37
38	37-91	2-65	37-90	2-82	37-88	2-98	37-87	3-15	38
39	38-90	2-72	38-89	2-89	38-88	3-06	38-87	3-23	39
40	39-90	2-79	39-89	2-96	39-88	3-14	39-86	3-31	40
41	40-90	2-86	40-89	3-04	40-87	3-22	40-86	3-40	41
42	41-90	2-93	41-88	3-11	41-87	3-30	41-86	3-48	42
43	42-90	3-00	42-88	3-19	42-87	3-37	42-85	3-56	43
44	43-89	3-07	43-88	3-26	43-86	3-45	43-85	3-64	44
45	44-89	3-14	44-88	3-33	44-86	3-53	44-85	3-73	45
46	45-89	3-21	45-87	3-41	45-86	3-61	45-84	3-81	46
47	46-89	3-28	46-87	3-48	46-86	3-69	46-84	3-89	47
48	47-88	3-35	47-87	3-56	47-85	3-77	47-84	3-97	48
49	48-88	3-42	48-87	3-63	48-85	3-84	48-83	4-06	49
50	49-88	3-49	49-86	3-71	49-85	3-92	49-83	4-14	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	86 Deg.		85¾ Deg.		85½ Deg.		85¼ Deg.		

TRAVERSE TABLE.

Distance.	4 Deg.		4¼ Deg.		4½ Deg.		4¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-88	3-56	50-86	3-78	50-84	4-00	50-82	4-22	51
52	51-87	3-63	51-86	3-85	51-84	4-08	51-82	4-31	52
53	52-87	3-70	52-85	3-93	52-84	4-16	52-82	4-39	53
54	53-87	3-77	53-85	4-00	53-83	4-24	53-81	4-47	54
55	54-87	3-84	54-85	4-08	54-83	4-32	54-81	4-55	55
56	55-86	3-91	55-85	4-15	55-83	4-39	55-81	4-64	56
57	56-86	3-98	56-84	4-22	56-82	4-47	56-80	4-72	57
58	57-86	4-05	57-84	4-30	57-82	4-55	57-80	4-80	58
59	58-86	4-12	58-84	4-37	58-82	4-63	58-80	4-89	59
60	59-85	4-19	59-84	4-45	59-82	4-71	59-79	4-97	60
61	60-85	4-26	60-83	4-52	60-81	4-79	60-79	5-05	61
62	61-85	4-32	61-83	4-59	61-81	4-86	61-79	5-13	62
63	62-85	4-39	62-83	4-67	62-81	4-94	62-78	5-22	63
64	63-84	4-46	63-82	4-74	63-80	5-02	63-78	5-30	64
65	64-84	4-53	64-82	4-82	64-80	5-10	64-78	5-38	65
66	65-84	4-60	65-82	4-89	65-80	5-18	65-77	5-47	66
67	66-84	4-67	66-82	4-97	66-79	5-26	66-77	5-55	67
68	67-83	4-74	67-81	5-04	67-79	5-34	67-77	5-63	68
69	68-83	4-81	68-81	5-11	68-79	5-41	68-76	5-71	69
70	69-83	4-88	69-81	5-19	69-78	5-49	69-76	5-80	70
71	70-83	4-95	70-80	5-26	70-78	5-57	70-76	5-88	71
72	71-82	5-02	71-80	5-34	71-78	5-65	71-75	5-96	72
73	72-82	5-09	72-80	5-41	72-77	5-73	72-75	6-04	73
74	73-82	5-16	73-80	5-48	73-77	5-81	73-75	6-13	74
75	74-82	5-23	74-79	5-56	74-77	5-88	74-74	6-21	75
76	75-81	5-30	75-79	5-63	75-77	5-96	75-74	6-29	76
77	76-81	5-37	76-79	5-71	76-76	6-04	76-74	6-38	77
78	77-81	5-44	77-79	5-78	77-76	6-12	77-73	6-46	78
79	78-81	5-51	78-78	5-85	78-76	6-20	78-73	6-54	79
80	79-81	5-58	79-78	5-93	79-75	6-28	79-73	6-62	80
81	80-80	5-65	80-78	6-00	80-75	6-36	80-72	6-71	81
82	81-80	5-72	81-78	6-08	81-75	6-43	81-72	6-79	82
83	82-80	5-79	82-77	6-15	82-74	6-51	82-71	6-87	83
84	83-80	5-86	83-77	6-23	83-74	6-59	83-71	6-96	84
85	84-79	5-93	84-77	6-30	84-74	6-67	84-71	7-04	85
86	85-79	6-00	85-76	6-37	85-73	6-75	85-70	7-12	86
87	86-79	6-07	86-76	6-45	86-73	6-83	86-70	7-20	87
88	87-79	6-14	87-76	6-52	87-73	6-90	87-70	7-29	88
89	88-78	6-21	88-76	6-60	88-73	6-98	88-70	7-37	89
90	89-78	6-28	89-75	6-67	89-72	7-06	89-69	7-45	90
91	90-78	6-35	90-75	6-74	90-72	7-14	90-69	7-54	91
92	91-78	6-42	91-75	6-82	91-72	7-22	91-68	7-62	92
93	92-77	6-49	92-74	6-89	92-71	7-30	92-68	7-70	93
94	93-77	6-56	93-74	6-97	93-71	7-38	93-68	7-78	94
95	94-77	6-63	94-74	7-04	94-71	7-45	94-67	7-87	95
96	95-77	6-70	95-74	7-11	95-70	7-53	95-67	7-95	96
97	96-76	6-77	96-73	7-19	96-70	7-61	96-67	8-03	97
98	97-76	6-84	97-73	7-26	97-70	7-69	97-66	8-12	98
99	98-76	6-91	98-73	7-34	98-69	7-77	98-66	8-20	99
100	99-76	6-98	99-73	7-41	99-69	7-85	99-66	8-28	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	86 Deg.		85¾ Deg.		85½ Deg.		85¼ Deg.		

TRAVERSE TABLE.

Distance.	5 Deg.		5¼ Deg.		5½ Deg.		5¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1-00	0-09	1-00	0-09	1-00	0-10	0-99	0-10	1
2	1-99	0-17	1-99	0-18	1-99	0-19	1-99	0-20	2
3	2-99	0-25	2-99	0-27	2-99	0-29	2-98	0-30	3
4	3-98	0-35	3-98	0-37	3-98	0-38	3-98	0-40	4
5	4-98	0-44	4-98	0-46	4-98	0-48	4-97	0-50	5
6	5-98	0-52	5-97	0-55	5-97	0-58	5-97	0-60	6
7	6-97	0-61	6-97	0-64	6-97	0-67	6-96	0-70	7
8	7-97	0-70	7-97	0-73	7-96	0-76	7-96	0-80	8
9	8-97	0-78	8-96	0-82	8-96	0-86	8-95	0-90	9
10	9-96	0-87	9-96	0-92	9-95	0-96	9-95	1-00	10
11	10-96	0-96	10-95	1-01	10-95	1-05	10-94	1-10	11
12	11-95	1-05	11-95	1-10	11-94	1-15	11-94	1-20	12
13	12-95	1-13	12-95	1-19	12-94	1-25	12-93	1-30	13
14	13-95	1-22	13-94	1-28	13-94	1-34	13-93	1-40	14
15	14-94	1-31	14-94	1-37	14-93	1-44	14-92	1-50	15
16	15-94	1-39	15-93	1-46	15-93	1-53	15-92	1-60	16
17	16-94	1-48	16-93	1-56	16-92	1-63	16-91	1-70	17
18	17-93	1-57	17-92	1-65	17-92	1-73	17-91	1-80	18
19	18-93	1-66	18-92	1-74	18-91	1-82	18-90	1-90	19
20	19-92	1-74	19-92	1-83	19-91	1-92	19-90	2-00	20
21	20-92	1-83	20-91	1-92	20-90	2-01	20-89	2-10	21
22	21-92	1-92	21-91	2-01	21-90	2-11	21-89	2-20	22
23	22-91	2-00	22-90	2-10	22-89	2-20	22-88	2-30	23
24	23-91	2-09	23-90	2-20	23-89	2-30	23-88	2-40	24
25	24-90	2-18	24-90	2-29	24-88	2-40	24-87	2-50	25
26	25-90	2-27	25-89	2-38	25-88	2-49	25-87	2-60	26
27	26-90	2-35	26-89	2-47	26-88	2-59	26-86	2-71	27
28	27-89	2-44	27-88	2-56	27-87	2-68	27-86	2-81	28
29	28-89	2-53	28-88	2-65	28-87	2-78	28-85	2-91	29
30	29-89	2-61	29-87	2-75	29-86	2-88	29-85	3-01	30
31	30-88	2-70	30-87	2-84	30-86	2-97	30-84	3-11	31
32	31-88	2-79	31-87	2-93	31-85	3-07	31-84	3-21	32
33	32-87	2-88	32-86	3-02	32-85	3-16	32-83	3-31	33
34	33-87	2-96	33-86	3-11	33-84	3-26	33-83	3-41	34
35	34-87	3-05	34-85	3-20	34-84	3-35	34-82	3-51	35
36	35-86	3-14	35-85	3-29	35-83	3-45	35-82	3-61	36
37	36-86	3-22	36-84	3-39	36-83	3-55	36-81	3-71	37
38	37-86	3-31	37-84	3-48	37-83	3-64	37-81	3-81	38
39	38-85	3-40	38-84	3-57	38-82	3-74	38-80	3-91	39
40	39-85	3-49	39-83	3-66	39-82	3-83	39-80	4-01	40
41	40-84	3-57	40-82	3-75	40-81	3-93	40-79	4-11	41
42	41-84	3-66	41-82	3-84	41-81	4-03	41-79	4-21	42
43	42-84	3-75	42-82	3-93	42-80	4-12	42-78	4-31	43
44	43-83	3-83	43-82	4-03	43-80	4-22	43-78	4-41	44
45	44-83	3-92	44-81	4-12	44-79	4-31	44-77	4-51	45
46	45-82	4-01	45-81	4-21	45-79	4-41	45-77	4-61	46
47	46-82	4-10	46-80	4-30	46-78	4-50	46-76	4-71	47
48	47-82	4-18	47-80	4-39	47-78	4-60	47-76	4-81	48
49	48-81	4-27	48-79	4-48	48-77	4-70	48-75	4-91	49
50	49-81	4-36	49-79	4-58	49-77	4-79	49-75	5-01	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	85 Deg.		84¾ Deg.		84½ Deg.		84¼ Deg.		

TRAVERSE TABLE.

Distance.	5 Deg.		5¼ Deg.		5½ Deg.		5¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-81	4-44	50-79	4-67	50-77	4-89	50-74	5-11	51
52	51-80	4-53	51-78	4-76	51-76	4-98	51-74	5-21	52
53	52-80	4-62	52-78	4-85	52-76	5-08	52-73	5-31	53
54	53-79	4-71	53-77	4-94	53-75	5-18	53-73	5-41	54
55	54-79	4-79	54-77	5-03	54-75	5-27	54-72	5-51	55
56	55-79	4-88	55-77	5-12	55-74	5-37	55-72	5-61	56
57	56-78	4-97	56-76	5-22	56-74	5-46	56-71	5-71	57
58	57-78	5-06	57-76	5-31	57-73	5-56	57-71	5-81	58
59	58-78	5-14	58-75	5-40	58-73	5-65	58-70	5-91	59
60	59-77	5-23	59-75	5-49	59-72	5-75	59-70	6-01	60
61	60-77	5-32	60-74	5-58	60-72	5-85	60-69	6-11	61
62	61-76	5-40	61-74	5-67	61-71	5-94	61-69	6-21	62
63	62-76	5-49	62-74	5-76	62-71	6-04	62-68	6-31	63
64	63-76	5-58	63-73	5-86	63-71	6-13	63-68	6-41	64
65	64-75	5-67	64-73	5-95	64-70	6-23	64-67	6-51	65
66	65-75	5-75	65-72	6-04	65-70	6-33	65-67	6-61	66
67	66-75	5-84	66-72	6-13	66-69	6-42	66-66	6-71	67
68	67-74	5-93	67-71	6-22	67-69	6-52	67-66	6-81	68
69	68-74	6-01	68-71	6-31	68-68	6-61	68-65	6-91	69
70	69-73	6-10	69-71	6-41	69-68	6-71	69-65	7-01	70
71	70-73	6-19	70-70	6-50	70-67	6-81	70-64	7-11	71
72	71-73	6-28	71-70	6-59	71-67	6-90	71-64	7-21	72
73	72-72	6-36	72-69	6-68	72-66	7-00	72-63	7-31	73
74	73-72	6-45	73-69	6-77	73-66	7-09	73-63	7-41	74
75	74-71	6-54	74-69	6-86	74-65	7-19	74-62	7-51	75
76	75-71	6-62	75-68	6-95	75-65	7-28	75-62	7-61	76
77	76-71	6-71	76-68	7-05	76-65	7-38	76-61	7-71	77
78	77-70	6-80	77-67	7-14	77-64	7-48	77-61	7-81	78
79	78-70	6-89	78-67	7-23	78-64	7-57	78-60	7-91	79
80	79-70	6-97	79-66	7-32	79-63	7-67	79-60	8-02	80
81	80-69	7-06	80-66	7-41	80-63	7-76	80-59	8-12	81
82	81-69	7-15	81-66	7-50	81-62	7-86	81-59	8-22	82
83	82-68	7-23	82-65	7-59	82-62	7-96	82-58	8-32	83
84	83-68	7-32	83-65	7-69	83-61	8-05	83-58	8-42	84
85	84-68	7-41	84-64	7-78	84-61	8-15	84-57	8-52	85
86	85-67	7-50	85-64	7-87	85-60	8-24	85-57	8-62	86
87	86-67	7-58	86-64	7-96	86-60	8-34	86-56	8-72	87
88	87-67	7-67	87-63	8-05	87-59	8-43	87-56	8-82	88
89	88-66	7-76	88-63	8-14	88-59	8-53	88-55	8-92	89
90	89-66	7-84	89-62	8-24	89-59	8-63	89-55	9-02	90
91	90-65	7-93	90-62	8-33	90-58	8-72	90-54	9-12	91
92	91-65	8-02	91-61	8-42	91-58	8-82	91-54	9-22	92
93	92-65	8-11	92-61	8-51	92-57	8-91	92-53	9-32	93
94	93-64	8-19	93-61	8-60	93-57	9-01	93-53	9-42	94
95	94-64	8-28	94-60	8-69	94-56	9-11	94-52	9-52	95
96	95-63	8-37	95-60	8-78	95-56	9-20	95-52	9-62	96
97	96-63	8-45	96-59	8-88	96-55	9-30	96-51	9-72	97
98	97-63	8-54	97-59	8-97	97-55	9-39	97-51	9-82	98
99	98-62	8-63	98-59	9-06	98-54	9-49	98-50	9-92	99
100	99-62	8-72	99-58	9-15	99-54	9-58	99-50	10-02	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	85 Deg.		84¾ Deg.		84½ Deg.		84¼ Deg.		

TRAVERSE TABLE.

Distance.	6 Deg.		6¼ Deg.		6½ Deg.		6¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-99	0-10	0-99	0-11	0-99	0-11	0-99	0-12	1
2	1-99	0-21	1-99	0-22	1-99	0-23	1-99	0-24	2
3	2-98	0-31	2-98	0-33	2-98	0-34	2-98	0-35	3
4	3-98	0-41	3-98	0-44	3-97	0-45	3-97	0-47	4
5	4-97	0-52	4-97	0-54	4-97	0-57	4-97	0-59	5
6	5-97	0-63	5-96	0-65	5-96	0-68	5-96	0-71	6
7	6-96	0-73	6-96	0-76	6-96	0-79	6-95	0-82	7
8	7-96	0-84	7-95	0-87	7-95	0-91	7-94	0-94	8
9	8-95	0-94	8-95	0-98	8-94	1-02	8-94	1-06	9
10	9-95	1-05	9-94	1-09	9-94	1-13	9-93	1-18	10
11	10-94	1-15	10-93	1-20	10-93	1-25	10-92	1-29	11
12	11-93	1-25	11-93	1-31	11-92	1-36	11-92	1-41	12
13	12-93	1-36	12-92	1-42	12-92	1-47	12-91	1-53	13
14	13-92	1-46	13-92	1-52	13-91	1-59	13-90	1-65	14
15	14-92	1-57	14-91	1-63	14-90	1-70	14-90	1-76	15
16	15-91	1-67	15-90	1-74	15-90	1-81	15-89	1-88	16
17	16-91	1-78	16-90	1-85	16-89	1-92	16-88	2-00	17
18	17-90	1-88	17-89	1-96	17-88	2-04	17-88	2-12	18
19	18-90	1-99	18-89	2-07	18-88	2-15	18-87	2-23	19
20	19-89	2-09	19-88	2-18	19-87	2-26	19-86	2-35	20
21	20-88	2-20	20-88	2-29	20-87	2-38	20-85	2-47	21
22	21-88	2-30	21-87	2-40	21-86	2-49	21-85	2-59	22
23	22-87	2-40	22-86	2-50	22-85	2-60	22-84	2-70	23
24	23-87	2-51	23-86	2-61	23-85	2-72	23-83	2-82	24
25	24-86	2-61	24-85	2-72	24-84	2-83	24-83	2-94	25
26	25-86	2-72	25-85	2-83	25-83	2-94	25-82	3-06	26
27	26-85	2-82	26-84	2-94	26-83	3-06	26-81	3-17	27
28	27-85	2-93	27-83	3-05	27-82	3-17	27-81	3-29	28
29	28-84	3-03	28-83	3-16	28-81	3-28	28-80	3-41	29
30	29-84	3-14	29-82	3-27	29-81	3-40	29-79	3-53	30
31	30-83	3-24	30-82	3-37	30-80	3-51	30-79	3-64	31
32	31-82	3-34	31-81	3-48	31-79	3-62	31-78	3-76	32
33	32-82	3-45	32-80	3-59	32-79	3-74	32-77	3-88	33
34	33-81	3-55	33-80	3-70	33-78	3-85	33-76	4-00	34
35	34-81	3-66	34-79	3-81	34-78	3-96	34-76	4-11	35
36	35-80	3-76	35-79	3-92	35-77	4-08	35-75	4-23	36
37	36-80	3-87	36-78	4-03	36-76	4-19	36-75	4-35	37
38	37-79	3-97	37-77	4-14	37-76	4-30	37-74	4-47	38
39	38-79	4-08	38-77	4-25	38-75	4-41	38-73	4-58	39
40	39-78	4-18	39-76	4-35	39-74	4-53	39-72	4-70	40
41	40-78	4-29	40-76	4-46	40-74	4-64	40-72	4-82	41
42	41-77	4-39	41-75	4-57	41-73	4-76	41-71	4-94	42
43	42-76	4-49	42-74	4-68	42-72	4-87	42-70	5-05	43
44	43-76	4-60	43-74	4-79	43-72	4-98	43-70	5-17	44
45	44-75	4-70	44-73	4-90	44-71	5-09	44-69	5-29	45
46	45-75	4-81	45-73	5-01	45-70	5-21	45-68	5-41	46
47	46-74	4-91	46-72	5-12	46-70	5-32	46-67	5-52	47
48	47-74	5-02	47-71	5-23	47-69	5-43	47-67	5-64	48
49	48-73	5-12	48-71	5-34	48-69	5-55	48-66	5-76	49
50	49-73	5-23	49-70	5-44	49-68	5-66	49-65	5-88	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	84 Deg.		83¾ Deg.		83½ Deg.		Deg. 83¼		

TRAVERSE TABLE.

Distance.	6 Deg.		6¼ Deg.		6½ Deg.		6¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	60-72	5-33	50-70	5-55	50-67	5-77	50-65	5-99	51
52	51-72	5-44	51-69	5-66	51-67	5-89	51-64	6-11	52
53	52-71	5-54	52-68	5-77	52-66	6-00	52-63	6-23	53
54	53-70	5-64	53-68	5-88	53-65	6-11	53-63	6-35	54
55	54-70	5-75	54-67	5-99	54-65	6-23	54-62	6-46	55
56	55-69	5-85	55-67	6-10	55-64	6-34	55-61	6-58	56
57	56-69	5-96	56-66	6-21	56-63	6-45	56-60	6-70	57
58	57-68	6-06	57-66	6-31	57-63	6-57	57-60	6-82	58
59	58-68	6-17	58-65	6-42	58-62	6-68	58-59	6-93	59
60	59-67	6-27	59-64	6-53	59-61	6-79	59-58	7-05	60
61	60-67	6-38	60-64	6-64	60-61	6-91	60-58	7-17	61
62	61-66	6-48	61-63	6-75	61-60	7-02	61-57	7-29	62
63	62-65	6-59	62-63	6-86	62-60	7-13	62-56	7-40	63
64	63-65	6-69	63-62	6-97	63-59	7-25	63-56	7-52	64
65	64-64	6-79	64-61	7-08	64-58	7-36	64-55	7-64	65
66	65-64	6-90	65-61	7-19	65-58	7-47	65-54	7-76	66
67	66-63	7-00	66-60	7-29	66-57	7-58	66-54	7-88	67
68	67-63	7-11	67-60	7-40	67-56	7-70	67-53	7-99	68
69	68-62	7-21	68-59	7-51	68-56	7-81	68-52	8-11	69
70	69-62	7-32	69-58	7-62	69-55	7-92	69-51	8-23	70
71	70-61	7-42	70-58	7-73	70-54	8-04	70-51	8-35	71
72	71-61	7-53	71-57	7-84	71-54	8-15	71-50	8-46	72
73	72-60	7-63	72-57	7-95	72-53	8-26	72-49	8-58	73
74	73-59	7-74	73-56	8-06	73-52	8-38	73-49	8-70	74
75	74-59	7-84	74-55	8-17	74-52	8-49	74-48	8-82	75
76	75-58	7-94	75-55	8-27	75-51	8-60	75-47	8-93	76
77	76-58	8-05	76-54	8-38	76-51	8-72	76-47	9-05	77
78	77-57	8-15	77-54	8-49	77-50	8-83	77-46	9-17	78
79	78-57	8-26	78-53	8-60	78-49	8-94	78-45	9-29	79
80	79-56	8-36	79-53	8-71	79-49	9-06	79-45	9-40	80
81	80-56	8-47	80-52	8-82	80-48	9-17	80-44	9-52	81
82	81-55	8-57	81-51	8-93	81-47	9-28	81-43	9-64	82
83	82-55	8-68	82-51	9-04	82-47	9-40	82-42	9-76	83
84	83-54	8-78	83-50	9-14	83-46	9-51	83-42	9-87	84
85	84-53	8-88	84-50	9-25	84-45	9-62	84-41	9-99	85
86	85-53	8-99	85-49	9-36	85-45	9-74	85-40	10-11	86
87	86-52	9-09	86-48	9-47	86-44	9-85	86-40	10-23	87
88	87-52	9-20	87-48	9-58	87-43	9-96	87-39	10-34	88
89	88-51	9-30	88-47	9-69	88-43	10-08	88-38	10-46	89
90	89-51	9-41	89-47	9-80	89-42	10-19	89-38	10-58	90
91	90-50	9-51	90-46	9-91	90-42	10-30	90-37	10-70	91
92	91-50	9-62	91-45	10-02	91-41	10-41	91-36	10-81	92
93	92-49	9-72	92-45	10-12	92-40	10-53	92-36	10-93	93
94	93-49	9-83	93-44	10-23	93-40	10-64	93-35	11-05	94
95	94-48	9-93	94-44	10-34	94-39	10-75	94-34	11-17	95
96	95-47	10-03	95-43	10-45	95-38	10-87	95-33	11-28	96
97	96-47	10-14	96-42	10-56	96-38	10-98	96-33	11-40	97
98	97-46	10-24	97-42	10-67	97-37	11-09	97-32	11-52	98
99	98-46	10-35	98-41	10-78	98-36	11-21	98-31	11-64	99
100	99-45	10-45	99-41	10-89	99-36	11-32	99-31	11-75	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	84 Deg.		83¾ Deg.		83½ Deg.		83¼ Deg.		

TRAVERSE TABLE.

Distance.	7 Deg.		7¼ Deg		7½ Deg.		7¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-99	0-12	0-99	0-13	0-99	0-13	0-99	0-13	1
2	1-99	0-24	1-98	0-25	1-98	0-26	1-98	0-27	2
3	2-98	0-37	2-98	0-38	2-97	0-39	2-97	0-40	3
4	3-97	0-49	3-97	0-50	3-97	0-52	3-96	0-54	4
5	4-96	0-61	4-96	0-63	4-96	0-65	4-95	0-67	5
6	5-96	0-73	5-95	0-76	5-95	0-78	5-95	0-81	6
7	6-95	0-85	6-94	0-88	6-94	0-91	6-94	0-94	7
8	7-94	0-97	7-94	1-01	7-93	1-04	7-93	1-08	8
9	8-93	1-10	8-93	1-14	8-92	1-17	8-92	1-21	9
10	9-93	1-22	9-92	1-26	9-91	1-31	9-91	1-36	10
11	10-92	1-34	10-91	1-39	10-91	1-44	10-90	1-48	11
12	11-91	1-46	11-90	1-51	11-90	1-57	11-89	1-62	12
13	12-90	1-58	12-90	1-64	12-89	1-70	12-88	1-75	13
14	13-90	1-71	13-89	1-77	13-88	1-83	13-87	1-89	14
15	14-89	1-83	14-88	1-89	14-87	1-96	14-86	2-02	15
16	15-88	1-95	15-87	2-02	15-86	2-09	15-85	2-16	16
17	16-87	2-07	16-86	2-15	16-85	2-22	16-84	2-29	17
18	17-87	2-19	17-86	2-27	17-85	2-35	17-84	2-43	18
19	18-86	2-32	18-85	2-40	18-84	2-48	18-83	2-56	19
20	19-85	2-44	19-84	2-52	19-83	2-61	19-82	2-70	20
21	20-84	2-56	20-83	2-65	20-82	2-74	20-81	2-83	21
22	21-84	2-68	21-82	2-78	21-81	2-87	21-80	2-97	22
23	22-83	2-80	22-82	2-90	22-80	3-00	22-79	3-10	23
24	23-82	2-92	23-81	3-03	23-79	3-13	23-78	3-24	24
25	24-81	3-05	24-80	3-15	24-79	3-26	24-77	3-37	25
26	25-81	3-17	25-79	3-28	25-78	3-39	25-76	3-51	26
27	26-80	3-29	26-78	3-41	26-77	3-52	26-75	3-64	27
28	27-79	3-41	27-78	3-53	27-76	3-65	27-74	3-78	28
29	28-78	3-53	28-77	3-66	28-75	3-79	28-74	3-91	29
30	29-78	3-66	29-76	3-79	29-74	3-92	29-73	4-05	30
31	30-77	3-78	30-75	3-91	30-73	4-05	30-72	4-18	31
32	31-76	3-90	31-74	4-04	31-73	4-18	31-71	4-32	32
33	32-75	4-02	32-74	4-16	32-72	4-31	32-70	4-45	33
34	33-75	4-14	33-73	4-29	33-71	4-44	33-69	4-58	34
35	34-74	4-27	34-72	4-42	34-70	4-57	34-68	4-72	35
36	35-73	4-39	35-71	4-54	35-69	4-70	35-67	4-85	36
37	36-72	4-51	36-70	4-67	36-68	4-83	36-66	4-99	37
38	37-72	4-63	37-70	4-80	37-67	4-96	37-65	5-12	38
39	38-71	4-75	38-69	4-92	38-67	5-09	38-64	5-26	39
40	39-70	4-87	39-68	5-05	39-66	5-22	39-63	5-39	40
41	40-70	5-00	40-67	5-17	40-65	5-35	40-63	5-53	41
42	41-69	5-12	41-66	5-30	41-64	5-48	41-62	5-66	42
43	42-68	5-24	42-66	5-43	42-63	5-61	42-61	5-80	43
44	43-67	5-36	43-65	5-55	43-62	5-74	43-60	5-93	44
45	44-67	5-48	44-64	5-68	44-62	5-87	44-59	6-07	45
46	45-66	5-61	45-63	5-81	45-61	6-00	45-58	6-20	46
47	46-65	5-73	46-62	5-93	46-60	6-13	46-57	6-34	47
48	47-64	5-85	47-62	6-06	47-59	6-27	47-56	6-47	48
49	48-63	5-97	48-61	6-18	48-58	6-40	48-55	6-61	49
50	49-63	6-09	49-60	6-31	49-57	6-53	49-54	6-74	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	83 Deg.		82¾ Deg.		82½ Deg.		82¼ Deg.		

TRAVERSE TABLE.

17

Distance.	7 Deg.		7¼ Deg.		7½ Deg.		7¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-62	6-22	50-59	6-44	50-56	6-66	50-53	6-88	51
52	51-61	6-34	51-58	6-50	51-56	6-79	51-53	7-01	52
53	52-60	6-46	52-58	6-69	52-55	6-92	52-52	7-15	53
54	53-60	6-58	53-57	6-81	53-54	7-05	53-51	7-28	54
55	54-59	6-70	54-50	6-94	54-53	7-18	54-50	7-42	55
56	55-58	6-82	55-55	7-07	55-52	7-31	55-49	7-55	56
57	56-58	6-95	56-54	7-19	56-51	7-44	56-48	7-69	57
58	57-57	7-07	57-54	7-32	57-50	7-57	57-47	7-82	58
59	58-56	7-19	58-53	7-45	58-50	7-70	58-46	7-96	59
60	59-55	7-31	59-52	7-57	59-49	7-83	59-45	8-09	60
61	60-55	7-43	60-51	7-70	60-48	7-96	60-44	8-23	61
62	61-54	7-56	61-50	7-82	61-47	8-09	61-43	8-36	62
63	62-53	7-68	62-50	7-95	62-46	8-22	62-42	8-50	63
64	63-52	7-80	63-49	8-08	63-45	8-35	63-42	8-63	64
65	64-52	7-92	64-48	8-20	64-44	8-48	64-41	8-77	65
66	65-51	8-04	65-47	8-33	65-44	8-61	65-40	8-90	66
67	66-50	8-17	66-46	8-46	66-43	8-75	66-39	9-04	67
68	67-49	8-29	67-46	8-58	67-42	8-88	67-38	9-17	68
69	68-49	8-41	68-45	8-71	68-41	9-01	68-37	9-30	69
70	69-48	8-53	69-44	8-83	69-40	9-14	69-36	9-44	70
71	70-47	8-65	70-43	8-96	70-39	9-27	70-35	9-57	71
72	71-46	8-77	71-42	9-09	71-38	9-40	71-34	9-71	72
73	72-46	8-90	72-42	9-21	72-38	9-53	72-33	9-84	73
74	73-45	9-02	73-41	9-34	73-37	9-66	73-32	9-98	74
75	74-44	9-14	74-40	9-46	74-36	9-79	74-31	10-11	75
76	75-43	9-26	75-39	9-59	75-35	9-92	75-31	10-25	76
77	76-43	9-38	76-38	9-72	76-34	10-05	76-30	10-38	77
78	77-42	9-51	77-38	9-84	77-33	10-18	77-29	10-52	78
79	78-41	9-63	78-37	9-97	78-32	10-31	78-28	10-65	79
80	79-40	9-75	79-36	10-10	79-32	10-44	79-27	10-79	80
81	80-40	9-87	80-35	10-22	80-31	10-57	80-26	10-92	81
82	81-39	9-99	81-34	10-35	81-30	10-70	81-25	11-06	82
83	82-38	10-12	82-34	10-47	82-29	10-83	82-24	11-19	83
84	83-37	10-24	83-33	10-60	83-28	10-96	83-23	11-33	84
85	84-37	10-36	84-32	10-73	84-27	11-09	84-22	11-46	85
86	85-36	10-48	85-31	10-85	85-26	11-23	85-21	11-60	86
87	86-35	10-60	86-30	10-98	86-26	11-36	86-21	11-73	87
88	87-34	10-72	87-30	11-11	87-25	11-49	87-20	11-87	88
89	88-34	10-85	88-29	11-23	88-24	11-62	88-19	12-00	89
90	89-33	10-97	89-28	11-36	89-23	11-75	89-18	12-14	90
91	90-32	11-09	90-27	11-48	90-22	11-88	90-17	12-27	91
92	91-31	11-21	91-26	11-61	91-21	12-01	91-16	12-41	92
93	92-31	11-33	92-26	11-74	92-20	12-14	92-15	12-54	93
94	93-30	11-46	93-25	11-86	93-20	12-27	93-14	12-68	94
95	94-29	11-58	94-24	11-99	94-19	12-40	94-13	12-81	95
96	95-28	11-70	95-23	12-12	95-18	12-53	95-12	12-95	96
97	96-28	11-82	96-22	12-24	96-17	12-66	96-11	13-08	97
98	97-27	11-94	97-22	12-37	97-16	12-79	97-10	13-22	98
99	98-26	12-07	98-21	12-49	98-15	12-92	98-10	13-35	99
100	99-25	12-19	99-20	12-62	99-14	13-05	99-09	13-49	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	83 Deg.		82¼ Deg.		82½ Deg.		82¾ Deg.		

TRAVERSE TABLE.

Distance.	8 Deg.		8¼ Deg.		8½ Deg.		8¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-99	0-14	0-99	0-14	0-99	0-15	0-99	0-15	1
2	1-98	0-28	1-98	0-29	1-98	0-30	1-98	0-30	2
3	2-97	0-42	2-97	0-43	2-97	0-44	2-97	0-46	3
4	3-96	0-56	3-96	0-57	3-96	0-59	3-95	0-61	4
5	4-95	0-70	4-95	0-72	4-95	0-74	4-94	0-76	5
6	5-94	0-84	5-94	0-86	5-93	0-89	5-93	0-91	6
7	6-93	0-97	6-93	1-00	6-92	1-03	6-92	1-06	7
8	7-92	1-11	7-92	1-15	7-91	1-18	7-91	1-22	8
9	8-91	1-25	8-91	1-29	8-90	1-33	8-90	1-37	9
10	9-90	1-39	9-90	1-43	9-89	1-48	9-88	1-52	10
11	10-89	1-53	10-89	1-58	10-88	1-63	10-87	1-67	11
12	11-88	1-67	11-88	1-72	11-87	1-77	11-86	1-83	12
13	12-87	1-81	12-87	1-87	12-86	1-92	12-85	1-98	13
14	13-86	1-95	13-86	2-01	13-85	2-07	13-84	2-13	14
15	14-85	2-09	14-85	2-15	14-84	2-22	14-83	2-28	15
16	15-84	2-23	15-84	2-30	15-82	2-36	15-81	2-43	16
17	16-83	2-37	16-83	2-44	16-81	2-51	16-80	2-59	17
18	17-82	2-51	17-81	2-58	17-80	2-66	17-79	2-74	18
19	18-82	2-64	18-80	2-73	18-79	2-81	18-78	2-89	19
20	19-81	2-78	19-79	2-87	19-78	2-96	19-77	3-04	20
21	20-80	2-92	20-78	3-01	20-77	3-10	20-76	3-19	21
22	21-79	3-06	21-77	3-16	21-76	3-25	21-74	3-35	22
23	22-78	3-20	22-76	3-30	22-75	3-40	22-73	3-50	23
24	23-77	3-34	23-75	3-44	23-74	3-55	23-72	3-65	24
25	24-76	3-48	24-74	3-59	24-73	3-70	24-71	3-80	25
26	25-75	3-62	25-73	3-73	25-71	3-84	25-70	3-96	26
27	26-74	3-76	26-72	3-87	26-70	3-99	26-69	4-11	27
28	27-73	3-90	27-71	4-02	27-69	4-14	27-67	4-26	28
29	28-72	4-04	28-70	4-16	28-68	4-29	28-66	4-41	29
30	29-71	4-18	29-69	4-30	29-67	4-43	29-65	4-56	30
31	30-70	4-31	30-68	4-45	30-66	4-58	30-64	4-72	31
32	31-69	4-45	31-67	4-59	31-65	4-73	31-63	4-87	32
33	32-68	4-59	32-66	4-74	32-64	4-88	32-62	5-02	33
34	33-67	4-73	33-65	4-88	33-63	5-03	33-60	5-17	34
35	34-66	4-87	34-64	5-02	34-62	5-17	34-59	5-32	35
36	35-65	5-01	35-63	5-17	35-60	5-32	35-58	5-48	36
37	36-64	5-15	36-62	5-31	36-59	5-47	36-57	5-63	37
38	37-63	5-29	37-61	5-45	37-58	5-62	37-56	5-78	38
39	38-62	5-43	38-60	5-60	38-57	5-76	38-55	5-93	39
40	39-61	5-57	39-59	5-74	39-56	5-91	39-53	6-08	40
41	40-60	5-71	40-58	5-88	40-55	6-06	40-52	6-24	41
42	41-59	5-85	41-57	6-03	41-54	6-21	41-51	6-39	42
43	42-58	5-98	42-56	6-17	42-53	6-36	42-50	6-54	43
44	43-57	6-12	43-54	6-31	43-52	6-50	43-49	6-69	44
45	44-56	6-26	44-53	6-46	44-51	6-65	44-48	6-85	45
46	45-55	6-40	45-52	6-60	45-49	6-80	45-46	7-00	46
47	46-54	6-54	46-51	6-74	46-48	6-95	46-45	7-15	47
48	47-53	6-68	47-50	6-89	47-47	7-09	47-44	7-30	48
49	48-52	6-82	48-49	7-03	48-46	7-24	48-43	7-45	49
50	49-51	6-96	49-48	7-17	49-45	7-39	49-42	7-61	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	82 Deg.		81¾ Deg.		81½ Deg.		81¼ Deg.		

Distance.	8 Deg.		8¼ Deg.		8½ Deg.		8¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50:50	7:10	50:47	7:32	50:44	7:54	50:41	7:76	51
52	51:49	7:24	51:46	7:46	51:43	7:09	51:39	7:91	52
53	52:48	7:38	52:45	7:61	52:42	7:83	52:38	8:06	53
54	53:47	7:52	53:44	7:75	53:41	7:98	53:37	8:21	54
55	54:46	7:65	54:43	7:89	54:40	8:13	54:36	8:37	55
56	55:46	7:79	55:42	8:04	55:38	8:28	55:35	8:52	56
57	56:45	7:93	56:41	8:18	56:37	8:43	56:34	8:67	57
58	57:44	8:07	57:40	8:32	57:36	8:57	57:32	8:82	58
59	58:43	8:21	58:39	8:47	58:35	8:72	58:31	8:98	59
60	59:42	8:35	59:38	8:61	59:34	8:87	59:30	9:13	60
61	60:41	8:49	60:37	8:75	60:33	9:02	60:29	9:28	61
62	61:40	8:63	61:36	8:90	61:32	9:16	61:28	9:43	62
63	62:39	8:77	62:35	9:04	62:31	9:31	62:27	9:58	63
64	63:38	8:91	63:34	9:18	63:30	9:46	63:26	9:74	64
65	64:37	9:05	64:33	9:33	64:29	9:61	64:24	9:89	65
66	65:36	9:19	65:32	9:47	65:28	9:76	65:23	10:04	66
67	66:35	9:32	66:31	9:61	66:26	9:90	66:22	10:19	67
68	67:34	9:46	67:30	9:76	67:25	10:05	67:21	10:34	68
69	68:33	9:60	68:29	9:90	68:24	10:20	68:20	10:50	69
70	69:32	9:74	69:28	10:04	69:23	10:35	69:19	10:65	70
71	70:31	9:88	70:27	10:19	70:22	10:49	70:17	10:80	71
72	71:30	10:02	71:25	10:33	71:21	10:64	71:16	10:95	72
73	72:29	10:16	72:24	10:47	72:20	10:79	72:15	11:10	73
74	73:28	10:30	73:23	10:62	73:19	10:94	73:14	11:26	74
75	74:27	10:44	74:22	10:76	74:18	11:09	74:13	11:41	75
76	75:26	10:58	75:21	10:91	75:17	11:23	75:12	11:56	76
77	76:25	10:72	76:20	11:05	76:15	11:38	76:10	11:71	77
78	77:24	10:86	77:19	11:19	77:14	11:53	77:09	11:87	78
79	78:23	10:99	78:18	11:34	78:13	11:68	78:08	12:02	79
80	79:22	11:13	79:17	11:48	79:12	11:82	79:07	12:17	80
81	80:21	11:27	80:16	11:62	80:11	11:97	80:06	12:32	81
82	81:20	11:41	81:15	11:77	81:10	12:12	81:05	12:47	82
83	82:19	11:55	82:14	11:91	82:09	12:27	82:03	12:63	83
84	83:18	11:69	83:13	12:05	83:08	12:42	83:02	12:78	84
85	84:17	11:83	84:12	12:20	84:07	12:56	84:01	12:93	85
86	85:16	11:97	85:11	12:34	85:06	12:71	85:00	13:08	86
87	86:15	12:11	86:10	12:48	86:04	12:86	85:99	13:23	87
88	87:14	12:25	87:09	12:63	87:03	13:01	86:98	13:39	88
89	88:13	12:39	88:08	12:77	88:02	13:16	87:96	13:54	89
90	89:12	12:53	89:07	12:91	89:01	13:30	88:95	13:69	90
91	90:11	12:66	90:06	13:06	90:00	13:45	89:94	13:84	91
92	91:10	12:80	91:05	13:20	90:99	13:60	90:93	14:00	92
93	92:09	12:94	92:04	13:34	91:98	13:75	91:92	14:15	93
94	93:09	13:08	93:03	13:49	92:97	13:89	92:91	14:30	94
95	94:08	13:22	94:02	13:63	93:96	14:04	93:89	14:45	95
96	95:07	13:36	95:01	13:78	94:95	14:19	94:88	14:60	96
97	96:06	13:50	96:00	13:92	95:93	14:34	95:87	14:76	97
98	97:05	13:64	96:99	14:06	96:92	14:49	96:86	14:91	98
99	98:04	13:78	97:98	14:21	97:91	14:63	97:85	15:06	99
100	99:03	13:92	98:97	14:35	98:90	14:78	98:84	15:21	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	82 Deg.		81¾ Deg.		81½ Deg.		81¼ Deg.		

TRAVERSE TABLE.

Distance.	9 Deg.		9¼ Deg.		9½ Deg.		9¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-99	0-16	0-99	0-16	0-99	0-17	0-99	0-17	1
2	1-08	0-31	1-97	0-32	1-97	0-33	1-97	0-34	2
3	2-06	0-47	2-96	0-48	2-96	0-50	2-96	0-51	3
4	3-95	0-63	3-95	0-64	3-95	0-66	3-94	0-68	4
5	4-94	0-78	4-93	0-80	4-93	0-83	4-93	0-85	5
6	5-93	0-94	5-92	0-96	5-92	0-99	5-91	1-02	6
7	6-91	1-10	6-91	1-13	6-90	1-16	6-90	1-19	7
8	7-90	1-25	7-90	1-29	7-89	1-32	7-88	1-35	8
9	8-89	1-41	8-88	1-45	8-88	1-49	8-87	1-52	9
10	9-88	1-56	9-87	1-61	9-86	1-65	9-86	1-69	10
11	10-86	1-72	10-86	1-77	10-85	1-82	10-84	1-86	11
12	11-85	1-88	11-84	1-93	11-84	1-98	11-83	2-03	12
13	12-84	2-03	12-83	2-09	12-82	2-15	12-81	2-20	13
14	13-83	2-19	13-82	2-25	13-81	2-31	13-80	2-37	14
15	14-82	2-35	14-80	2-41	14-79	2-48	14-78	2-54	15
16	15-80	2-50	15-79	2-57	15-78	2-64	15-77	2-71	16
17	16-79	2-66	16-78	2-73	16-77	2-81	16-75	2-88	17
18	17-78	2-82	17-77	2-89	17-75	2-97	17-74	3-05	18
19	18-77	2-97	18-75	3-05	18-74	3-14	18-73	3-22	19
20	19-75	3-13	19-74	3-21	19-73	3-30	19-71	3-39	20
21	20-74	3-29	20-73	3-38	20-71	3-47	20-70	3-56	21
22	21-73	3-44	21-71	3-54	21-70	3-63	21-68	3-73	22
23	22-72	3-60	22-70	3-70	22-68	3-80	22-67	3-90	23
24	23-70	3-75	23-69	3-86	23-67	3-96	23-65	4-06	24
25	24-69	3-91	24-67	4-02	24-66	4-13	24-64	4-23	25
26	25-68	4-07	25-66	4-18	25-64	4-29	25-62	4-40	26
27	26-67	4-22	26-65	4-34	26-63	4-46	26-61	4-57	27
28	27-66	4-38	27-64	4-50	27-62	4-62	27-60	4-74	28
29	28-64	4-54	28-62	4-66	28-60	4-79	28-58	4-91	29
30	29-63	4-69	29-61	4-82	29-59	4-95	29-57	5-08	30
31	30-62	4-85	30-60	4-98	30-57	5-12	30-55	5-25	31
32	31-61	5-01	31-58	5-14	31-56	5-28	31-54	5-42	32
33	32-59	5-16	32-57	5-30	32-55	5-45	32-52	5-59	33
34	33-58	5-32	33-56	5-47	33-53	5-61	33-51	5-76	34
35	34-57	5-48	34-54	5-63	34-52	5-78	34-49	5-93	35
36	35-56	5-63	35-53	5-79	35-51	5-94	35-48	6-10	36
37	36-54	5-79	36-52	5-95	36-49	6-11	36-47	6-27	37
38	37-53	5-94	37-51	6-11	37-48	6-27	37-45	6-44	38
39	38-52	6-10	38-49	6-27	38-47	6-44	38-44	6-60	39
40	39-51	6-26	39-48	6-43	39-45	6-60	39-42	6-77	40
41	40-50	6-41	40-47	6-59	40-44	6-77	40-41	6-94	41
42	41-48	6-57	41-45	6-75	41-42	6-92	41-39	7-11	42
43	42-47	6-73	42-44	6-91	42-41	7-10	42-38	7-28	43
44	43-46	6-88	43-43	7-07	43-40	7-26	43-36	7-45	44
45	44-45	7-04	44-41	7-23	44-38	7-43	44-35	7-62	45
46	45-43	7-20	45-40	7-39	45-37	7-59	45-34	7-79	46
47	46-42	7-35	46-39	7-55	46-36	7-76	46-32	7-96	47
48	47-41	7-51	47-38	7-72	47-34	7-92	47-31	8-13	48
49	48-40	7-67	48-36	7-88	48-33	8-09	48-29	8-30	49
50	49-38	7-82	49-35	8-04	49-32	8-25	49-28	8-47	50
Distance.	81 Deg.		80¾ Deg.		80½ Deg.		80¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

Distance.	9 Deg.		9¼ Deg.		9½ Deg.		9¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-37	7-98	50-34	8-20	50-30	8-42	50-28	8-64	51
52	51-36	8-13	51-32	8-36	51-29	8-58	51-25	8-81	52
53	52-35	8-29	52-31	8-52	52-27	8-75	52-23	8-98	53
54	53-34	8-45	53-30	8-68	53-26	8-91	53-22	9-14	54
55	54-32	8-60	54-28	8-84	54-25	9-08	54-21	9-31	55
56	55-31	8-76	55-27	9-00	55-23	9-24	55-19	9-48	56
57	56-30	8-92	56-26	9-16	56-22	9-41	56-18	9-65	57
58	57-29	9-07	57-25	9-32	57-20	9-57	57-16	9-82	58
59	58-27	9-23	58-23	9-48	58-19	9-74	58-15	9-99	59
60	59-26	9-39	59-22	9-64	59-18	9-90	59-13	10-16	60
61	60-25	9-54	60-21	9-81	60-16	10-07	60-12	10-33	61
62	61-24	9-70	61-19	9-97	61-15	10-23	61-10	10-50	62
63	62-22	9-86	62-18	10-13	62-14	10-40	62-09	10-67	63
64	63-21	10-01	63-17	10-29	63-12	10-56	63-08	10-84	64
65	64-20	10-17	64-15	10-45	64-11	10-73	64-06	11-01	65
66	65-19	10-32	65-14	10-61	65-09	10-89	65-05	11-18	66
67	66-18	10-48	66-13	10-77	66-08	11-06	66-03	11-35	67
68	67-16	10-64	67-12	10-93	67-07	11-22	67-02	11-52	68
69	68-15	10-79	68-10	11-09	68-05	11-39	68-00	11-69	69
70	69-14	10-95	69-09	11-25	69-04	11-55	68-99	11-85	70
71	70-13	11-11	70-08	11-41	70-03	11-72	69-97	12-02	71
72	71-11	11-26	71-06	11-57	71-01	11-88	70-96	12-19	72
73	72-10	11-42	72-05	11-73	72-00	12-05	71-95	12-36	73
74	73-09	11-58	73-04	11-89	72-99	12-21	72-93	12-53	74
75	74-08	11-73	74-02	12-06	73-97	12-38	73-92	12-70	75
76	75-06	11-89	75-01	12-22	74-96	12-54	74-90	12-87	76
77	76-05	12-05	76-00	12-38	75-94	12-71	75-89	13-04	77
78	77-04	12-20	76-99	12-54	76-93	12-87	76-87	13-21	78
79	78-03	12-36	77-97	12-70	77-92	13-04	77-86	13-38	79
80	79-02	12-51	78-96	12-86	78-90	13-20	78-84	13-55	80
81	80-00	12-67	79-95	13-02	79-89	13-37	79-83	13-72	81
82	80-99	12-83	80-93	13-18	80-88	13-53	80-82	13-89	82
83	81-98	12-98	81-92	13-34	81-86	13-70	81-80	14-06	83
84	82-97	13-14	82-91	13-50	82-85	13-86	82-79	14-23	84
85	83-95	13-30	83-89	13-66	83-83	14-03	83-77	14-39	85
86	84-94	13-45	84-88	13-82	84-82	14-19	84-76	14-56	86
87	85-93	13-61	85-87	13-98	85-81	14-36	85-74	14-73	87
88	86-92	13-77	86-86	14-15	86-79	14-52	86-73	14-90	88
89	87-90	13-92	87-84	14-31	87-78	14-69	87-71	15-07	89
90	88-89	14-08	88-83	14-47	88-77	14-85	88-70	15-24	90
91	89-88	14-24	89-82	14-63	89-75	15-02	89-69	15-41	91
92	90-87	14-39	90-80	14-79	90-74	15-18	90-67	15-58	92
93	91-86	14-55	91-79	14-95	91-72	15-35	91-66	15-75	93
94	92-84	14-70	92-78	15-11	92-71	15-51	92-64	15-92	94
95	93-83	14-86	93-76	15-27	93-70	15-68	93-63	16-09	95
96	94-82	15-02	94-75	15-43	94-68	15-84	94-61	16-26	96
97	95-81	15-17	95-74	15-59	95-67	16-01	95-60	16-43	97
98	96-79	15-33	96-73	15-75	96-66	16-17	96-58	16-60	98
99	97-78	15-49	97-71	15-91	97-64	16-34	97-57	16-77	99
100	98-77	15-64	98-70	16-07	98-63	16-50	98-56	16-93	100
Distance.	81 Deg.		80¾ Deg.		80½ Deg.		80¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	10 Deg.		10¼ Deg.		10½ Deg.		10¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-98	0-17	0-98	0-18	0-98	0-18	0-98	0-19	1
2	1-97	0-35	1-97	0-36	1-97	0-36	1-96	0-37	2
3	2-95	0-52	2-95	0-53	2-95	0-55	2-95	0-56	3
4	3-94	0-69	3-94	0-71	3-93	0-73	3-93	0-75	4
5	4-92	0-87	4-92	0-89	4-92	0-91	4-91	0-93	5
6	5-91	1-04	5-90	1-07	5-90	1-09	5-89	1-12	6
7	6-89	1-22	6-89	1-25	6-88	1-28	6-88	1-31	7
8	7-88	1-39	7-87	1-42	7-87	1-46	7-86	1-49	8
9	8-86	1-56	8-86	1-60	8-85	1-64	8-84	1-68	9
10	9-85	1-74	9-84	1-78	9-83	1-82	9-82	1-87	10
11	10-83	1-91	10-82	1-96	10-82	2-00	10-81	2-05	11
12	11-82	2-08	11-81	2-14	11-80	2-19	11-79	2-24	12
13	12-80	2-23	12-79	2-31	12-78	2-37	12-77	2-42	13
14	13-79	2-43	13-78	2-49	13-77	2-55	13-75	2-61	14
15	14-77	2-60	14-76	2-67	14-75	2-73	14-74	2-80	15
16	15-76	2-78	15-74	2-85	15-73	2-92	15-72	2-98	16
17	16-74	2-95	16-73	3-03	16-72	3-10	16-70	3-17	17
18	17-73	3-13	17-71	3-20	17-70	3-28	17-68	3-36	18
19	18-71	3-30	18-70	3-38	18-68	3-46	18-67	3-54	19
20	19-70	3-47	19-68	3-56	19-67	3-64	19-65	3-73	20
21	20-68	3-65	20-66	3-74	20-65	3-83	20-63	3-92	21
22	21-67	3-82	21-65	3-91	21-63	4-01	21-61	4-10	22
23	22-65	3-99	22-63	4-09	22-61	4-19	22-60	4-29	23
24	23-64	4-17	23-62	4-27	23-60	4-37	23-58	4-48	24
25	24-62	4-34	24-60	4-45	24-58	4-56	24-56	4-66	25
26	25-61	4-51	25-59	4-63	25-56	4-74	25-54	4-85	26
27	26-59	4-69	26-57	4-80	26-55	4-92	26-53	5-04	27
28	27-57	4-86	27-55	4-98	27-53	5-10	27-51	5-22	28
29	28-56	5-04	28-54	5-16	28-51	5-28	28-49	5-41	29
30	29-54	5-21	29-52	5-34	29-50	5-47	29-47	5-60	30
31	30-53	5-38	30-51	5-52	30-48	5-65	30-46	5-78	31
32	31-51	5-56	31-49	5-69	31-46	5-83	31-44	5-97	32
33	32-50	5-73	32-47	5-87	32-45	6-01	32-42	6-16	33
34	33-48	5-90	33-46	6-05	33-43	6-20	33-40	6-34	34
35	34-47	6-08	34-44	6-23	34-41	6-38	34-39	6-53	35
36	35-45	6-25	35-43	6-41	35-40	6-56	35-37	6-71	36
37	36-44	6-42	36-41	6-58	36-38	6-74	36-35	6-90	37
38	37-42	6-60	37-39	6-76	37-36	6-92	37-33	7-09	38
39	38-41	6-77	38-38	6-94	38-35	7-11	38-32	7-27	39
40	39-39	6-95	39-36	7-12	39-33	7-29	39-30	7-46	40
41	40-38	7-12	40-35	7-30	40-31	7-47	40-28	7-65	41
42	41-36	7-29	41-33	7-47	41-30	7-65	41-26	7-83	42
43	42-35	7-47	42-31	7-65	42-28	7-84	42-25	8-02	43
44	43-33	7-64	43-30	7-83	43-26	8-02	43-23	8-21	44
45	44-32	7-81	44-28	8-01	44-25	8-20	44-21	8-39	45
46	45-30	7-99	45-27	8-19	45-23	8-38	45-19	8-58	46
47	46-29	8-16	46-25	8-36	46-21	8-57	46-18	8-77	47
48	47-27	8-34	47-23	8-54	47-20	8-75	47-16	8-95	48
49	48-26	8-51	48-22	8-72	48-18	8-93	48-14	9-14	49
50	49-24	8-68	49-20	8-90	49-16	9-11	49-12	9-33	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	80 Deg.		79¾ Deg.		79½ Deg.		79¼ Deg.		

Distance.	10 Deg.		10¼ Deg.		10½ Deg.		10¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-23	8-86	50-19	9-08	50-15	9-29	50-10	9-51	51
52	51-21	9-03	51-17	9-25	51-13	9-48	51-09	9-70	52
53	52-19	9-20	52-15	9-43	52-11	9-66	52-07	9-89	53
54	53-18	9-38	53-14	9-61	53-10	9-84	53-05	10-07	54
55	54-16	9-55	54-12	9-79	54-08	10-02	54-03	10-26	55
56	55-15	9-72	55-11	9-96	55-06	10-21	55-02	10-45	56
57	56-13	9-90	56-09	10-14	56-05	10-39	56-00	10-63	57
58	57-12	10-07	57-07	10-32	57-03	10-57	56-98	10-82	58
59	58-10	10-25	58-06	10-50	58-01	10-75	57-96	11-00	59
60	59-09	10-42	59-04	10-68	59-00	10-93	58-95	11-19	60
61	60-07	10-59	60-03	10-85	59-98	11-12	59-93	11-38	61
62	61-06	10-77	61-01	11-03	60-96	11-30	60-91	11-56	62
63	62-04	10-94	61-99	11-21	61-95	11-48	61-89	11-75	63
64	63-03	11-11	62-98	11-39	62-93	11-66	62-88	11-94	64
65	64-01	11-29	63-96	11-57	63-91	11-85	63-86	12-12	65
66	65-00	11-46	64-95	11-74	64-89	12-03	64-84	12-31	66
67	65-98	11-63	65-93	11-92	65-88	12-21	65-82	12-50	67
68	66-97	11-81	66-91	12-10	66-86	12-39	66-81	12-68	68
69	67-95	11-98	67-90	12-28	67-84	12-57	67-79	12-87	69
70	68-94	12-16	68-88	12-46	68-83	12-76	68-77	13-06	70
71	69-92	12-33	69-87	12-63	69-81	12-94	69-75	13-24	71
72	70-91	12-50	70-85	12-81	70-79	13-12	70-74	13-43	72
73	71-89	12-68	71-83	12-99	71-78	13-30	71-72	13-62	73
74	72-88	12-85	72-82	13-17	72-76	13-49	72-70	13-80	74
75	73-86	13-02	73-80	13-35	73-74	13-67	73-68	13-99	75
76	74-85	13-20	74-79	13-52	74-73	13-85	74-67	14-18	76
77	75-83	13-37	75-77	13-70	75-71	14-03	75-65	14-36	77
78	76-82	13-54	76-76	13-88	76-69	14-21	76-63	14-55	78
79	77-80	13-72	77-74	14-06	77-68	14-40	77-61	14-74	79
80	78-78	13-89	78-72	14-24	78-66	14-58	78-60	14-92	80
81	79-77	14-07	79-71	14-41	79-64	14-76	79-58	15-11	81
82	80-75	14-24	80-69	14-59	80-63	14-94	80-56	15-29	82
83	81-74	14-41	81-68	14-77	81-61	15-13	81-54	15-48	83
84	82-72	14-59	82-66	14-95	82-59	15-31	82-53	15-67	84
85	83-71	14-76	83-64	15-13	83-58	15-49	83-51	15-85	85
86	84-69	14-93	84-63	15-30	84-56	15-67	84-49	16-04	86
87	85-68	15-11	85-61	15-48	85-54	15-85	85-47	16-23	87
88	86-66	15-28	86-60	15-66	86-53	16-04	86-46	16-41	88
89	87-65	15-45	87-58	15-84	87-51	16-22	87-44	16-60	89
90	88-63	15-63	88-56	16-01	88-49	16-40	88-42	16-79	90
91	89-62	15-80	89-55	16-19	89-48	16-58	89-40	16-97	91
92	90-60	15-98	90-53	16-37	90-46	16-77	90-39	17-16	92
93	91-59	16-15	91-52	16-55	91-44	16-95	91-37	17-35	93
94	92-57	16-32	92-50	16-73	92-43	17-13	92-35	17-53	94
95	93-56	16-50	93-48	16-90	93-41	17-31	93-33	17-72	95
96	94-54	16-67	94-47	17-08	94-39	17-49	94-32	17-91	96
97	95-53	16-84	95-45	17-26	95-38	17-68	95-30	18-09	97
98	96-51	17-02	96-44	17-44	96-36	17-86	96-28	18-28	98
99	97-50	17-19	97-42	17-62	97-34	18-04	97-26	18-47	99
100	98-48	17-36	98-40	17-79	98-33	18-22	98-25	18-65	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	80 Deg.		79¾ Deg.		79½ Deg.		79¼ Deg.		

TRAVERSE TABLE.

Distance.	11 Deg.		11¼ Deg.		11½ Deg.		11¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-98	0-19	0-98	0-20	0-98	0-20	0-98	0-20	1
2	1-96	0-38	1-96	0-39	1-96	0-40	1-96	0-41	2
3	2-94	0-57	2-94	0-59	2-94	0-60	2-94	0-61	3
4	3-93	0-76	3-92	0-78	3-92	0-80	3-92	0-82	4
5	4-91	0-95	4-90	0-98	4-90	1-00	4-90	1-02	5
6	5-89	1-14	5-88	1-17	5-88	1-20	5-87	1-22	6
7	6-87	1-34	6-87	1-37	6-86	1-40	6-85	1-43	7
8	7-85	1-53	7-85	1-56	7-84	1-59	7-83	1-63	8
9	8-83	1-72	8-83	1-76	8-82	1-79	8-81	1-83	9
10	9-82	1-91	9-81	1-95	9-80	1-99	9-79	2-04	10
11	10-80	2-10	10-79	2-15	10-78	2-19	10-77	2-24	11
12	11-78	2-29	11-77	2-34	11-76	2-39	11-75	2-44	12
13	12-76	2-48	12-75	2-54	12-74	2-59	12-73	2-65	13
14	13-74	2-67	13-73	2-73	13-72	2-79	13-71	2-85	14
15	14-72	2-86	14-71	2-93	14-70	2-99	14-69	3-06	15
16	15-71	3-05	15-69	3-12	15-68	3-19	15-66	3-26	16
17	16-69	3-24	16-67	3-32	16-66	3-39	16-64	3-46	17
18	17-67	3-43	17-65	3-51	17-64	3-59	17-62	3-66	18
19	18-65	3-63	18-63	3-71	18-62	3-79	18-60	3-87	19
20	19-63	3-82	19-62	3-90	19-60	3-99	19-58	4-07	20
21	20-61	4-01	20-60	4-10	20-58	4-19	20-56	4-28	21
22	21-60	4-20	21-58	4-29	21-56	4-39	21-54	4-48	22
23	22-58	4-39	22-56	4-49	22-54	4-59	22-52	4-68	23
24	23-56	4-58	23-54	4-68	23-52	4-78	23-50	4-89	24
25	24-54	4-77	24-52	4-88	24-50	4-98	24-48	5-09	25
26	25-52	4-96	25-50	5-07	25-48	5-18	25-46	5-30	26
27	26-50	5-15	26-48	5-27	26-46	5-38	26-43	5-50	27
28	27-49	5-34	27-46	5-46	27-44	5-58	27-41	5-70	28
29	28-47	5-53	28-44	5-66	28-42	5-78	28-39	5-91	29
30	29-45	5-72	29-42	5-85	29-40	5-98	29-37	6-11	30
31	30-43	5-92	30-40	6-05	30-38	6-18	30-35	6-31	31
32	31-41	6-11	31-39	6-24	31-36	6-38	31-33	6-52	32
33	32-39	6-30	32-37	6-44	32-34	6-58	32-31	6-72	33
34	33-38	6-49	33-35	6-63	33-32	6-78	33-29	6-92	34
35	34-36	6-68	34-33	6-83	34-30	6-98	34-27	7-13	35
36	35-34	6-87	35-31	7-02	35-28	7-18	35-25	7-33	36
37	36-32	7-06	36-29	7-22	36-26	7-38	36-22	7-53	37
38	37-30	7-25	37-27	7-41	37-24	7-58	37-20	7-74	38
39	38-28	7-44	38-25	7-61	38-22	7-78	38-18	7-94	39
40	39-27	7-63	39-23	7-80	39-20	7-97	39-16	8-15	40
41	40-25	7-82	40-21	8-00	40-18	8-17	40-14	8-35	41
42	41-23	8-01	41-19	8-19	41-16	8-37	41-12	8-55	42
43	42-21	8-20	42-17	8-39	42-14	8-57	42-10	8-76	43
44	43-19	8-40	43-15	8-58	43-12	8-77	43-08	8-96	44
45	44-17	8-59	44-14	8-78	44-10	8-97	44-06	9-16	45
46	45-15	8-78	45-12	8-97	45-08	9-17	45-04	9-37	46
47	46-14	8-97	46-10	9-17	46-06	9-37	46-02	9-57	47
48	47-12	9-16	47-08	9-36	47-04	9-57	46-99	9-78	48
49	48-10	9-35	48-06	9-56	48-02	9-77	47-97	9-98	49
50	49-08	9-54	49-04	9-75	49-00	9-97	48-95	10-18	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	79 Deg.		78¾ Deg.		78½ Deg.		78¼ Deg.		

TRAVERSE TABLE.

Distance.	11 Deg.		11¼ Deg.		11½ Deg.		11¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50-06	9-73	50-02	9-95	49-98	10-17	49-93	10-39	51
52	51-04	9-92	51-00	10-14	50-96	10-37	50-91	10-59	52
53	52-03	10-11	51-98	10-34	51-94	10-57	51-89	10-79	53
54	53-01	10-30	52-96	10-53	52-92	10-77	52-87	11-00	54
55	53-99	10-49	53-94	10-73	53-90	10-97	53-85	11-20	55
56	54-97	10-69	54-92	10-93	54-88	11-16	54-83	11-40	56
57	55-95	10-88	55-90	11-12	55-86	11-36	55-81	11-61	57
58	56-93	11-07	56-89	11-32	56-84	11-56	56-78	11-81	58
59	57-92	11-26	57-87	11-51	57-82	11-76	57-76	12-01	59
60	58-90	11-45	58-85	11-71	58-80	11-96	58-74	12-22	60
61	59-88	11-64	59-83	11-90	59-78	12-16	59-72	12-42	61
62	60-86	11-83	60-81	12-10	60-76	12-36	60-70	12-63	62
63	61-84	12-02	61-79	12-29	61-74	12-56	61-68	12-83	63
64	62-82	12-21	62-77	12-49	62-72	12-76	62-66	13-03	64
65	63-81	12-40	63-75	12-68	63-70	12-96	63-64	13-24	65
66	64-79	12-59	64-73	12-88	64-68	13-16	64-62	13-44	66
67	65-77	12-78	65-71	13-07	65-66	13-36	65-60	13-64	67
68	66-75	12-98	66-69	13-27	66-63	13-56	66-58	13-85	68
69	67-73	13-17	67-67	13-46	67-61	13-76	67-55	14-05	69
70	68-71	13-36	68-66	13-66	68-59	13-96	68-53	14-25	70
71	69-70	13-55	69-64	13-85	69-57	14-16	69-51	14-46	71
72	70-68	13-74	70-62	14-05	70-55	14-35	70-49	14-66	72
73	71-66	13-93	71-60	14-24	71-53	14-55	71-47	14-87	73
74	72-64	14-12	72-58	14-44	72-51	14-75	72-45	15-07	74
75	73-62	14-31	73-56	14-63	73-49	14-95	73-43	15-27	75
76	74-60	14-50	74-54	14-83	74-47	15-15	74-41	15-48	76
77	75-59	14-69	75-52	15-02	75-45	15-35	75-39	15-68	77
78	76-57	14-88	76-50	15-22	76-43	15-55	76-37	15-88	78
79	77-55	15-07	77-48	15-41	77-41	15-75	77-34	16-09	79
80	78-53	15-26	78-46	15-61	78-39	15-95	78-32	16-29	80
81	79-51	15-46	79-44	15-80	79-37	16-15	79-30	16-49	81
82	80-49	15-65	80-42	16-00	80-35	16-35	80-28	16-70	82
83	81-48	15-84	81-41	16-19	81-33	16-55	81-26	16-90	83
84	82-46	16-03	82-39	16-39	82-31	16-75	82-24	17-11	84
85	83-44	16-22	83-37	16-58	83-29	16-95	83-22	17-31	85
86	84-42	16-41	84-35	16-78	84-27	17-15	84-20	17-51	86
87	85-40	16-60	85-33	16-97	85-25	17-35	85-18	17-72	87
88	86-38	16-79	86-31	17-17	86-23	17-54	86-16	17-92	88
89	87-36	16-98	87-29	17-36	87-21	17-74	87-14	18-12	89
90	88-35	17-17	88-27	17-56	88-19	17-94	88-11	18-33	90
91	89-33	17-36	89-25	17-75	89-17	18-14	89-09	18-53	91
92	90-31	17-55	90-23	17-95	90-15	18-34	90-07	18-74	92
93	91-29	17-75	91-21	18-14	91-13	18-54	91-05	18-94	93
94	92-27	17-94	92-19	18-34	92-11	18-74	92-03	19-14	94
95	93-25	18-13	93-17	18-53	93-09	18-94	93-01	19-35	95
96	94-24	18-32	94-16	18-73	94-07	19-14	93-99	19-55	96
97	95-22	18-51	95-14	18-92	95-05	19-34	94-97	19-75	97
98	96-20	18-70	96-12	19-12	96-03	19-54	95-95	19-96	98
99	97-18	18-89	97-10	19-31	97-01	19-74	96-93	20-16	99
100	98-16	19-08	98-08	19-51	97-99	19-94	97-90	20-36	100
Distance.	79 Deg.		78¾ Deg.		78½ Deg.		78¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE

Distance.	12 Deg.		12¼ Deg.¹		12½ Deg.		12¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-98	0-21	0-98	0-21	0-98	0-22	0-98	0-22	1
2	1-96	0-42	1-95	0-42	1-95	0-43	1-95	0-44	2
3	2-93	0-62	2-93	0-64	2-93	0-65	2-93	0-66	3
4	3-91	0-83	3-91	0-85	3-91	0-87	3-90	0-88	4
5	4-89	1-04	4-89	1-06	4-88	1-08	4-88	1-10	5
6	5-87	1-25	5-86	1-27	5-86	1-30	5-85	1-32	6
7	6-85	1-46	6-84	1-49	6-83	1-52	6-83	1-54	7
8	7-83	1-66	7-82	1-70	7-81	1-73	7-80	1-77	8
9	8-80	1-87	8-80	1-91	8-79	1-95	8-78	1-99	9
10	9-78	2-08	9-77	2-12	9-76	2-16	9-75	2-21	10
11	10-76	2-29	10-75	2-33	10-74	2-38	10-73	2-43	11
12	11-74	2-49	11-73	2-55	11-72	2-60	11-70	2-65	12
13	12-72	2-70	12-70	2-76	12-69	2-81	12-68	2-87	13
14	13-69	2-91	13-68	2-97	13-67	3-03	13-65	3-09	14
15	14-67	3-12	14-66	3-18	14-64	3-25	14-63	3-31	15
16	15-65	3-33	15-64	3-39	15-62	3-46	15-61	3-53	16
17	16-63	3-53	16-61	3-61	16-60	3-68	16-58	3-75	17
18	17-61	3-74	17-59	3-82	17-57	3-90	17-56	3-97	18
19	18-58	3-95	18-57	4-03	18-55	4-11	18-53	4-19	19
20	19-56	4-16	19-54	4-24	19-53	4-33	19-51	4-41	20
21	20-54	4-37	20-52	4-46	20-50	4-55	20-48	4-63	21
22	21-52	4-57	21-50	4-67	21-48	4-76	21-46	4-86	22
23	22-50	4-78	22-48	4-88	22-45	4-98	22-43	5-08	23
24	23-48	4-99	23-45	5-09	23-43	5-19	23-41	5-30	24
25	24-45	5-20	24-43	5-30	24-41	5-41	24-38	5-52	25
26	25-43	5-41	25-41	5-52	25-38	5-63	25-36	5-74	26
27	26-41	5-61	26-39	5-73	26-36	5-84	26-33	5-96	27
28	27-39	5-82	27-36	5-94	27-34	6-06	27-31	6-18	28
29	28-37	6-03	28-34	6-15	28-31	6-28	28-28	6-40	29
30	29-34	6-24	29-32	6-37	29-29	6-49	29-26	6-62	30
31	30-32	6-45	30-29	6-58	30-27	6-71	30-24	6-84	31
32	31-30	6-65	31-27	6-79	31-24	6-93	31-21	7-06	32
33	32-28	6-86	32-25	7-00	32-22	7-14	32-19	7-28	33
34	33-26	7-07	33-23	7-21	33-19	7-36	33-16	7-50	34
35	34-24	7-28	34-20	7-43	34-17	7-58	34-14	7-72	35
36	35-21	7-48	35-18	7-64	35-15	7-79	35-11	7-95	36
37	36-19	7-69	36-16	7-85	36-12	8-01	36-09	8-17	37
38	37-17	7-90	37-13	8-06	37-10	8-22	37-06	8-39	38
39	38-15	8-11	38-11	8-27	38-08	8-44	38-04	8-61	39
40	39-13	8-32	39-09	8-49	39-05	8-66	39-01	8-83	40
41	40-10	8-52	40-07	8-70	40-03	8-87	39-99	9-05	41
42	41-08	8-73	41-04	8-91	41-00	9-09	40-96	9-27	42
43	42-06	8-94	42-02	9-12	41-98	9-31	41-94	9-49	43
44	43-04	9-15	43-00	9-34	42-96	9-52	42-92	9-71	44
45	44-02	9-36	43-98	9-55	43-93	9-74	43-89	9-93	45
46	44-99	9-56	44-95	9-76	44-91	9-96	44-87	10-15	46
47	45-97	9-77	45-93	9-97	45-89	10-17	45-84	10-37	47
48	46-95	9-98	46-91	10-18	46-86	10-39	46-82	10-59	48
49	47-93	10-19	47-88	10-40	47-84	10-61	47-79	10-81	49
50	48-91	10-40	48-86	10-61	48-81	10-82	48-77	11-03	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	78 Deg.		77¾ Deg.		77½ Deg.		77¼ Deg.		

TRAVERSE TABLE.

Distance.	12 Deg.		12¼ Deg.		12½ Deg.		12¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49-80	10-60	49-84	10-82	49-79	11-04	49-74	11-26	51
52	50-88	10-81	50-82	11-03	50-77	11-25	50-72	11-48	52
53	51-84	11-02	51-79	11-25	51-74	11-47	51-69	11-70	53
54	52-82	11-23	52-77	11-46	52-72	11-69	52-67	11-92	54
55	53-80	11-44	53-75	11-67	53-70	11-90	53-64	12-14	55
56	54-78	11-64	54-72	11-88	54-67	12-12	54-62	12-36	56
57	55-75	11-85	55-70	12-09	55-65	12-34	55-59	12-58	57
58	56-73	12-06	56-68	12-31	56-63	12-55	56-57	12-80	58
59	57-71	12-27	57-66	12-52	57-60	12-77	57-55	13-02	59
60	58-69	12-47	58-63	12-73	58-58	12-99	58-52	13-24	60
61	59-67	12-68	59-61	12-94	59-55	13-20	59-50	13-46	61
62	60-65	12-89	60-59	13-16	60-53	13-42	60-47	13-68	62
63	61-62	13-10	61-57	13-37	61-51	13-64	61-45	13-90	63
64	62-60	13-31	62-54	13-58	62-48	13-85	62-42	14-12	64
65	63-58	13-51	63-52	13-79	63-46	14-07	63-40	14-35	65
66	64-56	13-72	64-50	14-00	64-44	14-29	64-37	14-57	66
67	65-54	13-93	65-47	14-22	65-41	14-50	65-35	14-79	67
68	66-51	14-14	66-45	14-43	66-39	14-72	66-32	15-01	68
69	67-49	14-35	67-43	14-64	67-36	14-93	67-30	15-23	69
70	68-47	14-55	68-41	14-85	68-34	15-15	68-27	15-45	70
71	69-45	14-76	69-38	15-06	69-32	15-37	69-25	15-67	71
72	70-43	14-97	70-36	15-28	70-29	15-58	70-22	15-89	72
73	71-40	15-18	71-34	15-49	71-27	15-80	71-20	16-11	73
74	72-38	15-39	72-32	15-70	72-25	16-02	72-18	16-33	74
75	73-36	15-59	73-29	15-91	73-22	16-23	73-15	16-55	75
76	74-34	15-80	74-27	16-13	74-20	16-45	74-13	16-77	76
77	75-32	16-01	75-25	16-34	75-17	16-67	75-10	16-99	77
78	76-30	16-22	76-22	16-55	76-15	16-88	76-08	17-21	78
79	77-27	16-43	77-20	16-76	77-13	17-10	77-05	17-44	79
80	78-25	16-63	78-18	16-97	78-10	17-32	78-03	17-66	80
81	79-23	16-84	79-16	17-19	79-08	17-53	79-00	17-88	81
82	80-21	17-05	80-13	17-40	80-06	17-75	79-98	18-10	82
83	81-19	17-26	81-11	17-61	81-03	17-96	80-95	18-32	83
84	82-16	17-46	82-09	17-82	82-01	18-18	81-93	18-54	84
85	83-14	17-67	83-06	18-04	82-99	18-40	82-90	18-76	85
86	84-12	17-88	84-04	18-25	83-96	18-61	83-88	18-98	86
87	85-10	18-09	85-02	18-46	84-94	18-83	84-85	19-20	87
88	86-08	18-30	86-00	18-67	85-91	19-05	85-83	19-42	88
89	87-06	18-50	86-97	18-88	86-89	19-26	86-81	19-64	89
90	88-03	18-71	87-95	19-10	87-87	19-48	87-78	19-86	90
91	89-01	18-92	88-93	19-31	88-84	19-70	88-76	20-08	91
92	89-99	19-13	89-91	19-52	89-82	19-91	89-73	20-30	92
93	90-97	19-34	90-88	19-73	90-80	20-13	90-71	20-52	93
94	91-95	19-54	91-86	19-94	91-77	20-35	91-68	20-75	94
95	92-92	19-75	92-84	20-16	92-75	20-56	92-66	20-97	95
96	93-90	19-96	93-81	20-37	93-72	20-78	93-63	21-19	96
97	94-88	20-17	94-79	20-58	94-70	20-99	94-61	21-41	97
98	95-86	20-38	95-77	20-79	95-68	21-21	95-58	21-63	98
99	96-84	20-58	96-75	21-01	96-65	21-43	96-56	21-85	99
100	97-81	20-79	97-72	21-22	97-63	21-64	97-53	22-07	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	78 Deg.		77¾ Deg.		77½ Deg.		77¼ Deg.		

TRAVERSE TABLE.

Distance.	13 Deg.		13¼ Deg.		13½ Deg.		13¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-97	0-23	0-97	0-23	0-97	0-23	0-97	0-24	1
2	1-95	0-45	1-95	0-46	1-95	0-47	1-94	0-48	2
3	2-92	0-67	2-92	0-69	2-92	0-70	2-91	0-71	3
4	3-90	0-90	3-89	0-92	3-89	0-93	3-89	0-95	4
5	4-87	1-12	4-87	1-15	4-86	1-17	4-86	1-19	5
6	5-85	1-35	5-84	1-38	5-83	1-40	5-83	1-43	6
7	6-82	1-57	6-81	1-60	6-81	1-63	6-80	1-66	7
8	7-80	1-80	7-79	1-83	7-78	1-87	7-77	1-90	8
9	8-77	2-02	8-76	2-06	8-75	2-10	8-74	2-14	9
10	9-74	2-25	9-73	2-29	9-72	2-33	9-71	2-38	10
11	10-72	2-47	10-71	2-52	10-70	2-57	10-68	2-61	11
12	11-69	2-70	11-68	2-75	11-67	2-80	11-66	2-85	12
13	12-67	2-92	12-65	2-98	12-64	3-03	12-63	3-09	13
14	13-64	3-15	13-63	3-21	13-61	3-27	13-60	3-33	14
15	14-62	3-37	14-60	3-44	14-59	3-50	14-57	3-57	15
16	15-59	3-60	15-57	3-67	15-56	3-74	15-54	3-80	16
17	16-57	3-82	16-55	3-90	16-53	3-97	16-51	4-04	17
18	17-54	4-05	17-52	4-13	17-50	4-20	17-48	4-28	18
19	18-51	4-27	18-49	4-35	18-48	4-44	18-46	4-52	19
20	19-49	4-50	19-47	4-58	19-45	4-67	19-43	4-75	20
21	20-46	4-72	20-44	4-81	20-42	4-90	20-40	4-99	21
22	21-44	4-95	21-41	5-04	21-39	5-14	21-37	5-23	22
23	22-41	5-17	22-39	5-27	22-36	5-37	22-34	5-47	23
24	23-38	5-40	23-36	5-50	23-34	5-60	23-31	5-70	24
25	24-36	5-62	24-33	5-73	24-31	5-84	24-28	5-94	25
26	25-33	5-85	25-31	5-96	25-28	6-07	25-25	6-18	26
27	26-31	6-07	26-28	6-19	26-25	6-30	26-23	6-42	27
28	27-28	6-30	27-25	6-42	27-23	6-54	27-20	6-66	28
29	28-26	6-52	28-23	6-65	28-20	6-77	28-17	6-89	29
30	29-23	6-75	29-20	6-88	29-17	7-00	29-14	7-13	30
31	30-21	6-97	30-17	7-11	30-14	7-24	30-11	7-37	31
32	31-18	7-20	31-15	7-33	31-12	7-47	31-08	7-61	32
33	32-15	7-42	32-12	7-56	32-09	7-70	32-05	7-84	33
34	33-13	7-65	33-09	7-79	33-06	7-94	33-03	8-08	34
35	34-10	7-87	34-07	8-02	34-03	8-17	34-00	8-32	35
36	35-08	8-10	35-04	8-25	35-01	8-40	34-97	8-56	36
37	36-05	8-32	36-02	8-48	35-98	8-64	35-94	8-79	37
38	37-03	8-55	36-99	8-71	36-95	8-87	36-91	9-03	38
39	38-00	8-77	37-96	8-94	37-92	9-10	37-88	9-27	39
40	38-97	9-00	38-94	9-17	38-89	9-34	38-85	9-51	40
41	39-95	9-22	39-91	9-40	39-87	9-57	39-83	9-75	41
42	40-92	9-45	40-88	9-63	40-84	9-80	40-80	9-98	42
43	41-90	9-67	41-86	9-86	41-81	10-04	41-77	10-22	43
44	42-87	9-90	42-83	10-08	42-78	10-27	42-74	10-46	44
45	43-85	10-12	43-80	10-31	43-76	10-51	43-71	10-70	45
46	44-82	10-35	44-78	10-54	44-73	10-74	44-68	10-93	46
47	45-80	10-57	45-75	10-77	45-70	10-97	45-65	11-17	47
48	46-77	10-80	46-72	11-00	46-67	11-21	46-62	11-41	48
49	47-74	11-02	47-70	11-23	47-65	11-44	47-60	11-65	49
50	48-72	11-25	48-67	11-46	48-62	11-67	48-57	11-88	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	77 Deg.		76¾ Deg.		76½ Deg.		76¼ Deg.		

TRAVERSE TABLE.

Distance.	13 Deg.		13¼ Deg.		13½ Deg.		13¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49.69	11.47	49.64	11.69	49.59	11.91	49.54	12.12	51
52	50.67	11.70	50.62	11.92	50.56	12.14	50.51	12.36	52
53	51.64	11.92	51.59	12.15	51.54	12.37	51.48	12.60	53
54	52.62	12.15	52.56	12.38	52.51	12.61	52.45	12.84	54
55	53.59	12.37	53.54	12.61	53.48	12.84	53.42	13.07	55
56	54.56	12.60	54.51	12.84	54.45	13.07	54.40	13.31	56
57	55.54	12.82	55.48	13.06	55.43	13.31	55.37	13.55	57
58	56.51	13.05	56.46	13.29	56.40	13.54	56.34	13.79	58
59	57.49	13.27	57.43	13.52	57.37	13.77	57.31	14.02	59
60	58.46	13.50	58.40	13.75	58.34	14.01	58.28	14.26	60
61	59.44	13.72	59.38	13.98	59.31	14.24	59.25	14.50	61
62	60.41	13.95	60.35	14.21	60.29	14.47	60.22	14.74	62
63	61.39	14.17	61.32	14.44	61.26	14.71	61.19	14.97	63
64	62.36	14.40	62.30	14.67	62.23	14.94	62.17	15.21	64
65	63.33	14.62	63.27	14.90	63.20	15.17	63.14	15.45	65
66	64.31	14.85	64.24	15.13	64.18	15.41	64.11	15.69	66
67	65.28	15.07	65.22	15.36	65.15	15.64	65.08	15.93	67
68	66.26	15.30	66.19	15.59	66.12	15.87	66.05	16.16	68
69	67.23	15.52	67.16	15.81	67.09	16.11	67.02	16.40	69
70	68.21	15.75	68.14	16.04	68.07	16.34	67.99	16.64	70
71	69.18	15.97	69.11	16.27	69.04	16.57	68.97	16.88	71
72	70.15	16.20	70.08	16.50	70.01	16.81	69.94	17.11	72
73	71.13	16.42	71.06	16.73	70.98	17.04	70.91	17.35	73
74	72.10	16.65	72.03	16.96	71.96	17.28	71.88	17.59	74
75	73.08	16.87	73.00	17.19	72.93	17.50	72.85	17.83	75
76	74.05	17.10	73.98	17.42	73.90	17.74	73.82	18.06	76
77	75.03	17.32	74.95	17.65	74.87	17.98	74.79	18.30	77
78	76.00	17.55	75.92	17.88	75.84	18.21	75.76	18.54	78
79	76.98	17.77	76.90	18.11	76.82	18.44	76.74	18.78	79
80	77.95	18.00	77.87	18.34	77.79	18.68	77.71	19.01	80
81	78.92	18.22	78.84	18.57	78.76	18.91	78.68	19.25	81
82	79.90	18.45	79.82	18.79	79.73	19.14	79.65	19.49	82
83	80.87	18.67	80.79	19.02	80.71	19.38	80.62	19.73	83
84	81.85	18.90	81.76	19.25	81.68	19.61	81.59	19.97	84
85	82.82	19.12	82.74	19.48	82.65	19.84	82.56	20.20	85
86	83.80	19.35	83.71	19.71	83.62	20.08	83.54	20.44	86
87	84.77	19.57	84.68	19.94	84.60	20.31	84.51	20.68	87
88	85.74	19.80	85.66	20.17	85.57	20.54	85.48	20.92	88
89	86.72	20.02	86.63	20.40	86.54	20.78	86.45	21.15	89
90	87.69	20.25	87.60	20.63	87.51	21.01	87.42	21.39	90
91	88.67	20.47	88.58	20.86	88.49	21.24	88.39	21.63	91
92	89.64	20.70	89.55	21.09	89.46	21.48	89.36	21.87	92
93	90.62	20.92	90.52	21.32	90.43	21.71	90.33	22.10	93
94	91.59	21.15	91.50	21.54	91.40	21.94	91.31	22.34	94
95	92.57	21.37	92.47	21.77	92.38	22.18	92.28	22.58	95
96	93.54	21.60	93.44	22.00	93.35	22.41	93.25	22.82	96
97	94.51	21.82	94.42	22.23	94.32	22.64	94.22	23.06	97
98	95.49	22.05	95.39	22.46	95.29	22.88	95.19	23.29	98
99	96.46	22.27	96.36	22.69	96.26	23.11	96.16	23.53	99
100	97.44	22.50	97.34	22.92	97.24	23.34	97.13	23.77	100
Distance.	77 Deg.		76¾ Deg.		76½ Deg.		76¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	14 Deg.		14¼ Deg.		14½ Deg.		14¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-97	0-24	0-97	0-25	0-97	0-25	0-97	0-25	1
2	1-94	0-48	1-94	0-49	1-94	0-50	1-93	0-51	2
3	2-91	0-73	2-91	0-74	2-90	0-75	2-90	0-76	3
4	3-88	0-97	3-88	0-98	3-87	1-00	3-87	1-02	4
5	4-85	1-21	4-85	1-23	4-84	1-25	4-84	1-27	5
6	5-82	1-45	5-82	1-48	5-81	1-50	5-80	1-53	6
7	6-79	1-69	6-78	1-72	6-78	1-75	6-77	1-78	7
8	7-76	1-94	7-75	1-97	7-75	2-00	7-74	2-04	8
9	8-73	2-18	8-72	2-22	8-71	2-25	8-70	2-29	9
10	9-70	2-42	9-69	2-46	9-68	2-50	9-67	2-55	10
11	10-67	2-66	10-66	2-71	10-65	2-75	10-64	2-80	11
12	11-64	2-90	11-63	2-95	11-62	3-00	11-60	3-06	12
13	12-61	3-15	12-60	3-20	12-59	3-25	12-57	3-31	13
14	13-58	3-39	13-57	3-45	13-55	3-51	13-54	3-56	14
15	14-55	3-63	14-54	3-69	14-52	3-76	14-51	3-82	15
16	15-52	3-87	15-51	3-94	15-49	4-01	15-47	4-07	16
17	16-50	4-11	16-48	4-18	16-46	4-26	16-44	4-33	17
18	17-47	4-35	17-45	4-43	17-43	4-51	17-41	4-58	18
19	18-44	4-60	18-42	4-68	18-39	4-76	18-37	4-84	19
20	19-41	4-84	19-38	4-92	19-36	5-01	19-34	5-09	20
21	20-38	5-08	20-35	5-17	20-33	5-26	20-31	5-35	21
22	21-35	5-32	21-32	5-42	21-30	5-51	21-28	5-60	22
23	22-32	5-56	22-29	5-66	22-27	5-76	22-24	5-86	23
24	23-29	5-81	23-26	5-91	23-24	6-01	23-21	6-11	24
25	24-26	6-05	24-23	6-15	24-20	6-26	24-18	6-37	25
26	25-23	6-29	25-20	6-40	25-17	6-51	25-14	6-62	26
27	26-20	6-53	26-17	6-65	26-14	6-76	26-11	6-87	27
28	27-17	6-77	27-14	6-89	27-11	7-01	27-08	7-13	28
29	28-14	7-02	28-11	7-14	28-08	7-26	28-04	7-38	29
30	29-11	7-26	29-08	7-38	29-04	7-51	29-01	7-64	30
31	30-08	7-50	30-05	7-63	30-01	7-76	29-98	7-89	31
32	31-05	7-74	31-02	7-88	30-98	8-01	30-95	8-15	32
33	32-02	7-98	31-98	8-12	31-95	8-26	31-91	8-40	33
34	32-99	8-23	32-95	8-37	32-92	8-51	32-88	8-66	34
35	33-96	8-47	33-92	8-62	33-89	8-76	33-85	8-91	35
36	34-93	8-71	34-89	8-86	34-85	9-01	34-81	9-17	36
37	35-90	8-95	35-86	9-11	35-82	9-26	35-78	9-42	37
38	36-87	9-19	36-83	9-35	36-79	9-51	36-75	9-67	38
39	37-84	9-44	37-80	9-60	37-76	9-76	37-71	9-93	39
40	38-81	9-68	38-77	9-85	38-73	10-02	38-68	10-18	40
41	39-78	9-92	39-74	10-09	39-69	10-27	39-65	10-44	41
42	40-75	10-16	40-71	10-34	40-66	10-52	40-62	10-69	42
43	41-72	10-40	41-68	10-58	41-63	10-77	41-58	10-95	43
44	42-69	10-64	42-65	10-83	42-60	11-02	42-55	11-20	44
45	43-66	10-89	43-62	11-08	43-57	11-27	43-52	11-46	45
46	44-63	11-13	44-58	11-32	44-53	11-52	44-48	11-71	46
47	45-60	11-37	45-55	11-57	45-50	11-77	45-45	11-97	47
48	46-57	11-61	46-52	11-82	46-47	12-02	46-42	12-22	48
49	47-54	11-85	47-49	12-06	47-44	12-27	47-39	12-48	49
50	48-51	12-10	48-46	12-31	48-41	12-52	48-35	12-73	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	76 Deg		75¾ Deg.		75½ Deg.		75¼ Deg.		

TRAVERSE TABLE.

Distance.	14 Deg.		14¼ Deg.		14½ Deg.		14¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49-49	12-34	49-43	12-55	49-38	12-77	49-32	12-98	51
52	50-46	12-58	50-40	12-80	50-34	13-02	50-29	13-24	52
53	51-43	12-82	51-37	13-05	51-31	13-27	51-25	13-49	53
54	52-40	13-06	52-34	13-29	52-28	13-52	52-22	13-75	54
55	53-37	13-31	53-31	13-54	53-25	13-77	53-19	14-00	55
56	54-34	13-55	54-28	13-78	54-22	14-02	54-15	14-26	56
57	55-31	13-79	55-25	14-03	55-18	14-27	55-12	14-51	57
58	56-28	14-03	56-22	14-28	56-15	14-52	56-09	14-77	58
59	57-25	14-27	57-18	14-52	57-12	14-77	57-06	15-02	59
60	58-22	14-52	58-15	14-77	58-09	15-02	58-02	15-28	60
61	59-19	14-76	59-12	15-02	59-06	15-27	58-99	15-53	61
62	60-16	15-00	60-09	15-26	60-03	15-52	59-96	15-79	62
63	61-13	15-24	61-06	15-51	60-99	15-77	60-92	16-04	63
64	62-10	15-48	62-03	15-75	61-96	16-02	61-89	16-29	64
65	63-07	15-72	63-00	16-00	62-93	16-27	62-86	16-55	65
66	64-04	15-97	63-97	16-25	63-90	16-53	63-83	16-80	66
67	65-01	16-21	64-94	16-49	64-87	16-78	64-79	17-06	67
68	65-98	16-45	65-91	16-74	65-83	17-03	65-76	17-31	68
69	66-95	16-69	66-88	16-98	66-80	17-28	66-73	17-57	69
70	67-92	16-93	67-85	17-23	67-77	17-53	67-69	17-82	70
71	68-89	17-18	68-82	17-48	68-74	17-78	68-66	18-08	71
72	69-86	17-42	69-78	17-72	69-71	18-03	69-63	18-33	72
73	70-83	17-66	70-75	17-97	70-67	18-28	70-59	18-59	73
74	71-80	17-90	71-72	18-22	71-64	18-53	71-56	18-84	74
75	72-77	18-14	72-69	18-46	72-61	18-78	72-53	19-10	75
76	73-74	18-39	73-66	18-71	73-58	19-03	73-50	19-35	76
77	74-71	18-63	74-63	18-95	74-55	19-28	74-46	19-60	77
78	75-68	18-87	75-60	19-20	75-52	19-53	75-43	19-86	78
79	76-65	19-11	76-57	19-45	76-48	19-78	76-40	20-11	79
80	77-62	19-35	77-54	19-69	77-45	20-03	77-36	20-37	80
81	78-59	19-60	78-51	19-94	78-42	20-28	78-33	20-62	81
82	79-56	19-84	79-48	20-18	79-39	20-53	79-30	20-88	82
83	80-53	20-08	80-45	20-43	80-36	20-78	80-26	21-13	83
84	81-50	20-32	81-42	20-68	81-32	21-03	81-23	21-39	84
85	82-48	20-56	82-38	20-92	82-29	21-28	82-20	21-64	85
86	83-45	20-81	83-35	21-17	83-26	21-53	83-17	21-90	86
87	84-42	21-05	84-32	21-42	84-23	21-78	84-13	22-15	87
88	85-39	21-29	85-29	21-66	85-20	22-03	85-10	22-41	88
89	86-36	21-53	86-26	21-91	86-17	22-28	86-07	22-66	89
90	87-33	21-77	87-23	22-15	87-13	22-53	87-03	22-91	90
91	88-30	22-01	88-20	22-40	88-10	22-78	88-00	23-17	91
92	89-27	22-26	89-17	22-65	89-07	23-04	88-97	23-42	92
93	90-24	22-50	90-14	22-89	90-04	23-29	89-94	23-68	93
94	91-21	22-74	91-11	23-14	91-01	23-54	90-90	23-93	94
95	92-18	22-98	92-08	23-38	91-97	23-79	91-87	24-19	95
96	93-15	23-22	93-05	23-63	92-94	24-04	92-84	24-44	96
97	94-12	23-47	94-02	23-88	93-91	24-29	93-80	24-70	97
98	95-09	23-71	94-98	24-12	94-88	24-54	94-77	24-95	98
99	96-06	23-95	95-95	24-37	95-85	24-79	95-74	25-21	99
100	97-03	24-19	96-92	24-62	96-81	25-04	96-70	25-46	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	76 Deg.		75¾ Deg.		75½ Deg.		75¼ Deg.		

TRAVERSE TABLE.

Distance.	15 Deg.		15¼ Deg.		15½ Deg.		15¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-97	0-26	0-96	0-26	0-96	0-27	0-96	0-27	1
2	1-93	0-52	1-93	0-53	1-93	0-53	1-92	0-54	2
3	2-90	0-78	2-89	0-79	2-89	0-80	2-89	0-81	3
4	3-86	1-04	3-86	1-05	3-85	1-07	3-85	1-09	4
5	4-83	1-29	4-82	1-32	4-82	1-34	4-81	1-36	5
6	5-80	1-55	5-79	1-58	5-78	1-60	5-77	1-63	6
7	6-76	1-81	6-75	1-84	6-75	1-87	6-74	1-90	7
8	7-73	2-07	7-72	2-10	7-71	2-14	7-70	2-17	8
9	8-69	2-33	8-68	2-37	8-67	2-41	8-66	2-44	9
10	9-66	2-59	9-65	2-63	9-64	2-67	9-62	2-71	10
11	10-63	2-85	10-61	2-89	10-60	2-94	10-59	2-99	11
12	11-59	3-11	11-58	3-16	11-56	3-21	11-55	3-26	12
13	12-56	3-36	12-54	3-42	12-53	3-47	12-51	3-53	13
14	13-52	3-62	13-51	3-68	13-49	3-74	13-47	3-80	14
15	14-49	3-88	14-47	3-95	14-45	4-01	14-44	4-07	15
16	15-45	4-14	15-44	4-21	15-42	4-28	15-40	4-34	16
17	16-42	4-40	16-40	4-47	16-38	4-54	16-36	4-61	17
18	17-39	4-66	17-37	4-73	17-35	4-81	17-32	4-89	18
19	18-35	4-92	18-33	5-00	18-31	5-08	18-29	5-16	19
20	19-32	5-18	19-30	5-26	19-27	5-34	19-25	5-43	20
21	20-28	5-44	20-26	5-52	20-24	5-61	20-21	5-70	21
22	21-25	5-69	21-23	5-79	21-20	5-88	21-17	5-97	22
23	22-22	5-95	22-19	6-05	22-16	6-15	22-14	6-24	23
24	23-18	6-21	23-15	6-31	23-13	6-41	23-10	6-51	24
25	24-15	6-47	24-12	6-58	24-09	6-68	24-06	6-79	25
26	25-11	6-73	25-08	6-84	25-05	6-95	25-02	7-06	26
27	26-08	6-99	26-05	7-10	26-02	7-22	25-99	7-33	27
28	27-05	7-25	27-01	7-36	26-98	7-48	26-95	7-60	28
29	28-01	7-51	27-98	7-63	27-95	7-75	27-91	7-87	29
30	28-98	7-76	28-94	7-89	28-91	8-02	28-87	8-14	30
31	29-94	8-02	29-91	8-15	29-87	8-28	29-84	8-41	31
32	30-91	8-28	30-87	8-42	30-84	8-55	30-80	8-69	32
33	31-88	8-54	31-84	8-68	31-80	8-82	31-76	8-96	33
34	32-84	8-80	32-80	8-94	32-76	9-09	32-72	9-23	34
35	33-81	9-06	33-77	9-21	33-73	9-35	33-69	9-50	35
36	34-77	9-32	34-73	9-47	34-69	9-62	34-65	9-77	36
37	35-74	9-58	35-70	9-73	35-65	9-89	35-61	10-04	37
38	36-71	9-84	36-66	10-00	36-62	10-16	36-57	10-31	38
39	37-67	10-09	37-63	10-26	37-58	10-42	37-54	10-59	39
40	38-64	10-35	38-59	10-52	38-55	10-69	38-50	10-86	40
41	39-60	10-61	39-56	10-78	39-51	10-96	39-46	11-13	41
42	40-57	10-87	40-52	11-05	40-47	11-22	40-42	11-40	42
43	41-53	11-13	41-49	11-31	41-44	11-49	41-39	11-67	43
44	42-50	11-39	42-45	11-57	42-40	11-76	42-35	11-94	44
45	43-47	11-65	43-42	11-84	43-36	12-03	43-31	12-21	45
46	44-43	11-91	44-38	12-10	44-33	12-29	44-27	12-49	46
47	45-40	12-16	45-35	12-36	45-29	12-56	45-24	12-76	47
48	46-36	12-42	46-31	12-63	46-25	12-83	46-20	13-03	48
49	47-33	12-68	47-27	12-89	47-22	13-09	47-16	13-30	49
50	48-30	12-94	48-24	13-15	48-18	13-36	48-12	13-57	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	75 Deg.		74¾ Deg.		74½ Deg.		74¼ Deg.		

Distance.	15 Deg.		15¼ Deg.		15½ Deg.		15¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49-26	13-20	49-20	13-41	49-15	13-63	49-09	13-84	51
52	50-23	13-46	50-17	13-68	50-11	13-90	50-05	14-11	52
53	51-19	13-72	51-13	13-94	51-07	14-16	51-01	14-39	53
54	52-16	13-08	52-10	14-20	52-04	14-43	51-97	14-66	54
55	53-13	14-24	53-06	14-47	53-00	14-70	52-94	14-93	55
56	54-09	14-49	54-03	14-73	53-96	14-97	53-90	15-20	56
57	55-06	14-75	54-99	14-99	54-93	15-23	54-86	15-47	57
58	56-02	15-01	55-96	15-26	55-89	15-50	55-82	15-74	58
59	56-99	15-27	56-92	15-52	56-85	15-77	56-78	16-01	59
60	57-96	15-53	57-89	15-78	57-82	16-03	57-75	16-29	60
61	58-92	15-79	58-85	16-04	58-78	16-30	58-71	16-56	61
62	59-89	16-05	59-82	16-31	59-75	16-57	59-67	16-83	62
63	60-85	16-31	60-78	16-57	60-71	16-84	60-63	17-10	63
64	61-82	16-56	61-75	16-83	61-67	17-10	61-60	17-37	64
65	62-79	16-82	62-71	17-10	62-64	17-37	62-56	17-64	65
66	63-75	17-08	63-68	17-36	63-60	17-64	63-52	17-92	66
67	64-72	17-34	64-64	17-62	64-56	17-90	64-48	18-19	67
68	65-68	17-60	65-61	17-89	65-53	18-17	65-45	18-46	68
69	66-65	17-86	66-57	18-15	66-49	18-44	66-41	18-73	69
70	67-61	18-12	67-54	18-41	67-45	18-71	67-37	19-00	70
71	68-58	18-38	68-50	18-68	68-42	18-97	68-33	19-27	71
72	69-55	18-63	69-46	18-94	69-38	19-24	69-30	19-54	72
73	70-51	18-89	70-43	19-20	70-35	19-51	70-26	19-82	73
74	71-48	19-15	71-39	19-46	71-31	19-78	71-22	20-09	74
75	72-44	19-41	72-36	19-73	72-27	20-04	72-18	20-36	75
76	73-41	19-67	73-32	19-99	73-24	20-31	73-15	20-63	76
77	74-38	19-93	74-29	20-25	74-20	20-58	74-11	20-90	77
78	75-34	20-19	75-25	20-52	75-16	20-84	75-07	21-17	78
79	76-31	20-45	76-22	20-78	76-13	21-11	76-03	21-44	79
80	77-27	20-71	77-18	21-04	77-09	21-38	77-00	21-72	80
81	78-24	20-96	78-15	21-31	78-05	21-65	77-96	21-99	81
82	79-21	21-22	79-11	21-57	79-02	21-91	78-92	22-26	82
83	80-17	21-48	80-08	21-83	79-98	22-18	79-88	22-53	83
84	81-14	21-74	81-04	22-09	80-94	22-45	80-85	22-80	84
85	82-10	22-00	82-01	22-36	81-91	22-72	81-81	23-07	85
86	83-07	22-26	82-97	22-62	82-87	22-98	82-77	23-34	86
87	84-04	22-52	83-94	22-88	83-84	23-25	83-73	23-62	87
88	85-00	22-78	84-90	23-15	84-80	23-52	84-70	23-89	88
89	85-97	23-03	85-87	23-41	85-76	23-78	85-66	24-16	89
90	86-93	23-29	86-83	23-67	86-73	24-05	86-62	24-43	90
91	87-90	23-55	87-80	23-94	87-69	24-32	87-58	24-70	91
92	88-87	23-81	88-76	24-20	88-65	24-59	88-55	24-97	92
93	89-83	24-07	89-73	24-46	89-62	24-85	89-51	25-24	93
94	90-80	24-33	90-69	24-72	90-58	25-12	90-47	25-52	94
95	91-76	24-59	91-65	24-99	91-54	25-39	91-43	25-79	95
96	92-73	24-85	92-62	25-25	92-51	25-65	92-40	26-06	96
97	93-69	25-11	93-58	25-51	93-47	25-92	93-36	26-33	97
98	94-66	25-36	94-55	25-78	94-44	26-19	94-32	26-60	98
99	95-63	25-62	95-51	26-04	95-40	26-46	95-28	26-87	99
100	96-59	25-88	96-48	26-30	96-36	26-72	96-25	27-14	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	75 Deg.		74¾ Deg.		74½ Deg.		74¼ Deg.		

TRAVERSE TABLE.

Distance.	16 Deg.		16¼ Deg.		16½ Deg.		16¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-06	0-28	0-06	0-28	0-06	0-28	0-06	0-20	1
2	1-92	0-55	1-92	0-56	1-92	0-57	1-92	0-58	2
3	2-88	0-83	2-88	0-84	2-88	0-85	2-87	0-86	3
4	3-85	1-10	3-84	1-12	3-84	1-14	3-83	1-15	4
5	4-81	1-38	4-80	1-40	4-79	1-42	4-79	1-44	5
6	5-77	1-65	5-76	1-68	5-75	1-70	5-75	1-73	6
7	6-73	1-93	6-72	1-96	6-71	1-99	6-70	2-02	7
8	7-69	2-21	7-68	2-24	7-67	2-27	7-66	2-31	8
9	8-65	2-48	8-64	2-52	8-63	2-56	8-62	2-59	9
10	9-61	2-76	9-60	2-80	9-59	2-84	9-58	2-88	10
11	10-57	3-03	10-56	3-08	10-55	3-12	10-53	3-17	11
12	11-54	3-31	11-52	3-36	11-51	3-41	11-49	3-46	12
13	12-50	3-58	12-48	3-64	12-46	3-69	12-45	3-75	13
14	13-46	3-86	13-44	3-92	13-42	3-98	13-41	4-03	14
15	14-42	4-13	14-40	4-20	14-38	4-26	14-36	4-32	15
16	15-38	4-41	15-36	4-48	15-34	4-54	15-32	4-61	16
17	16-34	4-69	16-32	4-76	16-30	4-83	16-28	4-90	17
18	17-30	4-96	17-28	5-04	17-26	5-11	17-24	5-19	18
19	18-26	5-24	18-24	5-32	18-22	5-40	18-19	5-48	19
20	19-23	5-51	19-20	5-60	19-18	5-68	19-15	5-76	20
21	20-19	5-79	20-16	5-88	20-14	5-96	20-11	6-05	21
22	21-15	6-06	21-12	6-16	21-09	6-25	21-07	6-34	22
23	22-11	6-34	22-08	6-44	22-05	6-53	22-02	6-63	23
24	23-07	6-62	23-04	6-72	23-01	6-82	22-98	6-92	24
25	24-03	6-89	24-00	7-00	23-97	7-10	23-94	7-20	25
26	24-99	7-17	24-96	7-28	24-93	7-38	24-90	7-49	26
27	25-95	7-44	25-92	7-56	25-89	7-67	25-85	7-78	27
28	26-92	7-72	26-88	7-84	26-85	7-95	26-81	8-07	28
29	27-88	7-99	27-84	8-11	27-81	8-24	27-77	8-36	29
30	28-84	8-27	28-80	8-39	28-76	8-52	28-73	8-65	30
31	29-80	8-54	29-76	8-67	29-72	8-80	29-68	8-93	31
32	30-76	8-82	30-72	8-95	30-68	9-09	30-64	9-22	32
33	31-72	9-10	31-68	9-23	31-64	9-37	31-60	9-51	33
34	32-68	9-37	32-64	9-51	32-60	9-66	32-56	9-80	34
35	33-64	9-65	33-60	9-79	33-56	9-94	33-51	10-09	35
36	34-61	9-92	34-56	10-07	34-52	10-22	34-47	10-38	36
37	35-57	10-20	35-52	10-35	35-48	10-51	35-43	10-66	37
38	36-53	10-47	36-48	10-63	36-44	10-79	36-39	10-95	38
39	37-49	10-75	37-44	10-91	37-39	11-08	37-35	11-24	39
40	38-45	11-03	38-40	11-19	38-35	11-36	38-30	11-53	40
41	39-41	11-30	39-36	11-47	39-31	11-64	39-26	11-82	41
42	40-37	11-58	40-32	11-75	40-27	11-93	40-22	12-10	42
43	41-33	11-85	41-28	12-03	41-23	12-21	41-18	12-39	43
44	42-30	12-13	42-24	12-31	42-19	12-50	42-13	12-68	44
45	43-26	12-40	43-20	12-59	43-15	12-78	43-09	12-97	45
46	44-22	12-68	44-16	12-87	44-11	13-06	44-05	13-26	46
47	45-18	12-95	45-12	13-15	45-06	13-35	45-01	13-55	47
48	46-14	13-23	46-08	13-43	46-02	13-63	45-96	13-83	48
49	47-10	13-51	47-04	13-71	46-98	13-92	46-92	14-12	49
50	48-06	13-78	48-00	13-99	47-94	14-20	47-88	14-41	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	74 Deg.		73¾ Deg.		73½ Deg.		73¼ Deg.		

TRAVERSE TABLE.

Distance.	16 Deg.		16¼ Deg.		16½ Deg.		16¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49-02	14-06	48-96	14-27	48-90	14-48	48-84	14-70	51
52	49-99	14-33	49-92	14-55	49-86	14-77	49-79	14-99	52
53	50-95	14-61	50-88	14-83	50-82	15-05	50-75	15-27	53
54	51-91	14-88	51-84	15-11	51-78	15-34	51-71	15-56	54
55	52-87	15-16	52-80	15-39	52-74	15-62	52-67	15-85	55
56	53-83	15-44	53-76	15-67	53-69	15-90	53-62	16-14	56
57	54-79	15-71	54-72	15-95	54-65	16-19	54-58	16-43	57
58	55-75	15-99	55-68	16-23	55-61	16-47	55-54	16-72	58
59	56-71	16-26	56-64	16-51	56-57	16-76	56-50	17-00	59
60	57-68	16-54	57-60	16-79	57-53	17-04	57-45	17-29	60
61	58-64	16-81	58-56	17-07	58-49	17-32	58-41	17-58	61
62	59-60	17-09	59-52	17-35	59-45	17-61	59-37	17-87	62
63	60-56	17-37	60-48	17-63	60-41	17-89	60-33	18-16	63
64	61-52	17-64	61-44	17-91	61-36	18-18	61-28	18-44	64
65	62-48	17-92	62-40	18-19	62-32	18-46	62-24	18-73	65
66	63-44	18-19	63-36	18-47	63-28	18-74	63-20	19-02	66
67	64-40	18-47	64-32	18-75	64-24	19-03	64-16	19-31	67
68	65-37	18-74	65-28	19-03	65-20	19-31	65-11	19-60	68
69	66-33	19-02	66-24	19-31	66-16	19-60	66-07	19-89	69
70	67-29	19-29	67-20	19-59	67-12	19-88	67-03	20-17	70
71	68-25	19-57	68-16	19-87	68-08	20-17	67-99	20-46	71
72	69-21	19-85	69-12	20-15	69-03	20-45	68-95	20-75	72
73	70-17	20-12	70-08	20-43	69-99	20-73	69-90	21-04	73
74	71-13	20-40	71-04	20-71	70-95	21-02	70-86	21-33	74
75	72-09	20-67	72-00	20-99	71-91	21-30	71-82	21-61	75
76	73-06	20-95	72-96	21-27	72-87	21-59	72-78	21-90	76
77	74-02	21-22	73-92	21-55	73-83	21-87	73-73	22-19	77
78	74-98	21-50	74-88	21-83	74-79	22-15	74-69	22-48	78
79	75-94	21-78	75-84	22-11	75-75	22-44	75-65	22-77	79
80	76-90	22-05	76-80	22-39	76-71	22-72	76-61	23-06	80
81	77-86	22-33	77-76	22-67	77-66	23-01	77-56	23-34	81
82	78-82	22-60	78-72	22-95	78-62	23-29	78-52	23-63	82
83	79-78	22-88	79-68	23-23	79-58	23-57	79-48	23-92	83
84	80-75	23-15	80-64	23-51	80-54	23-86	80-44	24-21	84
85	81-71	23-43	81-60	23-79	81-50	24-14	81-39	24-50	85
86	82-67	23-70	82-56	24-07	82-46	24-43	82-35	24-78	86
87	83-63	23-98	83-52	24-35	83-42	24-71	83-31	25-07	87
88	84-59	24-26	84-48	24-62	84-38	24-99	84-27	25-36	88
89	85-55	24-53	85-44	24-90	85-33	25-28	85-22	25-65	89
90	86-51	24-81	86-40	25-18	86-29	25-56	86-18	25-94	90
91	87-47	25-08	87-36	25-46	87-25	25-85	87-14	26-23	91
92	88-44	25-36	88-32	25-74	88-21	26-13	88-10	26-51	92
93	89-40	25-63	89-28	26-02	89-17	26-41	89-05	26-80	93
94	90-36	25-91	90-24	26-30	90-13	26-70	90-01	27-09	94
95	91-32	26-19	91-20	26-58	91-09	26-98	90-97	27-38	95
96	92-28	26-46	92-16	26-86	92-05	27-27	91-93	27-67	96
97	93-24	26-74	93-12	27-14	93-01	27-55	92-88	27-95	97
98	94-20	27-01	94-08	27-42	93-96	27-83	93-84	28-24	98
99	95-16	27-29	95-04	27-70	94-92	28-12	94-80	28-53	99
100	96-13	27-56	96-00	27-98	95-88	28-40	95-76	28-82	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	74 Deg.		78¾ Deg.		73½ Deg.		73¼ Deg.		

TRAVERSE TABLE.

Distance.	17 Deg.		17¼ Deg.		17½ Deg.		17¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-96	0-29	0-95	0-30	0-95	0-30	0-95	0-30	1
2	1-91	0-58	1-91	0-59	1-91	0-60	1-90	0-61	2
3	2-87	0-88	2-87	0-89	2-86	0-90	2-86	0-91	3
4	3-83	1-17	3-82	1-19	3-81	1-20	3-81	1-22	4
5	4-78	1-46	4-78	1-48	4-77	1-50	4-76	1-52	5
6	5-74	1-75	5-73	1-78	5-72	1-80	5-71	1-83	6
7	6-69	2-05	6-69	2-08	6-68	2-10	6-67	2-13	7
8	7-65	2-34	7-64	2-37	7-63	2-41	7-62	2-44	8
9	8-61	2-63	8-60	2-67	8-58	2-71	8-57	2-74	9
10	9-56	2-92	9-55	2-97	9-54	3-01	9-52	3-05	10
11	10-52	3-22	10-51	3-26	10-49	3-31	10-48	3-35	11
12	11-48	3-51	11-46	3-56	11-44	3-61	11-43	3-66	12
13	12-43	3-80	12-42	3-85	12-40	3-91	12-38	3-96	13
14	13-39	4-09	13-37	4-15	13-35	4-21	13-33	4-27	14
15	14-34	4-39	14-33	4-45	14-31	4-51	14-29	4-57	15
16	15-30	4-68	15-28	4-74	15-26	4-81	15-24	4-88	16
17	16-26	4-97	16-24	5-04	16-21	5-11	16-19	5-18	17
18	17-21	5-26	17-19	5-34	17-17	5-41	17-14	5-49	18
19	18-17	5-56	18-15	5-63	18-12	5-71	18-10	5-79	19
20	19-13	5-85	19-10	5-93	19-07	6-01	19-05	6-10	20
21	20-08	6-14	20-06	6-23	20-03	6-31	20-00	6-40	21
22	21-04	6-43	21-01	6-52	20-98	6-62	20-95	6-71	22
23	21-99	6-72	21-97	6-82	21-94	6-92	21-91	7-01	23
24	22-95	7-02	22-92	7-12	22-89	7-22	22-86	7-32	24
25	23-91	7-31	23-88	7-41	23-84	7-52	23-81	7-62	25
26	24-86	7-60	24-83	7-71	24-80	7-82	24-76	7-93	26
27	25-82	7-89	25-79	8-01	25-75	8-12	25-71	8-23	27
28	26-78	8-19	26-74	8-30	26-70	8-42	26-67	8-54	28
29	27-73	8-48	27-70	8-60	27-66	8-72	27-62	8-84	29
30	28-69	8-77	28-65	8-90	28-61	9-02	28-57	9-15	30
31	29-65	9-06	29-61	9-19	29-57	9-32	29-52	9-45	31
32	30-60	9-36	30-56	9-49	30-52	9-62	30-48	9-76	32
33	31-56	9-65	31-52	9-79	31-47	9-92	31-43	10-06	33
34	32-51	9-94	32-47	10-08	32-43	10-22	32-38	10-37	34
35	33-47	10-23	33-43	10-38	33-38	10-52	33-33	10-67	35
36	34-43	10-53	34-38	10-68	34-33	10-83	34-29	10-98	36
37	35-38	10-82	35-34	10-97	35-29	11-13	35-24	11-28	37
38	36-34	11-11	36-29	11-27	36-24	11-43	36-19	11-58	38
39	37-30	11-40	37-25	11-57	37-19	11-73	37-14	11-89	39
40	38-25	11-69	38-20	11-86	38-15	12-03	38-10	12-19	40
41	39-21	11-99	39-16	12-16	39-10	12-33	39-05	12-50	41
42	40-16	12-28	40-11	12-45	40-06	12-63	40-00	12-80	42
43	41-12	12-57	41-07	12-75	41-01	12-93	40-95	13-11	43
44	42-08	12-86	42-02	13-05	41-96	13-23	41-91	13-41	44
45	43-03	13-16	42-98	13-34	42-92	13-53	42-86	13-72	45
46	43-99	13-45	43-93	13-64	43-87	13-83	43-81	14-02	46
47	44-95	13-74	44-89	13-94	44-82	14-13	44-76	14-33	47
48	45-90	14-03	45-84	14-23	45-78	14-43	45-71	14-63	48
49	46-86	14-33	46-80	14-53	46-73	14-73	46-67	14-94	49
50	47-82	14-62	47-75	14-83	47-69	15-04	47-62	15-24	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	73 Deg.		72¾ Deg.		72½ Deg.		72¼ Deg.		

TRAVERSE TABLE.

Distance.	17 Deg.		17¼ Deg.		17½ Deg.		17¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48-77	14-91	48-71	15-12	48-04	15-34	48-57	15-55	51
52	49-73	15-20	49-66	15-42	49-59	15-64	49-52	15-85	52
53	50-68	15-50	50-62	15-72	50-55	15-94	50-48	16-16	53
54	51-64	15-79	51-57	16-01	51-50	16-24	51-43	16-46	54
55	52-60	16-08	52-53	16-31	52-45	16-54	52-38	16-77	55
56	53-55	16-37	53-48	16-61	53-41	16-84	53-33	17-07	56
57	54-51	16-67	54-44	16-90	54-36	17-14	54-29	17-38	57
58	55-47	16-96	55-39	17-20	55-32	17-44	55-24	17-68	58
59	56-42	17-25	56-35	17-50	56-27	17-74	56-10	17-99	59
60	57-38	17-54	57-30	17-79	57-22	18-04	57-14	18-29	60
61	58-33	17-83	58-26	18-09	58-18	18-34	58-10	18-60	61
62	59-29	18-13	59-21	18-39	59-13	18-64	59-05	18-90	62
63	60-25	18-42	60-17	18-68	60-08	18-94	60-00	19-21	63
64	61-20	18-71	61-12	18-98	61-04	19-25	60-95	19-51	64
65	62-16	19-00	62-08	19-28	61-99	19-55	61-91	19-82	65
66	63-12	19-30	63-03	19-57	62-95	19-85	62-86	20-12	66
67	64-07	19-59	63-99	19-87	63-90	20-15	63-81	20-43	67
68	65-03	19-88	64-94	20-16	64-85	20-45	64-76	20-73	68
69	65-99	20-17	65-90	20-46	65-81	20-75	65-72	21-04	69
70	66-94	20-47	66-85	20-76	66-76	21-05	66-67	21-34	70
71	67-90	20-76	67-81	21-05	67-71	21-35	67-62	21-65	71
72	68-85	21-05	68-76	21-35	68-67	21-65	68-57	21-95	72
73	69-81	21-34	69-72	21-65	69-62	21-95	69-52	22-26	73
74	70-77	21-64	70-67	21-94	70-58	22-25	70-48	22-56	74
75	71-72	21-93	71-63	22-24	71-53	22-55	71-43	22-86	75
76	72-68	22-22	72-58	22-54	72-48	22-85	72-38	23-17	76
77	73-64	22-51	73-54	22-83	73-44	23-15	73-33	23-47	77
78	74-59	22-80	74-49	23-13	74-39	23-46	74-29	23-78	78
79	75-55	23-10	75-45	23-43	75-34	23-76	75-24	24-08	79
80	76-50	23-39	76-40	23-72	76-30	24-06	76-19	24-39	80
81	77-46	23-68	77-36	24-02	77-25	24-36	77-14	24-69	81
82	78-42	23-97	78-31	24-32	78-20	24-66	78-10	25-00	82
83	79-37	24-27	79-27	24-61	79-16	25-96	79-05	25-30	83
84	80-33	24-56	80-22	24-91	80-11	25-26	80-00	25-61	84
85	81-29	24-85	81-18	25-21	81-07	25-56	80-95	25-91	85
86	82-24	25-14	82-13	25-50	82-02	25-86	81-91	26-22	86
87	83-20	25-44	83-09	25-80	82-97	26-16	82-86	26-52	87
88	84-15	25-73	84-04	26-10	83-93	26-46	83-81	26-83	88
89	85-11	26-02	85-00	26-39	84-88	26-76	84-76	27-13	89
90	86-07	26-31	85-95	26-69	85-83	27-06	85-72	27-44	90
91	87-02	26-61	86-91	26-99	86-79	27-36	86-67	27-74	91
92	87-98	26-90	87-86	27-28	87-74	27-66	87-62	28-05	92
93	88-94	27-19	88-82	27-58	88-70	27-97	88-57	28-35	93
94	89-89	27-48	89-77	27-87	89-65	28-27	89-53	28-66	94
95	90-85	27-78	90-73	28-17	90-60	28-57	90-48	28-96	95
96	91-81	28-07	91-68	28-47	91-56	28-87	91-43	29-27	96
97	92-76	28-36	92-64	28-76	92-51	29-17	92-38	29-57	97
98	93-72	28-65	93-59	29-06	93-46	29-47	93-33	29-88	98
99	94-67	28-94	94-55	29-36	94-42	29-77	94-29	30-18	99
100	95-63	29-24	95-50	29-65	95-37	30-07	95-24	30-49	100
Distance.	73 Deg.		73¼ Deg.		73½ Deg.		73¾ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	18 Deg.		18¼ Deg.		18½ Deg.		18¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-95	0-31	0-95	0-31	0-95	0-32	0-95	0-32	1
2	1-90	0-62	1-90	0-63	1-90	0-63	1-89	0-64	2
3	2-85	0-93	2-85	0-94	2-84	0-95	2-84	0-96	3
4	3-80	1-24	3-80	1-25	3-79	1-27	3-79	1-29	4
5	4-76	1-55	4-75	1-57	4-74	1-59	4-73	1-61	5
6	5-71	1-85	5-70	1-88	5-69	1-90	5-68	1-93	6
7	6-66	2-16	6-65	2-19	6-64	2-22	6-63	2-25	7
8	7-61	2-47	7-60	2-51	7-59	2-54	7-58	2-57	8
9	8-56	2-78	8-55	2-82	8-53	2-86	8-52	2-89	9
10	9-51	3-09	9-50	3-13	9-48	3-17	9-47	3-21	10
11	10-46	3-40	10-45	3-44	10-43	3-49	10-42	3-54	11
12	11-41	3-71	11-40	3-76	11-38	3-81	11-36	3-86	12
13	12-36	4-02	12-35	4-07	12-33	4-12	12-31	4-18	13
14	13-31	4-33	13-30	4-38	13-28	4-44	13-26	4-50	14
15	14-27	4-64	14-25	4-70	14-22	4-76	14-20	4-82	15
16	15-22	4-94	15-20	5-01	15-17	5-08	15-15	5-14	16
17	16-17	5-25	16-14	5-32	16-12	5-39	16-10	5-46	17
18	17-12	5-56	17-09	5-64	17-07	5-71	17-04	5-79	18
19	18-07	5-87	18-04	5-95	18-02	6-03	17-99	6-11	19
20	19-02	6-18	18-99	6-26	18-97	6-35	18-94	6-43	20
21	19-07	6-49	19-04	6-58	19-01	6-66	19-89	6-75	21
22	20-02	6-80	20-89	6-89	20-86	6-98	20-83	7-07	22
23	21-87	7-11	21-84	7-20	21-81	7-30	21-78	7-39	23
24	22-83	7-42	22-79	7-52	22-76	7-62	22-73	7-71	24
25	23-78	7-73	23-74	7-83	23-71	7-93	23-67	8-04	25
26	24-73	8-03	24-69	8-14	24-66	8-25	24-62	8-36	26
27	25-68	8-34	25-64	8-46	25-60	8-57	25-57	8-68	27
28	26-63	8-65	26-59	8-77	26-55	8-88	26-51	9-00	28
29	27-58	8-96	27-54	9-08	27-50	9-20	27-46	9-32	29
30	28-53	9-27	28-49	9-39	28-45	9-52	28-41	9-64	30
31	29-48	9-58	29-44	9-71	29-40	9-84	29-35	9-96	31
32	30-43	9-89	30-39	10-02	30-35	10-15	30-30	10-29	32
33	31-38	10-20	31-34	10-33	31-29	10-47	31-25	10-61	33
34	32-34	10-51	32-29	10-65	32-24	10-79	32-20	10-93	34
35	33-29	10-82	33-24	10-96	33-19	11-11	33-14	11-25	35
36	34-24	11-12	34-19	11-27	34-14	11-42	34-09	11-57	36
37	35-19	11-43	35-14	11-59	35-09	11-74	35-04	11-89	37
38	36-14	11-74	36-09	11-90	36-04	12-06	35-98	12-21	38
39	37-09	12-05	37-04	12-21	36-98	12-37	36-93	12-54	39
40	38-04	12-36	37-99	12-53	37-93	12-69	37-88	12-86	40
41	38-99	12-67	38-94	12-84	38-88	13-01	38-82	13-18	41
42	39-94	12-98	39-89	13-15	39-83	13-33	39-77	13-50	42
43	40-90	13-29	40-84	13-47	40-78	13-64	40-72	13-82	43
44	41-85	13-60	41-79	13-78	41-73	13-96	41-66	14-14	44
45	42-80	13-91	42-74	14-09	42-67	14-28	42-61	14-45	45
46	43-75	14-21	43-69	14-41	43-62	14-60	43-55	14-79	46
47	44-70	14-52	44-64	14-72	44-57	14-91	44-51	15-11	47
48	45-65	14-83	45-59	15-03	45-52	15-23	45-45	15-43	48
49	46-60	15-14	46-54	15-35	46-47	15-55	46-40	15-75	49
50	47-55	15-45	47-48	15-66	47-42	15-87	47-35	16-07	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	72 Deg.		71¾ Deg.		71½ Deg.		71¼ Deg.		

TRAVERSE TABLE.

Distance.	18 Deg.		18¼ Deg.		18½ Deg.		18¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48-50	15-76	48-43	15-97	48-36	16-18	48-29	16-39	51
52	49-45	16-07	49-38	16-28	49-31	16-50	49-24	16-71	52
53	50-41	16-38	50-33	16-60	50-26	16-82	50-19	17-04	53
54	51-36	16-69	51-28	16-91	51-21	17-13	51-13	17-36	54
55	52-31	17-00	52-23	17-22	52-16	17-45	52-08	17-68	55
56	53-26	17-30	53-18	17-54	53-11	17-77	53-03	18-00	56
57	54-21	17-61	54-13	17-85	54-05	18-09	53-98	18-32	57
58	55-16	17-92	55-08	18-16	55-00	18-40	54-92	18-64	58
59	56-11	18-23	56-03	18-48	55-95	18-72	55-87	18-96	59
60	57-06	18-54	56-98	18-79	56-90	19-04	56-82	19-29	60
61	58-01	18-85	57-93	19-10	57-85	19-36	57-76	19-61	61
62	58-97	19-16	58-88	19-42	58-80	19-67	58-71	19-93	62
63	59-92	19-47	59-83	19-73	59-74	19-99	59-66	20-25	63
64	60-87	19-78	60-78	20-04	60-69	20-31	60-60	20-57	64
65	61-82	20-09	61-73	20-36	61-64	20-62	61-55	20-89	65
66	62-77	20-40	62-68	20-67	62-59	20-94	62-50	21-22	66
67	63-72	20-70	63-63	20-98	63-54	21-26	63-44	21-54	67
68	64-67	21-01	64-58	21-30	64-49	21-58	64-39	21-86	68
69	65-62	21-32	65-53	21-61	65-43	21-89	65-34	22-18	69
70	66-57	21-63	66-48	21-92	66-38	22-21	66-29	22-50	70
71	67-53	21-94	67-43	22-23	67-33	22-53	67-23	22-82	71
72	68-48	22-25	68-38	22-55	68-28	22-85	68-18	23-14	72
73	69-43	22-56	69-33	22-86	69-23	23-16	69-13	23-47	73
74	70-38	22-87	70-28	23-17	70-18	23-48	70-07	23-79	74
75	71-33	23-18	71-23	23-49	71-12	23-80	71-02	24-11	75
76	72-28	23-49	72-18	23-80	72-07	24-12	71-97	24-43	76
77	73-23	23-79	73-13	24-11	73-02	24-43	72-91	24-75	77
78	74-18	24-10	74-08	24-43	73-97	24-75	73-86	25-07	78
79	75-13	24-41	75-03	24-74	74-92	25-07	74-81	25-39	79
80	76-08	24-72	75-98	25-05	75-87	25-38	75-76	25-72	80
81	77-04	25-03	76-93	25-37	76-81	25-70	76-70	26-04	81
82	77-99	25-34	77-88	25-68	77-76	26-02	77-65	26-36	82
83	78-94	25-65	78-83	25-99	78-71	26-34	78-60	26-68	83
84	79-89	25-96	79-77	26-31	79-66	26-65	79-54	27-00	84
85	80-84	26-27	80-72	26-62	80-61	26-97	80-49	27-32	85
86	81-79	26-58	81-67	26-93	81-56	27-29	81-44	27-64	86
87	82-74	26-88	82-62	27-25	82-50	27-01	82-38	27-97	87
88	83-69	27-19	83-57	27-56	83-45	27-92	83-33	28-29	88
89	84-64	27-50	84-52	27-87	84-40	28-24	84-28	28-61	89
90	85-60	27-81	85-47	28-18	85-35	28-56	85-22	28-93	90
91	86-55	28-12	86-42	28-50	86-30	28-87	86-17	29-25	91
92	87-50	28-43	87-37	28-81	87-25	29-19	87-12	29-57	92
93	88-45	28-74	88-32	29-12	88-19	29-51	88-06	29-89	93
94	89-40	29-05	89-27	29-44	89-14	29-83	89-01	30-22	94
95	90-35	29-36	90-22	29-75	90-09	30-14	89-96	30-54	95
96	91-30	29-67	91-17	30-06	91-04	30-46	90-91	30-86	96
97	92-25	29-97	92-12	30-38	91-99	30-78	91-85	31-18	97
98	93-20	30-28	93-07	30-69	92-94	31-10	92-80	31-50	98
99	94-15	30-59	94-02	31-00	93-88	31-41	93-75	31-82	99
100	95-11	30-90	94-97	31-32	94-83	31-73	94-69	32-14	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	72 Deg.		71¾ Deg.		71½ Deg.		71¼ Deg.		

TRAVERSE TABLE

Distance.	19 Deg.		19¼ Deg.		19½ Deg.		19¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-95	0-33	0-94	0-33	0-94	0-33	0-94	0-34	1
2	1-89	0-65	1-89	0-66	1-89	0-67	1-88	0-68	2
3	2-84	0-98	2-83	0-99	2-83	1-00	2-82	1-01	3
4	3-78	1-30	3-78	1-32	3-77	1-34	3-76	1-35	4
5	4-73	1-63	4-72	1-65	4-71	1-67	4-71	1-69	5
6	5-67	1-95	5-66	1-98	5-66	2-00	5-65	2-03	6
7	6-62	2-28	6-61	2-31	6-60	2-34	6-59	2-37	7
8	7-56	2-60	7-55	2-64	7-54	2-67	7-53	2-70	8
9	8-51	2-93	8-50	2-97	8-48	3-00	8-47	3-04	9
10	9-46	3-26	9-44	3-30	9-43	3-34	9-41	3-38	10
11	10-40	3-58	10-38	3-63	10-37	3-67	10-35	3-72	11
12	11-35	3-91	11-33	3-96	11-31	4-01	11-29	4-06	12
13	12-29	4-23	12-27	4-29	12-25	4-34	12-24	4-39	13
14	13-24	4-56	13-22	4-62	13-20	4-67	13-18	4-73	14
15	14-18	4-88	14-16	4-95	14-14	5-01	14-12	5-07	15
16	15-13	5-21	15-11	5-28	15-08	5-34	15-06	5-41	16
17	16-07	5-53	16-05	5-60	16-02	5-67	16-00	5-74	17
18	17-02	5-86	16-99	5-93	16-97	6-01	16-94	6-08	18
19	17-96	6-19	17-94	6-26	17-91	6-34	17-88	6-42	19
20	18-91	6-51	18-88	6-59	18-85	6-68	18-82	6-76	20
21	19-86	6-84	19-83	6-92	19-80	7-01	19-76	7-10	21
22	20-80	7-16	20-77	7-25	20-74	7-34	20-71	7-43	22
23	21-75	7-49	21-71	7-58	21-68	7-68	21-65	7-77	23
24	22-69	7-81	22-66	7-91	22-62	8-01	22-59	8-11	24
25	23-64	8-14	23-60	8-24	23-57	8-35	23-53	8-45	25
26	24-58	8-46	24-55	8-57	24-51	8-68	24-47	8-79	26
27	25-53	8-79	25-49	8-90	25-45	9-01	25-41	9-12	27
28	26-47	9-12	26-43	9-23	26-39	9-35	26-35	9-46	28
29	27-42	9-44	27-38	9-56	27-34	9-68	27-29	9-80	29
30	28-37	9-77	28-32	9-89	28-28	10-01	28-24	10-14	30
31	29-31	10-09	29-27	10-22	29-22	10-35	29-18	10-48	31
32	30-26	10-42	30-21	10-55	30-16	10-68	30-12	10-81	32
33	31-20	10-74	31-15	10-88	31-11	11-02	31-06	11-15	33
34	32-15	11-07	32-10	11-21	32-05	11-35	32-00	11-49	34
35	33-09	11-39	33-04	11-54	32-99	11-68	32-94	11-83	35
36	34-04	11-72	33-99	11-87	33-94	12-02	33-88	12-17	36
37	34-98	12-05	34-93	12-20	34-88	12-35	34-82	12-50	37
38	35-93	12-37	35-88	12-53	35-82	12-68	35-76	12-84	38
39	36-88	12-70	36-82	12-86	36-76	13-02	36-71	13-18	39
40	37-82	13-02	37-76	13-19	37-71	13-35	37-65	13-52	40
41	38-77	13-35	38-71	13-52	38-65	13-69	38-59	13-85	41
42	39-71	13-67	39-65	13-85	39-59	14-02	39-53	14-19	42
43	40-66	14-00	40-60	14-18	40-53	14-35	40-47	14-53	43
44	41-60	14-32	41-54	14-51	41-48	14-69	41-41	14-87	44
45	42-55	14-65	42-48	14-84	42-42	15-02	42-35	15-21	45
46	43-49	14-98	43-43	15-17	43-36	15-36	43-29	15-54	46
47	44-44	15-30	44-37	15-50	44-30	15-69	44-24	15-88	47
48	45-38	15-63	45-32	15-83	45-25	16-02	45-18	16-22	48
49	46-33	15-95	46-26	16-15	46-19	16-36	46-12	16-56	49
50	47-28	16-28	47-20	16-48	47-13	16-69	47-06	16-90	50
Distance	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	71 Deg.		70¾ Deg.		70½ Deg.		70¼ Deg.		

TRAVERSE TABLE.

Distance.	19 Deg.		19¼ Deg.		19½ Deg.		19¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48-22	16-60	48-15	16-81	48-07	17-02	48-00	17-23	51
52	49-17	16-93	49-09	17-14	49-02	17-36	48-94	17-57	52
53	50-11	17-26	50-04	17-47	49-96	17-69	49-88	17-91	53
54	51-06	17-58	50-98	17-80	50-90	18-03	50-82	18-25	54
55	52-00	17-91	51-92	18-13	51-85	18-36	51-76	18-59	55
56	52-95	18-23	52-87	18-46	52-79	18-69	52-71	18-92	56
57	53-89	18-56	53-81	18-79	53-73	19-03	53-65	19-26	57
58	54-84	18-88	54-76	19-12	54-67	19-36	54-59	19-60	58
59	55-79	19-21	55-70	19-45	55-62	19-69	55-53	19-94	59
60	56-73	19-53	56-65	19-78	56-56	20-03	56-47	20-27	60
61	57-68	19-86	57-59	20-11	57-50	20-36	57-41	20-61	61
62	58-62	20-19	58-53	20-44	58-44	20-70	58-35	20-95	62
63	59-57	20-51	59-48	20-77	59-39	21-03	59-29	21-29	63
64	60-51	20-84	60-42	21-10	60-33	21-36	60-24	21-63	64
65	61-46	21-16	61-37	21-43	61-27	21-70	61-18	21-96	65
66	62-40	21-49	62-31	21-76	62-21	22-03	62-12	22-30	66
67	63-35	21-81	63-25	22-09	63-16	22-37	63-06	22-64	67
68	64-30	22-14	64-20	22-42	64-10	22-70	64-00	22-98	68
69	65-24	22-46	65-14	22-75	65-04	23-03	64-94	23-32	69
70	66-19	22-79	66-09	23-08	65-98	23-37	65-88	23-65	70
71	67-13	23-12	67-03	23-41	66-93	23-70	66-82	23-99	71
72	68-08	23-44	67-97	23-74	67-87	24-03	67-76	24-33	72
73	69-02	23-77	68-92	24-07	68-81	24-37	68-71	24-67	73
74	69-97	24-09	69-86	24-40	69-76	24-70	69-65	25-01	74
75	70-91	24-42	70-81	24-73	70-70	25-04	70-59	25-34	75
76	71-86	24-74	71-75	25-06	71-64	25-37	71-53	25-68	76
77	72-80	25-07	72-69	25-39	72-58	25-70	72-47	26-02	77
78	73-75	25-39	73-64	25-72	73-53	26-04	73-41	26-36	78
79	74-70	25-72	74-58	26-05	74-47	26-37	74-35	26-70	79
80	75-64	26-05	75-53	26-38	75-41	26-70	75-29	27-03	80
81	76-59	26-37	76-47	26-70	76-35	27-04	76-24	27-37	81
82	77-53	26-70	77-42	27-03	77-30	27-37	77-18	27-71	82
83	78-48	27-02	78-36	27-36	78-24	27-71	78-12	28-05	83
84	79-42	27-35	79-30	27-69	79-18	28-04	79-06	28-39	84
85	80-37	27-67	80-25	28-02	80-12	28-37	80-00	28-72	85
86	81-31	28-00	81-19	28-35	81-07	28-71	80-94	29-06	86
87	82-26	28-32	82-14	28-68	82-01	29-04	81-88	29-40	87
88	83-21	28-65	83-08	29-01	82-95	29-37	82-82	29-74	88
89	84-15	28-98	84-02	29-34	83-90	29-71	83-76	30-07	89
90	85-10	29-30	84-97	29-67	84-84	30-04	84-71	30-41	90
91	86-04	29-63	85-91	30-00	85-78	30-38	85-65	30-75	91
92	86-99	29-95	86-86	30-33	86-72	30-71	86-59	31-09	92
93	87-93	30-28	87-80	30-66	87-67	31-04	87-53	31-43	93
94	88-88	30-60	88-74	30-99	88-61	31-38	88-47	31-76	94
95	89-82	30-93	89-69	31-32	89-55	31-71	89-41	32-10	95
96	90-77	31-25	90-63	31-65	90-49	32-05	90-35	32-44	96
97	91-72	31-58	91-58	31-98	91-44	32-38	91-29	32-78	97
98	92-66	31-91	92-52	32-31	92-38	32-71	92-24	33-12	98
99	93-61	32-23	93-46	32-64	93-32	33-05	93-18	33-45	99
100	94-55	32-56	94-41	32-97	94-26	33-38	94-12	33-79	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	71 Deg.		70¾ Deg.		70½ Deg.		70¼ Deg.		

TRAVERSE TABLE.

Distance.	20 Deg.		20¼ Deg.		20½ Deg.		20¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-94	0-34	0-94	0-35	0-94	0-35	0-94	0-35	1
2	1-88	0-68	1-88	0-69	1-87	0-70	1-87	0-71	2
3	2-82	1-03	2-81	1-04	2-81	1-05	2-81	1-06	3
4	3-76	1-37	3-75	1-38	3-75	1-40	3-74	1-42	4
5	4-70	1-71	4-69	1-73	4-68	1-75	4-68	1-77	5
6	5-64	2-05	5-63	2-08	5-62	2-10	5-61	2-13	6
7	6-58	2-39	6-57	2-42	6-56	2-45	6-55	2-48	7
8	7-52	2-74	7-51	2-77	7-49	2-80	7-48	2-83	8
9	8-46	3-08	8-44	3-12	8-43	3-15	8-42	3-19	9
10	9-40	3-42	9-38	3-46	9-37	3-50	9-35	3-54	10
11	10-34	3-76	10-32	3-81	10-30	3-85	10-29	3-90	11
12	11-28	4-10	11-26	4-15	11-24	4-20	11-22	4-25	12
13	12-22	4-45	12-20	4-50	12-18	4-55	12-16	4-61	13
14	13-16	4-79	13-13	4-85	13-11	4-90	13-09	4-96	14
15	14-10	5-13	14-07	5-19	14-05	5-25	14-03	5-31	15
16	15-04	5-47	15-01	5-54	14-99	5-60	14-96	5-67	16
17	15-97	5-81	15-95	5-88	15-92	5-95	15-90	6-02	17
18	16-91	6-16	16-89	6-23	16-86	6-30	16-83	6-38	18
19	17-85	6-50	17-83	6-58	17-80	6-65	17-77	6-73	19
20	18-79	6-84	18-76	6-92	18-73	7-00	18-70	7-09	20
21	19-73	7-18	19-70	7-27	19-67	7-35	19-64	7-44	21
22	20-67	7-52	20-64	7-61	20-61	7-70	20-57	7-79	22
23	21-61	7-87	21-58	7-96	21-54	8-05	21-51	8-15	23
24	22-55	8-21	22-52	8-31	22-48	8-40	22-44	8-50	24
25	23-49	8-55	23-45	8-65	23-42	8-76	23-38	8-86	25
26	24-43	8-89	24-39	9-00	24-35	9-11	24-31	9-21	26
27	25-37	9-23	25-33	9-35	25-29	9-46	25-25	9-57	27
28	26-31	9-58	26-27	9-69	26-23	9-81	26-18	9-92	28
29	27-25	9-92	27-21	10-04	27-16	10-16	27-12	10-27	29
30	28-19	10-26	28-15	10-38	28-10	10-51	28-05	10-63	30
31	29-13	10-60	29-08	10-73	29-04	10-86	28-99	10-98	31
32	30-07	10-94	30-02	11-08	29-97	11-21	29-92	11-34	32
33	31-01	11-29	30-96	11-42	30-91	11-56	30-86	11-69	33
34	31-95	11-63	31-90	11-77	31-85	11-91	31-79	12-05	34
35	32-89	11-97	32-84	12-11	32-78	12-26	32-73	12-40	35
36	33-83	12-31	33-77	12-46	33-72	12-61	33-66	12-75	36
37	34-77	12-65	34-71	12-81	34-66	12-96	34-60	13-11	37
38	35-71	13-00	35-65	13-15	35-59	13-31	35-54	13-46	38
39	36-65	13-34	36-59	13-50	36-53	13-66	36-47	13-82	39
40	37-59	13-68	37-53	13-84	37-47	14-01	37-41	14-17	40
41	38-53	14-02	38-47	14-19	38-40	14-36	38-34	14-53	41
42	39-47	14-36	39-40	14-54	39-34	14-71	39-28	14-88	42
43	40-41	14-71	40-34	14-88	40-28	15-06	40-21	15-23	43
44	41-35	15-05	41-28	15-23	41-21	15-41	41-15	15-59	44
45	42-29	15-39	42-22	15-58	42-15	15-76	42-08	15-94	45
46	43-23	15-73	43-16	15-92	43-09	16-11	43-02	16-30	46
47	44-17	16-07	44-09	16-27	44-02	16-46	43-95	16-65	47
48	45-11	16-42	45-03	16-61	44-96	16-81	44-89	17-01	48
49	46-04	16-76	45-97	16-96	45-90	17-16	45-82	17-36	49
50	46-98	17-10	46-91	17-31	46-83	17-51	46-76	17-71	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	70 Deg.		69¾ Deg.		69½ Deg.		69¼ Deg.		

TRAVERSE TABLE.

Distance.	20 Deg.		20¼ Deg.		20½ Deg.		20¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	47-92	17-44	47-85	17-65	47-77	17-86	47-69	18-07	51
52	48-86	17-79	48-79	18-00	48-71	18-21	48-63	18-42	52
53	49-80	18-13	49-72	18-34	49-64	18-56	49-56	18-78	53
54	50-74	18-47	50-66	18-69	50-58	18-91	50-50	19-13	54
55	51-68	18-81	51-60	19-04	51-52	19-26	51-43	19-49	55
56	52-62	19-15	52-54	19-38	52-45	19-61	52-37	19-84	56
57	53-56	19-50	53-48	19-73	53-39	19-96	53-30	20-19	57
58	54-50	19-84	54-42	20-07	54-33	20-31	54-24	20-55	58
59	55-44	20-18	55-35	20-42	55-26	20-66	55-17	20-90	59
60	56-38	20-52	56-29	20-77	56-20	21-01	56-11	21-26	60
61	57-32	20-86	57-23	21-11	57-14	21-36	57-04	21-61	61
62	58-26	21-21	58-17	21-46	58-07	21-71	57-98	21-97	62
63	59-20	21-55	59-11	21-81	59-01	22-06	58-91	22-32	63
64	60-14	21-89	60-04	22-15	59-95	22-41	59-85	22-67	64
65	61-08	22-23	60-98	22-50	60-88	22-76	60-78	23-03	65
66	62-02	22-57	61-92	22-84	61-82	23-11	61-72	23-35	66
67	62-96	22-92	62-86	23-19	62-76	23-46	62-65	23-74	67
68	63-90	23-26	63-80	23-54	63-69	23-81	63-59	24-09	68
69	64-84	23-60	64-74	23-88	64-63	24-16	64-52	24-45	69
70	65-78	23-94	65-67	24-23	65-57	24-51	65-46	24-80	70
71	66-72	24-28	66-61	24-57	66-50	24-86	66-39	25-15	71
72	67-66	24-63	67-55	24-92	67-44	25-21	67-33	25-51	72
73	68-60	24-97	68-49	25-27	68-38	25-57	68-26	25-86	73
74	69-54	25-31	69-43	25-61	69-31	25-92	69-20	26-22	74
75	70-48	25-65	70-36	25-96	70-25	26-27	70-14	26-57	75
76	71-42	25-99	71-30	26-30	71-19	26-62	71-07	26-93	76
77	72-36	26-34	72-24	26-65	72-12	26-97	72-01	27-28	77
78	73-30	26-68	73-18	27-00	73-06	27-32	72-94	27-63	78
79	74-24	27-02	74-12	27-34	74-00	27-67	73-88	27-99	79
80	75-18	27-36	75-06	27-69	74-93	28-02	74-81	28-34	80
81	76-12	27-70	75-99	28-04	75-87	28-37	75-75	28-70	81
82	77-05	28-05	76-93	28-38	76-81	28-72	76-68	29-05	82
83	77-99	28-39	77-87	28-73	77-74	29-07	77-62	29-41	83
84	78-93	28-73	78-81	29-07	78-68	29-42	78-55	29-76	84
85	79-87	29-07	79-75	29-42	79-62	29-77	79-49	30-11	85
86	80-81	29-41	80-68	29-77	80-55	30-12	80-42	30-47	86
87	81-75	29-76	81-62	30-11	81-49	30-47	81-36	30-82	87
88	82-69	30-10	82-56	30-46	82-43	30-82	82-29	31-18	88
89	83-63	30-44	83-50	30-80	83-36	31-17	83-23	31-53	89
90	84-57	30-78	84-44	31-15	84-30	31-52	84-16	31-89	90
91	85-51	31-12	85-38	31-50	85-24	31-87	85-10	32-24	91
92	86-45	31-47	86-31	31-84	86-17	32-22	86-03	32-59	92
93	87-39	31-81	87-25	32-19	87-11	32-57	86-97	32-95	93
94	88-33	32-15	88-19	32-54	88-05	32-92	87-90	33-30	94
95	89-27	32-49	89-13	32-88	88-98	33-27	88-84	33-66	95
96	90-21	32-83	90-07	33-23	89-92	33-62	89-77	34-01	96
97	91-15	33-18	91-00	33-57	90-86	33-97	90-71	34-37	97
98	92-09	33-52	91-94	33-92	91-79	34-32	91-64	34-72	98
99	93-03	33-86	92-88	34-27	92-73	34-67	92-58	35-07	99
100	93-97	34-20	93-82	34-61	93-67	35-02	93-51	35-43	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	70 Deg.		69¾ Deg.		69½ Deg.		69¼ Deg.		

TRAVERSE TABLE.

Distance.	21 Deg.		21¼ Deg.		21½ Deg.		21¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-93	0-26	0-93	0-36	0-93	0-37	0-93	0-37	1
2	1-87	0-72	1-86	0-72	1-86	0-73	1-86	0-74	2
3	2-80	1-08	2-80	1-09	2-79	1-10	2-79	1-11	3
4	3-73	1-43	3-73	1-45	3-72	1-47	3-72	1-48	4
5	4-67	1-79	4-66	1-81	4-65	1-83	4-64	1-85	5
6	5-60	2-15	5-59	2-17	5-58	2-20	5-57	2-22	6
7	6-54	2-51	6-52	2-54	6-51	2-57	6-50	2-59	7
8	7-47	2-87	7-46	2-90	7-44	2-93	7-43	2-96	8
9	8-40	3-23	8-39	3-26	8-37	3-30	8-36	3-34	9
10	9-34	3-58	9-32	3-62	9-30	3-67	9-29	3-71	10
11	10-27	3-94	10-25	3-99	10-23	4-03	10-22	4-08	11
12	11-20	4-30	11-18	4-35	11-17	4-40	11-15	4-45	12
13	12-14	4-66	12-12	4-71	12-10	4-76	12-07	4-82	13
14	13-07	5-02	13-05	5-07	13-03	5-13	13-00	5-19	14
15	14-00	5-38	13-98	5-44	13-96	5-50	13-93	5-56	15
16	14-94	5-73	14-91	5-80	14-89	5-86	14-86	5-93	16
17	15-87	6-09	15-84	6-16	15-82	6-23	15-79	6-30	17
18	16-80	6-45	16-78	6-52	16-75	6-60	16-72	6-67	18
19	17-74	6-81	17-71	6-89	17-68	6-96	17-65	7-04	19
20	18-67	7-17	18-64	7-25	18-61	7-33	18-58	7-41	20
21	19-61	7-53	19-57	7-61	19-54	7-70	19-50	7-78	21
22	20-54	7-88	20-50	7-97	20-47	8-06	20-43	8-15	22
23	21-47	8-24	21-44	8-34	21-40	8-43	21-36	8-52	23
24	22-41	8-60	22-37	8-70	22-33	8-80	22-29	8-89	24
25	23-34	8-96	23-30	9-06	23-26	9-16	23-22	9-26	25
26	24-27	9-32	24-23	9-42	24-19	9-53	24-15	9-63	26
27	25-21	9-68	25-16	9-79	25-12	9-90	25-08	10-01	27
28	26-14	10-03	26-10	10-15	26-05	10-25	26-01	10-38	28
29	27-07	10-39	27-03	10-51	26-98	10-63	26-94	10-75	29
30	28-01	10-75	27-96	10-87	27-91	11-00	27-86	11-12	30
31	28-94	11-11	28-89	11-24	28-84	11-36	28-79	11-49	31
32	29-87	11-47	29-82	11-60	29-77	11-73	29-72	11-86	32
33	30-81	11-83	30-76	11-96	30-70	12-09	30-65	12-23	33
34	31-74	12-18	31-69	12-32	31-63	12-46	31-58	12-60	34
35	32-68	12-54	32-62	12-69	32-56	12-83	32-51	12-97	35
36	33-61	12-90	33-55	13-05	33-50	13-19	33-44	13-34	36
37	34-54	13-26	34-48	13-41	34-43	13-56	34-37	13-71	37
38	35-48	13-62	35-42	13-77	35-36	13-93	35-29	14-08	38
39	36-41	13-98	36-35	14-14	36-29	14-29	36-22	14-45	39
40	37-34	14-33	37-28	14-50	37-22	14-66	37-15	14-82	40
41	38-28	14-69	38-21	14-86	38-15	15-03	38-08	15-19	41
42	39-21	15-05	39-14	15-22	39-08	15-39	39-01	15-56	42
43	40-14	15-41	40-08	15-58	40-01	15-76	39-94	15-93	43
44	41-08	15-77	41-01	15-95	40-94	16-13	40-87	16-30	44
45	42-01	16-13	41-94	16-31	41-87	16-49	41-80	16-68	45
46	42-94	16-48	42-87	16-67	42-80	16-86	42-73	17-05	46
47	43-88	16-84	43-80	17-03	43-73	17-23	43-65	17-42	47
48	44-81	17-20	44-74	17-40	44-66	17-59	44-58	17-79	48
49	45-75	17-56	45-67	17-76	45-59	17-96	45-51	18-16	49
50	46-68	17-92	46-60	18-12	46-52	18-33	46-44	18-53	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	69 Deg.		68¾ Deg.		68½ Deg.		68¼ Deg.		

TRAVERSE TABLE.

Distance.	21 Deg.		21¼ Deg.		21½ Deg.		21¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	47·61	18·23	47·53	18·48	47·45	18·09	47·37	18·90	51
52	48·55	18·41	48·46	18·85	48·38	19·06	48·30	19·27	52
53	49·48	18·99	49·40	19·21	49·31	19·42	49·23	19·64	53
54	50·41	19·35	50·33	19·57	50·24	19·79	50·16	20·01	54
55	51·35	19·71	51·26	19·93	51·17	20·16	51·08	20·38	55
56	52·28	20·07	52·19	20·30	52·10	20·52	52·01	20·75	56
57	53·21	20·43	53·12	20·66	53·03	20·89	52·94	21·12	57
58	54·15	20·79	54·06	21·02	53·96	21·26	53·87	21·49	58
59	55·08	21·14	54·99	21·38	54·89	21·62	54·80	21·86	59
60	56·01	21·50	55·92	21·75	55·83	21·99	55·73	22·23	60
61	56·95	21·86	56·85	22·11	56·76	22·36	56·66	22·60	61
62	57·88	22·22	57·78	22·47	57·69	22·72	57·59	22·97	62
63	58·82	22·58	58·72	22·83	58·62	23·09	58·52	23·35	63
64	59·75	22·94	59·65	23·20	59·55	23·46	59·44	23·72	64
65	60·68	23·29	60·58	23·56	60·48	23·82	60·37	24·09	65
66	61·62	23·65	61·51	23·92	61·41	24·19	61·30	24·46	66
67	62·55	24·01	62·44	24·28	62·34	24·56	62·23	24·83	67
68	63·48	24·37	63·38	24·65	63·27	24·92	63·16	25·20	68
69	64·42	24·73	64·31	25·01	64·20	25·29	64·09	25·57	69
70	65·35	25·09	65·24	25·37	65·13	25·66	65·02	25·94	70
71	66·28	25·44	66·17	25·73	66·06	26·02	65·95	26·31	71
72	67·22	25·80	67·10	26·10	66·99	26·39	66·87	26·68	72
73	68·15	26·16	68·04	26·46	67·92	26·75	67·80	27·05	73
74	69·08	26·52	68·97	26·82	68·85	27·12	68·73	27·42	74
75	70·02	26·88	69·90	27·18	69·78	27·49	69·66	27·79	75
76	70·95	27·24	70·83	27·55	70·71	27·85	70·59	28·16	76
77	71·89	27·59	71·76	27·91	71·64	28·22	71·52	28·53	77
78	72·82	27·95	72·70	28·27	72·57	28·59	72·45	28·90	78
79	73·75	28·31	73·63	28·63	73·50	28·95	73·38	29·27	79
80	74·69	28·67	74·56	29·00	74·43	29·32	74·30	29·64	80
81	75·62	29·03	75·49	29·36	75·36	29·69	75·23	30·02	81
82	76·55	29·39	76·42	29·72	76·29	30·05	76·16	30·39	82
83	77·49	29·74	77·36	30·08	77·22	30·42	77·09	30·76	83
84	78·42	30·10	78·29	30·44	78·16	30·79	78·02	31·13	84
85	79·35	30·46	79·22	30·81	79·09	31·15	78·95	31·50	85
86	80·29	30·82	80·15	31·17	80·02	31·52	79·88	31·87	86
87	81·22	31·18	81·08	31·53	80·95	31·89	80·81	32·24	87
88	82·16	31·54	82·02	31·89	81·88	32·25	81·74	32·61	88
89	83·09	31·89	82·95	32·26	82·81	32·62	82·66	32·98	89
90	84·02	32·25	83·88	32·62	83·74	32·99	83·59	33·35	90
91	84·96	32·61	84·81	32·98	84·67	33·35	84·52	33·72	91
92	85·89	32·97	85·74	33·34	85·60	33·72	85·45	34·09	92
93	86·82	33·33	86·68	33·71	86·53	34·08	86·38	34·46	93
94	87·76	33·69	87·61	34·07	87·46	34·45	87·31	34·83	94
95	88·69	34·04	88·54	34·43	88·39	34·82	88·24	35·20	95
96	89·62	34·40	89·47	34·79	89·32	35·18	89·17	35·57	96
97	90·56	34·76	90·40	35·16	90·25	35·55	90·09	35·94	97
98	91·49	35·12	91·34	35·52	91·18	35·92	91·02	36·31	98
99	92·42	35·48	92·27	35·88	92·11	36·28	91·95	36·69	99
100	93·36	35·84	93·20	36·24	93·04	36·65	92·88	37·06	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	60 Deg.		68¼ Deg.		68½ Deg.		68¾ Deg.		

Distance.	22 Deg.		22¼ Deg.		22½ Deg.		22¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-33	0-37	0-93	0-38	0-92	0-38	0-92	0-39	1
2	1-85	0-75	1-85	0-76	1-85	0-77	1-84	0-77	2
3	2-78	1-12	2-78	1-14	2-77	1-15	2-77	1-16	3
4	3-71	1-50	3-70	1-51	3-70	1-53	3-69	1-55	4
5	4-64	1-87	4-63	1-89	4-62	1-91	4-61	1-93	5
6	5-56	2-25	5-55	2-27	5-54	2-30	5-53	2-32	6
7	6-49	2-62	6-48	2-65	6-47	2-68	6-46	2-71	7
8	7-42	3-00	7-40	3-03	7-39	3-06	7-38	3-09	8
9	8-34	3-37	8-33	3-41	8-31	3-44	8-30	3-48	9
10	9-27	3-75	9-26	3-79	9-24	3-83	9-22	3-87	10
11	10-20	4-12	10-18	4-17	10-16	4-21	10-14	4-25	11
12	11-13	4-50	11-11	4-54	11-09	4-59	11-07	4-64	12
13	12-05	4-87	12-03	4-92	12-01	4-97	11-99	5-03	13
14	12-98	5-24	12-96	5-30	12-93	5-36	12-91	5-41	14
15	13-91	5-62	13-88	5-68	13-86	5-74	13-83	5-80	15
16	14-83	5-99	14-81	6-06	14-78	6-12	14-76	6-19	16
17	15-76	6-37	15-73	6-44	15-71	6-51	15-68	6-57	17
18	16-69	6-74	16-66	6-82	16-63	6-89	16-60	6-96	18
19	17-62	7-12	17-59	7-19	17-55	7-27	17-52	7-35	19
20	18-54	7-49	18-51	7-57	18-48	7-65	18-44	7-73	20
21	19-47	7-87	19-44	7-95	19-40	8-04	19-37	8-12	21
22	20-40	8-24	20-36	8-33	20-33	8-42	20-29	8-51	22
23	21-33	8-62	21-29	8-71	21-25	8-80	21-21	8-89	23
24	22-25	8-99	22-21	9-09	22-17	9-18	22-13	9-28	24
25	23-18	9-37	23-14	9-47	23-10	9-57	23-05	9-67	25
26	24-11	9-74	24-06	9-84	24-02	9-95	23-98	10-05	26
27	25-03	10-11	24-99	10-22	24-94	10-33	24-90	10-44	27
28	25-96	10-49	25-92	10-60	25-87	10-72	25-82	10-83	28
29	26-89	10-86	26-84	10-98	26-79	11-10	26-74	11-21	29
30	27-82	11-24	27-77	11-36	27-72	11-48	27-67	11-60	30
31	28-74	11-61	28-69	11-74	28-64	11-86	28-59	11-99	31
32	29-67	11-99	29-62	12-12	29-56	12-25	29-51	12-37	32
33	30-60	12-36	30-54	12-50	30-49	12-63	30-43	12-76	33
34	31-52	12-74	31-47	12-87	31-41	13-01	31-35	13-15	34
35	32-45	13-11	32-39	13-25	32-34	13-39	32-28	13-53	35
36	33-38	13-49	33-32	13-63	33-26	13-78	33-20	13-92	36
37	34-31	13-86	34-24	14-01	34-18	14-16	34-12	14-31	37
38	35-23	14-24	35-17	14-39	35-11	14-54	35-04	14-70	38
39	36-16	14-61	36-10	14-77	36-03	14-92	35-97	15-08	39
40	37-09	14-98	37-02	15-15	36-96	15-31	36-89	15-47	40
41	38-01	15-36	37-95	15-52	37-88	15-69	37-81	15-86	41
42	38-94	15-73	38-87	15-90	38-80	16-07	38-73	16-24	42
43	39-87	16-11	39-80	16-28	39-73	16-46	39-65	16-63	43
44	40-80	16-48	40-72	16-66	40-65	16-84	40-58	17-02	44
45	41-72	16-86	41-65	17-04	41-57	17-22	41-50	17-40	45
46	42-65	17-23	42-57	17-42	42-50	17-60	42-42	17-79	46
47	43-58	17-61	43-50	17-80	43-42	17-99	43-34	18-18	47
48	44-50	17-98	44-43	18-18	44-35	18-37	44-27	18-56	48
49	45-43	18-36	45-35	18-55	45-27	18-75	45-19	18-95	49
50	46-36	18-73	46-28	18-93	46-19	19-13	46-11	19-34	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	68 Deg.		67¼ Deg.		67½ Deg.		67¼ Deg.		

TRAVERSE TABLE.

Distance.	22 Deg.		22¼ Deg.		22½ Deg.		22¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	47-29	19-10	47-20	19-31	47-12	19-52	47-03	19-72	51
52	48-21	19-48	48-13	19-69	48-04	19-90	47-95	20-11	52
53	49-14	19-85	49-05	20-07	48-97	20-28	48-88	20-50	53
54	50-07	20-23	49-98	20-45	49-89	20-66	49-80	20-88	54
55	51-00	20-60	50-90	20-83	50-81	21-05	50-72	21-27	55
56	51-92	20-98	51-83	21-20	51-74	21-43	51-64	21-66	56
57	52-85	21-35	52-76	21-58	52-66	21-81	52-57	22-04	57
58	53-78	21-73	53-68	21-96	53-59	22-20	53-49	22-43	58
59	54-70	22-10	54-61	22-34	54-51	22-58	54-41	22-82	59
60	55-63	22-48	55-53	22-72	55-43	22-96	55-33	23-20	60
61	56-56	22-85	56-47	23-10	56-36	23-34	56-25	23-59	61
62	57-49	23-23	57-38	23-48	57-28	23-73	57-18	23-98	62
63	58-41	23-60	58-31	23-85	58-20	24-11	58-10	24-36	63
64	59-34	23-97	59-23	24-23	59-13	24-49	59-02	24-75	64
65	60-27	24-35	60-16	24-61	60-05	24-87	59-94	25-14	65
66	61-19	24-72	61-09	24-99	60-98	25-26	60-87	25-52	66
67	62-12	25-10	62-01	25-37	61-90	25-64	61-79	25-91	67
68	63-05	25-47	62-94	25-75	62-82	26-02	62-71	26-30	68
69	63-98	25-85	63-86	26-13	63-75	26-41	63-63	26-68	69
70	64-90	26-22	64-79	26-51	64-67	26-79	64-55	27-07	70
71	65-83	26-60	65-71	26-88	65-60	27-17	65-48	27-46	71
72	66-76	26-97	66-64	27-26	66-52	27-55	66-40	27-84	72
73	67-68	27-35	67-56	27-64	67-44	27-94	67-32	28-23	73
74	68-61	27-72	68-49	28-02	68-37	28-32	68-24	28-62	74
75	69-54	28-10	69-42	28-40	69-29	28-70	69-17	29-00	75
76	70-47	28-47	70-34	28-78	70-21	29-08	70-09	29-39	76
77	71-39	28-84	71-27	29-16	71-14	29-47	71-01	29-78	77
78	72-32	29-22	72-19	29-53	72-06	29-85	71-93	30-16	78
79	73-25	29-59	73-12	29-91	72-99	30-23	72-85	30-55	79
80	74-17	29-97	74-04	30-29	73-91	30-61	73-78	30-94	80
81	75-10	30-34	74-97	30-67	74-83	31-00	74-70	31-32	81
82	76-03	30-72	75-89	31-05	75-76	31-38	75-62	31-71	82
83	76-96	31-09	76-82	31-43	76-68	31-76	76-54	32-10	83
84	77-88	31-47	77-75	31-81	77-61	32-15	77-46	32-48	84
85	78-81	31-84	78-67	32-19	78-53	32-53	78-39	32-87	85
86	79-74	32-22	79-60	32-56	79-45	32-91	79-31	33-26	86
87	80-66	32-59	80-52	32-94	80-38	33-29	80-23	33-64	87
88	81-59	32-97	81-45	33-32	81-30	33-68	81-15	34-03	88
89	82-52	33-34	82-37	33-70	82-23	34-06	82-08	34-42	89
90	83-45	33-71	83-30	34-08	83-15	34-44	83-00	34-80	90
91	84-37	34-09	84-22	34-46	84-07	34-82	83-92	35-19	91
92	85-30	34-46	85-15	34-84	85-00	35-21	84-84	35-58	92
93	86-23	34-84	86-08	35-21	85-92	35-59	85-76	35-96	93
94	87-16	35-21	87-00	35-59	86-84	35-97	86-69	36-35	94
95	88-08	35-59	87-93	35-97	87-77	36-35	87-61	36-74	95
96	89-01	35-96	88-85	36-35	88-69	36-74	88-53	37-12	96
97	89-94	36-34	89-78	36-73	89-62	37-12	89-45	37-51	97
98	90-86	36-71	90-70	37-11	90-54	37-50	90-38	37-90	98
99	91-79	37-09	91-63	37-49	91-46	37-89	91-30	38-28	99
100	92-72	37-46	92-55	37-86	92-39	38-27	92-22	38-67	100
Distance.	22 Deg.		22¼ Deg.		22½ Deg.		22¾ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	
	68 Deg.		67¾ Deg.		67½ Deg.		67¼ Deg.		

Distance.	28 Deg.		23¼ Deg.		23½ Deg.		23¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-92	0-39	0-92	0-39	0-92	0-40	0-92	0-40	1
2	1-84	0-78	1-84	0-79	1-83	0-80	1-83	0-81	2
3	2-76	1-17	2-76	1-18	2-75	1-20	2-75	1-21	3
4	3-68	1-56	3-68	1-58	3-67	1-59	3-66	1-61	4
5	4-60	1-95	4-59	1-97	4-59	1-99	4-58	2-01	5
6	5-52	2-34	5-51	2-37	5-50	2-39	5-49	2-42	6
7	6-44	2-74	6-43	2-76	6-42	2-79	6-41	2-82	7
8	7-36	3-13	7-35	3-16	7-34	3-19	7-32	3-22	8
9	8-28	3-52	8-27	3-55	8-25	3-59	8-24	3-62	9
10	9-20	3-91	9-19	3-95	9-17	3-99	9-15	4-03	10
11	10-13	4-30	10-11	4-34	10-09	4-39	10-07	4-43	11
12	11-05	4-69	11-03	4-74	11-00	4-78	10-98	4-83	12
13	11-97	5-08	11-04	5-13	11-92	5-18	11-90	5-24	13
14	12-89	5-47	12-86	5-53	12-84	5-58	12-81	5-64	14
15	13-81	5-86	13-78	5-92	13-76	5-98	13-73	6-04	15
16	14-73	6-25	14-70	6-32	14-67	6-28	14-64	6-44	16
17	15-65	6-64	15-62	6-71	15-59	6-78	15-56	6-85	17
18	16-57	7-03	16-54	7-11	16-51	7-18	16-48	7-25	18
19	17-49	7-42	17-46	7-50	17-42	7-58	17-39	7-65	19
20	18-41	7-81	18-38	7-89	18-34	7-97	18-31	8-05	20
21	19-33	8-21	19-29	8-29	19-26	8-37	19-22	8-46	21
22	20-25	8-60	20-21	8-68	20-18	8-77	20-14	8-86	22
23	21-17	8-99	21-13	9-08	21-09	9-17	21-05	9-26	23
24	22-09	9-38	22-05	9-47	22-01	9-57	21-97	9-67	24
25	23-01	9-77	22-97	9-87	22-93	9-97	22-88	10-07	25
26	23-93	10-16	23-89	10-26	23-84	10-37	23-80	10-47	26
27	24-85	10-55	24-81	10-66	24-76	10-77	24-71	10-87	27
28	25-77	10-94	25-73	11-05	25-68	11-16	25-63	11-28	28
29	26-69	11-33	26-64	11-45	26-59	11-56	26-54	11-68	29
30	27-62	11-72	27-56	11-84	27-51	11-96	27-46	12-08	30
31	28-54	12-11	28-48	12-24	28-43	12-36	28-37	12-49	31
32	29-46	12-50	29-40	12-63	29-35	12-76	29-29	12-89	32
33	30-38	12-89	30-32	13-03	30-26	13-16	30-21	13-29	33
34	31-30	13-28	31-24	13-42	31-18	13-56	31-12	13-69	34
35	32-22	13-68	32-16	13-82	32-10	13-96	32-04	14-10	35
36	33-14	14-07	33-08	14-21	33-01	14-35	32-95	14-50	36
37	34-06	14-46	34-00	14-61	33-93	14-75	33-87	14-90	37
38	34-98	14-85	34-91	15-00	34-85	15-15	34-78	15-30	38
39	35-90	15-24	35-83	15-39	35-77	15-55	35-70	15-71	39
40	36-82	15-63	36-75	15-79	36-68	15-95	36-61	16-11	40
41	37-74	16-02	37-67	16-18	37-60	16-35	37-53	16-51	41
42	38-66	16-41	38-59	16-58	38-52	16-75	38-44	16-92	42
43	39-58	16-80	39-51	16-97	39-43	17-15	39-36	17-32	43
44	40-50	17-19	40-43	17-37	40-35	17-54	40-27	17-72	44
45	41-42	17-58	41-35	17-76	41-27	17-94	41-19	18-12	45
46	42-34	17-97	42-26	18-16	42-18	18-34	42-10	18-53	46
47	43-26	18-36	43-18	18-55	43-10	18-74	43-02	18-93	47
48	44-18	18-76	44-10	18-95	44-02	19-14	43-93	19-33	48
49	45-10	19-15	45-02	19-34	44-94	19-54	44-85	19-73	49
50	46-03	19-54	45-94	19-74	45-85	19-94	45-77	20-14	50
Distance.	67 Deg.		66¾ Deg.		66½ Deg.		66¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	23 Deg.		23¼ Deg.		23½ Deg.		23¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	46-95	19-93	46-86	20-13	46-77	20-34	46-68	20-54	51
52	47-87	20-32	47-78	20-53	47-69	20-73	47-60	20-94	52
53	48-79	20-71	48-70	20-92	48-60	21-13	48-51	21-35	53
54	49-71	21-10	49-61	21-32	49-52	21-53	49-43	21-75	54
55	50-63	21-49	50-53	21-71	50-44	21-93	50-34	22-15	55
56	51-55	21-88	51-45	22-11	51-36	22-33	51-26	22-55	56
57	52-47	22-27	52-37	22-50	52-27	22-73	52-17	22-96	57
58	53-39	22-66	53-29	22-90	53-19	23-13	53-09	23-36	58
59	54-31	23-05	54-21	23-29	54-11	23-53	54-00	23-76	59
60	55-23	23-44	55-13	23-68	55-02	23-92	54-92	24-16	60
61	56-15	23-83	56-05	24-08	55-94	24-32	55-83	24-57	61
62	57-07	24-23	56-97	24-47	56-86	24-72	56-75	24-97	62
63	57-99	24-62	57-88	24-87	57-77	25-12	57-66	25-37	63
64	58-91	25-01	58-80	25-26	58-69	25-52	58-58	25-78	64
65	59-83	25-40	59-72	25-66	59-61	25-92	59-50	26-18	65
66	60-75	25-79	60-64	26-05	60-53	26-32	60-41	26-58	66
67	61-67	26-18	61-56	26-45	61-44	26-72	61-33	26-98	67
68	62-59	26-57	62-48	26-84	62-36	27-11	62-24	27-39	68
69	63-51	26-96	63-40	27-24	63-28	27-51	63-16	27-79	69
70	64-44	27-35	64-32	27-63	64-19	27-91	64-07	28-19	70
71	65-36	27-74	65-23	28-03	65-11	28-31	64-99	28-59	71
72	66-28	28-13	66-15	28-42	66-03	28-71	65-90	29-00	72
73	67-20	28-52	67-07	28-82	66-95	29-11	66-82	29-40	73
74	68-12	28-91	67-99	29-21	67-86	29-51	67-73	29-80	74
75	69-04	29-30	68-91	29-61	68-78	29-91	68-65	30-21	75
76	69-96	29-70	69-83	30-00	69-70	30-30	69-56	30-61	76
77	70-88	30-09	70-75	30-40	70-61	30-70	70-48	31-01	77
78	71-80	30-48	71-67	30-79	71-53	31-10	71-39	31-41	78
79	72-72	30-87	72-58	31-18	72-45	31-50	72-31	31-82	79
80	73-64	31-26	73-50	31-58	73-36	31-90	73-22	32-22	80
81	74-56	31-65	74-42	31-97	74-28	32-30	74-14	32-62	81
82	75-48	32-04	75-34	32-37	75-20	32-70	75-06	33-03	82
83	76-40	32-43	76-26	32-76	76-12	33-10	75-97	33-43	83
84	77-32	32-82	77-18	33-16	77-03	33-49	76-89	33-83	84
85	78-24	33-21	78-10	33-55	77-95	33-89	77-80	34-23	85
86	79-16	33-60	79-02	33-95	78-87	34-29	78-72	34-64	86
87	80-08	23-99	79-93	34-34	79-78	34-69	79-63	35-04	87
88	81-00	34-38	80-85	34-74	80-70	35-09	80-55	35-44	88
89	81-92	34-78	81-77	35-13	81-62	35-49	81-46	35-84	89
90	82-85	35-17	82-69	35-53	82-54	35-89	82-38	36-25	90
91	83-77	35-56	83-61	35-92	83-45	36-29	83-29	36-65	91
92	84-69	35-95	84-53	36-32	84-37	36-68	84-21	37-05	92
93	85-61	36-34	85-45	36-71	85-29	37-08	85-12	37-46	93
94	86-53	36-73	86-37	37-11	86-20	37-48	86-04	37-86	94
95	87-45	37-12	87-29	37-50	87-12	37-88	86-95	38-26	95
96	88-37	37-51	88-20	37-90	88-04	38-28	87-87	38-66	96
97	89-29	37-90	89-12	38-29	88-95	38-68	88-79	39-07	97
98	90-21	38-29	90-04	38-68	89-87	39-08	89-70	39-47	98
99	91-13	38-68	90-96	39-08	90-79	39-48	90-62	39-87	99
100	92-05	39-07	91-88	39-47	91-71	39-87	91-53	40-27	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	67 Deg.		67¾ Deg.		68½ Deg.		69¼ Deg.		

TRAVERSE TABLE.

Distance.	24 Deg.		24¼ Deg.		24½ Deg.		24¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-91	0-41	0-91	0-41	0-91	0-41	0-91	0-42	1
2	1-83	0-81	1-82	0-82	1-82	0-83	1-82	0-84	2
3	2-74	1-22	2-74	1-23	2-73	1-24	2-72	1-26	3
4	3-65	1-63	3-65	1-64	3-64	1-66	3-63	1-67	4
5	4-57	2-03	4-56	2-05	4-55	2-07	4-54	2-09	5
6	5-48	2-44	5-47	2-46	5-46	2-49	5-45	2-51	6
7	6-39	2-85	6-38	2-87	6-37	2-90	6-36	2-93	7
8	7-31	3-25	7-29	3-29	7-28	3-32	7-27	3-35	8
9	8-22	3-66	8-21	3-70	8-19	3-73	8-17	3-77	9
10	9-14	4-07	9-12	4-11	9-10	4-15	9-08	4-19	10
11	10-05	4-47	10-03	4-52	10-01	4-56	9-99	4-61	11
12	10-96	4-88	10-94	4-93	10-92	4-98	10-90	5-02	12
13	11-88	5-29	11-85	5-34	11-83	5-39	11-81	5-44	13
14	12-79	5-69	12-76	5-75	12-74	5-81	12-71	5-86	14
15	13-70	6-10	13-68	6-16	13-65	6-22	13-62	6-28	15
16	14-62	6-51	14-59	6-57	14-56	6-64	14-53	6-70	16
17	15-53	6-92	15-50	6-98	15-47	7-05	15-44	7-12	17
18	16-44	7-32	16-41	7-39	16-38	7-46	16-35	7-54	18
19	17-36	7-73	17-32	7-80	17-29	7-88	17-25	7-95	19
20	18-27	8-13	18-24	8-21	18-20	8-29	18-16	8-37	20
21	19-18	8-54	19-15	8-63	19-11	8-71	19-07	8-79	21
22	20-10	8-95	20-06	9-04	20-02	9-12	19-98	9-21	22
23	21-01	9-35	20-97	9-45	20-93	9-54	20-89	9-63	23
24	21-93	9-76	21-88	9-86	21-84	9-95	21-80	10-05	24
25	22-84	10-17	22-79	10-27	22-75	10-37	22-70	10-47	25
26	23-75	10-58	23-71	10-68	23-66	10-78	23-61	10-89	26
27	24-67	10-98	24-62	11-09	24-57	11-20	24-52	11-30	27
28	25-58	11-39	25-53	11-50	25-48	11-61	25-43	11-72	28
29	26-49	11-80	26-44	11-91	26-39	12-03	26-34	12-14	29
30	27-41	12-20	27-35	12-32	27-30	12-44	27-24	12-56	30
31	28-32	12-61	28-26	12-73	28-21	12-86	28-15	12-98	31
32	29-23	13-02	29-18	13-14	29-12	13-27	29-05	13-40	32
33	30-15	13-42	30-09	13-55	30-03	13-68	29-97	13-82	33
34	31-06	13-83	31-00	13-96	30-94	14-10	30-88	14-23	34
35	31-97	14-24	31-91	14-38	31-85	14-51	31-78	14-65	35
36	32-89	14-64	32-82	14-79	32-76	14-93	32-69	15-07	36
37	33-80	15-05	33-74	15-20	33-67	15-34	33-60	15-49	37
38	34-71	15-46	34-65	15-61	34-58	15-76	34-51	15-91	38
39	35-63	15-86	35-56	16-02	35-49	16-17	35-42	16-33	39
40	36-54	16-27	36-47	16-43	36-40	16-59	36-33	16-75	40
41	37-46	16-68	37-38	16-84	37-31	17-00	37-23	17-16	41
42	38-37	17-08	38-29	17-25	38-22	17-42	38-14	17-58	42
43	39-28	17-49	39-21	17-66	39-13	17-83	39-05	18-00	43
44	40-20	17-90	40-12	18-07	40-04	18-25	39-96	18-42	44
45	41-11	18-30	41-03	18-48	40-95	18-66	40-87	18-84	45
46	42-02	18-71	41-94	18-89	41-86	19-08	41-77	19-26	46
47	42-94	19-12	42-85	19-30	42-77	19-49	42-68	19-68	47
48	43-85	19-52	43-76	19-71	43-68	19-91	43-59	20-10	48
49	44-76	19-93	44-68	20-13	44-59	20-32	44-50	20-51	49
50	45-68	20-34	45-59	20-54	45-50	20-73	45-41	20-93	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	66 Deg.		65¾ Deg.		65½ Deg.		65¼ Deg.		

TRAVERSE TABLE.

Distance.	24 Deg.		24¼ Deg.		24½ Deg.		24¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	46:59	20:74	46:50	20:95	46:41	21:15	46:32	21:35	51
52	47:50	21:15	47:41	21:36	47:32	21:56	47:22	21:77	52
53	48:42	21:56	48:32	21:77	48:23	21:98	48:13	22:19	53
54	49:33	21:96	49:24	22:18	49:14	22:39	49:04	22:61	54
55	50:24	22:37	50:15	22:59	50:05	22:81	49:95	23:03	55
56	51:16	22:78	51:06	23:00	50:96	23:22	50:86	23:44	56
57	52:07	23:18	51:97	23:41	51:87	23:64	51:76	23:86	57
58	52:99	23:59	52:88	23:82	52:78	24:05	52:67	24:28	58
59	53:90	24:00	53:79	24:23	53:69	24:47	53:58	24:70	59
60	54:81	24:40	54:71	24:64	54:60	24:88	54:49	25:12	60
61	55:73	24:81	55:62	25:05	55:51	25:30	55:40	25:54	61
62	56:64	25:22	56:53	25:46	56:42	25:71	56:30	25:96	62
63	57:55	25:62	57:44	25:88	57:33	26:13	57:21	26:38	63
64	58:47	26:03	58:35	26:29	58:24	26:54	58:12	26:79	64
65	59:38	26:44	59:26	26:70	59:15	26:96	59:03	27:21	65
66	60:29	26:84	60:18	27:11	60:06	27:37	59:94	27:63	66
67	61:21	27:25	61:09	27:52	60:97	27:78	60:85	28:05	67
68	62:12	27:66	62:00	27:93	61:88	28:20	61:75	28:47	68
69	63:03	28:06	62:91	28:34	62:79	28:61	62:66	28:89	69
70	63:95	28:47	63:82	28:75	63:70	29:03	63:57	29:31	70
71	64:86	28:88	64:74	29:16	64:61	29:44	64:48	29:72	71
72	65:78	29:28	65:65	29:57	65:52	29:86	65:39	30:14	72
73	66:69	29:69	66:56	29:98	66:43	30:27	66:29	30:56	73
74	67:60	30:10	67:47	30:39	67:34	30:69	67:20	30:98	74
75	68:52	30:51	68:38	30:80	68:25	31:10	68:11	31:40	75
76	69:43	30:91	69:29	31:21	69:16	31:52	69:02	31:82	76
77	70:34	31:32	70:21	31:63	70:07	31:93	69:93	32:24	77
78	71:26	31:73	71:12	32:04	70:98	32:35	70:84	32:66	78
79	72:17	32:13	72:03	32:45	71:89	32:76	71:74	33:07	79
80	73:08	32:54	72:94	32:86	72:80	33:18	72:65	33:40	80
81	74:00	32:95	73:85	33:27	73:71	33:59	73:56	33:91	81
82	74:91	33:35	74:76	33:68	74:62	34:00	74:47	34:33	82
83	75:82	33:76	75:68	34:09	75:53	34:42	75:38	34:75	83
84	76:74	34:17	76:59	34:50	76:44	34:83	76:28	35:17	84
85	77:65	34:57	77:50	34:91	77:35	35:25	77:19	35:59	85
86	78:56	34:98	78:41	35:32	78:26	35:66	78:10	36:00	86
87	79:48	35:39	79:32	35:73	79:17	36:08	79:01	36:42	87
88	80:39	35:79	80:24	36:14	80:08	36:49	79:92	36:84	88
89	81:31	36:20	81:15	36:55	80:99	36:91	80:82	37:26	89
90	82:22	36:61	82:06	36:96	81:90	37:32	81:73	37:68	90
91	83:13	37:01	82:97	37:38	82:81	37:74	82:64	38:10	91
92	84:05	37:42	83:88	37:79	83:72	38:15	83:55	38:52	92
93	84:96	37:83	84:79	38:20	84:63	38:57	84:46	38:94	93
94	85:87	38:23	85:71	38:61	85:54	38:98	85:37	39:35	94
95	86:79	38:64	86:62	39:02	86:45	39:40	86:27	39:77	95
96	87:70	39:05	87:53	39:43	87:36	39:81	87:18	40:19	96
97	88:61	39:45	88:44	39:84	88:27	40:23	88:09	40:61	97
98	89:53	39:86	89:35	40:25	89:18	40:64	89:00	41:03	98
99	90:44	40:27	90:26	40:66	90:09	41:05	89:91	41:45	99
100	91:35	40:67	91:18	41:07	91:00	41:47	90:81	41:87	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	66 Deg.		65¾ Deg.		65½ Deg.		65¼ Deg.		

TRAVERSE TABLE.

Distance.	25 Deg.		25 $\frac{1}{4}$ Deg.		25 $\frac{1}{2}$ Deg.		25 $\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-91	0-42	0-90	0-43	0-90	0-43	0-90	0-43	1
2	1-81	0-85	1-81	0-85	1-81	0-86	1-80	0-87	2
3	2-72	1-27	2-71	1-28	2-71	1-29	2-70	1-30	3
4	3-63	1-69	3-62	1-71	3-61	1-72	3-60	1-74	4
5	4-53	2-11	4-52	2-13	4-51	2-15	4-50	2-17	5
6	5-44	2-54	5-43	2-56	5-42	2-58	5-40	2-61	6
7	6-34	2-96	6-33	2-99	6-32	3-01	6-30	3-04	7
8	7-25	3-38	7-24	3-41	7-22	3-44	7-21	3-48	8
9	8-16	3-80	8-14	3-84	8-12	3-87	8-11	3-91	9
10	9-06	4-23	9-04	4-27	9-03	4-31	9-01	4-34	10
11	9-97	4-65	9-95	4-69	9-93	4-74	9-91	4-78	11
12	10-88	5-07	10-85	5-12	10-83	5-17	10-81	5-21	12
13	11-78	5-49	11-76	5-55	11-73	5-60	11-71	5-65	13
14	12-69	5-92	12-66	5-97	12-64	6-03	12-61	6-08	14
15	13-59	6-34	13-57	6-40	13-54	6-46	13-51	6-52	15
16	14-50	6-76	14-47	6-83	14-44	6-89	14-41	6-95	16
17	15-41	7-18	15-38	7-25	15-34	7-32	15-31	7-39	17
18	16-31	7-61	16-28	7-68	16-25	7-75	16-21	7-82	18
19	17-22	8-03	17-18	8-10	17-15	8-18	17-11	8-25	19
20	18-13	8-45	18-09	8-53	18-05	8-61	18-01	8-69	20
21	19-03	8-87	18-99	8-96	18-95	9-04	18-91	9-12	21
22	19-94	9-30	19-90	9-38	19-86	9-47	19-82	9-56	22
23	20-85	9-72	20-80	9-81	20-76	9-90	20-72	9-99	23
24	21-75	10-14	21-71	10-24	21-66	10-33	21-62	10-43	24
25	22-66	10-57	22-61	10-66	22-56	10-76	22-52	10-86	25
26	23-56	10-99	23-52	11-09	23-47	11-19	23-42	11-30	26
27	24-47	11-41	24-42	11-52	24-37	11-62	24-32	11-73	27
28	25-38	11-83	25-32	11-94	25-27	12-05	25-22	12-16	28
29	26-28	12-26	26-23	12-37	26-17	12-48	26-12	12-60	29
30	27-19	12-68	27-13	12-80	27-08	12-92	27-02	13-03	30
31	28-10	13-10	28-04	13-22	27-98	13-35	27-92	13-47	31
32	29-00	13-52	28-94	13-65	28-88	13-78	28-82	13-90	32
33	29-91	13-95	29-85	14-08	29-79	14-21	29-72	14-34	33
34	30-81	14-37	30-75	14-50	30-69	14-64	30-62	14-77	34
35	31-72	14-79	31-66	14-93	31-59	15-07	31-52	15-21	35
36	32-63	15-21	32-56	15-36	32-49	15-50	32-43	15-64	36
37	33-53	15-64	33-46	15-78	33-40	15-93	33-33	16-07	37
38	34-44	16-06	34-37	16-21	34-30	16-36	34-23	16-51	38
39	35-35	16-48	35-27	16-64	35-20	16-79	35-13	16-94	39
40	36-25	16-90	36-18	17-06	36-10	17-22	36-03	17-38	40
41	37-16	17-33	37-08	17-49	37-01	17-65	36-93	17-81	41
42	38-06	17-75	37-99	17-92	37-91	18-08	37-83	18-25	42
43	38-97	18-17	38-89	18-34	38-81	18-51	38-73	18-68	43
44	39-88	18-60	39-80	18-77	39-71	18-94	39-63	19-12	44
45	40-78	19-02	40-70	19-20	40-62	19-37	40-53	19-55	45
46	41-69	19-44	41-60	19-62	41-52	19-80	41-43	19-98	46
47	42-60	19-86	42-51	20-05	42-42	20-23	42-33	20-42	47
48	43-50	20-29	43-41	20-48	43-32	20-66	43-23	20-85	48
49	44-41	20-71	44-32	20-90	44-23	21-10	44-13	21-29	49
50	45-32	21-13	45-22	21-33	45-13	21-53	45-03	21-72	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	65 Deg.		64 $\frac{3}{4}$ Deg.		64 $\frac{1}{2}$ Deg.		64 $\frac{1}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	25 Deg.		26¼ Deg.		25½ Deg.		26¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	46-22	21-55	46-13	21-75	46-03	21-96	45-94	22-16	51
52	47-13	21-98	47-03	22-18	46-93	22-39	46-84	22-59	52
53	48-03	22-40	47-94	22-61	47-84	22-82	47-74	23-03	53
54	48-94	22-82	48-84	23-03	48-74	23-25	48-64	23-46	54
55	49-85	23-24	49-74	23-46	49-64	23-68	49-54	23-89	55
56	50-75	23-67	50-65	23-89	50-54	24-11	50-44	24-33	56
57	51-66	24-09	51-55	24-31	51-45	24-54	51-34	24-76	57
58	52-57	24-51	52-46	24-74	52-35	24-97	52-24	25-20	58
59	53-47	24-93	53-36	25-17	53-25	25-40	53-14	25-63	59
60	54-38	25-36	54-27	25-59	54-16	25-83	54-04	26-07	60
61	55-28	25-78	55-17	26-02	55-06	26-26	54-94	26-50	61
62	56-19	26-20	56-08	26-45	55-96	26-69	55-84	26-94	62
63	57-10	26-62	56-98	26-87	56-86	27-12	56-74	27-37	63
64	58-00	27-05	57-89	27-30	57-77	27-55	57-64	27-80	64
65	58-91	27-47	58-79	27-73	58-67	27-98	58-55	28-24	65
66	59-82	27-89	59-69	28-15	59-57	28-41	59-45	28-67	66
67	60-72	28-32	60-60	28-58	60-47	28-84	60-35	29-11	67
68	61-63	28-74	61-50	29-01	61-38	29-27	61-25	29-54	68
69	62-54	29-16	62-41	29-43	62-28	29-71	62-15	29-98	69
70	63-44	29-58	63-31	29-86	63-18	30-14	63-05	30-41	70
71	64-35	30-01	64-22	30-29	64-08	30-57	63-95	30-85	71
72	65-25	30-43	65-12	30-71	64-99	31-00	64-85	31-28	72
73	66-16	30-85	66-03	31-14	65-89	31-43	65-75	31-71	73
74	67-07	31-27	66-93	31-57	66-79	31-86	66-65	32-15	74
75	67-97	31-70	67-83	31-99	67-69	32-29	67-55	32-58	75
76	68-88	32-12	68-74	32-42	68-60	32-72	68-45	33-02	76
77	69-79	32-54	69-64	32-85	69-50	33-15	69-35	33-45	77
78	70-69	32-96	70-55	33-27	70-40	33-58	70-25	33-89	78
79	71-60	33-39	71-45	33-70	71-30	34-01	71-16	34-32	79
80	72-50	33-81	72-36	34-13	72-21	34-44	72-06	34-76	80
81	73-41	34-23	73-26	34-55	73-11	34-87	72-96	35-19	81
82	74-32	34-65	74-17	34-98	74-01	35-30	73-86	35-62	82
83	75-22	35-08	75-07	35-41	74-91	35-73	74-76	36-06	83
84	76-13	35-50	75-97	35-83	75-82	36-16	75-66	36-49	84
85	77-04	35-92	76-88	36-26	76-72	36-59	76-56	36-93	85
86	77-94	36-35	77-78	36-68	77-62	37-02	77-46	37-36	86
87	78-85	36-77	78-69	37-11	78-52	37-45	78-36	37-80	87
88	79-76	37-19	79-59	37-54	79-43	37-88	79-26	38-23	88
89	80-66	37-61	80-50	37-96	80-33	38-32	80-16	38-67	89
90	81-57	38-04	81-40	38-39	81-23	38-75	81-06	39-10	90
91	82-47	38-46	82-31	38-82	82-14	39-18	81-96	39-53	91
92	83-38	38-88	83-21	39-24	83-04	39-61	82-86	39-97	92
93	84-29	39-30	84-11	39-67	83-94	40-04	83-76	40-40	93
94	85-19	39-73	85-02	40-10	84-84	40-47	84-67	40-84	94
95	86-10	40-15	85-92	40-52	85-75	40-90	85-57	41-27	95
96	87-01	40-57	86-83	40-95	86-65	41-33	86-47	41-71	96
97	87-91	40-99	87-73	41-38	87-55	41-76	87-37	42-14	97
98	88-82	41-42	88-64	41-80	88-45	42-19	88-27	42-58	98
99	89-72	41-84	89-54	42-23	89-36	42-62	89-17	43-01	99
100	90-63	42-26	90-45	42-66	90-26	43-05	90-07	43-44	100
Distance.	65 Deg.		64¾ Deg.		64½ Deg.		64¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	26 Deg.		26¼ Deg.		26½ Deg.		26¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0:00	0:44	0:90	0:44	0:89	0:45	0:89	0:45	1
2	1:80	0:88	1:79	0:88	1:79	0:89	1:79	0:90	2
3	2:70	1:32	2:69	1:33	2:68	1:34	2:68	1:35	3
4	3:60	1:75	3:59	1:77	3:58	1:78	3:57	1:80	4
5	4:49	2:19	4:48	2:21	4:47	2:23	4:46	2:25	5
6	5:30	2:63	5:38	2:65	5:37	2:68	5:36	2:70	6
7	6:29	3:07	6:28	3:10	6:26	3:12	6:25	3:15	7
8	7:19	3:51	7:17	3:54	7:16	3:57	7:14	3:60	8
9	8:09	3:95	8:07	3:98	8:05	4:02	8:04	4:05	9
10	8:99	4:38	8:97	4:42	8:95	4:46	8:93	4:50	10
11	9:89	4:82	9:87	4:87	9:84	4:91	9:82	4:95	11
12	10:79	5:26	10:76	5:31	10:74	5:35	10:72	5:40	12
13	11:68	5:70	11:66	5:75	11:63	5:80	11:61	5:85	13
14	12:58	6:14	12:56	6:19	12:53	6:25	12:50	6:30	14
15	13:48	6:58	13:45	6:63	13:42	6:69	13:39	6:75	15
16	14:38	7:01	14:35	7:08	14:32	7:14	14:29	7:20	16
17	15:28	7:45	15:25	7:52	15:21	7:59	15:18	7:65	17
18	16:18	7:89	16:14	7:96	16:11	8:03	16:07	8:10	18
19	17:08	8:33	17:04	8:40	17:00	8:48	16:97	8:55	19
20	17:98	8:77	17:94	8:85	17:90	8:92	17:86	9:00	20
21	18:87	9:21	18:83	9:29	18:77	9:37	18:75	9:45	21
22	19:77	9:64	19:73	9:73	19:69	9:82	19:65	9:90	22
23	20:67	10:08	20:63	10:17	20:58	10:26	20:54	10:35	23
24	21:57	10:52	21:52	10:61	21:48	10:71	21:43	10:80	24
25	22:47	10:96	22:42	11:06	22:37	11:15	22:32	11:25	25
26	23:37	11:40	23:32	11:50	23:27	11:60	23:22	11:70	26
27	24:27	11:84	24:22	11:94	24:16	12:05	24:11	12:15	27
28	25:17	12:27	25:11	12:38	25:06	12:49	25:00	12:60	28
29	26:06	12:71	26:01	12:83	25:95	12:94	25:90	13:05	29
30	26:96	13:15	26:91	13:27	26:85	13:39	26:79	13:50	30
31	27:86	13:59	27:80	13:71	27:74	13:83	27:68	13:95	31
32	28:76	14:03	28:70	14:15	28:64	14:28	28:58	14:40	32
33	29:66	14:47	29:60	14:60	29:53	14:72	29:47	14:85	33
34	30:56	14:90	30:49	15:04	30:43	15:17	30:36	15:30	34
35	31:46	15:34	31:39	15:48	31:32	15:62	31:25	15:75	35
36	32:36	15:78	32:29	15:92	32:22	16:06	32:15	16:20	36
37	33:26	16:22	33:18	16:36	33:11	16:51	33:04	16:65	37
38	34:15	16:66	34:08	16:81	34:01	16:96	33:93	17:10	38
39	35:05	17:10	34:98	17:25	34:90	17:40	34:83	17:55	39
40	35:95	17:53	35:87	17:69	35:80	17:85	35:72	18:00	40
41	36:85	17:97	36:77	18:13	36:69	18:29	36:61	18:45	41
42	37:75	18:41	37:67	18:58	37:59	18:74	37:51	18:90	42
43	38:65	18:85	38:57	19:02	38:48	19:19	38:40	19:35	43
44	39:55	19:29	39:46	19:46	39:38	19:63	39:29	19:80	44
45	40:45	19:73	40:36	19:90	40:27	20:08	40:18	20:25	45
46	41:34	20:17	41:26	20:35	41:17	20:53	41:08	20:70	46
47	42:24	20:60	42:15	20:79	42:06	20:97	41:97	21:15	47
48	43:14	21:04	43:05	21:23	42:96	21:42	42:86	21:60	48
49	44:04	21:48	43:95	21:67	43:85	21:86	43:76	22:05	49
50	44:94	21:92	44:84	22:11	44:75	22:31	44:65	22:50	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	64 Deg.		63¾ Deg.		63½ Deg.		63¼ Deg.		

TRAVERSE TABLE.

Distance.	26 Deg.		26¼ Deg.		26½ Deg.		26¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	45-84	22-36	45-74	22-56	45-64	22-76	45-54	22-96	51
52	46-74	22-80	46-64	23-00	46-54	23-20	46-43	23-41	52
53	47-64	23-23	47-53	23-44	47-43	23-65	47-33	23-86	53
54	48-53	23-67	48-43	23-88	48-33	24-00	48-22	24-31	54
55	49-43	24-11	49-33	24-33	49-22	24-54	49-11	24-76	55
56	50-33	24-55	50-22	24-77	50-12	24-99	50-01	25-21	56
57	51-23	24-99	51-12	25-21	51-01	25-43	50-00	25-66	57
58	52-13	25-43	52-02	25-65	51-91	25-88	51-79	26-11	58
59	53-03	25-86	52-92	26-09	52-80	26-33	52-69	26-56	59
60	53-93	26-30	53-81	26-54	53-70	26-77	53-58	27-01	60
61	54-83	26-74	54-71	26-98	54-59	27-22	54-47	27-46	61
62	55-73	27-18	55-61	27-42	55-49	27-66	55-36	27-91	62
63	56-62	27-62	56-50	27-86	56-38	28-11	56-26	28-36	63
64	57-52	28-06	57-40	28-31	57-28	28-56	57-15	28-81	64
65	58-42	28-49	58-30	28-75	58-17	29-00	58-04	29-26	65
66	59-32	28-93	59-19	29-19	59-07	29-45	58-94	29-71	66
67	60-22	29-37	60-09	29-63	59-96	29-90	59-83	30-16	67
68	61-12	29-81	60-99	30-08	60-86	30-34	60-72	30-61	68
69	62-02	30-25	61-88	30-52	61-75	30-79	61-62	31-06	69
70	62-92	30-69	62-78	30-96	62-65	31-23	62-51	31-51	70
71	63-81	31-12	63-68	31-40	63-54	31-68	63-40	31-96	71
72	64-71	31-56	64-57	31-84	64-44	32-13	64-29	32-41	72
73	65-61	32-00	65-47	32-29	65-33	32-57	65-19	32-86	73
74	66-51	32-44	66-37	32-73	66-23	33-02	66-08	33-31	74
75	67-41	32-88	67-27	33-17	67-12	33-46	66-97	33-76	75
76	68-31	33-32	68-16	33-61	68-01	33-91	67-87	34-21	76
77	69-21	33-75	69-06	34-06	68-91	34-36	68-76	34-66	77
78	70-11	34-19	69-96	34-50	69-80	34-80	69-65	35-11	78
79	71-00	34-63	70-85	34-94	70-70	35-25	70-55	35-56	79
80	71-90	35-07	71-75	35-38	71-59	35-70	71-44	36-01	80
81	72-80	35-51	72-65	35-83	72-49	36-14	72-33	36-46	81
82	73-70	35-95	73-54	36-27	73-38	36-59	73-22	36-91	82
83	74-60	36-38	74-44	36-71	74-28	37-03	74-12	37-36	83
84	75-50	36-82	75-34	37-15	75-17	37-48	75-01	37-81	84
85	76-40	37-26	76-23	37-59	76-07	37-93	75-90	38-26	85
86	77-30	37-70	77-13	38-04	76-96	38-37	76-80	38-71	86
87	78-20	38-14	78-03	38-48	77-86	38-82	77-69	39-16	87
88	79-09	38-58	78-92	38-92	78-75	39-27	78-58	39-61	88
89	79-99	39-01	79-82	39-36	79-65	39-71	79-48	40-06	89
90	80-89	39-45	80-72	39-81	80-54	40-16	80-37	40-51	90
91	81-79	39-89	81-62	40-25	81-44	40-60	81-26	40-96	91
92	82-69	40-33	82-51	40-69	82-33	41-05	82-15	41-41	92
93	83-59	40-77	83-41	41-13	83-23	41-50	83-05	41-86	93
94	84-49	41-21	84-31	41-58	84-12	41-94	83-94	42-31	94
95	85-39	41-65	85-20	42-02	85-02	42-39	84-83	42-76	95
96	86-28	42-08	86-10	42-46	85-91	42-83	85-73	43-21	96
97	87-18	42-52	87-00	42-90	86-81	43-28	86-62	43-66	97
98	88-08	42-96	87-89	43-34	87-70	43-73	87-51	44-11	98
99	88-98	43-40	88-79	43-79	88-60	44-17	88-40	44-56	99
100	89-88	43-84	89-69	44-23	89-49	44-62	89-30	45-01	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	64 Deg.		63¾ Deg.		63½ Deg.		63¼ Deg.		

TRAVERSE TABLE.

Distance.	27 Deg.		27¼ Deg.		27½ Deg.		27¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-89	0-45	0-89	0-46	0-89	0-46	0-88	0-47	1
2	1-78	0-91	1-78	0-92	1-77	0-92	1-77	0-93	2
3	2-07	1-36	2-07	1-37	2-06	1-39	2-05	1-40	3
4	3-56	1-82	3-56	1-83	3-55	1-85	3-54	1-86	4
5	4-45	2-27	4-45	2-29	4-44	2-31	4-42	2-33	5
6	5-35	2-72	5-33	2-75	5-32	2-77	5-31	2-79	6
7	6-24	3-18	6-22	3-21	6-21	3-23	6-19	3-26	7
8	7-13	3-63	7-11	3-66	7-10	3-69	7-08	3-72	8
9	8-02	4-09	8-00	4-12	7-98	4-16	7-96	4-19	9
10	8-91	4-54	8-89	4-58	8-87	4-62	8-85	4-66	10
11	9-80	4-99	9-78	5-04	9-76	5-08	9-73	5-12	11
12	10-69	5-45	10-67	5-49	10-64	5-54	10-62	5-59	12
13	11-58	5-90	11-56	5-95	11-53	6-00	11-50	6-05	13
14	12-47	6-36	12-45	6-41	12-42	6-46	12-39	6-52	14
15	13-37	6-81	13-34	6-87	13-31	6-93	13-27	6-98	15
16	14-26	7-26	14-22	7-33	14-19	7-39	14-16	7-45	16
17	15-15	7-72	15-11	7-78	15-08	7-85	15-04	7-92	17
18	16-04	8-17	16-00	8-24	15-97	8-31	15-93	8-38	18
19	16-93	8-63	16-89	8-70	16-85	8-77	16-81	8-85	19
20	17-82	9-08	17-78	9-16	17-74	9-23	17-70	9-31	20
21	18-71	9-53	18-67	9-62	18-63	9-70	18-58	9-78	21
22	19-60	9-99	19-56	10-07	19-51	10-16	19-47	10-24	22
23	20-49	10-44	20-45	10-53	20-40	10-62	20-35	10-71	23
24	21-38	10-90	21-34	10-99	21-29	11-08	21-24	11-17	24
25	22-28	11-35	22-23	11-45	22-18	11-54	22-12	11-64	25
26	23-17	11-80	23-11	11-90	23-06	12-01	23-01	12-11	26
27	24-06	12-26	24-00	12-36	23-95	12-47	23-89	12-57	27
28	24-95	12-71	24-89	12-82	24-84	12-93	24-78	13-04	28
29	25-84	13-17	25-78	13-28	25-72	13-39	25-66	13-50	29
30	26-73	13-62	26-67	13-74	26-61	13-85	26-55	13-97	30
31	27-62	14-07	27-56	14-19	27-50	14-31	27-43	14-43	31
32	28-51	14-53	28-45	14-65	28-38	14-78	28-32	14-90	32
33	29-40	14-98	29-34	15-11	29-27	15-24	29-20	15-37	33
34	30-29	15-44	30-23	15-57	30-16	15-70	30-09	15-83	34
35	31-19	15-89	31-12	16-03	31-05	16-16	30-97	16-30	35
36	32-08	16-34	32-20	16-48	31-93	16-62	31-86	16-76	36
37	32-97	16-80	32-89	16-94	32-82	17-08	32-74	17-23	37
38	33-86	17-25	33-78	17-40	33-71	17-55	33-63	17-69	38
39	34-75	17-71	34-67	17-86	34-59	18-01	34-51	18-16	39
40	35-64	18-16	35-56	18-31	35-48	18-47	35-40	18-62	40
41	36-53	18-61	36-45	18-77	36-37	18-93	36-28	19-09	41
42	37-42	19-07	37-34	19-23	37-25	19-39	37-17	19-56	42
43	38-31	19-52	38-23	19-69	38-14	19-86	38-05	20-02	43
44	39-20	19-98	39-12	20-15	39-03	20-32	38-94	20-49	44
45	40-10	20-43	40-01	20-60	39-92	20-78	39-82	20-95	45
46	40-99	20-88	40-89	21-06	40-80	21-24	40-71	21-42	46
47	41-88	21-34	41-78	21-52	41-69	21-70	41-59	21-88	47
48	42-77	21-79	42-67	21-98	42-58	22-16	42-48	22-35	48
49	43-66	22-25	43-56	22-44	43-46	22-63	43-36	22-82	49
50	44-55	22-70	44-45	22-89	44-35	23-09	44-25	23-28	50
Distance.	63 Deg.		62¾ Deg.		62½ Deg.		62¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	27 Deg.		27¼ Deg.		27½ Deg.		27¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	45·44	23·15	45·34	23·35	45·24	23·55	45·13	23·75	51
52	46·33	23·61	46·23	23·81	46·12	24·01	46·02	24·21	52
53	47·22	24·06	47·12	24·27	47·01	24·47	46·90	24·58	53
54	48·11	24·52	48·01	24·73	47·90	24·93	47·79	25·14	54
55	49·01	24·97	48·90	25·18	48·79	25·40	48·67	25·61	55
56	49·90	25·42	49·78	25·64	49·67	25·86	49·56	26·07	56
57	50·79	25·88	50·67	26·10	50·56	26·32	50·44	26·54	57
58	51·68	26·33	51·56	26·56	51·45	26·78	51·33	27·01	58
59	52·57	26·79	52·45	27·01	52·33	27·24	52·21	27·47	59
60	53·46	27·24	53·34	27·47	53·22	27·70	53·10	27·94	60
61	54·35	27·69	54·23	27·93	54·11	28·17	53·98	28·40	61
62	55·24	28·15	55·12	28·39	54·99	28·63	54·87	28·87	62
63	56·13	28·60	56·01	28·85	55·88	29·09	55·75	29·33	63
64	57·02	29·06	56·90	29·30	56·77	29·55	56·64	29·80	64
65	57·92	29·51	57·79	29·76	57·66	30·01	57·52	30·25	65
66	58·81	29·96	58·68	30·22	58·54	30·48	58·41	30·73	66
67	59·70	30·42	59·56	30·68	59·43	30·94	59·29	31·20	67
68	60·59	30·87	60·45	31·14	60·32	31·40	60·18	31·66	68
69	61·48	31·33	61·34	31·69	61·20	31·86	61·06	32·13	69
70	62·37	31·78	62·23	32·05	62·09	32·32	61·95	32·59	70
71	63·26	32·23	63·12	32·51	62·98	32·78	62·83	33·06	71
72	64·15	32·69	64·01	32·97	63·86	33·25	63·72	33·52	72
73	65·04	33·14	64·90	33·42	64·75	33·71	64·60	33·99	73
74	65·93	33·60	65·79	33·88	65·64	34·17	65·49	34·46	74
75	66·83	34·05	66·68	34·34	66·53	34·63	66·37	34·92	75
76	67·72	34·50	67·57	34·80	67·41	35·09	67·26	35·39	76
77	68·61	34·96	68·45	35·26	68·30	35·55	68·14	35·85	77
78	69·50	35·41	69·34	35·71	69·19	36·02	69·03	36·32	78
79	70·39	35·87	70·23	36·17	70·07	36·48	69·91	36·78	79
80	71·28	36·32	71·12	36·63	70·96	36·94	70·80	37·25	80
81	72·17	36·77	72·01	37·09	71·85	37·40	71·68	37·71	81
82	73·06	37·23	72·90	37·55	72·73	37·86	72·57	38·18	82
83	73·95	37·68	73·79	38·00	73·62	38·33	73·45	38·65	83
84	74·84	38·14	74·68	38·46	74·51	38·79	74·34	39·11	84
85	75·74	38·59	75·57	38·92	75·40	39·25	75·22	39·58	85
86	76·63	39·04	76·46	39·38	76·29	39·71	76·11	40·04	86
87	77·52	39·50	77·34	39·83	77·17	40·17	76·99	40·51	87
88	78·41	39·95	78·23	40·29	78·06	40·63	77·88	40·97	88
89	79·30	40·41	79·12	40·75	78·94	41·10	78·76	41·44	89
90	80·19	40·86	80·01	41·21	79·83	41·56	79·65	41·91	90
91	81·08	41·31	80·90	41·67	80·72	42·02	80·53	42·37	91
92	81·97	41·77	81·79	42·12	81·60	42·48	81·42	42·84	92
93	82·86	42·22	82·68	42·58	82·49	42·94	82·30	43·30	93
94	83·75	42·68	83·57	43·04	83·38	43·40	83·19	43·77	94
95	84·65	43·13	84·46	43·50	84·27	43·87	84·07	44·23	95
96	85·54	43·58	85·35	43·96	85·15	44·33	84·96	44·70	96
97	86·43	44·04	86·23	44·41	86·04	44·79	85·84	45·16	97
98	87·32	44·49	87·12	44·87	86·93	45·25	86·73	45·63	98
99	88·21	44·95	88·01	45·33	87·81	45·71	87·61	46·10	99
100	89·10	45·40	88·90	45·79	88·70	46·17	88·50	46·56	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	68 Deg.		62¾ Deg.		62½ Deg.		62¼ Deg.		

Distance.	28 Deg.		28¼ Deg.		28½ Deg.		28¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0:58	0:47	0:88	0:47	0:58	0:48	0:88	0:48	1
2	1:77	0:94	1:76	0:95	1:76	0:95	1:75	0:96	2
3	2:65	1:41	2:64	1:42	2:64	1:43	2:63	1:44	3
4	3:53	1:88	3:52	1:89	3:52	1:91	3:51	1:92	4
5	4:41	2:35	4:40	2:37	4:39	2:39	4:38	2:40	5
6	5:30	2:82	5:29	2:84	5:27	2:86	5:26	2:89	6
7	6:18	3:29	6:17	3:31	6:15	3:34	6:14	3:37	7
8	7:06	3:76	7:05	3:79	7:03	3:82	7:01	3:85	8
9	7:95	4:23	7:93	4:26	7:91	4:29	7:89	4:33	9
10	8:83	4:69	8:81	4:73	8:79	4:77	8:77	4:81	10
11	9:71	5:16	9:69	5:21	9:67	5:25	9:64	5:29	11
12	10:60	5:63	10:57	5:68	10:55	5:73	10:52	5:77	12
13	11:48	6:10	11:45	6:15	11:42	6:20	11:40	6:25	13
14	12:36	6:57	12:33	6:63	12:30	6:68	12:27	6:73	14
15	13:24	7:04	13:21	7:10	13:18	7:16	13:15	7:21	15
16	14:13	7:51	14:09	7:57	14:06	7:63	14:03	7:70	16
17	15:01	7:98	14:98	8:05	14:94	8:11	14:90	8:18	17
18	15:89	8:45	15:86	8:52	15:82	8:59	15:78	8:66	18
19	16:78	8:92	16:74	8:99	16:70	9:07	16:66	9:14	19
20	17:66	9:39	17:62	9:47	17:58	9:54	17:53	9:62	20
21	18:54	9:86	18:50	9:94	18:46	10:02	18:41	10:10	21
22	19:42	10:33	19:38	10:41	19:33	10:50	19:29	10:58	22
23	20:31	10:80	20:26	10:89	20:21	10:97	20:16	11:06	23
24	21:19	11:27	21:14	11:36	21:09	11:45	21:04	11:54	24
25	22:07	11:74	22:02	11:83	21:97	11:93	21:92	12:02	25
26	22:96	12:21	22:90	12:31	22:85	12:41	22:79	12:51	26
27	23:84	12:68	23:78	12:78	23:73	12:88	23:67	12:99	27
28	24:72	13:15	24:66	13:25	24:61	13:36	24:55	13:47	28
29	25:61	13:61	25:55	13:73	25:49	13:84	25:43	13:95	29
30	26:49	14:08	26:43	14:20	26:36	14:31	26:30	14:43	30
31	27:37	14:55	27:31	14:67	27:24	14:79	27:18	14:91	31
32	28:25	15:02	28:19	15:15	28:12	15:27	28:06	15:39	32
33	29:14	15:49	29:07	15:62	29:00	15:75	28:93	15:87	33
34	30:02	15:96	29:95	16:09	29:88	16:22	29:81	16:35	34
35	30:90	16:43	30:83	16:57	30:76	16:70	30:69	16:83	35
36	31:79	16:90	31:71	17:04	31:64	17:18	31:56	17:32	36
37	32:67	17:37	32:59	17:51	32:52	17:65	32:44	17:80	37
38	33:55	17:84	33:47	17:99	33:39	18:13	33:32	18:28	38
39	34:43	18:31	34:35	18:46	34:27	18:61	34:19	18:76	39
40	35:32	18:78	35:24	18:93	35:15	19:09	35:07	19:24	40
41	36:20	19:25	36:12	19:41	36:03	19:56	35:95	19:72	41
42	37:08	19:72	37:00	19:88	36:91	20:04	36:82	20:20	42
43	37:97	20:19	37:88	20:35	37:79	20:52	37:70	20:68	43
44	38:85	20:66	38:76	20:83	38:67	20:99	38:58	21:16	44
45	39:73	21:13	39:64	21:30	39:55	21:47	39:45	21:64	45
46	40:62	21:60	40:52	21:77	40:43	21:95	40:33	22:13	46
47	41:50	22:07	41:40	22:25	41:30	22:43	41:21	22:61	47
48	42:38	22:53	42:28	22:72	42:18	22:90	42:08	23:09	48
49	43:26	23:00	43:16	23:19	43:06	23:38	42:96	23:57	49
50	44:15	23:47	44:04	23:67	43:94	23:86	43:84	24:05	50
Distance.	62 Deg.		61¾ Deg.		61½ Deg.		61¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	28 Deg.		28¼ Deg.		28½ Deg.		28¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	45-03	23-94	44-93	24-14	44-82	24-34	44-71	24-53	51
52	45-91	24-41	45-81	24-61	45-70	24-81	45-59	25-01	52
53	46-80	24-88	46-69	25-09	46-58	25-29	46-47	25-49	53
54	47-68	25-35	47-57	25-56	47-46	25-77	47-34	25-97	54
55	48-56	25-82	48-45	26-03	48-33	26-24	48-22	26-45	55
56	49-45	26-29	49-33	26-51	49-21	26-72	49-10	26-94	56
57	50-33	26-76	50-21	26-98	50-09	27-20	49-97	27-42	57
58	51-21	27-23	51-09	27-45	50-97	27-68	50-85	27-90	58
59	52-09	27-70	51-97	27-93	51-85	28-15	51-73	28-38	59
60	52-98	28-17	52-85	28-40	52-73	28-63	52-60	28-86	60
61	53-86	28-64	53-73	28-87	53-61	29-11	53-48	29-34	61
62	54-74	29-11	54-62	29-35	54-49	29-58	54-36	29-82	62
63	55-63	29-58	55-50	29-82	55-37	30-06	55-23	30-30	63
64	56-51	30-05	56-38	30-29	56-24	30-54	56-11	30-78	64
65	57-39	30-52	57-26	30-77	57-12	31-02	56-99	31-26	65
66	58-27	30-99	58-14	31-24	58-00	31-49	57-86	31-75	66
67	59-16	31-45	59-02	31-71	58-88	31-97	58-74	32-23	67
68	60-04	31-92	59-90	32-19	59-76	32-45	59-62	32-71	68
69	60-92	32-39	60-78	32-66	60-64	32-92	60-49	33-19	69
70	61-81	32-86	61-66	33-13	61-52	33-49	61-37	33-67	70
71	62-69	33-33	62-54	33-61	62-40	33-88	62-25	34-15	71
72	63-57	33-80	63-42	34-08	63-27	34-36	63-12	34-63	72
73	64-46	34-27	64-30	34-55	64-15	34-83	64-00	35-11	73
74	65-34	34-74	65-19	35-03	65-03	35-31	64-88	35-59	74
75	66-22	35-21	66-07	35-50	65-91	35-79	65-75	36-07	75
76	67-10	35-68	66-95	36-97	66-79	36-26	66-63	36-56	76
77	67-99	36-15	67-83	36-45	67-67	36-74	67-51	37-04	77
78	68-87	36-62	68-71	36-92	68-55	37-22	68-38	37-52	78
79	69-75	37-09	69-59	37-39	69-43	37-70	69-26	38-00	79
80	70-64	37-56	70-47	37-87	70-31	38-17	70-14	38-48	80
81	71-52	38-03	71-35	38-34	71-18	38-65	71-01	38-96	81
82	72-40	38-50	72-23	38-81	72-06	39-13	71-89	39-44	82
83	73-28	38-97	73-11	39-29	72-94	39-60	72-77	39-92	83
84	74-17	39-44	73-99	39-76	73-82	40-08	73-64	40-40	84
85	75-05	39-91	74-88	40-23	74-70	40-56	74-52	40-88	85
86	75-93	40-37	75-76	40-71	75-58	41-04	75-40	41-36	86
87	76-82	40-84	76-64	41-18	76-46	41-51	76-28	41-85	87
88	77-70	41-31	77-52	41-65	77-34	41-99	77-15	42-33	88
89	78-58	41-78	78-40	42-13	78-21	42-47	78-03	42-81	89
90	79-47	42-25	79-28	42-60	79-09	42-94	78-91	43-29	90
91	80-35	42-72	80-16	43-07	79-97	43-42	79-78	43-77	91
92	81-23	43-19	81-04	43-55	80-85	43-90	80-66	44-25	92
93	82-11	43-66	81-92	44-02	81-73	44-38	81-54	44-73	93
94	83-00	44-13	82-80	44-49	82-61	44-85	82-41	45-21	94
95	83-88	44-60	83-68	44-97	83-49	45-33	83-29	45-69	95
96	84-76	45-07	84-57	45-44	84-37	45-81	84-17	46-17	96
97	85-65	45-54	85-45	45-91	85-25	46-28	85-04	46-66	97
98	86-53	46-01	86-33	46-39	86-12	46-76	85-92	47-14	98
99	87-41	46-48	87-21	46-86	87-00	47-24	86-80	47-62	99
100	88-29	46-95	88-09	47-33	87-88	47-72	87-67	48-10	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	62 Deg.		61¾ Deg.		61½ Deg.		61¼ Deg.		

TRAVERSE TABLE.

Distance.	29 Deg.		29¼ Deg.		29½ Deg.		29¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-87	0-48	0-87	0-49	0-87	0-49	0-87	0-50	1
2	1-75	0-97	1-74	0-98	1-74	0-98	1-74	0-99	2
3	2-62	1-45	2-62	1-47	2-61	1-48	2-60	1-49	3
4	3-50	1-94	3-49	1-95	3-48	1-97	3-47	1-98	4
5	4-37	2-42	4-36	2-44	4-35	2-46	4-34	2-48	5
6	5-25	2-91	5-23	2-93	5-22	2-95	5-21	2-98	6
7	6-12	3-39	6-11	3-42	6-09	3-45	6-08	3-47	7
8	7-00	3-88	6-98	3-91	6-96	3-94	6-95	3-97	8
9	7-87	4-36	7-85	4-40	7-83	4-43	7-81	4-47	9
10	8-75	4-85	8-72	4-89	8-70	4-92	8-68	4-96	10
11	9-62	5-33	9-60	5-37	9-57	5-42	9-55	5-46	11
12	10-50	5-82	10-47	5-86	10-44	5-91	10-42	5-95	12
13	11-37	6-30	11-34	6-35	11-31	6-40	11-29	6-45	13
14	12-24	6-79	12-21	6-84	12-18	6-89	12-15	6-95	14
15	13-12	7-27	13-09	7-33	13-06	7-39	13-02	7-44	15
16	13-99	7-76	13-96	7-82	13-93	7-88	13-89	7-94	16
17	14-87	8-24	14-83	8-31	14-80	8-37	14-76	8-44	17
18	15-74	8-73	15-70	8-80	15-67	8-86	15-63	8-93	18
19	16-62	9-21	16-58	9-28	16-54	9-36	16-50	9-43	19
20	17-49	9-70	17-45	9-77	17-41	9-85	17-36	9-92	20
21	18-37	10-18	18-32	10-26	18-28	10-34	18-23	10-42	21
22	19-24	10-67	19-19	10-75	19-15	10-83	19-10	10-92	22
23	20-12	11-15	20-07	11-24	20-02	11-33	19-07	11-41	23
24	20-99	11-64	20-94	11-73	20-89	11-82	20-84	11-91	24
25	21-87	12-12	21-81	12-22	21-76	12-31	21-70	12-41	25
26	22-74	12-60	22-68	12-70	22-63	12-80	22-57	12-90	26
27	23-61	13-09	23-56	13-19	23-51	13-30	23-44	13-40	27
28	24-49	13-57	24-43	13-68	24-37	13-79	24-31	13-89	28
29	25-36	14-06	25-30	14-17	25-24	14-28	25-18	14-39	29
30	26-24	14-54	26-17	14-66	26-11	14-77	26-05	14-89	30
31	27-11	15-03	27-05	15-15	26-98	15-27	26-91	15-38	31
32	27-99	15-51	27-92	15-64	27-85	15-76	27-78	15-88	32
33	28-86	16-00	28-79	16-12	28-72	16-25	28-65	16-38	33
34	29-74	16-48	29-66	16-61	29-59	16-74	29-52	16-87	34
35	30-61	16-97	30-54	17-10	30-46	17-23	30-39	17-37	35
36	31-49	17-45	31-41	17-59	31-33	17-73	31-26	17-86	36
37	32-36	17-94	32-28	18-08	32-20	18-22	32-12	18-36	37
38	33-24	18-42	33-15	18-57	33-07	18-71	32-99	18-86	38
39	34-11	18-91	34-03	19-06	33-94	19-20	33-86	19-35	39
40	34-98	19-39	34-90	19-54	34-81	19-70	34-73	19-85	40
41	35-86	19-88	35-77	20-03	35-68	20-19	35-60	20-34	41
42	36-73	20-36	36-64	20-52	36-55	20-68	36-46	20-84	42
43	37-61	20-85	37-52	21-01	37-43	21-17	37-33	21-34	43
44	38-48	21-33	38-39	21-50	38-30	21-67	38-20	21-83	44
45	39-36	21-82	39-26	21-99	39-17	22-16	39-07	22-33	45
46	40-23	22-30	40-13	22-48	40-04	22-65	39-94	22-83	46
47	41-11	22-79	41-01	22-97	40-91	23-14	40-81	23-32	47
48	41-98	23-27	41-88	23-45	41-78	23-63	41-67	23-82	48
49	42-86	23-76	42-75	23-94	42-65	24-13	42-54	24-31	49
50	43-73	24-24	43-62	24-43	43-52	24-62	43-41	24-81	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	61 Deg.		60¾ Deg.		60½ Deg.		60¼ Deg.		

TRAVERSE TABLE.

Distance.	29 Deg.		29¼ Deg.		29½ Deg.		29¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	44-61	24-73	44-50	24-92	44-39	25-11	44-28	25-31	51
52	45-48	25-21	45-37	25-41	45-26	25-61	45-15	25-80	52
53	46-35	25-69	46-24	25-90	46-13	26-10	46-01	26-30	53
54	47-23	26-18	47-11	26-39	47-00	26-59	46-88	26-80	54
55	48-10	26-66	47-99	26-87	47-87	27-08	47-75	27-29	55
56	48-98	27-15	48-86	27-36	48-74	27-58	48-62	27-79	56
57	49-85	27-63	49-73	27-85	49-61	28-07	49-49	28-28	57
58	50-73	28-12	50-60	28-34	50-48	28-56	50-36	28-78	58
59	51-60	28-60	51-48	28-83	51-35	29-05	51-22	29-28	59
60	52-48	29-09	52-35	29-32	52-22	29-55	52-09	29-77	60
61	53-35	29-57	53-22	29-81	53-09	30-04	52-96	30-27	61
62	54-23	30-06	54-09	30-29	53-96	30-53	53-83	30-77	62
63	55-10	30-54	54-97	30-78	54-83	31-02	54-70	31-26	63
64	55-98	31-03	55-84	31-27	55-70	31-52	55-56	31-76	64
65	56-85	31-51	56-71	31-76	56-57	32-01	56-43	32-25	65
66	57-72	32-00	57-58	32-25	57-44	32-50	57-30	32-75	66
67	58-60	32-48	58-46	32-74	58-31	32-99	58-17	33-25	67
68	59-47	32-97	59-33	33-23	59-18	33-48	59-04	33-74	68
69	60-35	33-45	60-20	33-71	60-05	33-98	59-91	34-24	69
70	61-22	33-94	61-07	34-20	60-92	34-47	60-77	34-74	70
71	62-10	34-42	61-95	34-69	61-80	34-96	61-64	35-23	71
72	62-97	34-91	62-82	35-18	62-67	35-45	62-51	35-73	72
73	63-85	35-39	63-69	35-67	63-54	35-95	63-38	36-22	73
74	64-72	35-88	64-56	36-16	64-41	36-44	64-25	36-72	74
75	65-60	36-36	65-44	36-65	65-28	36-93	65-11	37-22	75
76	66-47	36-85	66-31	37-14	66-15	37-42	65-98	37-71	76
77	67-35	37-33	67-18	37-62	67-02	37-92	66-85	38-21	77
78	68-22	37-82	68-05	38-11	67-89	38-41	67-72	38-70	78
79	69-09	38-30	68-93	38-60	68-76	38-90	68-59	39-20	79
80	69-97	38-78	69-80	39-09	69-63	39-39	69-46	39-70	80
81	70-84	39-27	70-67	39-58	70-50	39-89	70-32	40-19	81
82	71-72	39-75	71-54	40-07	71-37	40-38	71-19	40-69	82
83	72-59	40-24	72-42	40-56	72-24	40-87	72-06	41-19	83
84	73-47	40-72	73-29	41-04	73-11	41-36	72-93	41-68	84
85	74-34	41-21	74-16	41-53	73-98	41-86	73-80	42-18	85
86	75-22	41-69	75-03	42-02	74-85	42-35	74-67	42-67	86
87	76-09	42-18	75-91	42-51	75-72	42-84	75-53	43-17	87
88	76-97	42-66	76-78	43-00	76-59	43-33	76-40	43-67	88
89	77-84	43-15	77-65	43-49	77-46	43-83	77-27	44-16	89
90	78-72	43-63	78-52	43-98	78-33	44-32	78-14	44-66	90
91	79-59	44-12	79-40	44-46	79-20	44-81	79-01	45-16	91
92	80-46	44-60	80-27	44-95	80-07	45-30	79-87	45-65	92
93	81-34	45-09	81-14	45-44	80-94	45-80	80-74	46-15	93
94	82-21	45-57	82-01	45-93	81-81	46-29	81-61	46-64	94
95	83-09	46-06	82-89	46-42	82-68	46-78	82-48	47-14	95
96	83-96	46-54	83-76	46-91	83-55	47-27	83-35	47-64	96
97	84-84	47-03	84-63	47-40	84-42	47-77	84-22	48-13	97
98	85-71	47-51	85-50	47-88	85-29	48-26	85-08	48-63	98
99	86-59	48-00	86-38	48-37	86-17	48-75	85-95	49-13	99
100	87-46	48-48	87-25	48-86	87-04	49-24	86-82	49-62	100
Distance.	61 Deg.		60¾ Deg.		60½ Deg.		60¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	30 Deg.		30 $\frac{1}{4}$ Deg.		30 $\frac{1}{2}$ Deg.		30 $\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.87	0.50	0.86	0.50	0.86	0.51	0.86	0.51	1
2	1.73	1.00	1.73	1.01	1.72	1.02	1.72	1.02	2
3	2.60	1.50	2.59	1.51	2.58	1.52	2.58	1.53	3
4	3.46	2.00	3.46	2.02	3.45	2.03	3.44	2.05	4
5	4.33	2.50	4.32	2.52	4.31	2.54	4.30	2.56	5
6	5.20	3.00	5.18	3.02	5.17	3.05	5.16	3.07	6
7	6.06	3.50	6.05	3.53	6.03	3.55	6.02	3.58	7
8	6.93	4.00	6.91	4.03	6.89	4.06	6.88	4.09	8
9	7.79	4.50	7.77	4.53	7.75	4.57	7.73	4.60	9
10	8.66	5.00	8.64	5.04	8.62	5.08	8.59	5.11	10
11	9.53	5.50	9.50	5.54	9.48	5.58	9.45	5.62	11
12	10.39	6.00	10.37	6.05	10.34	6.09	10.31	6.14	12
13	11.26	6.50	11.23	6.55	11.20	6.60	11.17	6.65	13
14	12.12	7.00	12.09	7.05	12.06	7.11	12.03	7.16	14
15	12.99	7.50	12.96	7.56	12.92	7.61	12.89	7.67	15
16	13.86	8.00	13.82	8.06	13.79	8.12	13.75	8.18	16
17	14.72	8.50	14.69	8.56	14.65	8.63	14.61	8.69	17
18	15.59	9.00	15.55	9.07	15.51	9.14	15.47	9.20	18
19	16.45	9.50	16.41	9.57	16.37	9.64	16.33	9.71	19
20	17.32	10.00	17.28	10.08	17.23	10.15	17.19	10.23	20
21	18.19	10.50	18.14	10.58	18.09	10.66	18.05	10.74	21
22	19.05	11.00	19.00	11.08	18.96	11.17	18.91	11.25	22
23	19.92	11.50	19.87	11.59	19.82	11.67	19.77	11.76	23
24	20.78	12.00	20.73	12.09	20.68	12.18	20.63	12.27	24
25	21.65	12.50	21.60	12.59	21.54	12.69	21.49	12.78	25
26	22.52	13.00	22.46	13.10	22.40	13.20	22.34	13.29	26
27	23.38	13.50	23.32	13.60	23.26	13.70	23.20	13.80	27
28	24.25	14.00	24.19	14.11	24.13	14.21	24.06	14.32	28
29	25.11	14.50	25.05	14.61	24.99	14.72	24.92	14.83	29
30	25.98	15.00	25.92	15.11	25.85	15.23	25.78	15.34	30
31	26.85	15.50	26.78	15.62	26.71	15.73	26.64	15.85	31
32	27.71	16.00	27.64	16.12	27.57	16.24	27.50	16.36	32
33	28.58	16.50	28.51	16.62	28.43	16.75	28.36	16.87	33
34	29.44	17.00	29.37	17.13	29.30	17.26	29.22	17.38	34
35	30.31	17.50	30.23	17.63	30.16	17.76	30.08	17.90	35
36	31.18	18.00	31.10	18.14	31.02	18.27	30.94	18.41	36
37	32.04	18.50	31.96	18.64	31.88	18.78	31.80	18.92	37
38	32.91	19.00	32.83	19.14	32.74	19.29	32.66	19.43	38
39	33.77	19.50	33.69	19.65	33.60	19.79	33.52	19.94	39
40	34.64	20.00	34.55	20.15	34.47	20.30	34.38	20.45	40
41	35.51	20.50	35.42	20.65	35.33	20.81	35.24	20.96	41
42	36.37	21.00	36.28	21.16	36.19	21.32	36.10	21.47	42
43	37.24	21.50	37.14	21.66	37.05	21.82	36.95	21.99	43
44	38.11	22.00	38.01	22.17	37.91	22.33	37.81	22.50	44
45	38.97	22.50	38.87	22.67	38.77	22.84	38.67	23.01	45
46	39.84	23.00	39.74	23.17	39.63	23.35	39.53	23.52	46
47	40.70	23.50	40.60	23.68	40.50	23.85	40.39	24.03	47
48	41.57	24.00	41.46	24.18	41.36	24.36	41.25	24.54	48
49	42.44	24.50	42.33	24.68	42.22	24.87	42.11	25.05	49
50	43.30	25.00	43.19	25.19	43.08	25.38	42.97	25.56	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	60 Deg.		59 $\frac{3}{4}$ Deg.		59 $\frac{1}{2}$ Deg.		59 $\frac{1}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	30 Deg.		30¼ Deg.		30½ Deg.		30¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	44-17	25-50	44-06	25-69	43-94	25-88	43-83	26-08	51
52	45-03	26-00	44-92	26-20	44-80	26-39	44-69	26-59	52
53	45-90	26-50	45-78	26-70	45-67	26-90	45-55	27-10	53
54	46-77	27-00	46-65	27-20	46-53	27-41	46-41	27-61	54
55	47-63	27-50	47-51	27-71	47-39	27-91	47-27	28-12	55
56	48-50	28-00	48-37	28-21	48-25	28-42	48-13	28-63	56
57	49-36	28-50	49-24	28-72	49-11	28-93	48-99	29-14	57
58	50-23	29-00	50-10	29-22	49-97	29-44	49-85	29-65	58
59	51-10	29-50	50-97	29-72	50-84	29-94	50-70	30-17	59
60	51-96	30-00	51-83	30-23	51-70	30-45	51-56	30-68	60
61	52-83	30-50	52-69	30-73	52-56	30-96	52-42	31-19	61
62	53-69	31-00	53-56	31-23	53-42	31-47	53-28	31-70	62
63	54-56	31-50	54-42	31-74	54-28	31-97	54-14	32-21	63
64	55-43	32-00	55-29	32-24	55-14	32-48	55-00	32-72	64
65	56-29	32-50	56-15	32-75	56-01	32-99	55-86	33-23	65
66	57-16	33-00	57-01	33-25	56-87	33-50	56-72	33-75	66
67	58-02	33-50	57-88	33-75	57-73	34-01	57-58	34-26	67
68	58-89	34-00	58-74	34-26	58-59	34-51	58-44	34-77	68
69	59-76	34-50	59-60	34-76	59-45	35-02	59-30	35-28	69
70	60-62	35-00	60-47	35-26	60-31	35-53	60-16	35-79	70
71	61-49	35-50	61-33	35-77	61-18	36-04	61-02	36-30	71
72	62-35	36-00	62-20	36-27	62-04	36-54	61-88	36-81	72
73	63-22	36-50	63-06	36-78	62-90	37-05	62-74	37-32	73
74	64-09	37-00	63-92	37-28	63-76	37-56	63-60	37-84	74
75	64-95	37-50	64-79	37-78	64-62	38-07	64-46	38-35	75
76	65-82	38-00	65-65	38-29	65-48	38-57	65-31	38-86	76
77	66-68	38-50	66-52	38-79	66-35	39-08	66-17	39-37	77
78	67-55	39-00	67-38	39-29	67-21	39-59	67-03	39-88	78
79	68-42	39-50	68-24	39-80	68-07	40-10	67-89	40-39	79
80	69-28	40-00	69-11	40-30	68-93	40-60	68-75	40-90	80
81	70-15	40-50	69-97	40-81	69-79	41-11	69-61	41-41	81
82	71-01	41-00	70-83	41-31	70-65	41-62	70-47	41-93	82
83	71-88	41-50	71-70	41-81	71-52	42-13	71-33	42-44	83
84	72-75	42-00	72-56	42-32	72-38	42-63	72-19	42-95	84
85	73-61	42-50	73-43	42-82	73-24	43-14	73-05	43-46	85
86	74-48	43-00	74-29	43-32	74-10	43-65	73-91	43-97	86
87	75-34	43-50	75-15	43-83	74-96	44-16	74-77	44-48	87
88	76-21	44-00	76-02	44-33	75-82	44-66	75-63	44-99	88
89	77-08	44-50	76-88	44-84	76-68	45-17	76-49	45-51	89
90	77-94	45-00	77-75	45-34	77-55	45-68	77-35	46-02	90
91	78-81	45-50	78-61	45-84	78-41	46-19	78-21	46-53	91
92	79-67	46-00	79-47	46-35	79-27	46-69	79-07	47-04	92
93	80-54	46-50	80-34	46-85	80-13	47-20	79-92	47-55	93
94	81-41	47-00	81-20	47-35	80-99	47-71	80-78	48-06	94
95	82-27	47-50	82-06	47-86	81-85	48-22	81-64	48-57	95
96	83-14	48-00	82-93	48-36	82-72	48-72	82-50	49-08	96
97	84-00	48-50	83-79	48-87	83-58	49-23	83-36	49-60	97
98	84-87	49-00	84-66	49-37	84-44	49-74	84-22	50-11	98
99	85-74	49-50	85-52	49-87	85-30	50-25	85-08	50-62	99
100	86-60	50-00	86-38	50-38	86-16	50-75	85-94	51-13	100
Distance.	60 Deg.		59¾ Deg.		59½ Deg.		59¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	31 Deg.		31¼ Deg.		31½ Deg.		31¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-86	0-51	0-85	0-52	0-85	0-52	0-85	0-53	1
2	1-71	1-03	1-71	1-04	1-71	1-04	1-70	1-05	2
3	2-57	1-55	2-56	1-56	2-56	1-57	2-55	1-58	3
4	3-43	2-06	3-42	2-08	3-41	2-09	3-40	2-10	4
5	4-29	2-58	4-27	2-59	4-26	2-61	4-25	2-63	5
6	5-14	3-09	5-13	3-11	5-12	3-13	5-10	3-16	6
7	6-00	3-61	5-98	3-63	5-97	3-66	5-95	3-68	7
8	6-86	4-12	6-84	4-15	6-82	4-18	6-80	4-21	8
9	7-71	4-64	7-69	4-67	7-67	4-70	7-65	4-74	9
10	8-57	5-15	8-55	5-19	8-53	5-22	8-50	5-26	10
11	9-43	5-67	9-40	5-71	9-38	5-75	9-35	5-79	11
12	10-29	6-18	10-26	6-23	10-23	6-27	10-20	6-31	12
13	11-14	6-70	11-11	6-74	11-08	6-79	11-05	6-84	13
14	12-00	7-21	11-97	7-26	11-94	7-31	11-90	7-37	14
15	12-86	7-73	12-82	7-78	12-79	7-84	12-76	7-89	15
16	13-71	8-24	13-68	8-30	13-64	8-36	13-61	8-42	16
17	14-57	8-76	14-53	8-82	14-49	8-88	14-46	8-95	17
18	15-43	9-27	15-39	9-34	15-35	9-40	15-31	9-47	18
19	16-29	9-79	16-24	9-86	16-20	9-93	16-16	10-00	19
20	17-14	10-30	17-10	10-38	17-05	10-45	17-01	10-52	20
21	18-00	10-82	17-95	10-89	17-91	10-97	17-86	11-05	21
22	18-86	11-33	18-81	11-41	18-76	11-49	18-71	11-58	22
23	19-71	11-85	19-66	11-93	19-61	12-02	19-56	12-10	23
24	20-57	12-36	20-52	12-45	20-46	12-54	20-41	12-63	24
25	21-43	12-88	21-37	12-97	21-32	13-06	21-26	13-16	25
26	22-29	13-39	22-23	13-49	22-17	13-58	22-11	13-68	26
27	23-14	13-91	23-08	14-01	23-02	14-11	22-96	14-21	27
28	24-00	14-42	23-94	14-53	23-87	14-63	23-81	14-73	28
29	24-86	14-94	24-79	15-04	24-73	15-15	24-66	15-26	29
30	25-71	15-45	25-65	15-56	25-58	15-67	25-51	15-79	30
31	26-57	15-97	26-50	16-08	26-43	16-20	26-36	16-31	31
32	27-43	16-48	27-36	16-60	27-28	16-72	27-21	16-84	32
33	28-29	17-00	28-21	17-12	28-14	17-24	28-06	17-37	33
34	29-14	17-51	29-07	17-64	28-99	17-76	28-91	17-89	34
35	30-00	18-03	29-92	18-16	29-84	18-29	29-76	18-42	35
36	30-86	18-54	30-78	18-68	30-70	18-81	30-61	18-94	36
37	31-72	19-06	31-63	19-19	31-55	19-33	31-46	19-47	37
38	32-57	19-57	32-49	19-71	32-40	19-85	32-31	20-00	38
39	33-43	20-09	33-34	20-23	33-25	20-38	33-16	20-52	39
40	34-29	20-60	34-20	20-75	34-11	20-90	34-01	21-05	40
41	35-14	21-12	35-05	21-27	34-96	21-42	34-86	21-57	41
42	36-00	21-63	35-91	21-79	35-81	21-94	35-71	22-10	42
43	36-86	22-15	36-76	22-31	36-66	22-47	36-57	22-63	43
44	37-72	22-66	37-62	22-83	37-52	22-99	37-42	23-15	44
45	38-57	23-18	38-47	23-34	38-37	23-51	38-27	23-68	45
46	39-43	23-69	39-33	23-86	39-22	24-03	39-12	24-21	46
47	40-29	24-21	40-18	24-38	40-07	24-56	39-97	24-73	47
48	41-14	24-72	41-04	24-90	40-93	25-08	40-82	25-26	48
49	42-00	25-24	41-89	25-42	41-78	25-60	41-67	25-78	49
50	42-86	25-75	42-75	25-94	42-63	26-12	42-52	26-31	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	59 Deg.		58¾ Deg.		58½ Deg.		58¼ Deg.		

TRAVERSE TABLE.

Distance.	31 Deg.		31¼ Deg.		31½ Deg.		31¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	43-72	26-27	43-00	26-46	43-48	26-65	43-37	26-84	51
52	44-57	26-78	44-46	26-98	44-34	27-17	44-22	27-36	52
53	45-43	27-30	45-31	27-49	45-19	27-69	45-07	27-89	53
54	46-29	27-81	46-17	28-01	46-04	28-21	45-92	28-42	54
55	47-14	28-33	47-02	28-53	46-90	28-74	46-77	28-94	55
56	48-00	28-84	47-88	29-05	47-75	29-26	47-62	29-47	56
57	48-86	29-36	48-73	29-57	48-60	29-78	48-47	29-99	57
58	49-72	29-87	49-58	30-09	49-45	30-30	49-32	30-52	58
59	50-57	30-39	50-44	30-61	50-31	30-83	50-17	31-05	59
60	51-43	30-90	51-29	31-13	51-16	31-35	51-02	31-57	60
61	52-29	31-42	52-15	31-65	52-01	31-87	51-87	32-10	61
62	53-14	31-93	53-00	32-16	52-86	32-39	52-72	32-63	62
63	54-00	32-45	53-86	32-68	53-72	32-92	53-57	33-15	63
64	54-86	32-96	54-71	33-20	54-57	33-44	54-42	33-68	64
65	55-72	33-48	55-57	33-72	55-42	33-96	55-27	34-20	65
66	56-57	33-99	56-42	34-24	56-27	34-48	56-12	34-73	66
67	57-43	34-51	57-28	34-76	57-13	35-01	56-98	35-26	67
68	58-29	35-02	58-13	35-28	57-98	35-53	57-82	35-78	68
69	59-14	35-54	58-99	35-80	58-83	36-05	58-67	36-31	69
70	60-00	36-05	59-84	36-31	59-68	36-57	59-52	36-83	70
71	60-86	36-57	60-70	36-83	60-54	37-10	60-37	37-36	71
72	61-72	37-08	61-55	37-35	61-39	37-62	61-23	37-89	72
73	62-57	37-60	62-41	37-87	62-24	38-14	62-08	38-41	73
74	63-43	38-11	63-26	38-39	63-10	38-66	62-93	38-94	74
75	64-29	38-63	64-12	38-91	63-95	39-19	63-78	39-47	75
76	65-14	39-14	64-97	39-43	64-80	39-71	64-63	39-99	76
77	66-00	39-66	65-83	39-95	65-65	40-23	65-48	40-52	77
78	66-86	40-17	66-68	40-46	66-51	40-75	66-33	41-04	78
79	67-72	40-69	67-54	40-98	67-36	41-28	67-18	41-57	79
80	68-57	41-20	68-39	41-50	68-21	41-80	68-03	42-10	80
81	69-43	41-72	69-25	42-02	69-06	42-32	68-88	42-62	81
82	70-29	42-23	70-10	42-54	69-92	42-84	69-73	43-15	82
83	71-14	42-75	70-96	43-06	70-77	43-37	70-58	43-68	83
84	72-00	43-26	71-81	43-58	71-62	43-89	71-43	44-20	84
85	72-86	43-78	72-67	44-10	72-47	44-41	72-28	44-73	85
86	73-72	44-29	73-52	44-61	73-33	44-93	73-13	45-25	86
87	74-57	44-81	74-38	45-13	74-18	45-46	73-98	45-78	87
88	75-43	45-32	75-23	45-65	75-03	45-98	74-83	46-31	88
89	76-29	45-84	76-09	46-17	75-88	46-50	75-68	46-83	89
90	77-15	46-35	76-94	46-69	76-74	47-02	76-53	47-36	90
91	78-00	46-87	77-80	47-21	77-59	47-55	77-38	47-89	91
92	78-86	47-38	78-65	47-73	78-44	48-07	78-23	48-41	92
93	79-72	47-90	79-51	48-25	79-30	48-59	79-08	48-94	93
94	80-57	48-41	80-36	48-76	80-15	49-11	79-93	49-47	94
95	81-43	48-93	81-22	49-28	81-00	49-64	80-78	49-99	95
96	82-29	49-44	82-07	49-80	81-85	50-16	81-63	50-52	96
97	83-15	49-96	82-93	50-32	82-71	50-68	82-48	51-04	97
98	84-00	50-47	83-78	50-84	83-56	51-20	83-33	51-57	98
99	84-86	50-99	84-64	51-36	84-41	51-73	84-18	52-10	99
100	85-72	51-50	85-49	51-88	85-26	52-25	85-04	52-62	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	59 Deg.		58¾ Deg.		58½ Deg.		58¼ Deg.		

TRAVERSE TABLE.

Distance.	32 Deg.		32¼ Deg.		32½ Deg.		32¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-85	0-53	0-85	0-53	0-84	0-54	0-84	0-54	1
2	1-70	1-06	1-69	1-07	1-69	1-07	1-68	1-08	2
3	2-54	1-59	2-54	1-60	2-53	1-61	2-52	1-62	3
4	3-39	2-12	3-38	2-13	3-37	2-15	3-36	2-16	4
5	4-24	2-65	4-23	2-67	4-22	2-69	4-21	2-70	5
6	5-09	3-18	5-07	3-20	5-06	3-22	5-05	3-25	6
7	5-94	3-71	5-92	3-74	5-90	3-76	5-89	3-79	7
8	6-78	4-24	6-77	4-27	6-75	4-30	6-73	4-33	8
9	7-63	4-77	7-61	4-80	7-59	4-84	7-57	4-87	9
10	8-48	5-30	8-46	5-34	8-43	5-37	8-41	5-41	10
11	9-33	5-83	9-30	5-87	9-28	5-91	9-25	5-95	11
12	10-18	6-36	10-15	6-40	10-12	6-45	10-09	6-49	12
13	11-02	6-89	10-99	6-94	10-96	6-98	10-93	7-03	13
14	11-87	7-42	11-84	7-47	11-81	7-52	11-77	7-57	14
15	12-72	7-95	12-69	8-00	12-65	8-06	12-62	8-11	15
16	13-57	8-48	13-53	8-54	13-49	8-60	13-46	8-66	16
17	14-42	9-01	14-38	9-07	14-34	9-13	14-30	9-20	17
18	15-26	9-54	15-22	9-61	15-18	9-67	15-14	9-74	18
19	16-11	10-07	16-07	10-14	16-02	10-21	15-98	10-28	19
20	16-96	10-60	16-91	10-67	16-87	10-75	16-82	10-82	20
21	17-81	11-13	17-76	11-21	17-71	11-28	17-66	11-36	21
22	18-66	11-66	18-61	11-74	18-55	11-82	18-50	11-90	22
23	19-51	12-19	19-45	12-27	19-40	12-36	19-34	12-44	23
24	20-35	12-72	20-30	12-81	20-24	12-90	20-18	12-98	24
25	21-20	13-25	21-14	13-34	21-08	13-43	21-03	13-52	25
26	22-05	13-78	21-99	13-87	21-93	13-97	21-87	14-07	26
27	22-90	14-31	22-83	14-41	22-77	14-51	22-71	14-61	27
28	23-75	14-84	23-68	14-94	23-61	15-04	23-55	15-15	28
29	24-59	15-37	24-53	15-47	24-46	15-58	24-39	15-69	29
30	25-44	15-90	25-37	16-01	25-30	16-12	25-23	16-23	30
31	26-29	16-43	26-22	16-54	26-15	16-66	26-07	16-77	31
32	27-14	16-96	27-06	17-08	26-99	17-19	26-91	17-31	32
33	27-99	17-49	27-91	17-61	27-83	17-73	27-75	17-85	33
34	28-83	18-02	28-75	18-14	28-68	18-27	28-60	18-39	34
35	29-68	18-55	29-60	18-68	29-52	18-81	29-44	18-93	35
36	30-53	19-08	30-45	19-21	30-36	19-34	30-28	19-48	36
37	31-38	19-61	31-29	19-74	31-21	19-88	31-12	20-02	37
38	32-23	20-14	32-14	20-28	32-05	20-42	31-96	20-56	38
39	33-07	20-67	32-98	20-81	32-89	20-95	32-80	21-10	39
40	33-92	21-20	33-83	21-34	33-74	21-49	33-64	21-64	40
41	34-77	21-73	34-67	21-88	34-58	22-03	34-48	22-18	41
42	35-62	22-26	35-52	22-41	35-42	22-57	35-32	22-72	42
43	36-47	22-79	36-37	22-95	36-27	23-10	36-16	23-26	43
44	37-31	23-32	37-21	23-48	37-11	23-64	37-01	23-80	44
45	38-16	23-85	38-06	24-01	37-95	24-18	37-85	24-34	45
46	39-01	24-38	38-90	24-55	38-80	24-72	38-69	24-88	46
47	39-86	24-91	39-75	25-08	39-64	25-25	39-53	25-43	47
48	40-71	25-44	40-59	25-61	40-48	25-79	40-37	25-97	48
49	41-55	25-97	41-44	26-15	41-33	26-33	41-21	26-51	49
50	42-40	26-50	42-29	26-68	42-17	26-86	42-05	27-05	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	58 Deg.		57¾ Deg.		57½ Deg.		57¼ Deg.		

TRAVERSE TABLE.

Distance.	32 Deg.		32¼ Deg.		32½ Deg.		32¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	43.25	27.03	43.13	27.21	43.01	27.40	42.89	27.59	51
52	44.10	27.56	43.98	27.75	43.86	27.94	43.73	28.13	52
53	44.95	28.09	44.82	28.28	44.70	28.48	44.58	28.67	53
54	45.79	28.62	45.67	28.82	45.54	29.01	45.42	29.21	54
55	46.64	29.15	46.51	29.35	46.39	29.55	46.26	29.75	55
56	47.49	29.68	47.36	29.88	47.23	30.09	47.10	30.29	56
57	48.34	30.21	48.21	30.42	48.07	30.63	47.94	30.84	57
58	49.19	30.74	49.05	30.95	48.92	31.16	48.78	31.38	58
59	50.03	31.27	49.90	31.48	49.76	31.70	49.62	31.92	59
60	50.88	31.80	50.74	32.02	50.60	32.24	50.46	32.46	60
61	51.73	32.33	51.59	32.55	51.45	32.78	51.30	33.00	61
62	52.58	32.85	52.44	33.08	52.29	33.31	52.14	33.54	62
63	53.43	33.38	53.28	33.62	53.13	33.85	52.99	34.08	63
64	54.28	33.91	54.13	34.15	53.98	34.39	53.83	34.62	64
65	55.12	34.44	54.97	34.68	54.82	34.92	54.67	35.16	65
66	55.97	34.97	55.82	35.22	55.66	35.46	55.51	35.70	66
67	56.82	35.50	56.66	35.75	56.51	36.00	56.35	36.25	67
68	57.67	36.03	57.51	36.29	57.35	36.54	57.19	36.79	68
69	58.52	36.56	58.36	36.82	58.19	37.07	58.03	37.33	69
70	59.36	37.09	59.20	37.35	59.04	37.61	58.87	37.87	70
71	60.21	37.62	60.05	37.89	59.88	38.15	59.71	38.41	71
72	61.06	38.15	60.89	38.42	60.72	38.69	60.55	38.95	72
73	61.91	38.68	61.74	38.95	61.57	39.22	61.40	39.49	73
74	62.76	39.21	62.58	39.49	62.41	39.76	62.24	40.03	74
75	63.60	39.74	63.43	40.02	63.25	40.30	63.08	40.57	75
76	64.45	40.27	64.28	40.55	64.10	40.83	63.92	41.11	76
77	65.30	40.80	65.12	41.09	64.94	41.37	64.76	41.65	77
78	66.15	41.33	65.97	41.62	65.78	41.91	65.60	42.20	78
79	67.00	41.86	66.81	42.16	66.63	42.45	66.44	42.74	79
80	67.84	42.39	67.66	42.69	67.47	42.98	67.28	43.28	80
81	68.69	42.92	68.50	43.22	68.31	43.52	68.12	43.82	81
82	69.54	43.45	69.35	43.76	69.16	44.06	68.97	44.36	82
83	70.39	43.98	70.20	44.29	70.00	44.60	69.81	44.90	83
84	71.24	44.51	71.04	44.82	70.84	45.13	70.65	45.44	84
85	72.08	45.04	71.89	45.36	71.69	45.67	71.49	45.98	85
86	72.93	45.57	72.73	45.89	72.53	46.21	72.33	46.52	86
87	73.78	46.10	73.58	46.42	73.38	46.75	73.17	47.06	87
88	74.63	46.63	74.42	46.96	74.22	47.28	74.01	47.61	88
89	75.48	47.16	75.27	47.49	75.06	47.82	74.85	48.15	89
90	76.32	47.69	76.12	48.03	75.91	48.36	75.69	48.69	90
91	77.17	48.22	76.96	48.56	76.75	48.89	76.53	49.23	91
92	78.02	48.75	77.81	49.09	77.59	49.43	77.38	49.77	92
93	78.87	49.28	78.65	49.63	78.44	49.97	78.22	50.31	93
94	79.72	49.81	79.50	50.16	79.28	50.51	79.06	50.85	94
95	80.56	50.34	80.34	50.69	80.12	51.04	79.90	51.39	95
96	81.41	50.87	81.19	51.23	80.97	51.58	80.74	51.93	96
97	82.26	51.40	82.04	51.76	81.81	52.12	81.58	52.47	97
98	83.11	51.93	82.88	52.29	82.65	52.66	82.42	53.02	98
99	83.96	52.46	83.73	52.83	83.50	53.19	83.26	53.56	99
100	84.80	52.99	84.57	53.36	84.34	53.73	84.10	54.10	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	58 Deg.		57¾ Deg.		57½ Deg.		57¼ Deg.		

TRAVERSE TABLE.

Distance.	33 Deg.		33¼ Deg.		33½ Deg.		33¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.84	0.54	0.84	0.55	0.83	0.55	0.83	0.56	1
2	1.68	1.09	1.67	1.10	1.67	1.10	1.66	1.11	2
3	2.52	1.63	2.51	1.64	2.50	1.66	2.49	1.67	3
4	3.35	2.18	3.35	2.19	3.34	2.21	3.33	2.22	4
5	4.19	2.72	4.18	2.74	4.17	2.76	4.16	2.78	5
6	5.03	3.27	5.02	3.29	5.00	3.31	4.99	3.33	6
7	5.87	3.81	5.85	3.84	5.84	3.86	5.82	3.89	7
8	6.71	4.36	6.69	4.39	6.67	4.42	6.65	4.44	8
9	7.55	4.90	7.53	4.93	7.50	4.97	7.48	5.00	9
10	8.39	5.45	8.36	5.48	8.34	5.52	8.31	5.56	10
11	9.23	5.99	9.20	6.03	9.17	6.07	9.15	6.11	11
12	10.06	6.54	10.04	6.58	10.01	6.62	9.98	6.67	12
13	10.90	7.08	10.87	7.13	10.84	7.18	10.81	7.22	13
14	11.74	7.62	11.71	7.68	11.67	7.73	11.64	7.78	14
15	12.58	8.17	12.54	8.22	12.51	8.28	12.47	8.33	15
16	13.42	8.71	13.38	8.77	13.34	8.83	13.30	8.89	16
17	14.26	9.26	14.22	9.32	14.18	9.38	14.13	9.44	17
18	15.10	9.80	15.05	9.87	15.01	9.93	14.97	10.00	18
19	15.93	10.35	15.89	10.42	15.84	10.49	15.80	10.56	19
20	16.77	10.89	16.73	10.97	16.68	11.04	16.63	11.11	20
21	17.61	11.44	17.56	11.51	17.51	11.59	17.46	11.67	21
22	18.45	11.98	18.40	12.06	18.35	12.14	18.29	12.22	22
23	19.29	12.53	19.23	12.61	19.18	12.69	19.12	12.78	23
24	20.13	13.07	20.07	13.16	20.01	13.25	19.96	13.33	24
25	20.97	13.62	20.91	13.71	20.85	13.80	20.79	13.89	25
26	21.81	14.16	21.74	14.26	21.68	14.35	21.62	14.44	26
27	22.64	14.71	22.58	14.80	22.51	14.90	22.45	15.00	27
28	23.48	15.25	23.42	15.35	23.35	15.45	23.28	15.56	28
29	24.32	15.79	24.25	15.90	24.18	16.01	24.11	16.11	29
30	25.16	16.34	25.09	16.45	25.02	16.56	24.94	16.67	30
31	26.00	16.88	25.92	17.00	25.85	17.11	25.78	17.22	31
32	26.84	17.43	26.76	17.55	26.68	17.66	26.61	17.78	32
33	27.68	17.97	27.60	18.09	27.52	18.21	27.44	18.33	33
34	28.51	18.52	28.43	18.64	28.35	18.77	28.27	18.89	34
35	29.35	19.06	29.27	19.19	29.19	19.32	29.10	19.44	35
36	30.19	19.61	30.11	19.74	30.02	19.87	29.93	20.00	36
37	31.03	20.15	30.94	20.29	30.85	20.42	30.76	20.56	37
38	31.87	20.70	31.78	20.84	31.69	20.97	31.60	21.11	38
39	32.71	21.24	32.62	21.38	32.52	21.53	32.43	21.67	39
40	33.55	21.79	33.45	21.93	33.36	22.08	33.26	22.22	40
41	34.39	22.33	34.29	22.48	34.19	22.63	34.09	22.78	41
42	35.22	22.87	35.12	23.03	35.02	23.18	34.92	23.33	42
43	36.06	23.42	35.96	23.58	35.86	23.73	35.75	23.89	43
44	36.90	23.96	36.80	24.12	36.69	24.29	36.58	24.45	44
45	37.74	24.51	37.63	24.67	37.52	24.84	37.42	25.00	45
46	38.58	25.05	38.47	25.22	38.36	25.39	38.25	25.56	46
47	39.42	25.60	39.31	25.77	39.19	25.94	39.08	26.11	47
48	40.26	26.14	40.14	26.32	40.03	26.49	39.91	26.67	48
49	41.09	26.69	40.98	26.87	40.86	27.04	40.74	27.22	49
50	41.93	27.23	41.81	27.41	41.69	27.60	41.57	27.78	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	57 Deg.		56¾ Deg.		56½ Deg.		56¼ Deg.		

TRAVERSE TABLE.

Distance.	33 Deg.		33¼ Deg.		33½ Deg.		33¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	42-77	27-78	42-65	27-96	42-53	28-15	42-40	28-33	51
52	43-61	28-32	43-40	28-51	43-36	28-70	43-24	28-89	52
53	44-45	28-87	44-32	29-06	44-20	29-25	44-07	29-45	53
54	45-29	29-41	45-16	29-61	45-03	29-80	44-90	30-00	54
55	46-13	29-96	46-00	30-16	45-86	30-36	45-73	30-56	55
56	46-97	30-50	46-83	30-70	46-70	30-91	46-56	31-11	56
57	47-80	31-04	47-67	31-25	47-53	31-46	47-39	31-67	57
58	48-64	31-59	48-50	31-80	48-37	32-01	48-23	32-22	58
59	49-48	32-13	49-34	32-35	49-20	32-56	49-06	32-78	59
60	50-32	32-68	50-18	32-90	50-03	33-12	49-89	33-33	60
61	51-16	33-22	51-01	33-45	50-87	33-67	50-72	33-89	61
62	52-00	33-77	51-85	33-99	51-70	34-22	51-55	34-45	62
63	52-84	34-31	52-69	34-54	52-53	34-77	52-38	35-00	63
64	53-67	34-86	53-52	35-09	53-37	35-32	53-21	35-56	64
65	54-51	35-40	54-36	35-64	54-20	35-88	54-05	36-11	65
66	55-35	35-95	55-19	36-19	55-04	36-43	54-88	36-67	66
67	56-19	36-49	56-03	36-74	55-87	36-98	55-71	37-22	67
68	57-03	37-04	56-87	37-28	56-70	37-53	56-54	37-78	68
69	57-87	37-58	57-70	37-83	57-54	38-08	57-37	38-33	69
70	58-71	38-12	58-54	38-38	58-37	38-64	58-20	38-89	70
71	59-55	38-67	59-38	38-93	59-21	39-19	59-03	39-45	71
72	60-38	39-21	60-21	39-48	60-04	39-74	59-87	40-00	72
73	61-22	39-76	61-05	40-03	60-87	40-29	60-70	40-56	73
74	62-06	40-30	61-89	40-57	61-71	40-84	61-53	41-11	74
75	62-90	40-85	62-72	41-12	62-54	41-40	62-36	41-67	75
76	63-74	41-39	63-56	41-67	63-38	41-95	63-19	42-22	76
77	64-58	41-94	64-39	42-22	64-21	42-50	64-02	42-78	77
78	65-42	42-48	65-23	42-77	65-04	43-05	64-85	43-33	78
79	66-25	43-03	66-07	43-32	65-88	43-60	65-69	43-89	79
80	67-09	43-57	66-90	43-86	66-71	44-15	66-52	44-45	80
81	67-93	44-12	67-74	44-41	67-54	44-71	67-35	45-00	81
82	68-77	44-66	68-58	44-96	68-38	45-26	68-18	45-56	82
83	69-61	45-20	69-41	45-51	69-21	45-81	69-01	46-11	83
84	70-45	45-75	70-25	46-06	70-05	46-36	69-84	46-67	84
85	71-29	46-29	71-08	46-60	70-88	46-91	70-67	47-22	85
86	72-13	46-84	71-92	47-15	71-71	47-47	71-51	47-78	86
87	72-96	47-38	72-76	47-70	72-55	48-02	72-34	48-33	87
88	73-80	47-93	73-59	48-25	73-38	48-57	73-17	48-89	88
89	74-64	48-47	74-43	48-80	74-22	49-12	74-00	49-45	89
90	75-48	49-02	75-27	49-35	75-05	49-67	74-83	50-00	90
91	76-32	49-56	76-10	49-89	75-88	50-23	75-66	50-56	91
92	77-16	50-11	76-94	50-44	76-72	50-78	76-50	51-11	92
93	78-00	50-65	77-77	50-99	77-55	51-33	77-33	51-67	93
94	78-83	51-20	78-61	51-54	78-39	51-88	78-16	52-22	94
95	79-67	51-74	79-45	52-09	79-22	52-43	78-99	52-78	95
96	80-51	52-29	80-28	52-64	80-05	52-99	79-82	53-33	96
97	81-35	52-83	81-12	53-18	80-89	53-54	80-65	53-89	97
98	82-19	53-37	81-96	53-73	81-72	54-09	81-48	54-45	98
99	83-03	53-92	82-79	54-28	82-55	54-64	82-32	55-00	99
100	83-87	54-46	83-63	54-83	83-39	55-19	83-15	55-56	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	57 Deg.		56¾ Deg.		56½ Deg.		56¼ Deg.		

TRAVERSE TABLE.

Distance.	34 Deg.		34¼ Deg.		34½ Deg.		34¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-83	0-56	0-83	0-56	0-82	0-57	0-82	0-57	1
2	1-66	1-12	1-65	1-13	1-65	1-13	1-64	1-14	2
3	2-49	1-68	2-48	1-69	2-47	1-70	2-46	1-71	3
4	3-32	2-24	3-31	2-25	3-30	2-27	3-29	2-28	4
5	4-15	2-80	4-13	2-81	4-12	2-83	4-11	2-85	5
6	4-97	3-36	4-96	3-38	4-94	3-40	4-93	3-42	6
7	5-80	3-91	5-79	3-94	5-77	3-96	5-75	3-99	7
8	6-63	4-47	6-61	4-50	6-59	4-53	6-57	4-56	8
9	7-46	5-03	7-44	5-07	7-42	5-10	7-39	5-13	9
10	8-29	5-59	8-27	5-63	8-24	5-66	8-22	5-70	10
11	9-12	6-15	9-09	6-19	9-07	6-23	9-04	6-27	11
12	9-35	6-71	9-32	6-75	9-29	6-80	9-26	6-84	12
13	10-78	7-27	10-75	7-32	10-71	7-36	10-68	7-41	13
14	11-61	7-83	11-57	7-88	11-54	7-93	11-50	7-98	14
15	12-44	8-39	12-40	8-44	12-36	8-50	12-32	8-55	15
16	13-26	8-95	13-23	9-00	13-19	9-06	13-15	9-12	16
17	14-09	9-51	14-05	9-57	14-01	9-63	13-97	9-69	17
18	14-92	10-07	14-88	10-13	14-83	10-20	14-79	10-26	18
19	15-75	10-62	15-71	10-69	15-66	10-76	15-61	10-83	19
20	16-58	11-18	16-53	11-26	16-48	11-33	16-43	11-40	20
21	17-41	11-74	17-36	11-82	17-31	11-89	17-25	11-97	21
22	18-24	12-30	18-18	12-38	18-13	12-46	18-08	12-54	22
23	19-07	12-86	19-01	12-94	18-95	13-03	18-90	13-11	23
24	19-90	13-42	19-84	13-51	19-78	13-59	19-72	13-68	24
25	20-73	13-98	20-66	14-07	20-60	14-16	20-54	14-25	25
26	21-55	14-54	21-49	14-63	21-43	14-73	21-36	14-82	26
27	22-38	15-10	22-32	15-20	22-25	15-29	22-18	15-39	27
28	23-21	15-66	23-14	15-76	23-08	15-86	23-01	15-96	28
29	24-04	16-22	23-97	16-32	23-90	16-43	23-83	16-53	29
30	24-87	16-78	24-80	16-88	24-72	16-99	24-65	17-10	30
31	25-70	17-33	25-62	17-45	25-55	17-56	25-47	17-67	31
32	26-53	17-89	26-45	18-01	26-37	18-12	26-29	18-24	32
33	27-36	18-45	27-28	18-57	27-20	18-69	27-11	18-81	33
34	28-19	19-01	28-10	19-14	28-02	19-26	27-94	19-28	34
35	29-02	19-57	28-93	19-70	28-84	19-82	28-76	19-95	35
36	29-85	20-13	29-76	20-26	29-67	20-39	29-58	20-52	36
37	30-67	20-69	30-58	20-82	30-49	20-96	30-40	21-09	37
38	31-50	21-25	31-41	21-39	31-32	21-52	31-22	21-66	38
39	32-33	21-81	32-24	21-95	32-14	22-09	32-04	22-23	39
40	33-16	22-37	33-06	22-51	32-97	22-66	32-87	22-80	40
41	33-99	22-93	33-89	23-07	33-79	23-22	33-69	23-37	41
42	34-82	23-49	34-72	23-64	34-61	23-79	34-51	23-94	42
43	35-65	24-05	35-54	24-20	35-44	24-36	35-33	24-51	43
44	36-48	24-60	36-37	24-76	36-26	24-92	36-15	25-08	44
45	37-31	25-16	37-20	25-33	37-09	25-49	36-97	25-65	45
46	38-14	25-72	38-02	25-89	37-91	26-05	37-80	26-22	46
47	38-96	26-28	38-85	26-45	38-73	26-62	38-62	26-79	47
48	39-79	26-84	39-68	27-01	39-56	27-19	39-44	27-36	48
49	40-62	27-40	40-50	27-58	40-38	27-75	40-26	27-93	49
50	41-45	27-96	41-33	28-14	41-21	28-32	41-08	28-50	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	56 Deg.		55¾ Deg.		55½ Deg.		55¼ Deg.		

TRAVERSE TABLE.

Distance.	34 Deg.		34¼ Deg.		34½ Deg.		34¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	42-28	28-52	42-16	28-70	42-03	28-80	41-90	29-07	51
52	43-11	29-08	42-08	29-27	42-55	29-45	42-73	29-64	52
53	43-04	29-64	43-81	29-83	43-08	30-02	43-55	30-21	53
54	44-77	30-20	44-64	30-39	44-30	30-59	44-37	30-78	54
55	45-60	30-76	45-46	30-95	45-33	31-15	45-19	31-35	55
56	46-43	31-31	46-29	31-52	46-15	31-72	46-01	31-92	56
57	47-26	31-87	47-12	32-08	46-98	32-29	46-83	32-49	57
58	48-08	32-43	47-94	32-64	47-80	32-85	47-66	33-06	58
59	48-91	32-99	48-77	33-21	48-62	33-42	48-48	33-63	59
60	49-74	33-55	49-60	33-77	49-45	33-98	49-30	34-20	60
61	50-57	34-11	50-42	34-33	50-27	34-55	50-12	34-77	61
62	51-40	34-67	51-25	34-89	51-10	35-12	50-94	35-34	62
63	52-23	35-23	52-08	35-46	51-92	35-68	51-76	35-91	63
64	53-06	35-79	52-90	36-02	52-74	36-25	52-59	36-48	64
65	53-89	36-35	53-73	36-58	53-57	36-82	53-41	37-05	65
66	54-72	36-91	54-55	37-15	54-39	37-38	54-23	37-62	66
67	55-55	37-46	55-38	37-71	55-22	37-95	55-05	38-19	67
68	56-37	38-03	56-21	38-27	56-04	38-52	55-87	38-76	68
69	57-20	38-58	57-03	38-83	56-86	39-08	56-69	39-33	69
70	58-03	39-14	57-86	39-40	57-68	39-65	57-52	39-90	70
71	58.86	39-70	58-69	39-96	58-51	40-21	58-34	40-47	71
72	59-69	40-26	59-51	40-52	59-34	40-78	59-16	41-04	72
73	60-52	40-82	60-34	41-08	60-16	41-35	59-98	41-61	73
74	61-35	41-38	61-17	41-65	60-99	41-91	60-80	42-18	74
75	62-18	41-94	61-99	42-21	61-81	42-48	61-62	42-75	75
76	63-01	42-50	62-82	42-77	62-63	43-05	62-45	43-32	76
77	63-84	43-06	63-65	43-34	63-46	43-61	63-27	43-89	77
78	64-66	43-62	64-47	43-90	64-28	44-18	64-09	44-46	78
79	65-49	44-18	65-30	44-46	65-11	44-75	64-91	45-03	79
80	66-32	44-74	66-13	45-02	65-93	45-31	65-73	45-60	80
81	67-15	45-29	66-95	45-59	66-75	45-88	66-55	46-17	81
82	67-98	45-85	67-78	46-15	67-58	46-45	67-37	46-74	82
83	68-81	46-41	68-61	46-71	68-40	47-01	68-20	47-31	83
84	69-64	46-97	69-43	47-28	69-23	47-58	69-02	47-88	84
85	70-47	47-53	70-26	47-84	70-05	48-14	69-84	48-45	85
86	71-30	48-09	71-09	48-40	70-87	48-71	70-66	49-02	86
87	72-13	48-65	71-91	48-96	71-70	49-28	71-48	49-59	87
88	72-96	49-21	72-74	49-53	72-52	49-84	72-30	50-16	88
89	73-78	49-77	73-57	50-09	73-35	50-41	73-13	50-73	89
90	74-61	50-33	74-39	50-65	74-17	50-98	73-95	51-30	90
91	75-44	50-89	75-22	51-22	75-00	51-54	74-77	51-87	91
92	76-27	51-45	76-05	51-78	75-82	52-11	75-59	52-44	92
93	77-10	52-00	76-87	52-34	76-64	52-68	76-41	53-01	93
94	77-93	52-56	77-70	52-90	77-47	53-24	77-23	53-58	94
95	78-76	53-12	78-53	53-47	78-29	53-81	78-06	54-15	95
96	79-59	53-68	79-35	54-03	79-12	54-37	78-88	54-72	96
97	80-42	54-24	80-18	54-59	79-94	54-94	79-70	55-29	97
98	81-25	54-80	81-01	55-15	80-76	55-51	80-52	55-86	98
99	82-07	55-36	81-83	55-72	81-53	56-07	81-34	56-43	99
100	82-90	55-92	82-66	56-28	82-41	56-64	82-16	57-00	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	56 Deg.		55¾ Deg.		55½ Deg.		55¼ Deg.		

TRAVERSE TABLE

Distance.	35 Deg.		35¼ Deg.		35½ Deg.		35¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0:82	0:57	0:82	0:58	0:81	0:58	0:81	0:58	1
2	1:64	1:15	1:63	1:15	1:63	1:16	1:62	1:17	2
3	2:46	1:72	2:45	1:73	2:44	1:74	2:43	1:75	3
4	3:28	2:29	3:27	2:31	3:26	2:32	3:25	2:34	4
5	4:10	2:87	4:08	2:89	4:07	2:90	4:06	2:92	5
6	4:91	3:44	4:90	3:46	4:88	3:48	4:87	3:51	6
7	5:73	4:01	5:72	4:04	5:70	4:06	5:68	4:09	7
8	6:55	4:59	6:53	4:62	6:51	4:65	6:49	4:67	8
9	7:37	5:16	7:35	5:19	7:33	5:23	7:30	5:26	9
10	8:19	5:74	8:17	5:77	8:14	5:81	8:12	5:84	10
11	9:01	6:31	8:98	6:35	8:96	6:39	8:93	6:43	11
12	9:83	6:88	9:80	6:93	9:77	6:97	9:74	7:01	12
13	10:65	7:46	10:62	7:50	10:58	7:55	10:55	7:60	13
14	11:47	8:03	11:43	8:08	11:40	8:13	11:36	8:18	14
15	12:29	8:60	12:25	8:66	12:21	8:71	12:17	8:76	15
16	13:11	9:18	13:07	9:23	13:03	9:29	12:99	9:35	16
17	13:93	9:75	13:88	9:81	13:84	9:87	13:80	9:93	17
18	14:74	10:32	14:70	10:39	14:65	10:45	14:61	10:52	18
19	15:56	10:90	15:52	10:97	15:47	11:03	15:42	11:10	19
20	16:38	11:47	16:33	11:54	16:28	11:61	16:23	11:68	20
21	17:20	12:05	17:15	12:12	17:10	12:19	17:04	12:27	21
22	18:02	12:62	17:97	12:70	17:01	12:78	17:85	12:85	22
23	18:84	13:19	18:78	13:27	18:72	13:36	18:67	13:44	23
24	19:66	13:77	19:60	13:85	19:54	13:94	19:48	14:02	24
25	20:48	14:34	20:42	14:43	20:35	14:52	20:29	14:61	25
26	21:30	14:91	21:23	15:01	21:17	15:10	21:10	15:19	26
27	22:12	15:49	22:05	15:58	21:98	15:68	21:91	15:77	27
28	22:94	16:06	22:87	16:16	22:80	16:26	22:72	16:36	28
29	23:76	16:63	23:68	16:74	23:61	16:84	23:54	16:94	29
30	24:57	17:21	24:50	17:31	24:42	17:42	24:35	17:53	30
31	25:39	17:78	25:32	17:89	25:24	18:00	25:16	18:11	31
32	26:21	18:35	26:13	18:47	26:05	18:58	25:97	18:70	32
33	27:03	18:93	26:95	19:05	26:87	19:16	26:78	19:28	33
34	27:85	19:50	27:77	19:62	27:68	19:74	27:59	19:86	34
35	28:67	20:08	28:58	20:20	28:49	20:32	28:41	20:45	35
36	29:49	20:65	29:40	20:78	29:31	20:91	29:22	21:03	36
37	30:31	21:22	30:22	21:35	30:12	21:49	30:03	21:62	37
38	31:13	21:80	31:03	21:93	30:94	22:07	30:84	22:20	38
39	31:95	22:37	31:85	22:51	31:75	22:65	31:65	22:79	39
40	32:77	22:94	32:67	23:09	32:56	23:23	32:46	23:37	40
41	33:59	23:52	33:48	23:66	33:38	23:81	33:27	23:95	41
42	34:40	24:09	34:30	24:24	34:19	24:39	34:09	24:54	42
43	35:22	24:66	35:12	24:82	35:01	24:97	34:90	25:12	43
44	36:04	25:24	35:93	25:39	35:82	25:55	35:71	25:71	44
45	36:86	25:81	36:75	25:97	36:64	26:13	36:52	26:29	45
46	37:68	26:38	37:57	26:55	37:45	26:71	37:33	26:88	46
47	38:50	26:96	38:38	27:13	38:26	27:29	38:14	27:46	47
48	39:32	27:53	39:20	27:70	39:08	27:87	38:96	28:04	48
49	40:14	28:11	40:02	28:28	39:89	28:45	39:77	28:63	49
50	40:96	28:68	40:83	28:86	40:71	29:04	40:58	29:21	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	55 Deg.		54¾ Deg.		54½ Deg.		54¼ Deg.		

TRAVERSE TABLE.

Distance.	35 Deg.		35¼ Deg.		35½ Deg.		35¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	41 78	29 25	41 65	29 43	41 52	29 62	41 39	29 80	51
52	42 60	29 53	42 47	30 01	42 33	30 20	42 20	30 38	52
53	43 42	30 40	43 28	30 59	43 15	30 78	43 01	30 97	53
54	44 23	30 97	44 10	31 17	43 96	31 36	43 82	31 55	54
55	45 05	31 55	44 92	31 74	44 78	31 94	44 64	32 13	55
56	45 87	32 12	45 73	32 32	45 59	32 52	45 45	32 72	56
57	46 69	32 69	46 55	32 90	46 40	33 10	46 26	33 30	57
58	47 51	33 27	47 37	33 47	47 22	33 68	47 07	33 89	58
59	48 33	33 84	48 18	34 05	48 08	34 26	47 88	34 47	59
60	49 15	34 41	49 00	34 63	48 85	34 84	48 69	35 05	60
61	49 97	34 99	49 82	35 21	49 66	35 42	49 51	35 64	61
62	50 79	35 56	50 63	35 78	50 48	36 00	50 32	36 22	62
63	51 61	36 14	51 45	36 36	51 29	36 58	51 13	36 81	63
64	52 43	36 71	52 27	36 94	52 10	37 16	51 94	37 39	64
65	53 24	37 28	53 08	37 51	52 92	37 75	52 75	37 98	65
66	54 06	37 86	53 90	38 09	53 73	38 33	53 56	38 56	66
67	54 88	38 43	54 71	38 67	54 55	38 91	54 38	39 14	67
68	55 70	39 00	55 53	39 25	55 36	39 49	55 19	39 73	68
69	56 52	39 58	56 35	39 82	56 17	40 07	56 00	40 31	69
70	57 34	40 15	57 16	40 40	56 99	40 65	56 81	40 90	70
71	58 16	40 72	57 98	40 98	57 80	41 23	57 62	41 48	71
72	58 98	41 30	58 80	41 55	58 62	41 81	58 43	42 07	72
73	59 80	41 87	59 61	42 13	59 43	42 39	59 24	42 65	73
74	60 62	42 44	60 43	42 71	60 24	42 97	60 06	43 23	74
75	61 44	43 02	61 25	43 29	61 06	43 55	60 87	43 82	75
76	62 26	43 59	62 06	43 86	61 87	44 13	61 68	44 40	76
77	63 07	44 17	62 88	44 44	62 69	44 71	62 49	44 99	77
78	63 89	44 74	63 70	45 02	63 50	45 29	63 30	45 57	78
79	64 71	45 31	64 51	45 59	64 32	45 88	64 11	46 16	79
80	65 53	45 89	65 33	46 17	65 13	46 46	64 93	46 74	80
81	66 35	46 46	66 15	46 75	65 94	47 04	65 74	47 32	81
82	67 17	47 03	66 96	47 33	66 76	47 62	66 55	47 91	82
83	67 99	47 61	67 78	47 90	67 57	48 20	67 36	48 49	83
84	68 81	48 18	68 60	48 48	68 39	48 78	68 17	49 08	84
85	69 63	48 75	69 41	49 06	69 20	49 36	68 98	49 66	85
86	70 45	49 33	70 23	49 63	70 01	49 94	69 80	50 25	86
87	71 27	49 90	71 05	50 21	70 83	50 52	70 61	50 83	87
88	72 09	50 47	71 86	50 79	71 64	51 10	71 42	51 41	88
89	72 90	51 05	72 68	51 37	72 46	51 68	72 23	52 00	89
90	73 72	51 62	73 50	51 94	73 27	52 26	73 04	52 58	90
91	74 54	52 20	74 31	52 52	74 08	52 84	73 85	53 17	91
92	75 36	52 77	75 13	53 10	74 90	53 42	74 66	53 75	92
93	76 18	53 34	75 95	53 67	75 71	54 01	75 48	54 34	93
94	77 00	53 92	76 76	54 25	76 53	54 59	76 29	54 92	94
95	77 82	54 49	77 58	54 83	77 34	55 17	77 10	55 50	95
96	78 64	55 06	78 40	55 41	78 16	55 75	77 91	56 09	96
97	79 46	55 64	79 21	55 98	78 97	56 33	78 72	56 67	97
98	80 28	56 21	80 03	56 56	79 78	56 91	79 53	57 26	98
99	81 10	56 78	80 85	57 14	80 60	57 49	80 35	57 84	99
100	81 92	57 36	81 66	57 71	81 41	58 07	81 16	58 42	100

Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	55 Deg.		54¾ Deg.		54½ D g.		54¼ Deg.		

Distance.	36 Deg.		36 $\frac{1}{4}$ Deg.		36 $\frac{1}{2}$ Deg.		36 $\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-81	0-59	0-81	0-59	0-80	0-59	0-80	0-60	1
2	1-02	1-18	1-61	1-18	1-61	1-19	1-60	1-20	2
3	2-43	1-76	2-42	1-77	2-41	1-78	2-40	1-79	3
4	3-24	2-35	3-23	2-37	3-22	2-38	3-20	2-39	4
5	4-05	2-94	4-03	2-96	4-02	2-97	4-01	2-99	5
6	4-85	3-53	4-84	3-55	4-82	3-57	4-81	3-59	6
7	5-66	4-11	5-65	4-14	5-63	4-16	5-61	4-19	7
8	6-47	4-70	6-45	4-73	6-43	4-76	6-41	4-79	8
9	7-28	5-29	7-26	5-32	7-23	5-35	7-21	5-38	9
10	8-09	5-88	8-06	5-91	8-04	5-95	8-01	5-98	10
11	8-30	6-47	8-87	6-50	8-84	6-54	8-81	6-58	11
12	9-71	7-05	9-68	7-10	9-65	7-14	9-61	7-18	12
13	10-52	7-64	10-48	7-69	10-45	7-73	10-42	7-78	13
14	11-33	8-23	11-29	8-28	11-25	8-33	11-22	8-38	14
15	12-14	8-82	12-10	8-87	12-06	8-92	12-02	8-97	15
16	12-94	9-40	12-90	9-46	12-86	9-52	12-82	9-57	16
17	13-75	9-99	13-71	10-05	13-67	10-11	13-62	10-17	17
18	14-56	10-58	14-52	10-64	14-47	10-71	14-42	10-77	18
19	15-37	11-17	15-32	11-23	15-27	11-30	15-22	11-37	19
20	16-18	11-76	16-13	11-83	16-08	11-90	16-03	11-97	20
21	16-99	12-34	16-94	12-42	16-88	12-49	16-83	12-56	21
22	17-80	12-93	17-74	13-01	17-68	13-09	17-63	13-16	22
23	18-61	13-52	18-55	13-60	18-49	13-68	18-43	13-76	23
24	19-42	14-11	19-35	14-19	19-29	14-28	19-23	14-36	24
25	20-23	14-69	20-16	14-78	20-10	14-87	20-03	14-96	25
26	21-03	15-28	20-97	15-37	20-90	15-47	20-83	15-56	26
27	21-84	15-87	21-77	15-97	21-70	16-06	21-63	16-15	27
28	22-65	16-46	22-58	16-56	22-51	16-65	22-44	16-75	28
29	23-46	17-05	23-39	17-15	23-31	17-25	23-24	17-35	29
30	24-27	17-63	24-19	17-74	24-12	17-84	24-04	17-95	30
31	25-08	18-22	25-00	18-33	24-92	18-44	24-84	18-55	31
32	25-89	18-81	25-81	18-92	25-72	19-03	25-64	19-15	32
33	26-70	19-40	26-61	19-51	26-53	19-63	26-44	19-74	33
34	27-51	19-98	27-42	20-10	27-33	20-22	27-24	20-34	34
35	28-32	20-57	28-23	20-70	28-13	20-82	28-04	20-94	35
36	29-12	21-16	29-03	21-29	28-94	21-41	28-85	21-54	36
37	29-93	21-75	29-84	21-88	29-74	22-01	29-65	22-14	37
38	30-74	22-34	30-64	22-47	30-55	22-60	30-45	22-74	38
39	31-55	22-92	31-45	23-06	31-35	23-20	31-25	23-33	39
40	32-36	23-51	32-26	23-65	32-15	23-79	32-05	23-93	40
41	33-17	24-10	33-06	24-24	32-96	24-39	32-85	24-53	41
42	33-98	24-69	33-87	24-83	33-76	24-98	33-65	25-13	42
43	34-79	25-27	34-68	25-43	34-57	25-58	34-45	25-73	43
44	35-60	25-86	35-48	26-02	35-37	26-17	35-26	26-33	44
45	36-41	26-45	36-29	26-61	36-17	26-77	36-06	26-92	45
46	37-21	27-04	37-10	27-20	36-98	27-36	36-86	27-52	46
47	38-02	27-63	37-90	27-79	37-78	27-96	37-66	28-12	47
48	38-83	28-21	38-71	28-38	38-59	28-55	38-46	28-72	48
49	39-64	28-80	39-52	28-97	39-39	29-15	39-26	29-32	49
50	40-45	29-39	40-32	29-57	40-19	29-74	40-06	29-92	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	54 Deg.		53 $\frac{1}{4}$ Deg.		53 $\frac{1}{2}$ Deg.		53 $\frac{3}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	36 Deg.		36¼ Deg.		36½ Deg.		36¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	41.26	29.98	41.13	30.16	41.00	30.34	40.86	30.51	51
52	42.07	30.56	41.94	30.75	41.80	30.93	41.67	31.11	52
53	42.88	31.15	42.74	31.34	42.60	31.53	42.47	31.71	53
54	43.69	31.74	43.55	31.93	43.41	32.12	43.27	32.31	54
55	44.50	32.33	44.35	32.52	44.21	32.72	44.07	32.91	55
56	45.30	32.92	45.16	33.11	45.02	33.31	44.87	33.51	56
57	46.11	33.50	45.97	33.70	45.82	33.90	45.67	34.10	57
58	46.92	34.09	46.77	34.30	46.62	34.50	46.47	34.70	58
59	47.73	34.68	47.58	34.89	47.43	35.09	47.27	35.30	59
60	48.54	35.27	48.39	35.48	48.23	35.69	48.08	35.90	60
61	49.35	35.85	49.19	36.07	49.04	36.28	48.88	36.50	61
62	50.16	36.44	50.00	36.66	49.84	36.88	49.68	37.10	62
63	50.97	37.03	50.81	37.25	50.64	37.47	50.48	37.69	63
64	51.78	37.62	51.61	37.84	51.45	38.07	51.28	38.29	64
65	52.59	38.21	52.42	38.44	52.25	38.66	52.08	38.89	65
66	53.40	38.79	53.23	39.03	53.05	39.26	52.88	39.49	66
67	54.20	39.38	54.03	39.62	53.86	39.85	53.68	40.09	67
68	55.01	39.97	54.84	40.21	54.66	40.45	54.49	40.69	68
69	55.82	40.56	55.64	40.80	55.47	41.04	55.29	41.28	69
70	56.63	41.14	56.45	41.39	56.27	41.64	56.09	41.88	70
71	57.44	41.73	57.26	41.98	57.07	42.23	56.89	42.48	71
72	58.25	42.32	58.06	42.57	57.88	42.83	57.69	43.08	72
73	59.06	42.91	58.87	43.17	58.68	43.42	58.49	43.68	73
74	59.87	43.50	59.68	43.76	59.49	44.02	59.29	44.28	74
75	60.68	44.08	60.48	44.35	60.29	44.61	60.09	44.87	75
76	61.49	44.67	61.29	44.94	61.09	45.21	60.90	45.47	76
77	62.29	45.26	62.10	45.53	61.90	45.80	61.70	46.07	77
78	63.10	45.85	62.90	46.12	62.70	46.40	62.50	46.67	78
79	63.91	46.43	63.71	46.71	63.50	46.99	63.30	47.27	79
80	64.72	47.02	64.52	47.30	64.31	47.59	64.10	47.87	80
81	65.53	47.61	65.32	47.90	65.11	48.18	64.90	48.46	81
82	66.34	48.20	66.13	48.49	65.92	48.78	65.70	49.06	82
83	67.15	48.79	66.93	49.08	66.72	49.37	66.50	49.66	83
84	67.96	49.37	67.74	49.67	67.52	49.97	67.31	50.26	84
85	68.77	49.96	68.55	50.26	68.33	50.56	68.11	50.86	85
86	69.58	50.55	69.35	50.85	69.13	51.15	68.91	51.46	86
87	70.38	51.14	70.16	51.44	69.94	51.75	69.71	52.05	87
88	71.19	51.73	70.97	52.04	70.74	52.34	70.51	52.65	88
89	72.00	52.31	71.77	52.63	71.54	52.94	71.31	53.25	89
90	72.81	52.90	72.58	53.22	72.35	53.53	72.11	53.85	90
91	73.62	53.49	73.39	53.81	73.15	54.13	72.91	54.45	91
92	74.43	54.08	74.19	54.40	73.95	54.72	73.72	55.05	92
93	75.24	54.66	75.00	54.99	74.76	55.32	74.52	55.64	93
94	76.05	55.25	75.81	55.58	75.56	55.91	75.32	56.24	94
95	76.86	55.84	76.61	56.17	76.37	56.51	76.12	56.84	95
96	77.67	56.43	77.42	56.77	77.17	57.10	76.92	57.44	96
97	78.47	57.02	78.23	57.36	77.97	57.70	77.72	58.04	97
98	79.28	57.60	79.03	57.95	78.78	58.29	78.52	58.64	98
99	80.09	58.19	79.84	58.54	79.58	58.89	79.32	59.23	99
100	80.90	58.78	80.64	59.13	80.39	59.48	80.13	59.83	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	54 Deg.		53¾ Deg.		53½ Deg.		53¼ Deg.		

TRAVERSE TABLE.

Distance.	37 Deg.		37¼ Deg.		37½ Deg.		37¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0:80	0:60	0:80	0:61	0:79	0:61	0:79	0:61	1
2	1:60	1:20	1:59	1:21	1:59	1:22	1:58	1:22	2
3	2:40	1:81	2:39	1:82	2:38	1:83	2:37	1:84	3
4	3:19	2:41	3:18	2:42	3:17	2:43	3:16	2:45	4
5	3:99	3:01	3:98	3:03	3:97	3:04	3:95	3:06	5
6	4:79	3:61	4:78	3:63	4:76	3:65	4:74	3:67	6
7	5:59	4:21	5:57	4:24	5:55	4:26	5:53	4:29	7
8	6:39	4:81	6:37	4:84	6:35	4:87	6:33	4:90	8
9	7:19	5:42	7:16	5:45	7:14	5:48	7:12	5:51	9
10	7:99	6:02	7:96	6:05	7:93	6:09	7:91	6:12	10
11	8:78	6:62	8:76	6:66	8:73	6:70	8:70	6:73	11
12	9:58	7:22	9:55	7:26	9:52	7:31	9:49	7:35	12
13	10:38	7:82	10:35	7:87	10:31	7:91	10:28	7:96	13
14	11:18	8:43	11:14	8:47	11:11	8:52	11:07	8:57	14
15	11:98	9:03	11:94	9:08	11:90	9:13	11:86	9:18	15
16	12:78	9:63	12:74	9:68	12:69	9:74	12:65	9:80	16
17	13:58	10:23	13:53	10:29	13:49	10:35	13:44	10:41	17
18	14:38	10:83	14:33	10:90	14:28	10:96	14:23	11:02	18
19	15:17	11:43	15:12	11:50	15:07	11:57	15:02	11:63	19
20	15:97	12:04	15:92	12:11	15:87	12:18	15:81	12:24	20
21	16:77	12:64	16:72	12:71	16:66	12:78	16:60	12:86	21
22	17:57	13:24	17:51	13:32	17:45	13:39	17:40	13:47	22
23	18:37	13:84	18:31	13:92	18:25	14:00	18:19	14:08	23
24	19:17	14:44	19:10	14:53	19:04	14:61	18:98	14:69	24
25	19:97	15:05	19:90	15:13	19:83	15:22	19:77	15:31	25
26	20:76	15:65	20:70	15:74	20:63	15:83	20:56	15:92	26
27	21:56	16:25	21:49	16:34	21:42	16:44	21:35	16:53	27
28	22:36	16:85	22:29	16:95	22:21	17:05	22:14	17:14	28
29	23:16	17:45	23:08	17:55	23:01	17:65	22:93	17:75	29
30	23:96	18:05	23:88	18:16	23:80	18:26	23:72	18:37	30
31	24:76	18:66	24:68	18:76	24:59	18:87	24:51	18:98	31
32	25:56	19:26	25:47	19:37	25:39	19:48	25:30	19:59	32
33	26:35	19:86	26:27	19:97	26:18	20:09	26:09	20:20	33
34	27:15	20:46	27:06	20:58	26:97	20:70	26:88	20:82	34
35	27:95	21:06	27:86	21:19	27:77	21:31	27:67	21:43	35
36	28:75	21:67	28:66	21:79	28:56	21:92	28:46	22:04	36
37	29:55	22:27	29:45	22:40	29:35	22:52	29:26	22:65	37
38	30:35	22:87	30:25	23:00	30:15	23:13	30:05	23:26	38
39	31:15	23:47	31:04	23:61	30:94	23:74	30:84	23:88	39
40	31:95	24:07	31:84	24:21	31:73	24:35	31:63	24:49	40
41	32:74	24:67	32:64	24:82	32:53	24:96	32:42	25:10	41
42	33:54	25:28	33:43	25:42	33:32	25:57	33:21	25:71	42
43	34:34	25:88	34:23	26:03	34:11	26:18	34:00	26:33	43
44	35:14	26:48	35:02	26:63	34:91	26:79	34:79	26:94	44
45	35:94	27:08	35:82	27:24	35:70	27:39	35:58	27:55	45
46	36:74	27:68	36:62	27:84	36:49	28:00	36:37	28:16	46
47	37:54	28:29	37:41	28:45	37:29	28:61	37:16	28:77	47
48	38:33	28:89	38:21	29:05	38:08	29:22	37:95	29:39	48
49	39:13	29:49	39:00	29:66	38:87	29:83	38:74	30:00	49
50	39:93	30:09	39:80	30:26	39:67	30:44	39:53	30:61	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	53 Deg.		52¾ Deg.		52½ Deg.		52¼ Deg.		

TRAVERSE TABLE.

Distance.	37 Deg.		37¼ Deg.		37½ Deg.		37¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	40-73	30-69	40-60	30-87	40-46	31-05	40-33	31-22	51
52	41-53	31-29	41-39	31-48	41-25	31-66	41-12	31-84	52
53	42-33	31-90	42-19	32-08	42-05	32-26	41-91	32-45	53
54	43-13	32-50	42-98	32-69	42-84	32-87	42-70	33-06	54
55	43-92	33-10	43-78	33-29	43-63	33-48	43-49	33-67	55
56	44-72	33-70	44-58	33-90	44-43	34-09	44-28	34-28	56
57	45-52	34-30	45-37	34-50	45-22	34-70	45-07	34-90	57
58	46-32	34-91	46-17	35-11	46-01	35-31	45-86	35-51	58
59	47-12	35-51	46-96	35-71	46-81	35-92	46-65	36-12	59
60	47-92	36-11	47-76	36-32	47-60	36-53	47-44	36-73	60
61	48-72	36-71	48-56	36-92	48-39	37-13	48-23	37-35	61
62	49-52	37-31	49-35	37-53	49-19	37-74	49-02	37-96	62
63	50-31	37-91	50-15	38-13	49-98	38-35	49-81	38-57	63
64	51-11	38-52	50-94	38-74	50-77	38-96	50-60	39-18	64
65	51-91	39-12	51-74	39-34	51-57	39-57	51-39	39-79	65
66	52-71	39-72	52-54	39-95	52-36	40-18	52-19	40-41	66
67	53-51	40-32	53-33	40-55	53-15	40-79	52-98	41-02	67
68	54-31	40-92	54-13	41-16	53-95	41-40	53-77	41-63	68
69	55-11	41-53	54-92	41-77	54-74	42-00	54-56	42-24	69
70	55-90	42-13	55-72	42-37	55-53	42-61	55-35	42-86	70
71	56-70	42-73	56-52	42-98	56-33	43-22	56-14	43-47	71
72	57-50	43-33	57-31	43-58	57-12	43-83	56-93	44-08	72
73	58-30	43-93	58-11	44-19	57-91	44-44	57-72	44-69	73
74	59-10	44-53	58-90	44-79	58-71	45-05	58-51	45-30	74
75	59-90	45-14	59-70	45-40	59-50	45-66	59-30	45-92	75
76	60-70	45-74	60-50	46-00	60-29	46-27	60-09	46-53	76
77	61-49	46-34	61-29	46-61	61-09	46-87	60-88	47-14	77
78	62-29	46-94	62-09	47-21	61-88	47-48	61-67	47-75	78
79	63-09	47-54	62-88	47-82	62-67	48-09	62-46	48-37	79
80	63-89	48-15	63-68	48-42	63-47	48-70	63-26	48-98	80
81	64-69	48-75	64-48	49-03	64-26	49-31	64-05	49-59	81
82	65-49	49-35	65-27	49-63	65-05	49-92	64-84	50-20	82
83	66-29	49-95	66-07	50-24	65-85	50-53	65-63	50-81	83
84	67-09	50-55	66-86	50-84	66-64	51-14	66-42	51-43	84
85	67-88	51-15	67-66	51-45	67-43	51-74	67-21	52-04	85
86	68-68	51-76	68-46	52-06	68-23	52-35	68-00	52-65	86
87	69-48	52-36	69-25	52-66	69-02	52-96	68-79	53-26	87
88	70-28	52-96	70-05	53-27	69-82	53-57	69-58	53-88	88
89	71-08	53-56	70-84	53-87	70-61	54-18	70-37	54-49	89
90	71-88	54-16	71-64	54-48	71-40	54-79	71-16	55-10	90
91	72-68	54-77	72-44	55-08	72-20	55-40	71-95	55-71	91
92	73-47	55-37	73-23	55-69	72-99	56-01	72-74	56-32	92
93	74-27	55-97	74-03	56-29	73-78	56-61	73-53	56-94	93
94	75-07	56-57	74-82	56-90	74-58	57-22	74-32	57-55	94
95	75-87	57-17	75-62	57-50	75-37	57-83	75-12	58-16	95
96	76-67	57-77	76-42	58-11	76-16	58-44	75-91	58-77	96
97	77-47	58-38	77-21	58-71	76-96	59-05	76-70	59-39	97
98	78-27	58-98	78-01	59-32	77-75	59-66	77-49	60-00	98
99	79-06	59-58	78-80	59-92	78-54	60-27	78-28	60-61	99
100	79-86	60-18	79-60	60-53	79-34	60-88	79-07	61-22	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	53 Deg.		52¾ Deg.		52½ Deg.		52¼ Deg.		

Distance.	38 Deg.		38¼ Deg.		38½ Deg.		38¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-79	0-62	0-79	0-62	0-78	0-62	0-78	0-63	1
2	1-58	1-23	1-57	1-24	1-57	1-24	1-56	1-25	2
3	2-36	1-85	2-36	1-86	2-35	1-87	2-34	1-88	3
4	3-15	2-46	3-14	2-48	3-13	2-49	3-12	2-50	4
5	3-94	3-08	3-93	3-10	3-91	3-11	3-90	3-13	5
6	4-73	3-69	4-71	3-71	4-70	3-74	4-68	3-76	6
7	5-52	4-31	5-50	4-33	5-48	4-36	5-46	4-38	7
8	6-30	4-93	6-28	4-95	6-26	4-98	6-24	5-01	8
9	7-09	5-54	7-07	5-57	7-04	5-60	7-02	5-63	9
10	7-88	6-16	7-85	6-19	7-83	6-23	7-80	6-26	10
11	8-67	6-77	8-64	6-81	8-61	6-85	8-58	6-89	11
12	9-46	7-39	9-42	7-43	9-39	7-47	9-36	7-51	12
13	10-24	8-00	10-21	8-05	10-17	8-09	10-14	8-14	13
14	11-03	8-62	10-99	8-67	10-96	8-72	10-92	8-76	14
15	11-82	9-23	11-78	9-29	11-74	9-34	11-70	9-39	15
16	12-61	9-85	12-57	9-91	12-52	9-96	12-48	10-01	16
17	13-40	10-47	13-35	10-52	13-30	10-58	13-26	10-64	17
18	14-18	11-08	14-14	11-14	14-09	11-21	14-04	11-27	18
19	14-97	11-70	14-92	11-76	14-87	11-83	14-82	11-89	19
20	15-76	12-31	15-71	12-38	15-65	12-45	15-60	12-52	20
21	16-55	12-93	16-49	13-00	16-43	13-07	16-38	13-14	21
22	17-34	13-54	17-28	13-62	17-22	13-70	17-16	13-77	22
23	18-12	14-16	18-08	14-24	18-00	14-32	17-94	14-40	23
24	18-91	14-78	18-85	14-86	18-78	14-94	18-72	15-02	24
25	19-70	15-39	19-63	15-48	19-57	15-56	19-50	15-65	25
26	20-49	16-01	20-42	16-10	20-35	16-19	20-28	16-27	26
27	21-28	16-62	21-20	16-72	21-13	16-81	21-06	16-90	27
28	22-06	17-24	21-99	17-33	21-91	17-43	21-84	17-53	28
29	22-85	17-85	22-77	17-95	22-70	18-05	22-62	18-15	29
30	23-64	18-47	23-56	18-57	23-48	18-68	23-40	18-78	30
31	24-43	19-09	24-34	19-19	24-26	19-30	24-18	19-40	31
32	25-22	19-70	25-13	19-81	25-04	19-92	24-96	20-03	32
33	26-00	20-32	25-92	20-43	25-83	20-54	25-74	20-66	33
34	26-79	20-93	26-70	21-05	26-61	21-17	26-52	21-28	34
35	27-58	21-55	27-49	21-67	27-39	21-79	27-30	21-91	35
36	28-37	22-16	28-27	22-29	28-17	22-41	28-08	22-53	36
37	29-16	22-78	29-06	22-91	28-96	23-03	28-86	23-16	37
38	29-94	23-40	29-84	23-53	29-74	23-66	29-64	23-79	38
39	30-73	24-01	30-63	24-14	30-52	24-28	30-42	24-41	39
40	31-52	24-63	31-41	24-76	31-30	24-90	31-20	25-04	40
41	32-31	25-24	32-20	25-38	32-09	25-52	31-98	25-66	41
42	33-10	25-86	32-98	26-00	32-87	26-15	32-76	26-29	42
43	33-88	26-47	33-77	26-62	33-65	26-77	33-53	26-91	43
44	34-67	27-09	34-55	27-24	34-43	27-39	34-31	27-54	44
45	35-46	27-70	35-34	27-86	35-22	28-01	35-09	28-17	45
46	36-25	28-32	36-12	28-48	36-00	28-64	35-87	28-79	46
47	37-04	28-94	36-51	29-10	36-78	29-26	36-65	29-42	47
48	37-82	29-55	37-79	29-72	37-57	29-88	37-43	30-04	48
49	38-61	30-17	38-48	30-34	38-35	30-50	38-21	30-67	49
50	39-40	30-78	39-27	30-95	39-13	31-13	38-99	31-30	50
Distance.	52 Deg.		51¾ Deg.		51½ Deg.		51¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	33 Deg.		38¼ Deg.		38½ Deg.		38¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	40-19	31-40	40-05	31-57	39-91	31-75	39-77	31-92	51
52	40-98	32-01	40-84	32-19	40-70	32-37	40-55	32-55	52
53	41-76	32-63	41-62	32-81	41-48	32-99	41-33	33-17	53
54	42-55	33-25	42-41	33-43	42-26	33-62	42-11	33-80	54
55	42-24	33-86	43-19	34-05	43-04	34-24	42-89	34-43	55
56	44-13	34-48	43-98	34-67	43-83	34-86	43-67	35-05	56
57	44-92	35-09	44-76	35-29	44-61	35-48	44-46	35-68	57
58	45-70	35-71	45-55	35-91	45-39	36-11	45-23	36-30	58
59	46-49	36-32	46-33	36-53	46-17	36-73	46-01	36-93	59
60	47-28	36-94	47-12	37-15	46-96	37-35	46-79	37-56	60
61	48-07	37-56	47-90	37-76	47-74	37-97	47-57	38-18	61
62	48-86	38-17	48-69	38-38	48-52	38-60	48-35	38-81	62
63	49-64	38-79	49-47	39-00	49-30	39-22	49-13	39-43	63
64	50-43	39-40	50-26	39-62	50-09	39-84	49-91	40-06	64
65	51-22	40-02	51-05	40-24	50-87	40-46	50-69	40-68	65
66	52-01	40-63	51-83	40-86	51-65	41-09	51-47	41-31	66
67	52-80	41-25	52-62	41-48	52-43	41-71	52-25	41-94	67
68	53-58	41-86	53-40	42-10	53-22	42-33	53-03	42-56	68
69	54-37	42-48	54-19	42-72	54-00	42-95	53-81	43-19	69
70	55-16	43-10	54-97	43-34	54-78	43-58	54-59	43-81	70
71	55-95	43-71	55-76	43-96	55-57	44-20	55-37	44-44	71
72	56-74	44-33	56-54	44-57	56-35	44-82	56-15	45-07	72
73	57-52	44-94	57-33	45-19	57-13	45-44	56-93	45-69	73
74	58-31	45-56	58-11	45-81	57-91	46-07	57-71	46-32	74
75	59-10	46-17	58-90	46-43	58-70	46-69	58-49	46-94	75
76	59-89	46-79	59-68	47-05	59-48	47-31	59-27	47-57	76
77	60-68	47-41	60-47	47-67	60-26	47-93	60-05	48-20	77
78	61-46	48-02	61-25	48-29	61-04	48-56	60-83	48-82	78
79	62-25	48-64	62-04	48-91	61-83	49-18	61-61	49-45	79
80	63-04	49-25	62-83	49-53	62-61	49-80	62-39	50-07	80
81	63-83	49-87	63-61	50-15	63-39	50-42	63-17	50-70	81
82	64-62	50-48	64-40	50-77	64-17	51-05	63-95	51-33	82
83	65-40	51-10	65-18	51-38	64-96	51-67	64-73	51-95	83
84	66-19	51-72	65-97	52-00	65-74	52-29	65-51	52-58	84
85	66-98	52-33	66-75	52-62	66-52	52-91	66-29	53-20	85
86	67-77	52-95	67-54	53-24	67-30	53-54	67-07	53-83	86
87	68-56	53-56	68-32	53-86	68-09	54-16	67-85	54-46	87
88	69-34	54-18	69-11	54-48	68-87	54-78	68-63	55-08	88
89	70-13	54-79	69-89	55-10	69-65	55-40	69-41	55-71	89
90	70-92	55-41	70-68	55-72	70-43	56-03	70-19	56-33	90
91	71-71	56-03	71-46	56-34	71-22	56-65	70-97	56-96	91
92	72-50	56-64	72-25	56-96	72-00	57-27	71-75	57-58	92
93	73-28	57-26	73-03	57-58	72-78	57-89	72-53	58-21	93
94	74-07	57-87	73-82	58-19	73-57	58-52	73-31	58-84	94
95	74-86	58-49	74-61	58-81	74-35	59-14	74-09	59-46	95
96	75-65	59-10	75-39	59-43	75-13	59-76	74-87	60-09	96
97	76-44	59-72	76-18	60-05	75-91	60-38	75-65	60-71	97
98	77-22	60-33	76-96	60-67	76-70	61-01	76-43	61-34	98
99	78-01	60-95	77-75	61-29	77-48	61-63	77-21	61-97	99
100	78-80	61-57	78-53	61-91	78-26	62-25	77-99	62-59	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	52 Deg.		51¾ Deg.		51½ Deg.		51¼ Deg.		

TRAVERSE TABLE.

Distance.	39 Deg.		39¼ Deg.		39½ Deg.		39¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-78	0-63	0-77	0-63	0-77	0-64	0-77	0-64	1
2	1-55	1-26	1-55	1-27	1-54	1-27	1-54	1-28	2
3	2-33	1-89	2-32	1-90	2-31	1-91	2-31	1-92	3
4	3-11	2-52	3-10	2-53	3-09	2-54	3-08	2-56	4
5	3-89	3-15	3-87	3-16	3-86	3-18	3-84	3-20	5
6	4-66	3-78	4-65	3-80	4-63	3-82	4-61	3-84	6
7	5-44	4-41	5-42	4-43	5-40	4-45	5-38	4-48	7
8	6-22	5-03	6-20	5-06	6-17	5-09	6-15	5-12	8
9	6-99	5-66	6-97	5-69	6-94	5-72	6-92	5-75	9
10	7-77	6-29	7-74	6-33	7-72	6-36	7-69	6-39	10
11	8-55	6-92	8-52	6-96	8-49	7-00	8-46	7-03	11
12	9-33	7-55	9-29	7-59	9-26	7-63	9-23	7-67	12
13	10-10	8-18	10-07	8-23	10-03	8-27	9-99	8-31	13
14	10-88	8-81	10-84	8-86	10-80	8-91	10-76	8-95	14
15	11-66	9-44	11-62	9-49	11-57	9-54	11-53	9-59	15
16	12-43	10-07	12-39	10-12	12-35	10-18	12-30	10-23	16
17	13-21	10-70	13-16	10-76	13-12	10-81	13-07	10-87	17
18	13-99	11-33	13-94	11-39	13-89	11-45	13-84	11-51	18
19	14-77	11-96	14-71	12-02	14-66	12-09	14-61	12-15	19
20	15-54	12-59	15-49	12-65	15-43	12-72	15-38	12-79	20
21	16-32	13-22	16-26	13-29	16-20	13-36	16-15	13-43	21
22	17-10	13-84	17-04	13-92	16-98	13-99	16-91	14-07	22
23	17-87	14-47	17-81	14-55	17-75	14-63	17-68	14-71	23
24	18-65	15-10	18-59	15-18	18-52	15-27	18-45	15-35	24
25	19-43	15-73	19-36	15-82	19-29	15-90	19-22	15-99	25
26	20-21	16-36	20-13	16-45	20-06	16-54	19-99	16-63	26
27	20-98	16-99	20-91	17-08	20-83	17-17	20-76	17-26	27
28	21-76	17-62	21-68	17-72	21-61	17-81	21-53	17-90	28
29	22-54	18-25	22-46	18-35	22-38	18-45	22-30	18-54	29
30	23-31	18-88	23-23	18-98	23-15	19-08	23-07	19-18	30
31	24-09	19-51	24-01	19-61	23-92	19-72	23-83	19-82	31
32	24-87	20-14	24-78	20-25	24-69	20-35	24-60	20-46	32
33	25-65	20-77	25-55	20-88	25-46	20-99	25-37	21-10	33
34	26-42	21-40	26-33	21-51	26-24	21-63	26-14	21-74	34
35	27-20	22-03	27-10	22-14	27-01	22-26	26-91	22-38	35
36	27-98	22-66	27-88	22-78	27-78	22-90	27-68	23-02	36
37	28-75	23-28	28-65	23-41	28-55	23-53	28-45	23-66	37
38	29-53	23-91	29-43	24-04	29-32	24-17	29-22	24-30	38
39	30-31	24-54	30-20	24-68	30-09	24-81	29-98	24-94	39
40	31-09	25-17	30-98	25-31	30-86	25-44	30-75	25-58	40
41	31-86	25-80	31-75	25-94	31-64	26-08	31-52	26-22	41
42	32-64	26-43	32-52	26-57	32-41	26-72	32-29	26-86	42
43	33-42	27-06	33-30	27-21	33-18	27-35	33-06	27-50	43
44	34-19	27-69	34-07	27-84	33-95	27-99	33-83	28-14	44
45	34-97	28-32	34-85	28-47	34-72	28-62	34-60	28-77	45
46	35-75	28-95	35-62	29-10	35-49	29-26	35-37	29-41	46
47	36-53	29-58	36-40	29-74	36-27	29-90	36-14	30-05	47
48	37-30	30-21	37-17	30-37	37-04	30-53	36-90	30-69	48
49	38-08	30-84	37-95	31-00	37-81	31-17	37-67	31-33	49
50	38-86	31-47	38-72	31-64	38-58	31-80	38-44	31-97	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		

Distance.	39 Deg.		39¼ Deg.		39½ Deg.		39¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	39.63	32.10	39.49	32.27	39.35	32.44	39.21	32.61	51
52	40.41	32.72	40.27	32.90	40.12	33.08	39.98	33.25	52
53	41.19	33.35	41.04	33.53	40.90	33.71	40.75	33.89	53
54	41.97	33.98	41.82	34.17	41.67	34.35	41.52	34.53	54
55	42.74	34.61	42.59	34.80	42.44	34.98	42.29	35.17	55
56	43.52	35.24	43.37	35.43	43.21	35.62	43.06	35.81	56
57	44.30	35.87	44.14	36.06	43.98	36.26	43.82	36.45	57
58	45.07	36.50	44.91	36.70	44.75	36.89	44.59	37.09	58
59	45.85	37.13	45.69	37.33	45.53	37.53	45.36	37.73	59
60	46.63	37.76	46.46	37.96	46.30	38.16	46.13	38.37	60
61	47.41	38.39	47.24	38.60	47.07	38.80	46.90	39.01	61
62	48.18	39.02	48.01	39.23	47.84	39.44	47.67	39.65	62
63	48.96	39.65	48.79	39.86	48.61	40.07	48.44	40.28	63
64	49.74	40.28	49.56	40.49	49.38	40.71	49.21	40.92	64
65	50.51	40.91	50.34	41.13	50.16	41.35	49.97	41.56	65
66	51.29	41.54	51.11	41.76	50.93	41.98	50.74	42.20	66
67	52.07	42.16	51.88	42.39	51.70	42.62	51.51	42.84	67
68	52.85	42.79	52.66	43.02	52.47	43.25	52.28	43.48	68
69	53.62	43.42	53.43	43.66	53.24	43.89	53.05	44.12	69
70	54.40	44.05	54.21	44.29	54.01	44.53	53.82	44.76	70
71	55.18	44.68	54.98	44.92	54.79	45.16	54.59	45.40	71
72	55.95	45.31	55.76	45.55	55.56	45.80	55.36	46.04	72
73	56.73	45.94	56.53	46.19	56.33	46.43	56.13	46.68	73
74	57.51	46.57	57.31	46.82	57.10	47.07	56.89	47.32	74
75	58.29	47.20	58.08	47.45	57.87	47.71	57.66	47.96	75
76	59.06	47.83	58.85	48.09	58.64	48.34	58.43	48.60	76
77	59.84	48.46	59.63	48.72	59.42	48.98	59.20	49.24	77
78	60.62	49.09	60.40	49.35	60.19	49.61	59.97	49.88	78
79	61.39	49.72	61.18	49.98	60.96	50.25	60.74	50.52	79
80	62.17	50.35	61.95	50.62	61.73	50.89	61.51	51.16	80
81	62.95	50.97	62.73	51.25	62.50	51.52	62.28	51.79	81
82	63.73	51.60	63.50	51.88	63.27	52.16	63.04	52.43	82
83	64.50	52.23	64.27	52.51	64.04	52.79	63.81	53.07	83
84	65.28	52.86	65.05	53.15	64.82	53.43	64.58	53.71	84
85	66.06	53.49	65.82	53.78	65.59	54.07	65.35	54.35	85
86	66.83	54.12	66.60	54.41	66.36	54.70	66.12	54.99	86
87	67.61	54.75	67.37	55.05	67.13	55.34	66.89	55.63	87
88	68.39	55.38	68.15	55.68	67.90	55.97	67.66	56.27	88
89	69.17	56.01	68.92	56.32	68.67	56.61	68.43	56.91	89
90	69.94	56.64	69.70	56.94	69.45	57.25	69.20	57.55	90
91	70.72	57.27	70.47	57.58	70.22	57.88	69.96	58.19	91
92	71.50	57.90	71.24	58.21	70.99	58.52	70.73	58.83	92
93	72.27	58.53	72.02	58.84	71.76	59.16	71.50	59.47	93
94	73.05	59.16	72.79	59.47	72.53	59.79	72.27	60.11	94
95	73.83	59.79	73.57	60.11	73.30	60.43	73.04	60.75	95
96	74.61	60.41	74.34	60.74	74.08	61.06	73.81	61.39	96
97	75.38	61.04	75.12	61.37	74.85	61.70	74.58	62.03	97
98	76.16	61.67	75.89	62.01	75.62	62.34	75.35	62.66	98
99	76.94	62.30	76.66	62.64	76.39	62.97	76.12	63.30	99
100	77.71	62.93	77.44	63.27	77.16	63.61	76.88	63.94	100

Distance.	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-77	0-64	0-76	0-65	0-76	0-65	0-76	0-65	1
2	1-53	1-29	1-53	1-29	1-52	1-30	1-52	1-31	2
3	2-30	1-93	2-29	1-94	2-28	1-95	2-27	1-96	3
4	3-06	2-57	3-05	2-58	3-04	2-60	3-03	2-61	4
5	3-83	3-21	3-82	3-23	3-80	3-25	3-79	3-26	5
6	4-60	3-86	4-58	3-88	4-56	3-90	4-55	3-92	6
7	5-36	4-50	5-34	4-52	5-32	4-55	5-30	4-57	7
8	6-13	5-14	6-11	5-17	6-08	5-20	6-06	5-22	8
9	6-89	5-79	6-87	5-82	6-84	5-84	6-82	5-87	9
10	7-66	6-43	7-63	6-46	7-60	6-49	7-58	6-53	10
11	8-43	7-07	8-40	7-11	8-36	7-14	8-33	7-18	11
12	9-19	7-71	9-16	7-75	9-12	7-79	9-09	7-83	12
13	9-96	8-36	9-92	8-40	9-89	8-44	9-85	8-49	13
14	10-72	9-00	10-69	9-05	10-65	9-09	10-61	9-14	14
15	11-49	9-64	11-45	9-69	11-41	9-74	11-36	9-79	15
16	12-26	10-28	12-21	10-34	12-17	10-39	12-12	10-44	16
17	13-02	10-93	12-97	10-98	12-93	11-04	12-88	11-10	17
18	13-79	11-57	13-74	11-63	13-69	11-69	13-64	11-75	18
19	14-55	12-21	14-50	12-28	14-45	12-34	14-39	12-40	19
20	15-32	12-86	15-26	12-92	15-21	12-99	15-15	13-06	20
21	16-09	13-50	16-03	13-57	15-97	13-64	15-91	13-71	21
22	16-85	14-14	16-79	14-21	16-73	14-29	16-67	14-36	22
23	17-62	14-78	17-55	14-86	17-49	14-94	17-42	15-01	23
24	18-39	15-43	18-32	15-51	18-25	15-59	18-18	15-67	24
25	19-15	16-07	19-08	16-15	19-01	16-24	18-94	16-32	25
26	19-92	16-71	19-84	16-80	19-77	16-89	19-70	16-97	26
27	20-68	17-36	20-61	17-45	20-53	17-54	20-45	17-62	27
28	21-45	18-00	21-37	18-09	21-29	18-18	21-21	18-28	28
29	22-22	18-64	22-13	18-74	22-05	18-83	21-97	18-93	29
30	22-98	19-28	22-90	19-38	22-81	19-48	22-73	19-58	30
31	23-75	19-93	23-66	20-03	23-57	20-13	23-48	20-24	31
32	24-51	20-57	24-42	20-68	24-33	20-78	24-24	20-89	32
33	25-28	21-21	25-19	21-32	25-09	21-43	25-00	21-54	33
34	26-05	21-85	25-95	21-97	25-85	22-08	25-76	22-19	34
35	26-81	22-50	26-71	22-61	26-61	22-73	26-51	22-85	35
36	27-58	23-14	27-48	23-26	27-37	23-38	27-27	23-50	36
37	28-34	23-78	28-24	23-91	28-13	24-03	28-03	24-15	37
38	29-11	24-43	29-00	24-55	28-90	24-68	28-79	24-80	38
39	29-88	25-07	29-77	25-20	29-66	25-33	29-54	25-46	39
40	30-64	25-71	30-53	25-84	30-42	25-98	30-30	26-11	40
41	31-41	26-35	31-29	26-49	31-18	26-63	31-06	26-76	41
42	32-17	27-00	32-06	27-14	31-94	27-28	31-82	27-42	42
43	32-94	27-64	32-82	27-78	32-70	27-93	32-58	28-07	43
44	33-71	28-28	33-58	28-43	33-46	28-68	33-33	28-72	44
45	34-47	28-93	34-35	29-08	34-22	29-23	34-09	29-37	45
46	35-24	29-57	35-11	29-72	34-98	29-87	34-85	30-03	46
47	36-00	30-21	35-87	30-37	35-74	30-52	35-61	30-68	47
48	36-77	30-85	36-64	31-01	36-50	31-17	36-36	31-33	48
49	37-54	31-50	37-40	31-66	37-26	31-82	37-12	31-99	49
50	38-30	32-14	38-16	32-31	38-02	32-47	37-88	32-64	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

TRAVERSE TABLE.

Distance.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	39-07	32-78	38-92	32-95	38-78	33-12	38-64	33-29	51
52	39-83	33-42	39-69	33-60	39-54	33-77	39-39	33-94	52
53	40-60	34-07	40-45	34-24	40-30	34-42	40-15	34-60	53
54	41-37	34-71	41-21	34-89	41-06	35-07	40-91	35-25	54
55	42-13	35-35	41-98	35-54	41-82	35-72	41-67	35-90	55
56	42-90	36-00	42-74	36-18	42-58	36-37	42-42	36-55	56
57	43-66	36-64	43-50	36-83	43-34	37-02	43-18	37-21	57
58	44-43	37-28	44-27	37-48	44-10	37-67	43-94	37-86	58
59	45-20	37-92	45-03	38-12	44-86	38-32	44-70	38-51	59
60	45-96	38-57	45-79	38-77	45-62	38-97	45-45	39-17	60
61	46-73	39-21	46-56	39-41	46-38	39-62	46-21	39-82	61
62	47-49	39-85	47-32	40-06	47-15	40-27	46-97	40-47	62
63	48-26	40-50	48-08	40-71	47-91	40-92	47-73	41-12	63
64	49-03	41-14	48-55	41-35	48-67	41-56	48-48	41-78	64
65	49-79	41-78	49-61	42-00	49-43	42-21	49-24	42-43	65
66	50-56	42-42	50-37	42-64	50-19	42-86	50-00	43-08	66
67	51-32	43-07	51-14	43-29	50-95	43-51	50-76	43-73	67
68	52-09	43-71	51-90	43-94	51-71	44-16	51-51	44-39	68
69	52-86	44-35	52-66	44-58	52-47	44-81	52-27	45-04	69
70	53-62	45-00	53-43	45-23	53-23	45-46	53-03	45-69	70
71	54-39	45-64	54-19	45-87	53-99	46-11	53-79	46-35	71
72	55-16	46-28	54-95	46-52	54-75	46-76	54-54	47-00	72
73	55-92	46-92	55-72	47-17	55-51	47-41	55-30	47-65	73
74	56-69	47-57	56-48	47-81	56-27	48-06	56-06	48-30	74
75	57-45	48-21	57-24	48-46	57-03	48-71	56-82	48-96	75
76	58-22	48-85	58-01	49-11	57-79	49-36	57-57	49-61	76
77	58-99	49-49	58-77	49-75	58-55	50-01	58-33	50-26	77
78	59-75	50-14	59-53	50-40	59-31	50-66	59-09	50-92	78
79	60-52	50-78	60-30	51-04	60-07	51-31	59-85	51-57	79
80	61-28	51-42	61-06	51-69	60-83	51-96	60-61	52-22	80
81	62-05	52-07	61-82	52-34	61-59	52-61	61-36	52-87	81
82	62-82	52-71	62-59	52-98	62-35	53-25	62-12	53-53	82
83	63-58	53-35	63-35	53-63	63-11	53-90	62-88	54-18	83
84	64-35	53-99	64-11	54-27	63-87	54-55	63-64	54-83	84
85	65-11	54-64	64-87	54-92	64-63	55-20	64-39	55-48	85
86	65-88	55-28	65-64	55-57	65-39	55-85	65-15	56-14	86
87	66-65	55-92	66-40	56-21	66-16	56-50	65-91	56-79	87
88	67-41	56-57	67-16	56-86	66-92	57-15	66-67	57-44	88
89	68-18	57-21	67-93	57-50	67-68	57-80	67-42	58-10	89
90	68-94	57-85	68-69	58-15	68-44	58-45	68-18	58-75	90
91	69-71	58-49	69-45	58-80	69-20	59-10	68-94	59-40	91
92	70-48	59-14	70-22	59-44	69-96	59-75	69-70	60-05	92
93	71-24	59-78	70-98	60-09	70-72	60-40	70-45	60-71	93
94	72-01	60-42	71-74	60-74	71-48	61-05	71-21	61-36	94
95	72-77	61-06	72-51	61-38	72-24	61-70	71-97	62-01	95
96	73-54	61-71	73-27	62-03	73-00	62-35	72-73	62-66	96
97	74-31	62-35	74-03	62-67	73-76	63-00	73-48	63-32	97
98	75-07	62-99	74-80	63-32	74-52	63-65	74-24	63-97	98
99	75-84	63-64	75-56	63-97	75-28	64-30	75-00	64-62	99
100	76-60	64-28	76-32	64-61	76-04	64-94	75-76	65-28	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

TRAVERSE TABLE.

Distance.	41 Deg.		41¼ Deg.		41½ Deg.		41¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-75	0-66	0-75	0-66	0-75	0-66	0-75	0-67	1
2	1-51	1-31	1-50	1-32	1-50	1-33	1-49	1-33	2
3	2-26	1-97	2-26	1-98	2-25	1-99	2-24	2-06	3
4	3-02	2-62	3-01	2-64	3-00	2-65	2-98	2-66	4
5	3-77	3-28	3-76	3-30	3-74	3-31	3-73	3-33	5
6	4-53	3-94	4-51	3-96	4-49	3-98	4-48	4-00	6
7	5-28	4-59	5-26	4-62	5-24	4-64	5-22	4-66	7
8	6-04	5-25	6-01	5-27	5-99	5-30	5-97	5-33	8
9	6-79	5-90	6-77	5-93	6-74	5-96	6-71	5-99	9
10	7-55	6-56	7-52	6-59	7-49	6-63	7-46	6-66	10
11	8-30	7-22	8-27	7-25	8-24	7-29	8-21	7-32	11
12	9-06	7-87	9-02	7-91	8-99	7-95	8-95	7-99	12
13	9-81	8-53	9-77	8-57	9-74	8-61	9-70	8-66	13
14	10-57	9-18	10-53	9-23	10-49	9-28	10-44	9-32	14
15	11-32	9-84	11-28	9-89	11-23	9-94	11-19	9-99	15
16	12-08	10-50	12-03	10-55	11-98	10-60	11-94	10-65	16
17	12-83	11-15	12-78	11-21	12-73	11-26	12-68	11-32	17
18	13-58	11-81	13-53	11-87	13-48	11-93	13-43	11-99	18
19	14-34	12-47	14-28	12-53	14-23	12-59	14-18	12-65	19
20	15-09	13-12	15-04	13-19	14-98	13-25	14-92	13-32	20
21	15-85	13-78	15-79	13-85	15-73	13-91	15-67	13-98	21
22	16-60	14-43	16-54	14-51	16-48	14-58	16-41	14-65	22
23	17-36	15-09	17-29	15-16	17-23	15-24	17-16	15-32	23
24	18-11	15-75	18-04	15-82	17-97	15-90	17-91	15-98	24
25	18-87	16-40	18-80	16-48	18-72	16-57	18-65	16-65	25
26	19-62	17-06	19-55	17-14	19-47	17-23	19-40	17-31	26
27	20-38	17-71	20-30	17-80	20-22	17-89	20-14	17-98	27
28	21-13	18-37	21-05	18-46	20-97	18-55	20-89	18-64	28
29	21-89	19-03	21-80	19-12	21-72	19-22	21-64	19-31	29
30	22-64	19-68	22-56	19-78	22-47	19-88	22-38	19-98	30
31	23-40	20-34	23-31	20-44	23-22	20-54	23-13	20-64	31
32	24-15	20-99	24-06	21-10	23-97	21-20	23-87	21-31	32
33	24-91	21-65	24-81	21-76	24-72	21-87	24-62	21-97	33
34	25-66	22-31	25-56	22-42	25-46	22-53	25-37	22-64	34
35	26-41	22-96	26-31	23-08	26-21	23-19	26-11	23-31	35
36	27-17	23-62	27-07	23-74	26-96	23-85	26-86	23-97	36
37	27-92	24-27	27-82	24-40	27-71	24-52	27-60	24-64	37
38	28-68	24-93	28-57	25-06	28-46	25-18	28-35	25-30	38
39	29-43	25-59	29-32	25-71	29-21	25-84	29-10	25-97	39
40	30-19	26-24	30-07	26-37	29-96	26-50	29-84	26-64	40
41	30-94	26-90	30-83	27-03	30-71	27-17	30-59	27-30	41
42	31-70	27-55	31-58	27-69	31-46	27-83	31-33	27-97	42
43	32-45	28-21	32-33	28-35	32-21	28-49	32-08	28-63	43
44	33-21	28-87	33-08	29-01	32-95	29-16	32-83	29-30	44
45	33-96	29-52	33-83	29-67	33-70	29-82	33-57	29-97	45
46	34-72	30-18	34-58	30-33	34-45	30-48	34-32	30-63	46
47	35-47	30-83	35-34	30-99	35-20	31-14	35-06	31-30	47
48	36-23	31-49	36-09	31-65	35-95	31-81	35-81	31-96	48
49	36-98	32-15	36-84	32-31	36-70	32-47	36-56	32-63	49
50	37-74	32-80	37-59	32-97	37-45	33-13	37-30	33-29	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	49 Deg.		48¾ Deg.		48½ Deg.		48¼ Deg.		

TRAVERSE TABLE.

Distance.	41 Deg.		41¼ Deg.		41½ Deg.		41¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	38-49	33-46	38-34	33-63	38-20	33-79	38-05	33-96	51
52	39-24	34-12	39-10	34-29	38-05	34-46	38-79	34-63	52
53	40-00	34-77	39-85	34-95	39-69	35-12	39-54	35-29	53
54	40-75	35-43	40-60	35-60	40-44	35-78	40-29	35-96	54
55	41-51	36-08	41-35	36-26	41-19	36-44	41-03	36-62	55
56	42-26	36-74	42-10	36-92	41-94	37-11	41-78	37-29	56
57	43-02	37-40	42-85	37-58	42-69	37-77	42-53	37-96	57
58	43-77	38-05	43-61	38-24	43-44	38-43	43-27	38-62	58
59	44-53	38-71	44-36	38-90	44-19	39-09	44-02	39-29	59
60	45-28	39-36	45-11	39-56	44-94	39-76	44-76	39-95	60
61	46-04	40-02	45-86	40-22	45-69	40-42	45-51	40-62	61
62	46-79	40-68	46-61	40-88	46-44	41-08	46-26	41-28	62
63	47-55	41-33	47-37	41-54	47-18	41-75	47-00	41-95	63
64	48-30	41-99	48-12	42-20	47-93	42-41	47-75	42-62	64
65	49-06	42-64	48-87	42-86	48-68	43-07	48-49	43-28	65
66	49-81	43-30	49-62	43-52	49-43	43-73	49-24	43-95	66
67	50-57	43-96	50-37	44-18	50-18	44-40	49-99	44-61	67
68	51-32	44-61	51-13	44-84	50-93	45-06	50-73	45-28	68
69	52-07	45-27	51-88	45-49	51-68	45-72	51-48	45-95	69
70	52-83	45-92	52-63	46-15	52-43	46-38	52-22	46-61	70
71	53-58	46-58	53-38	46-81	53-18	47-05	52-97	47-28	71
72	54-34	47-24	54-13	47-47	53-92	47-71	53-72	47-94	72
73	55-09	47-89	54-88	48-13	54-67	48-37	54-46	48-61	73
74	55-85	48-55	55-64	48-79	55-42	49-03	55-21	49-28	74
75	56-60	49-20	56-39	49-45	56-17	49-70	55-95	49-94	75
76	57-36	49-86	57-14	50-11	56-92	50-36	56-70	50-61	76
77	58-11	50-52	57-89	50-77	57-67	51-02	57-45	51-27	77
78	58-87	51-17	58-64	51-43	58-42	51-68	58-19	51-94	78
79	59-62	51-83	59-40	52-09	59-17	52-35	58-94	52-60	79
80	60-38	52-48	60-15	52-75	59-92	53-01	59-68	53-27	80
81	61-13	53-14	60-90	53-41	60-67	53-67	60-43	53-94	81
82	61-89	53-80	61-65	54-07	61-41	54-33	61-18	54-60	82
83	62-64	54-45	62-40	54-73	62-16	55-00	61-92	55-27	83
84	63-40	55-11	63-15	55-38	62-91	55-66	62-67	55-93	84
85	64-15	55-76	63-91	56-04	63-66	56-32	63-41	56-60	85
86	64-90	56-42	64-66	56-70	64-41	56-99	64-16	57-27	86
87	65-66	57-08	65-41	57-36	65-16	57-65	64-91	57-93	87
88	66-41	57-73	66-16	58-02	65-91	58-31	65-65	58-60	88
89	67-17	58-39	66-91	58-68	66-66	58-97	66-40	59-26	89
90	67-92	59-05	67-67	59-34	67-41	59-64	67-15	59-93	90
91	68-68	59-70	68-42	60-00	68-15	60-30	67-89	60-60	91
92	69-43	60-36	69-17	60-66	68-90	60-96	68-64	61-26	92
93	70-19	61-01	69-92	61-32	69-65	61-62	69-38	61-93	93
94	70-94	61-67	70-67	61-98	70-40	62-29	70-13	62-59	94
95	71-70	62-33	71-43	62-64	71-15	62-95	70-88	63-26	95
96	72-45	62-98	72-18	63-30	71-90	63-61	71-62	63-92	96
97	73-21	63-64	72-93	63-96	72-65	64-27	72-37	64-59	97
98	73-96	64-29	73-68	64-62	73-40	64-94	73-11	65-26	98
99	74-72	64-95	74-43	65-28	74-15	65-60	73-86	65-92	99
100	75-47	65-61	75-18	65-93	74-90	66-26	74-61	66-59	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	49 Deg.		48¾ Deg.		48½ Deg.		48¼ Deg.		

TRAVERSE TABLE.

Distance.	42 Deg.		42 $\frac{1}{4}$ Deg.		42 $\frac{1}{2}$ Deg.		42 $\frac{3}{4}$ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-74	0-67	0-74	0-67	0-74	0-68	0-73	0-68	1
2	1-49	1-34	1-48	1-34	1-47	1-35	1-47	1-36	2
3	2-23	2-01	2-22	2-02	2-21	2-03	2-20	2-04	3
4	2-97	2-68	2-96	2-69	2-95	2-70	2-94	2-72	4
5	3-72	3-35	3-70	3-36	3-69	3-38	3-67	3-39	5
6	4-46	4-01	4-44	4-03	4-42	4-05	4-41	4-07	6
7	5-20	4-68	5-18	4-71	5-16	4-73	5-14	4-75	7
8	5-95	5-35	5-92	5-38	5-90	5-40	5-87	5-43	8
9	6-69	6-02	6-66	6-05	6-64	6-08	6-61	6-11	9
10	7-43	6-69	7-40	6-72	7-37	6-76	7-34	6-79	10
11	8-17	7-36	8-14	7-40	8-11	7-43	8-08	7-47	11
12	8-92	8-03	8-88	8-07	8-85	8-11	8-81	8-15	12
13	9-66	8-70	9-62	8-74	9-58	8-78	9-55	8-82	13
14	10-40	9-37	10-36	9-41	10-32	9-46	10-28	9-50	14
15	11-15	10-04	11-10	10-09	11-06	10-13	11-01	10-18	15
16	11-89	10-71	11-84	10-76	11-80	10-81	11-75	10-86	16
17	12-63	11-38	12-58	11-43	12-53	11-48	12-48	11-54	17
18	13-38	12-04	13-32	12-10	13-27	12-16	13-22	12-22	18
19	14-12	12-71	14-06	12-77	14-01	12-84	13-95	12-90	19
20	14-86	13-38	14-80	13-45	14-75	13-51	14-69	13-58	20
21	15-61	14-05	15-54	14-12	15-48	14-19	15-42	14-25	21
22	16-35	14-72	16-28	14-79	16-22	14-86	16-16	14-93	22
23	17-09	15-39	17-02	15-46	16-96	15-54	16-89	15-61	23
24	17-84	16-06	17-77	16-14	17-69	16-21	17-62	16-29	24
25	18-58	16-73	18-51	16-81	18-43	16-89	18-36	16-97	25
26	19-32	17-40	19-25	17-48	19-17	17-57	19-09	17-65	26
27	20-06	18-07	19-99	18-15	19-91	18-24	19-83	18-33	27
28	20-81	18-74	20-73	18-83	20-64	18-92	20-56	19-01	28
29	21-55	19-40	21-47	19-50	21-38	19-59	21-30	19-69	29
30	22-29	20-07	22-21	20-17	22-12	20-27	22-03	20-36	30
31	23-04	20-74	22-95	20-84	22-86	20-94	22-76	21-04	31
32	23-78	21-41	23-69	21-52	23-59	21-62	23-50	21-72	32
33	24-52	22-08	24-43	22-19	24-33	22-29	24-23	22-40	33
34	25-27	22-75	25-17	22-86	25-07	22-97	24-97	23-08	34
35	26-01	23-42	25-91	23-53	25-80	23-65	25-70	23-76	35
36	26-75	24-09	26-65	24-21	26-54	24-32	26-44	24-44	36
37	27-50	24-76	27-39	24-88	27-28	25-00	27-17	25-12	37
38	28-24	25-43	28-13	25-55	28-02	25-67	27-90	25-79	38
39	28-98	26-10	28-87	26-22	28-75	26-35	28-64	26-47	39
40	29-73	26-77	29-61	26-89	29-49	27-02	29-37	27-15	40
41	30-47	27-43	30-35	27-57	30-23	27-70	30-11	27-83	41
42	31-21	28-10	31-09	28-24	30-97	28-37	30-84	28-51	42
43	31-96	28-77	31-83	28-91	31-70	29-05	31-58	29-19	43
44	32-70	29-44	32-57	29-58	32-44	29-73	32-31	29-87	44
45	33-44	30-11	33-31	30-26	33-18	30-40	33-04	30-55	45
46	34-18	30-78	34-05	30-93	33-91	31-08	33-78	31-22	46
47	34-93	31-45	34-79	31-60	34-65	31-75	34-51	31-90	47
48	35-67	32-12	35-53	32-27	35-39	32-43	35-25	32-58	48
49	36-41	32-79	36-27	32-95	36-13	33-10	35-98	33-26	49
50	37-16	33-46	37-01	33-62	36-86	33-78	36-72	33-94	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	48 Deg.		47 $\frac{3}{4}$ Deg.		47 $\frac{1}{2}$ Deg.		47 $\frac{1}{4}$ Deg.		

TRAVERSE TABLE.

Distance.	42 Deg.		42¼ Deg.		42½ Deg.		42¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	37-90	34-13	37-75	34-29	37-60	34-46	37-45	34-62	51
52	38-64	34-79	38-49	34-96	38-34	35-13	38-18	35-30	52
53	39-39	35-46	39-23	35-64	39-08	35-81	38-92	35-98	53
54	40-13	36-13	39-97	36-31	39-81	36-48	39-65	36-66	54
55	40-87	36-80	40-71	36-98	40-55	37-16	40-39	37-33	55
56	41-62	37-47	41-45	37-65	41-29	37-83	41-12	38-01	56
57	42-36	38-14	42-19	38-32	42-02	38-51	41-86	38-69	57
58	43-10	38-81	42-93	39-00	42-76	39-18	42-59	39-37	58
59	43-85	39-48	43-67	39-67	43-50	39-86	43-32	40-05	59
60	44-59	40-15	44-41	40-34	44-24	40-54	44-06	40-73	60
61	45-33	40-82	45-15	41-01	44-97	41-21	44-79	41-41	61
62	46-07	41-49	45-89	41-69	45-71	41-89	45-53	42-09	62
63	46-82	42-16	46-63	42-36	46-45	42-56	46-26	42-76	63
64	47-56	42-82	47-37	43-03	47-19	43-24	47-00	43-44	64
65	48-30	43-49	48-11	43-70	47-92	43-91	47-73	44-12	65
66	49-05	44-16	48-85	44-38	48-66	44-59	48-47	44-80	66
67	49-79	44-83	49-59	45-05	49-40	45-26	49-20	45-48	67
68	50-53	45-50	50-33	45-72	50-13	45-94	49-93	46-16	68
69	51-28	46-17	51-07	46-39	50-87	46-62	50-67	46-84	69
70	52-02	46-84	51-82	47-07	51-61	47-29	51-40	47-52	70
71	52-76	47-51	52-56	47-74	52-35	47-97	52-14	48-19	71
72	53-51	48-18	53-30	48-41	53-08	48-64	52-87	48-87	72
73	54-25	48-85	54-04	49-08	53-82	49-32	53-61	49-55	73
74	54-99	49-52	54-78	49-76	54-56	49-99	54-34	50-23	74
75	55-74	50-18	55-52	50-43	55-30	50-67	55-07	50-91	75
76	56-48	50-85	56-26	51-10	56-03	51-34	55-81	51-59	76
77	57-22	51-52	57-00	51-77	56-77	52-02	56-54	52-27	77
78	57-97	52-19	57-74	52-44	57-51	52-70	57-28	52-95	78
79	58-71	52-86	58-48	53-12	58-24	53-37	58-01	53-63	79
80	59-45	53-53	59-22	53-79	58-98	54-05	58-75	54-30	80
81	60-19	54-20	59-96	54-46	59-72	54-72	59-48	54-98	81
82	60-94	54-87	60-70	55-13	60-46	55-40	60-21	55-66	82
83	61-68	55-54	61-44	55-81	61-19	56-07	60-95	56-34	83
84	62-42	56-21	62-18	56-48	61-93	56-75	61-68	57-02	84
85	63-17	56-88	62-92	57-15	62-67	57-43	62-42	57-70	85
86	63-91	57-55	63-66	57-82	63-41	58-10	63-15	58-38	86
87	64-65	58-21	64-40	58-50	64-14	58-78	63-89	59-06	87
88	65-40	58-88	65-14	59-17	64-88	59-45	64-62	59-73	88
89	66-14	59-55	65-88	59-84	65-62	60-13	65-35	60-41	89
90	66-88	60-22	66-62	60-51	66-35	60-80	66-09	61-09	90
91	67-63	60-89	67-36	61-19	67-09	61-48	66-82	61-77	91
92	68-37	61-56	68-10	61-86	67-83	62-15	67-56	62-45	92
93	69-11	62-23	68-84	62-53	68-57	62-83	68-29	63-13	93
94	69-86	62-90	69-58	63-20	69-30	63-51	69-03	63-81	94
95	70-60	63-57	70-32	63-87	70-04	64-18	69-76	64-49	95
96	71-34	64-24	71-06	64-55	70-78	64-86	70-49	65-16	96
97	72-08	64-91	71-80	65-22	71-52	65-53	71-23	65-84	97
98	72-83	65-57	72-54	65-89	72-25	66-21	71-96	66-52	98
99	73-57	66-24	73-28	66-56	72-99	66-88	72-70	67-20	99
100	74-31	66-91	74-02	67-24	73-73	67-56	73-43	67-88	100
Distance.	48 Deg.		47¾ Deg.		47½ Deg.		47¼ Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

TRAVERSE TABLE.

Distance.	43 Deg.		43¼ Deg.		43½ Deg.		43¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-73	0-68	0-73	0-69	0-73	0-69	0-72	0-69	1
2	1-46	1-33	1-46	1-37	1-45	1-38	1-44	1-38	2
3	2-19	2-05	2-19	2-06	2-18	2-07	2-17	2-07	3
4	2-93	2-73	2-91	2-74	2-90	2-75	2-89	2-77	4
5	3-66	3-41	3-64	3-43	3-63	3-44	3-61	3-46	5
6	4-39	4-09	4-37	4-11	4-35	4-13	4-33	4-15	6
7	5-12	4-77	5-10	4-80	5-08	4-82	5-06	4-84	7
8	5-85	5-46	5-83	5-48	5-80	5-51	5-78	5-53	8
9	6-58	6-14	6-56	6-17	6-53	6-20	6-50	6-22	9
10	7-31	6-82	7-28	6-85	7-25	6-88	7-22	6-92	10
11	8-04	7-50	8-01	7-54	7-98	7-57	7-95	7-61	11
12	8-78	8-18	8-74	8-22	8-70	8-26	8-67	8-30	12
13	9-51	8-87	9-47	8-91	9-43	8-95	9-39	8-99	13
14	10-24	9-55	10-20	9-59	10-16	9-64	10-11	9-68	14
15	10-97	10-23	10-93	10-28	10-88	10-33	10-84	10-37	15
16	11-70	10-91	11-65	10-96	11-61	11-01	11-56	11-06	16
17	12-43	11-59	12-38	11-65	12-33	11-70	12-28	11-76	17
18	13-16	12-28	13-11	12-33	13-06	12-39	13-00	12-45	18
19	13-90	12-96	13-84	13-02	13-78	13-08	13-72	13-14	19
20	14-63	13-64	14-57	13-70	14-51	13-77	14-45	13-83	20
21	15-36	14-32	15-30	14-39	15-23	14-46	15-17	14-52	21
22	16-09	15-00	16-02	15-07	15-96	15-14	15-89	15-21	22
23	16-82	15-69	16-75	15-76	16-68	15-83	16-51	15-90	23
24	17-55	16-37	17-48	16-44	17-41	16-52	17-34	16-60	24
25	18-28	17-05	18-21	17-13	18-13	17-21	18-06	17-29	25
26	19-02	17-73	18-94	17-81	18-86	17-90	18-78	17-98	26
27	19-75	18-41	19-67	18-50	19-59	18-59	19-50	18-67	27
28	20-48	19-10	20-39	19-19	20-31	19-27	20-23	19-36	28
29	21-21	19-78	21-12	19-87	21-04	19-96	20-95	20-05	29
30	21-94	20-46	21-85	20-56	21-76	20-65	21-67	20-75	30
31	22-67	21-14	22-58	21-24	22-49	21-34	22-39	21-44	31
32	23-40	21-82	23-31	21-93	23-21	22-03	23-12	22-13	32
33	24-13	22-51	24-04	22-61	23-94	22-72	23-84	22-82	33
34	24-87	23-19	24-76	23-30	24-66	23-40	24-56	23-51	34
35	25-60	23-87	25-49	23-98	25-39	24-09	25-28	24-20	35
36	26-33	24-55	26-22	24-67	26-11	24-78	26-01	24-89	36
37	27-06	25-23	26-95	25-35	26-84	25-47	26-73	25-59	37
38	27-79	25-92	27-68	26-04	27-56	26-16	27-45	26-28	38
39	28-52	26-60	28-41	26-72	28-29	26-85	28-17	26-97	39
40	29-25	27-28	29-13	27-41	29-01	27-53	28-89	27-66	40
41	29-99	27-96	29-86	28-09	29-74	28-22	29-62	28-35	41
42	30-72	28-64	30-59	28-78	30-47	28-91	30-34	29-04	42
43	31-45	29-33	31-32	29-46	31-19	29-60	31-06	29-74	43
44	32-18	30-01	32-05	30-15	31-92	30-29	31-78	30-43	44
45	32-91	30-69	32-78	30-83	32-64	30-98	32-51	31-12	45
46	33-64	31-37	33-51	31-52	33-37	31-66	33-23	31-81	46
47	34-37	32-05	34-23	32-20	34-09	32-35	33-95	32-50	47
48	35-10	32-74	34-96	32-89	34-82	33-04	34-67	33-19	48
49	35-84	33-42	35-69	33-57	35-54	33-73	35-40	33-88	49
50	36-57	34-10	36-42	34-26	36-27	34-42	36-12	34-58	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	47 Deg.		46¾ Deg.		46½ Deg.		46¼ Deg.		

TRAVERSE TABLE.

Distance.	43 Deg.		43¼ Deg.		43½ Deg.		43¾ Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	37-30	34-78	37-15	34-94	36-99	35-11	36-84	35-27	51
52	38-03	35-46	37-88	35-63	37-72	35-79	37-56	35-96	52
53	38-76	36-15	38-60	36-31	38-44	36-48	38-29	36-65	53
54	39-49	36-83	39-33	37-00	39-17	37-17	39-01	37-34	54
55	40-22	37-51	40-06	37-69	39-90	37-86	39-73	38-03	55
56	40-96	38-19	40-79	38-37	40-62	38-55	40-45	38-72	56
57	41-69	38-87	41-52	39-06	41-35	39-24	41-17	39-42	57
58	42-42	39-56	42-25	39-74	42-07	39-92	41-90	40-11	58
59	43-15	40-24	42-97	40-43	42-80	40-61	42-62	40-80	59
60	43-88	40-92	43-70	41-11	43-52	41-30	43-34	41-49	60
61	44-61	41-60	44-43	41-80	44-25	41-99	44-06	42-18	61
62	45-34	42-28	45-16	42-48	44-97	42-68	44-79	42-87	62
63	46-08	42-97	45-89	43-17	45-70	43-37	45-51	43-57	63
64	46-81	43-65	46-62	43-85	46-42	44-05	46-23	44-26	64
65	47-54	44-33	47-34	44-54	47-15	44-74	46-95	44-95	65
66	48-27	45-01	48-07	45-22	47-87	45-43	47-68	45-64	66
67	49-00	45-69	48-80	45-91	48-60	46-12	48-40	46-33	67
68	49-73	46-38	49-53	46-59	49-33	46-81	49-12	47-02	68
69	50-46	47-06	50-26	47-28	50-05	47-50	49-84	47-71	69
70	51-19	47-74	50-99	47-96	50-78	48-18	50-57	48-41	70
71	51-93	48-42	51-71	48-65	51-50	48-87	51-29	49-10	71
72	52-66	49-10	52-44	49-33	52-23	49-56	52-01	49-79	72
73	53-39	49-79	53-17	50-02	52-95	50-25	52-73	50-48	73
74	54-12	50-47	53-90	50-70	53-68	50-94	53-45	51-17	74
75	54-85	51-15	54-63	51-39	54-40	51-63	54-18	51-86	75
76	55-58	51-83	55-36	52-07	55-13	52-31	54-90	52-55	76
77	56-31	52-51	56-08	52-76	55-85	53-00	55-62	53-25	77
78	57-05	53-20	56-81	53-44	56-58	53-69	56-34	53-94	78
79	57-78	53-88	57-54	54-13	57-30	54-38	57-07	54-63	79
80	58-51	54-56	58-27	54-81	58-03	55-07	57-79	55-32	80
81	59-24	55-24	59-00	55-50	58-76	55-76	58-51	56-01	81
82	59-97	55-92	59-73	56-18	59-48	56-45	59-23	56-70	82
83	60-70	56-61	60-45	56-87	60-21	57-13	59-96	57-40	83
84	61-43	57-29	61-18	57-56	60-93	57-82	60-68	58-09	84
85	62-17	57-97	61-91	58-24	61-66	58-51	61-40	58-78	85
86	62-90	58-65	62-64	58-93	62-38	59-20	62-12	59-47	86
87	63-63	59-33	63-37	59-61	63-11	59-89	62-85	60-16	87
88	64-36	60-02	64-10	60-30	63-83	60-58	63-57	60-85	88
89	65-09	60-70	64-82	60-98	64-56	61-26	64-29	61-54	89
90	65-82	61-38	65-55	61-67	65-28	61-95	65-01	62-24	90
91	66-55	62-06	66-28	62-35	66-01	62-64	65-74	62-93	91
92	67-28	62-74	67-01	63-04	66-73	63-33	66-46	63-62	92
93	68-02	63-43	67-74	63-72	67-46	64-02	67-18	64-31	93
94	68-75	64-11	68-47	64-41	68-19	64-71	67-90	65-00	94
95	69-48	64-79	69-20	65-09	68-91	65-39	68-62	65-69	95
96	70-21	65-47	69-92	65-78	69-64	66-08	69-35	66-39	96
97	70-94	66-15	70-65	66-46	70-36	66-77	70-07	67-08	97
98	71-67	66-84	71-37	67-15	71-09	67-46	70-79	67-77	98
99	72-40	67-52	72-11	67-83	71-81	68-15	71-51	68-46	99
100	73-14	68-20	72-84	68-52	72-54	68-84	72-24	69-15	100
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	47 Deg.		46¾ Deg.		46½ Deg.		46¼ Deg.		

TRAVERSE TABLE

Distance.	44 Deg.		44¼ Deg.		44½ Deg.		44¾ Deg.		45 Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0-72	0-69	0-72	0-70	0-71	0-70	0-71	0-71	0-71	0-71	1
2	1-44	1-39	1-43	1-40	1-43	1-40	1-42	1-41	1-41	1-41	2
3	2-16	2-08	2-15	2-09	2-14	2-10	2-13	2-11	2-12	2-12	3
4	2-88	2-78	2-87	2-79	2-85	2-80	2-84	2-82	2-83	2-83	4
5	3-60	3-47	3-58	3-49	3-57	3-50	3-55	3-52	3-54	3-54	5
6	4-32	4-17	4-30	4-19	4-28	4-21	4-26	4-22	4-24	4-24	6
7	5-04	4-86	5-01	4-88	4-99	4-91	4-97	4-93	4-95	4-95	7
8	5-75	5-56	5-73	5-58	5-71	5-61	5-68	5-63	5-66	5-66	8
9	6-47	6-25	6-45	6-28	6-42	6-31	6-39	6-34	6-36	6-36	9
10	7-19	6-95	7-16	6-98	7-13	7-01	7-10	7-04	7-07	7-07	10
11	7-91	7-64	7-88	7-68	7-85	7-71	7-81	7-74	7-78	7-78	11
12	8-63	8-34	8-66	8-37	8-56	8-41	8-52	8-45	8-49	8-49	12
13	9-35	9-03	9-31	9-07	9-27	9-11	9-23	9-15	9-19	9-19	13
14	10-07	9-73	10-03	9-77	9-99	9-81	9-94	9-86	9-90	9-90	14
15	10-79	10-42	10-74	10-47	10-70	10-51	10-65	10-56	10-61	10-61	15
16	11-51	11-11	11-46	11-16	11-41	11-21	11-36	11-26	11-31	11-31	16
17	12-23	11-81	12-18	11-86	12-13	11-92	12-07	11-97	12-02	12-02	17
18	12-95	12-50	12-89	12-56	12-84	12-62	12-78	12-67	12-73	12-73	18
19	13-67	13-20	13-61	13-26	13-55	13-32	13-49	13-38	13-43	13-43	19
20	14-39	13-89	14-33	13-96	14-26	14-02	14-20	14-08	14-14	14-14	20
21	15-11	14-59	15-04	14-65	14-98	14-72	14-91	14-78	14-85	14-85	21
22	15-83	15-28	15-76	15-35	15-69	15-42	15-62	15-49	15-56	15-56	22
23	16-54	15-98	16-47	16-05	16-40	16-12	16-33	16-19	16-26	16-26	23
24	17-26	16-67	17-19	16-75	17-12	16-82	17-04	16-90	16-97	16-97	24
25	17-98	17-37	17-91	17-44	17-83	17-52	17-75	17-60	17-68	17-68	25
26	18-70	18-06	18-62	18-14	18-54	18-22	18-46	18-30	18-38	18-38	26
27	19-42	18-76	19-34	18-84	19-26	18-92	19-17	19-01	19-09	19-09	27
28	20-14	19-45	20-06	19-54	19-97	19-63	19-89	19-71	19-80	19-80	28
29	20-86	20-15	20-77	20-24	20-68	20-33	20-60	20-42	20-51	20-51	29
30	21-58	20-84	21-49	20-93	21-40	21-03	21-31	21-12	21-21	21-21	30
31	22-30	21-53	22-21	21-63	22-11	21-73	22-02	21-82	21-92	21-92	31
32	23-02	22-23	22-92	22-33	22-82	22-43	22-73	22-53	22-63	22-63	32
33	23-74	22-92	23-64	23-03	23-54	23-13	23-44	23-23	23-33	23-33	33
34	24-46	23-62	24-35	23-72	24-25	23-83	24-15	23-94	24-04	24-04	34
35	25-18	24-31	25-07	24-42	24-96	24-53	24-86	24-64	24-75	24-75	35
36	25-90	25-01	25-79	25-12	25-68	25-23	25-57	25-34	25-46	25-46	36
37	26-62	25-70	26-50	25-82	26-39	25-93	26-28	26-05	26-16	26-16	37
38	27-33	26-40	27-22	26-52	27-10	26-63	26-99	26-75	26-87	26-87	38
39	28-05	27-09	27-94	27-21	27-82	27-34	27-70	27-46	27-58	27-58	39
40	28-77	27-79	28-65	27-91	28-53	28-04	28-41	28-16	28-28	28-28	40
41	29-49	28-48	29-37	28-61	29-24	28-74	29-12	28-86	28-99	28-99	41
42	30-21	29-18	30-08	29-31	29-96	29-44	29-83	29-57	29-70	29-70	42
43	30-93	29-87	30-80	30-00	30-67	30-14	30-54	30-27	30-41	30-41	43
44	31-65	30-56	31-52	30-70	31-38	30-84	31-25	30-98	31-11	31-11	44
45	32-37	31-26	32-23	31-40	32-10	31-64	31-96	31-68	31-82	31-82	45
46	33-09	31-95	32-95	32-10	32-81	32-24	32-67	32-38	32-53	32-53	46
47	33-81	32-65	33-67	32-80	33-52	32-94	33-38	33-09	33-23	33-23	47
48	34-53	33-34	34-38	33-49	34-24	33-64	34-09	33-79	33-94	33-94	48
49	35-25	34-04	35-10	34-19	34-95	34-34	34-80	34-50	34-65	34-65	49
50	35-97	34-73	35-82	34-89	35-66	35-05	35-51	35-20	35-36	35-36	50
Distance.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Distance.
	46 Deg.		45¾ Deg.		45½ Deg.		45¼ Deg.		45 Deg.		

TRAVERSE TABLE.

Distance.	44 Deg.		44¼ Deg.		44½ Deg.		44¾ Deg.		45 Deg.		Distance.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	36-69	35-43	36-53	35-59	36-38	35-75	36-22	35-90	36-06	36-06	51
52	37-41	36-12	37-25	36-29	37-09	36-45	36-93	36-61	36-77	36-77	52
53	38-12	36-82	37-96	36-98	37-50	37-15	37-64	37-31	37-48	37-48	53
54	38-84	37-51	38-68	37-68	38-52	37-85	38-35	38-02	38-18	38-18	54
55	39-56	38-21	39-40	38-38	39-23	38-55	39-06	38-72	38-89	38-89	55
56	40-28	38-90	40-11	39-08	39-94	39-25	39-77	39-42	39-60	39-60	56
57	41-00	39-60	40-83	39-77	40-66	39-95	40-48	40-13	40-31	40-31	57
58	41-72	40-29	41-55	40-47	41-37	40-65	41-19	40-83	41-01	41-01	58
59	42-44	40-98	42-26	41-17	42-08	41-35	41-90	41-54	41-72	41-72	59
60	43-16	41-68	42-98	41-87	42-79	42-05	42-61	42-24	42-43	42-43	60
61	43-88	42-37	43-69	42-57	43-51	42-76	43-32	42-94	43-13	43-13	61
62	44-60	43-07	44-41	43-26	44-22	43-46	44-03	43-65	43-84	43-84	62
63	45-32	43-76	45-13	43-96	44-93	44-16	44-74	44-35	44-55	44-55	63
64	46-04	44-46	45-84	44-66	45-65	44-86	45-45	45-06	45-25	45-25	64
65	46-76	45-15	46-56	45-36	46-36	45-56	46-16	45-76	45-96	45-96	65
66	47-48	45-85	47-28	46-05	47-07	46-26	46-87	46-46	46-67	46-67	66
67	48-20	46-54	47-99	46-75	47-79	46-96	47-58	47-17	47-38	47-38	67
68	48-92	47-24	48-71	47-45	48-50	47-66	48-29	47-87	48-08	48-08	68
69	49-63	47-93	49-42	48-15	49-21	48-36	49-00	48-58	48-79	48-79	69
70	50-35	48-63	50-14	48-85	49-93	49-06	49-71	49-28	49-50	49-50	70
71	51-07	49-32	50-86	49-54	50-64	49-76	50-42	49-98	50-20	50-20	71
72	51-79	50-02	51-57	50-24	51-35	50-47	51-13	50-69	50-91	50-91	72
73	52-51	50-71	52-29	50-94	52-07	51-17	51-84	51-39	51-62	51-62	73
74	53-23	51-40	53-01	51-64	52-78	51-87	52-55	52-10	52-33	52-33	74
75	53-95	52-10	53-72	52-33	53-49	52-57	53-26	52-80	53-03	53-03	75
76	54-67	52-79	54-44	53-03	54-21	53-27	53-97	53-51	53-74	53-74	76
77	55-39	53-49	55-16	53-73	54-92	53-97	54-68	54-21	54-45	54-45	77
78	56-11	54-18	55-87	54-43	55-63	54-67	55-39	54-91	55-15	55-15	78
79	56-83	54-88	56-59	55-13	56-35	55-37	56-10	55-62	55-86	55-86	79
80	57-55	55-57	57-30	55-82	57-06	56-07	56-81	56-32	56-57	56-57	80
81	58-27	56-27	58-02	56-52	57-77	56-77	57-52	57-03	57-28	57-28	81
82	58-99	56-96	58-74	57-22	58-49	57-47	58-24	57-73	57-98	57-98	82
83	59-71	57-56	59-45	57-92	59-20	58-18	58-95	58-43	58-69	58-69	83
84	60-42	58-35	60-17	58-01	59-01	58-88	59-66	59-14	59-40	59-40	84
85	61-14	59-05	60-89	59-31	60-63	59-58	60-37	59-84	60-10	60-10	85
86	61-86	59-74	61-60	60-01	61-34	60-28	61-08	60-55	60-81	60-81	86
87	62-58	60-44	62-32	60-71	62-05	60-98	61-79	61-25	61-52	61-52	87
88	63-30	61-13	63-03	61-41	62-77	61-68	62-50	61-95	62-23	62-23	88
89	64-02	61-82	63-75	62-10	63-48	62-38	63-21	62-66	62-93	62-93	89
90	64-74	62-52	64-47	62-80	64-19	63-08	63-92	63-36	63-64	63-64	90
91	65-46	63-21	65-18	63-50	64-91	63-78	64-63	64-07	64-35	64-35	91
92	66-18	63-91	65-90	64-20	65-62	64-48	65-34	64-77	65-05	65-05	92
93	66-90	64-60	66-62	64-89	66-33	65-18	66-05	65-47	65-76	65-76	93
94	67-62	65-30	67-33	65-59	67-05	65-89	66-76	66-18	66-47	66-47	94
95	68-34	65-99	68-05	66-29	67-76	66-59	67-47	66-88	67-18	67-18	95
96	69-06	66-69	68-76	66-99	68-47	67-29	68-18	67-59	67-88	67-88	96
97	69-78	67-38	69-48	67-69	69-19	67-99	68-89	68-29	68-59	68-59	97
98	70-50	68-08	70-20	68-38	69-90	68-69	69-60	68-99	69-30	69-30	98
99	71-21	68-77	70-91	69-08	70-61	69-39	70-31	69-70	70-00	70-00	99
100	71-93	69-47	71-63	69-78	71-33	70-09	71-02	70-40	70-71	70-71	100
Distance.	46 Deg.		45¾ Deg.		45½ Deg.		45¼ Deg.		45 Deg.		Distance.
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	

	0°	1°	2°	3°	4°	5°	6°	7°	
0	.000 0000	.017 4524	.034 8995	.052 3360	.069 7665	.087 1557	.104 5285	.121 8693	60
1	2909	7432	.035 1902	6264	.070 0467	4455	8178	.122 1581	59
2	5818	.018 0341	4809	9169	3368	7363	.105 1070	4468	58
3	8727	3249	7716	.053 2074	6270	.088 0251	3063	7355	57
4	.001 1636	6158	.036 0623	4979	9171	3148	6856	.123 0241	56
5	4544	9066	3530	7883	.071 2073	6046	9748	3128	55
6	7453	.019 1974	6437	.054 0788	4974	8943	.106 2641	6015	54
7	.002 0362	4883	9344	3693	7876	.089 1840	5533	8901	53
8	3271	7791	.037 2251	6597	.072 0777	4738	8425	.124 1788	52
9	6180	.020 0699	5158	9502	3678	7635	.107 1318	4674	51
10	9090	3609	8065	.055 2406	6580	.090 0532	4210	7560	50
11	.003 1938	6516	.038 0971	5311	9481	3429	7102	.125 0446	49
12	4907	9424	3878	8215	.073 2382	6326	9994	3332	48
13	7815	.021 2332	6785	.056 1119	5283	9223	.108 2885	6218	47
14	.004 0724	5211	9692	4024	8184	.091 2119	5777	9104	46
15	3633	8149	.039 2598	6928	.074 1085	5016	8669	.126 1900	45
16	6542	.022 1057	5505	9832	3986	7913	.109 1560	4875	44
17	9451	3965	8411	.057 2738	6887	.092 0809	4452	7761	43
18	.005 2360	6873	.040 1818	5640	9787	3706	7343	.127 0646	42
19	5268	9781	4224	8544	.075 2688	6602	.110 0234	3531	41
20	8177	.023 2690	7131	.058 1448	5589	9499	3126	6410	40
21	.006 1086	5598	.041 0037	4352	8489	.093 2355	6017	9302	39
22	3935	8506	2944	7256	.076 1390	5291	8908	.128 2186	38
23	6934	.024 1414	5850	.059 0160	4290	8187	.111 1799	6071	37
24	9813	4322	8757	3064	7190	.094 1083	4689	7956	36
25	.007 2721	7230	.042 1663	5967	.077 0091	3979	7580	.129 0841	35
26	5630	.025 0138	4569	8871	2991	6875	.112 0471	3725	34
27	8539	3046	7475	.060 1775	5891	9771	3361	6609	33
28	.008 1448	5954	.043 0382	4678	8791	.095 2666	6252	9494	32
29	4337	8862	3288	7582	.078 1091	5562	9142	.130 2378	31
30	7255	.026 1769	6194	.061 0485	4591	8458	.113 2032	6262	30
31	.009 0174	4677	9100	3389	7491	.096 1353	4922	8146	29
32	3083	7585	.044 2006	6292	.079 0391	4248	7812	.131 1030	28
33	5992	.027 0493	4912	9196	3290	7144	.114 0702	3917	27
34	8900	3401	7818	.062 2099	6190	.097 0039	3592	6797	26
35	.010 1809	6309	.045 0724	5002	9090	2934	6482	9681	25
36	4718	9216	3630	7905	.080 1989	5829	9372	.132 2564	24
37	7627	.028 2124	6536	.063 0808	4889	8724	.115 2261	5447	23
38	.011 0535	5032	9442	3711	7788	.098 1619	5151	8330	22
39	3444	7940	.046 2347	6614	.081 0687	4514	8040	.133 1213	21
40	6353	.029 0847	5253	9517	3587	7408	.116 0929	4096	20
41	9261	3755	8159	.064 2420	6486	.099 0303	3818	6979	19
42	.012 2170	6662	.047 1065	5323	9385	3197	6707	9862	18
43	5979	9570	3970	8226	.082 2284	6092	9596	.134 2744	17
44	7987	.030 2478	6876	.065 1129	5183	8986	.117 2485	5627	16
45	.013 0895	5385	9781	4031	8082	.100 1881	5374	8509	15
46	3805	8293	.048 2687	6934	.083 0981	4775	8263	.135 1392	14
47	6713	.031 1209	5592	9836	3880	7689	.118 1151	4274	13
48	9622	4108	8498	.066 2739	6778	.101 0563	4040	7156	12
49	.014 2539	7015	.049 1493	5641	9677	3457	6928	.136 0038	11
50	5439	9922	4308	8544	.084 2576	6351	9816	2919	10
51	8348	.032 2839	7214	.067 1446	5474	9245	.119 2704	5801	9
52	.015 1256	5737	.050 0119	4349	8373	.102 2138	5593	8683	8
53	4165	8644	3024	7251	.085 1271	5032	8481	.137 1564	7
54	7073	.033 1552	5929	.068 0153	4169	7925	.120 1368	4445	6
55	9982	4453	8835	3055	7067	.103 0819	4256	7327	5
56	.016 2899	7366	.051 1740	5957	9966	3712	7144	.138 0208	4
57	5799	.034 0274	4645	8859	.086 2864	6605	.121 0031	3089	3
58	8707	3181	7550	.069 1761	5762	9499	2919	5670	2
59	.017 1616	6088	.052 0455	4663	8660	.104 2032	5806	8850	1
60	4524	8995	3390	7565	.087 1557	5285	8693	.139 1731	0
	89°	88°	87°	86°	85°	84°	83°	82°	

	8°	9°	10°	11°	12°	13°	14°	15°	
0	139 1731	156 4345	173 6482	190 8090	207 9117	224 9511	241 9219	258 8190	60
1	4612	7218	9346	191 0945	208 1962	225 2345	242 2041	259 1000	59
2	7492	157 0091	174 2211	3801	4807	5179	4863	3810	58
3	140 0372	2963	5075	6656	7652	8013	7685	6619	57
4	3252	5838	7939	9510	209 0497	226 0846	243 0507	9428	56
5	6132	8708	175 0803	192 2365	3341	3680	3329	260 2237	55
6	9012	158 1581	3667	5220	6186	6513	6156	5045	54
7	141 1892	4455	6531	8074	9030	9346	8971	7855	53
8	4772	7325	9395	193 0928	210 1874	227 2179	244 1792	261 0662	52
9	7651	159 0197	176 2258	3782	4718	5012	4613	3469	51
10	142 0531	3066	5121	6636	7561	7844	7435	6277	50
11	3410	5940	7984	9490	211 0405	228 0677	245 0254	9085	49
12	6289	8812	177 0847	194 2344	3248	3509	3074	262 1892	48
13	9168	160 1683	3710	5197	6091	6341	5894	4692	47
14	143 2047	4555	6573	8050	8934	9172	8713	7502	46
15	4926	7420	9435	195 0903	212 1777	229 2004	246 1532	263 0312	45
16	7805	161 0297	178 2298	3756	4619	4835	4352	3112	44
17	144 0684	3167	5160	6609	7462	7666	7171	5922	43
18	3562	6038	8022	9461	213 0304	230 0497	9990	8730	42
19	6440	8909	179 0884	196 2314	3140	3328	247 2800	264 1530	41
20	9319	162 1779	3746	5166	5988	6159	5627	4342	40
21	145 2197	4650	6607	8018	8829	8989	8445	7142	39
22	5075	7520	9469	197 0870	214 1671	231 1819	248 1263	9952	38
23	7953	163 0390	180 2330	3722	4512	4649	4081	265 2757	37
24	146 0830	3260	5191	6573	7353	7479	6895	5561	36
25	3708	6129	8052	9425	215 0194	232 0309	9710	8360	35
26	6585	8999	181 0913	198 2276	3035	3138	249 2532	266 1170	34
27	9463	164 1868	3774	5127	5876	5967	5350	3972	33
28	147 2340	4738	6635	7978	8716	8796	8167	6777	32
29	5217	7607	9495	199 0829	216 1556	233 1625	250 0984	9581	31
30	8094	165 0477	182 2355	3679	4396	4454	3800	267 2382	30
31	148 0971	3345	5215	6530	7236	7282	6610	5182	29
32	3848	6214	8075	9380	217 0076	234 0110	9432	7986	28
33	6724	9082	183 0935	200 2230	2915	2938	251 2248	268 0792	27
34	9601	166 1951	3795	5080	5754	5760	5063	3594	26
35	149 2477	4819	6654	7930	8593	8594	7879	6390	25
36	5353	7687	9514	201 0779	218 1432	235 1421	252 0694	9198	24
37	8230	167 0550	184 2373	3629	4271	4248	3508	269 2006	23
38	150 1100	3423	5232	6478	7110	7075	6323	4801	22
39	3981	6291	8091	9327	9948	9902	9137	7602	21
40	6857	9159	185 0949	202 2176	219 2786	236 2729	253 1952	270 0400	20
41	9733	168 2026	3808	5024	5624	5555	4760	3202	19
42	151 2008	4894	6666	7873	8462	8381	7579	6004	18
43	5484	7761	9524	203 0721	220 1300	237 1207	254 0392	8805	17
44	8359	169 0628	186 2382	3569	4137	4033	3206	271 1605	16
45	152 1234	3495	5240	6418	6974	6850	6019	4404	15
46	4109	6362	8098	9265	9811	9684	8832	7204	14
47	6984	9228	187 0956	204 2113	221 2648	238 2510	255 1642	272 0000	13
48	9858	170 2095	3813	4961	5485	5335	4458	2802	12
49	153 2733	4961	6670	7808	8321	8159	7270	5602	11
50	5607	7828	9528	205 0655	222 1158	239 0984	256 0982	8102	10
51	8482	171 0694	188 2385	3502	3994	3808	2891	273 1102	9
52	154 1356	3560	5241	6349	6830	6633	5705	3905	8
53	4230	6425	8098	9195	9666	9457	8517	6742	7
54	7104	9291	189 0954	206 2042	223 2501	240 2280	257 1328	9202	6
55	9978	172 2156	3811	4888	5337	5104	4130	274 2200	5
56	155 2851	5022	6667	7734	8172	7927	6950	5187	4
57	5725	7887	9523	207 0580	224 1007	241 0751	257 9760	7924	3
58	8598	173 0752	190 2379	3423	3842	3574	258 2576	275 0781	2
59	156 1472	3617	5234	6272	6676	6396	5381	3577	1
60	4345	6482	8090	9117	9511	9219	8190	6374	0
	81°	80°	79°	78°	77°	76°	75°	74°	

	16°	17°	18°	19°	20°	21°	22°	23°	
0	.275 6374	.292 3717	.309 0170	.325 5682	.342 0201	.358 3679	.374 6066	.390 7311	60
1	9170	6499	2936	8432	2936	6395	8763	9989	59
2	.276 1965	9280	5702	.326 1182	5668	9110	.375 1459	.391 2666	58
3	4761	.293 2061	8468	3932	8400	.359 1825	4156	5343	57
4	7554	4842	.310 1224	6681	.343 1132	4540	6852	8019	56
5	.277 6352	7623	3999	9430	3865	7254	9647	.392 0695	55
6	3147	.294 0403	6764	.327 2179	6597	9968	.376 2243	3371	54
7	5945	3182	9529	4928	9329	.360 2682	4938	6047	53
8	8739	5963	.311 2204	7676	.344 2060	5395	7632	8722	52
9	.278 1530	8743	5058	.328 0424	4791	8108	.377 0327	.393 1397	51
10	4324	.295 1522	7822	3172	7521	.361 6821	3021	4071	50
11	7118	4302	.312 0586	5919	.345 0252	3534	5714	6745	49
12	9911	7081	3349	8666	2982	6246	8408	9419	48
13	.279 2704	9859	6112	.329 1413	5712	8958	.378 1101	.394 2093	47
14	5497	.296 2638	8875	4160	8441	.362 1669	3794	4766	46
15	8290	5416	.313 1638	6906	.346 1171	4380	6486	7439	45
16	.280 1082	8194	4406	9653	3900	7091	9178	.395 0111	44
17	3871	.297 0971	7163	.330 2398	6628	9802	.379 1870	2783	43
18	6667	3749	9925	5144	9357	.363 2512	4562	5455	42
19	9458	6526	.314 2086	7889	.347 2085	5222	7253	8127	41
20	.281 2251	9303	5448	.331 0634	4812	7932	9944	.396 0798	40
21	5042	.298 2079	8206	3379	7540	.364 0641	.380 2634	3468	39
22	7832	4851	.315 0969	6123	.348 0267	3351	5324	6139	38
23	.282 0624	7632	3736	8867	2994	6059	8014	8809	37
24	3418	.299 0408	6490	.332 1611	5720	8768	.381 0704	.397 1479	36
25	6205	3184	9250	4355	8447	.365 1476	3393	4148	35
26	8995	5959	.316 2010	7098	.349 1173	4184	6082	6818	34
27	.283 1782	8734	4770	9841	3898	6891	8770	9486	33
28	4575	.300 1509	7529	.333 2584	6624	9699	.382 1459	.398 2165	32
29	7364	4284	.317 0288	5326	9349	.366 2306	4147	4823	31
30	.284 0153	7058	3047	8069	.350 2074	5012	6834	7491	30
31	2942	9832	5805	.334 0810	4798	7719	9522	.399 0158	29
32	5731	.301 2006	8563	3552	7523	.367 0425	.383 2209	2825	28
33	8520	5386	.318 1321	6295	.351 0246	3130	4895	5492	27
34	.285 1368	8152	4079	9034	2970	5836	7582	8158	26
35	4906	.302 0920	6836	.335 1775	5693	8541	.384 0268	.400 0825	25
36	7694	3699	9593	4510	8416	.368 1246	2953	3490	24
37	9871	6471	.319 2350	7256	.352 1139	3950	5739	6156	23
38	.286 2158	9244	5106	9996	3862	6654	8324	8821	22
39	5246	.303 2016	7863	.336 2736	6584	9258	.385 1008	.401 1486	21
40	8032	4788	.320 0619	5475	9306	.369 2061	3693	4150	20
41	.287 6614	7559	3274	8214	.353 2027	4765	6377	6814	19
42	3002	.304 0331	6130	.337 0953	4748	7468	9066	9478	18
43	5791	3102	8885	3691	7469	.370 0170	.386 1744	.402 2141	17
44	8577	5872	.321 1640	6429	.354 0190	2872	4427	4804	16
45	.288 1362	8642	4395	9167	2916	5574	7110	7467	15
46	4144	.305 1413	7149	.338 1905	5630	8276	9792	.403 0129	14
47	6932	4186	9903	4642	8350	.371 0977	.387 2474	2791	13
48	.289 6618	6952	.322 2657	7379	.355 1070	3678	5156	5453	12
49	3166	9725	5411	.339 0116	3789	6379	7837	8114	11
50	5952	.306 2496	8164	2852	6508	9079	.388 0518	.404 0775	10
51	8737	3231	.323 0917	5589	9226	.372 1780	3199	3436	9
52	.290 1456	6026	3670	8325	.356 1944	4479	5880	6096	8
53	4222	.307 0798	6422	.340 1666	4662	7179	8560	8756	7
54	7007	3360	9174	3796	7386	9878	.389 1240	.405 1416	6
55	9792	6136	.324 1426	6531	.357 0697	.373 2577	3919	4675	5
56	.291 1752	9006	4678	9265	2814	5275	6598	6734	4
57	4577	.308 1869	7429	.341 2000	5531	7973	9277	9393	3
58	7362	4376	.325 0180	4734	8248	.374 0671	.399 1955	.406 2051	2
59	.292 6856	7439	2931	7468	.358 0964	3369	4633	4709	1
60	9641	.309 0176	5682	.342 0201	3679	6066	7311	7366	0
	70°	72°	71°	70°	69°	68°	67°	66°	

	24°	25°	26°	27°	28°	29°	30°	31°	
0	406 7306	422 6183	438 3711	453 9905	469 4716	484 8096	500 0000	515 0331	00
1	407 0024	423 8819	439 6326	454 2497	470 7284	485 0640	501 2519	516 2874	59
2	2681	423 1455	439 8940	455 5088	471 9552	486 3184	502 5037	517 5367	58
3	5337	40 0	439 1553	456 7679	472 2419	487 5727	503 7556	518 7859	57
4	7993	6725	4166	455 0269	473 4986	488 8270	504 0073	519 0351	56
5	408 0649	9369	6779	2859	7553	486 0812	2591	2842	55
6	3305	424 1900	9392	5449	471 0119	3354	5107	5333	54
7	5060	4628	440 2004	8038	2685	5895	7624	7824	53
8	8615	7262	4315	456 0627	5250	8436	502 0140	517 0314	52
9	409 1269	9895	7227	3216	7815	487 0977	2655	2804	51
10	3323	425 2528	9933	5804	472 0380	3517	5170	5293	50
11	6577	5161	441 2448	8392	2944	6057	7685	7782	49
12	9230	7793	5059	457 0979	5508	8597	503 0199	518 0270	48
13	410 1883	426 0425	7668	3566	8071	488 1136	2713	2758	47
14	4536	3056	442 0278	6153	473 0634	3674	5227	5246	46
15	7189	5687	2887	8739	3197	6212	7740	7733	45
16	9841	8318	5496	458 1325	5759	8750	504 0252	519 0219	44
17	411 2432	427 0349	8104	3910	8321	489 1288	2765	2705	43
18	5144	3579	443 0712	6496	474 0882	3825	5276	5191	42
19	7795	6208	3319	9080	3443	6361	7788	7676	41
20	412 0445	8838	5927	459 1665	6004	8897	505 0298	520 0161	40
21	3096	428 1467	8534	4248	8564	490 1433	2809	2646	39
22	5745	4095	444 1140	6832	475 1124	3968	5319	5130	38
23	8395	6723	3746	9415	3683	6503	7828	7613	37
24	413 1044	9351	6352	460 1998	6242	9038	506 0338	521 0096	36
25	3693	429 1979	8957	4580	8801	491 1572	2846	2579	35
26	6342	4600	445 1562	7162	476 1359	4105	5355	5061	34
27	8990	7233	4167	9744	3917	6638	7863	7543	33
28	414 1638	9859	6771	461 2325	6474	9171	507 0370	522 0024	32
29	4285	430 2485	9375	4906	9031	492 1704	2877	2505	31
30	6932	5111	446 1978	7486	477 1588	4236	5384	4986	30
31	9579	7736	4581	462 0066	4144	6767	7890	7466	29
32	415 2226	431 0361	7184	2646	6700	9298	508 0396	523 2424	28
33	4872	2386	9786	5225	9255	493 1829	2901	2727	27
34	7517	5610	447 2388	7804	478 1810	4359	5406	4903	26
35	416 0163	8234	4990	463 0382	4364	6889	7910	7381	25
36	2808	432 0857	7591	2960	6919	9419	509 0414	524 2336	24
37	5453	3481	448 0192	5538	9472	494 1948	2918	2733	23
38	8097	6103	2792	8115	479 2026	4176	5421	4813	22
39	417 0741	8726	5332	464 0692	4579	7005	7924	7290	21
40	3385	433 1348	7932	3269	7131	9532	510 0426	525 2241	20
41	6028	3970	449 0591	5845	9083	495 2060	2928	2747	19
42	8671	6591	3190	8420	480 2235	4587	5429	4717	18
43	418 1313	9212	5789	465 0998	4786	7113	7930	7191	17
44	3956	434 1832	8387	3571	7337	9639	511 0431	526 2139	16
45	6597	4453	450 0984	6145	9988	496 2165	2331	2139	15
46	9230	7072	3582	8719	481 2438	4690	5431	4613	14
47	419 1880	9692	6179	466 1233	4987	7215	7930	7085	13
48	4521	435 2311	8775	3866	7537	9740	512 0423	527 2036	12
49	7161	4930	451 1372	6439	482 0086	497 2264	2927	2736	11
50	9801	7548	3967	9012	2634	4787	5425	4502	10
51	420 2441	436 0166	6563	467 1584	5182	7310	7923	6973	9
52	5080	2784	9158	4156	7730	9833	513 0420	528 1914	8
53	7719	5401	452 1753	6727	483 0277	498 2355	2910	2736	7
54	421 0358	8018	4347	9298	2824	4877	5413	4388	6
55	2996	437 0634	6941	468 1869	5370	7399	7908	6853	5
56	5634	3251	9535	4439	7916	9920	514 0404	529 1796	4
57	8272	5866	453 2128	7003	484 0462	499 2441	2899	2703	3
58	422 0909	8482	4721	9578	3007	4961	5333	4258	2
59	3546	438 1097	7313	469 2147	5552	7481	7887	6726	1
60	6183	3711	9905	4716	8096	500 0000	515 0381	529 1796	0
	65°	64°	63°	62°	61°	60°	59°	58°	

NAT. SINE.

	32°	33°	34°	35°	36°	37°	38°	39°	
0	.529 9193	.544 6390	.559 1929	.573 5764	.587 7853	.601 8150	.615 6615	.629 3204	60
1	.530 1659	.8830	.4340	.8147	.588 0206	.602 0473	.8907	.5464	59
2	.4125	.545 1269	.6751	.574 0529	.2558	.2795	.616 1198	.7724	58
3	.6591	.3707	.9182	.2911	.4910	.5117	.3489	.9983	57
4	.9057	.6145	.560 1572	.5292	.7262	.7439	.5780	.630 2242	56
5	.531 1521	.8583	.3981	.7672	.9613	.9760	.8069	.4500	55
6	.3986	.546 1020	.6390	.575 0053	.589 1964	.603 2080	.617 0359	.6758	54
7	.6450	.3456	.8798	.2432	.4314	.4400	.2648	.9015	53
8	.8913	.5892	.561 1206	.4811	.6663	.6719	.4936	.631 1272	52
9	.532 1370	.8328	.3614	.7190	.9012	.9038	.7224	.3528	51
10	.3839	.547 0763	.6021	.9568	.590 1361	.604 1356	.9511	.5784	50
11	.6301	.3198	.8428	.576 1946	.3709	.3674	.618 1798	.8039	49
12	.8763	.5632	.562 0834	.4323	.6057	.5991	.4084	.632 0293	48
13	.533 1224	.8066	.3239	.6700	.8404	.8308	.6370	.2547	47
14	.3685	.548 0499	.5645	.9076	.591 0750	.605 0624	.8655	.4800	46
15	.6145	.2932	.8049	.577 1452	.3096	.2940	.619 0939	.7052	45
16	.8605	.5365	.563 0453	.3827	.5442	.5255	.3224	.9306	44
17	.534 1065	.7797	.2857	.6202	.7757	.7570	.5507	.633 1557	43
18	.3523	.549 0228	.5260	.8576	.592 0132	.9884	.7790	.3809	42
19	.5982	.2659	.7663	.578 0950	.2476	.606 2198	.620 0073	.6059	41
20	.8440	.5090	.564 0066	.3323	.4819	.4511	.2355	.8310	40
21	.535 0898	.7520	.2467	.5696	.7163	.6824	.4636	.634 0556	39
22	.3355	.9950	.4869	.8069	.9505	.9130	.6917	.2808	38
23	.5812	.550 2379	.7270	.579 0440	.593 1847	.607 1447	.9198	.5057	37
24	.8268	.4807	.9670	.2812	.4189	.3758	.621 1478	.7305	36
25	.536 0724	.7236	.565 2070	.5183	.6530	.6069	.3757	.9553	35
26	.3179	.9663	.4469	.7553	.8871	.8379	.6036	.635 1806	34
27	.5634	.551 2091	.6868	.9923	.594 1211	.608 0689	.8314	.4043	33
28	.8089	.4518	.9267	.580 2292	.3550	.2998	.622 0592	.6292	32
29	.537 0543	.6944	.566 1665	.4661	.5889	.5306	.2870	.8537	31
30	.2990	.9370	.4062	.7030	.8223	.7614	.5146	.636 0782	30
31	.5449	.552 1795	.6459	.9397	.595 0566	.9922	.7423	.3026	29
32	.7902	.4220	.8856	.581 1765	.2904	.609 2229	.9698	.5270	28
33	.538 0354	.6645	.567 1252	.4132	.5241	.4535	.623 1974	.7515	27
34	.2806	.9069	.3648	.6498	.7577	.6841	.4248	.9756	26
35	.5257	.553 1492	.6043	.8864	.9913	.9147	.6522	.637 1998	25
36	.7708	.3915	.8437	.582 1230	.596 2249	.610 1452	.8796	.4240	24
37	.539 0158	.6338	.568 0832	.3595	.4584	.3756	.624 1069	.6481	23
38	.2608	.8769	.3225	.5959	.6918	.6000	.3342	.8721	22
39	.5058	.554 1182	.5019	.8323	.9252	.8363	.5614	.638 0961	21
40	.7507	.3603	.8011	.583 0687	.597 1586	.611 0660	.7885	.3201	20
41	.9955	.6024	.569 0403	.3050	.3919	.2969	.625 0156	.5440	19
42	.540 210	.8444	.2795	.5412	.6251	.5270	.2427	.7678	18
43	.4851	.555 0864	.5187	.7774	.8583	.7572	.4696	.9916	17
44	.7238	.3283	.7577	.584 0136	.598 0915	.9873	.6966	.639 2152	16
45	.9745	.5702	.9968	.2497	.3246	.612 2173	.9235	.4390	15
46	.541 2191	.8121	.570 2357	.4857	.5577	.4473	.626 1503	.6622	14
47	.4637	.556 0539	.4747	.7217	.7906	.6772	.3771	.8862	13
48	.7082	.2956	.7136	.9577	.599 0236	.9071	.6038	.640 1097	12
49	.9527	.5373	.9524	.585 1936	.2565	.613 1369	.8305	.3332	11
50	.542 1971	.7790	.571 1912	.4294	.4893	.366	.627 0571	.5560	10
51	.4415	.557 0206	.4299	.6652	.7221	.5964	.2837	.7799	9
52	.6859	.2621	.6686	.9010	.9549	.8260	.5102	.641 0032	8
53	.9302	.5036	.9073	.586 1367	.600 1876	.614 0556	.7366	.2264	7
54	.543 1744	.7451	.572 1459	.3724	.4202	.2852	.9631	.4406	6
55	.4187	.9865	.3844	.6080	.6528	.5147	.628 1894	.6728	5
56	.6628	.558 2279	.6229	.8435	.8854	.7442	.4157	.8958	4
57	.9060	.4692	.8614	.587 0790	.601 1179	.9730	.6420	.642 1159	3
58	.544 1510	.7105	.573 0398	.3145	.3503	.615 2029	.8682	.3418	2
59	.3951	.9517	.3381	.5499	.5827	.4322	.0943	.5647	1
60	.6396	.559 1929	.5764	.7853	.8150	.6615	.623 3204	.7876	0
	57°	56°	55°	54°	53°	52°	51°	50°	

NAT. COSINE.

	40°	41°	42°	43°	44°	45°	46°	47°	
0	642 7876	656 0590	669 1306	681 9984	694 6584	707 1068	719 2398	731 2537	60
1	643 0104	2785	3468	682 2111	8676	3124	6418	5521	59
2	2332	4980	5628	4237	695 0767	5180	7438	7503	58
3	4559	7174	7789	6363	2858	7236	9457	9486	57
4	6785	9367	9948	8489	4949	9291	720 1476	732 1467	56
5	9011	657 1500	670 2108	683 0613	7039	708 1345	3494	3449	55
6	644 1236	3752	4266	2738	9128	3398	5511	5423	54
7	3461	5944	6424	4861	696 1217	5451	7528	7409	53
8	5685	8135	8582	6984	3305	7504	9544	9388	52
9	7909	658 0326	671 0739	9107	5392	9556	721 1559	733 1367	51
10	645 0132	2516	2895	684 1229	7479	709 1607	3574	3345	50
11	2355	4706	5051	3350	9565	3657	5589	5322	49
12	4577	6895	7206	5471	697 1651	5707	7602	7299	48
13	6798	9083	9361	7591	3736	7757	9615	9275	47
14	9019	659 1271	672 1515	9711	5821	9806	722 1628	734 1250	46
15	646 1240	3458	3668	685 1830	7905	710 1854	3640	3225	45
16	3460	5645	5821	3948	9958	3901	5651	5199	44
17	5679	7831	7973	6066	698 2071	5948	7661	7173	43
18	7898	660 0017	673 0125	8184	4153	7995	9671	9146	42
19	647 0116	2202	2276	686 0300	6234	711 0041	723 1681	735 1118	41
20	2334	4386	4427	2416	8315	2086	3690	3090	40
21	4551	6570	6577	4532	699 0396	4130	5698	5061	39
22	6767	8754	8727	6647	2476	6174	7705	7032	38
23	8984	661 0936	674 0876	8761	4555	8218	9712	9002	37
24	648 1199	3119	3024	687 0875	6633	712 0260	724 1719	736 0971	36
25	3414	5300	5172	2988	8711	2303	3724	2940	35
26	5628	7482	7319	5101	700 0789	4344	5729	4908	34
27	7842	9662	9466	7213	2866	6385	7734	6875	33
28	649 0056	662 1842	675 1612	9325	4942	8426	9738	8842	32
29	2268	4022	3757	688 1435	7018	713 0465	725 1741	737 0808	31
30	4480	6200	5902	3546	9093	2504	3744	2773	30
31	6692	8379	8046	5655	701 1167	4543	5746	4738	29
32	8903	663 0557	676 0190	7765	3241	6581	7747	6703	28
33	650 1114	2734	2333	9873	5314	8618	9748	8666	27
34	3324	4910	4476	689 1981	7387	714 0655	726 1748	738 0629	26
35	5532	7087	6618	4089	9459	2691	3748	2592	25
36	7742	9262	8760	6196	702 1531	4727	5747	4553	24
37	9951	664 1437	677 0901	8302	3601	6762	7745	6515	23
38	651 2158	3612	3041	690 0407	5672	8796	9743	8475	22
39	4366	5785	5181	2512	7741	715 0830	727 1740	739 0435	21
40	6572	7959	7320	4617	9811	2863	3736	2394	20
41	8778	665 0131	9459	6721	703 1879	4895	5732	4352	19
42	652 0984	2304	678 1597	8824	3947	6927	7728	6311	18
43	3189	4475	3734	691 0927	6014	8959	9722	8287	17
44	5394	6646	5871	3029	8081	716 0989	728 1716	740 0225	16
45	7598	8817	8007	5131	704 0147	3019	3710	2181	15
46	9801	666 0987	679 0143	7232	2213	5049	5703	4137	14
47	653 2004	3156	2278	9332	4278	7078	7695	6092	13
48	4200	5325	4413	692 1432	6342	9106	9686	8046	12
49	6408	7493	6547	3531	8406	717 1134	729 1677	741 0000	11
50	8609	9661	8681	5630	705 0469	3161	3668	1963	10
51	654 0810	667 1828	680 0813	7728	2532	5187	5657	3905	9
52	3010	3994	2946	9825	4594	7213	7646	5857	8
53	5209	6160	5078	693 1922	6655	9238	9635	7808	7
54	7408	8326	7209	4018	8716	718 1263	730 1623	9756	6
55	9607	668 0490	9339	6114	706 0776	3287	3610	742 1708	5
56	655 1804	2653	681 1469	8209	2835	5310	5597	3656	4
57	4002	4818	3599	694 0304	4894	7333	7583	5606	3
58	6198	6981	5728	2398	6953	9355	9568	7554	2
59	8395	9144	7856	4491	9011	719 1377	731 1553	9502	1
60	656 0590	669 1306	9984	6584	707 1068	3398	3537	743 1448	0
	49°	48°	47°	46°	45°	44°	43°	42°	

/	48°	49°	50°	51°	52°	53°	54°	/
0	743 1448	754 7096	766 0444	777 1460	788 0108	798 6355	809 0170	60
1	3394	9004	2314	3290	1898	8105	1879	59
2	5340	755 0911	4183	5120	3688	9855	3588	58
3	7285	2818	6051	6949	5477	799 1604	5296	57
4	9229	4724	7918	8777	7266	3352	7004	56
5	744 1173	6630	9785	778 0604	9054	5100	8710	55
6	3115	8535	767 1652	2431	789 0841	6847	810 0416	54
7	5058	756 0439	3517	4258	2627	8593	2122	53
8	6999	2342	5382	6084	4413	800 0378	3825	52
9	8941	4246	7246	7909	6198	2083	5530	51
10	745 0881	6148	9110	9733	7983	3827	7234	50
11	2821	8050	768 0973	779 1557	9767	5571	8936	49
12	4760	9951	2835	3380	790 1560	7314	811 0638	48
13	6699	767 1851	4697	5202	3333	9056	2339	47
14	8636	3751	6558	7024	5115	801 0797	4040	46
15	746 0574	5650	8418	8845	6896	2538	5740	45
16	2510	7548	769 0278	780 0665	8676	4278	7439	44
17	4446	9446	2137	2485	791 0456	6018	9137	43
18	6382	758 1843	3996	4304	2235	7756	812 0835	42
19	8317	3240	5853	6123	4014	9495	2532	41
20	747 0251	5136	7710	7940	5792	802 1232	4229	40
21	2184	7031	9567	9757	7569	2969	5925	39
22	4117	8926	770 1423	781 1574	9345	4705	7620	38
23	6049	759 0820	3278	3390	792 1121	6440	9314	37
24	7981	2713	5132	5205	2896	8175	813 1008	36
25	9312	4606	6986	7019	4671	9909	2701	35
26	748 1842	6498	8840	8833	6445	803 1642	4393	34
27	3772	8389	771 0692	782 0646	8218	3375	6084	33
28	5701	700 0280	2544	2459	9990	5107	7775	32
29	7629	2170	4395	4270	793 1762	6838	9466	31
30	9557	4060	6246	6082	3533	8569	814 1155	30
31	749 1484	5949	8096	7892	5304	804 0299	2844	29
32	3411	7837	9945	9702	7074	2028	4532	28
33	5337	9724	772 1794	783 1511	8843	3756	6220	27
34	7262	761 1611	3642	3320	794 0611	5484	7966	26
35	9187	3497	5489	5127	2379	7211	9593	25
36	750 1111	5383	7336	6335	4146	8938	815 1278	24
37	3034	7268	9182	8741	5913	805 0664	2963	23
38	4957	9152	773 1027	784 0547	7678	2389	4647	22
39	6879	762 1036	2872	2352	9444	4113	6330	21
40	8800	2919	4716	4157	795 1208	5837	8013	20
41	751 0721	4802	6559	5961	2972	7560	9695	19
42	2641	6683	8402	7764	4735	9283	816 1376	18
43	4561	8564	774 0244	9566	6497	806 1005	3056	17
44	6480	763 0445	2086	785 1368	8259	2726	4736	16
45	8398	3235	3928	3169	796 0020	4446	6416	15
46	752 0316	4204	5767	4970	1780	6166	8094	14
47	2233	6082	7606	6770	3540	7885	9772	13
48	4149	7960	9445	5869	5299	9603	817 1449	12
49	6065	9838	775 1283	786 0367	7058	807 1321	3125	11
50	7980	764 1714	3121	2165	8815	3038	4801	10
51	9894	3590	4957	3963	797 0572	4754	6476	9
52	753 1808	5465	6794	5759	2329	6470	8151	8
53	3721	7340	8629	7555	4084	8185	9824	7
54	5634	9214	776 0464	9350	5839	9899	818 1497	6
55	7546	765 1087	2298	787 1145	7594	808 1612	3169	5
56	9457	2060	4132	2339	9347	3325	4841	4
57	754 1368	4832	5965	4732	798 1100	5037	6512	3
58	3278	6704	7797	6524	2853	6749	8182	2
59	5187	8574	9629	8316	4604	8460	9852	1
60	7096	766 0444	777 1460	788 0108	6355	809 0170	819 1520	0
/	41°	40°	39°	38°	37°	36°	35°	/

	55°	56°	57°	58°	59°	60°	61°	
0	·819 1520	·829 0376	·838 6706	·848 0481	·857 1673	·866 0254	·874 6197	60
1	3189	2002	8290	2022	3171	1708	7607	59
2	4556	3628	9873	3562	4668	3161	9016	58
3	6523	5252	·839 1455	5102	6164	4614	·875 0425	57
4	8189	6877	3037	6641	7600	6066	1832	56
5	9554	8500	4618	8179	9155	7517	3239	55
6	·820 1519	·830 0123	6199	9717	·858 0649	8967	4645	54
7	3183	1745	7778	·849 1254	2143	·867 0417	6051	53
8	4846	3366	9357	2790	3635	1866	7455	52
9	6509	4987	·840 0936	4325	5127	3314	8859	51
10	8170	6607	2513	5860	6619	4762	·876 0263	50
11	9832	8226	4090	7391	8109	6209	1665	49
12	·821 1492	9845	5666	8927	9599	7655	3067	48
13	3152	·831 1403	7241	·850 0459	·859 1088	9100	4468	47
14	4811	3080	8816	1931	2576	·868 0544	5868	46
15	6469	4696	·841 0330	3522	4064	1988	7208	45
16	8127	6312	1963	5053	5551	3431	8666	44
17	9784	7927	3536	6582	7037	4874	·877 0064	43
18	·822 1440	9541	5108	8111	8523	6315	1462	42
19	3096	·832 1155	6679	9639	·860 0007	7756	2858	41
20	4751	2768	8243	·851 1167	1491	9196	4254	40
21	6405	4380	9819	2693	2975	·869 0636	5649	39
22	8059	5991	·842 1388	4219	4457	2074	7043	38
23	9712	7602	2356	5745	5939	3512	8437	37
24	·823 1364	9212	4524	7209	7420	4949	9830	36
25	3015	·833 0822	6091	8793	8901	6386	·878 1222	35
26	4666	2430	7657	·852 0316	·861 0380	7821	2613	34
27	6316	4038	9222	1839	1859	9256	4004	33
28	7965	5646	·843 0787	3360	3337	·870 0691	5394	32
29	9614	7252	2351	4881	4815	2124	6783	31
30	·824 1262	8858	3914	6402	6292	3557	8171	30
31	2939	·834 0463	5477	7921	7768	4989	9559	29
32	4556	2068	7039	9440	9243	6420	·879 0946	28
33	6212	3672	8600	·853 0958	·862 0717	7851	2332	27
34	7847	5275	·844 0161	2475	2191	9281	3717	26
35	9491	6877	1720	3492	3664	·871 0710	5102	25
36	·825 1135	8479	3279	5508	5137	2138	6486	24
37	2778	·835 0080	4838	7023	6608	3566	7869	23
38	4120	1680	6395	8538	8079	4993	9251	22
39	6062	3279	7952	·854 0951	9549	6419	·880 0633	21
40	7703	4878	9598	1564	·863 1019	7844	2014	20
41	9343	6476	·845 1064	3077	2488	9269	3394	19
42	·826 0983	8074	2618	4588	3956	·872 0693	4774	18
43	2622	9670	4172	6099	5423	2116	6152	17
44	4260	·836 1266	5726	7609	6889	3538	7530	16
45	5897	2862	7278	9119	8355	4360	8907	15
46	7534	4456	8830	·855 0627	9820	6381	·881 0284	14
47	9170	6050	·846 0381	2135	·864 1284	7801	1660	13
48	·827 0806	7643	1932	3643	2748	9221	3035	12
49	2440	9236	3481	5149	4211	·873 0640	4409	11
50	4074	·837 0827	5030	6655	5673	2058	5782	10
51	5708	2418	6579	8160	7134	3475	7155	9
52	7340	4009	8126	9664	8595	4891	8527	8
53	8972	5598	9673	·856 1168	·865 0655	6307	9898	7
54	·828 0603	7187	·847 1219	2671	1514	7722	·882 1269	6
55	2234	8775	2765	4173	2973	9137	2628	5
56	3864	·838 0363	4309	5674	4430	·874 0550	4007	4
57	5493	1950	5853	7175	5887	1963	5376	3
58	7121	3536	7397	8675	7344	3375	6743	2
59	8749	5121	8939	·857 0174	8799	4786	8110	1
60	·829 0376	6706	·848 0481	1673	·866 0254	6197	9476	0
	34°	33°	32°	31°	30°	29°	28°	

/'	62°	63°	64°	65°	66°	67°	68°	/'
0	.882 9476	.891 0065	.898 7940	.906 3078	.913 5455	.920 5049	.927 1839	60
1	.883 0841	1385	9215	4307	6637	6185	2928	59
2	2206	2705	.899 0489	5535	7819	7320	4016	58
3	3569	4024	1763	6762	9001	8455	5104	57
4	4933	5342	3035	7989	.914 0181	9589	6191	56
5	6295	6659	4307	9215	1361	.921 0722	7277	55
6	7656	7975	5578	.907 0440	2540	1854	8363	54
7	9017	9291	6848	1665	3718	2986	9447	53
8	.884 0377	.892 0606	8117	2888	4895	4116	.928 0531	52
9	1736	1920	9386	4111	6072	6246	1614	51
10	3095	3234	.900 0654	5333	7247	6375	2696	50
11	4453	4546	1921	6554	8422	7504	3778	49
12	5810	5858	3188	7775	9597	8632	4858	48
13	7166	7169	4453	8995	.915 0770	9758	5938	47
14	8522	8480	5718	.908 0214	1943	.922 0884	7017	46
15	9876	9789	6982	1432	3115	2010	8096	45
16	.885 1230	.893 1098	8246	2649	4286	3134	9173	44
17	2584	2406	9508	3866	5456	4258	.929 0250	43
18	3936	3714	.901 0770	5082	6626	5381	1326	42
19	5288	5021	2031	6297	7795	6503	2401	41
20	6639	6326	3292	7511	8903	7624	3475	40
21	7989	7632	4551	8725	.916 0130	8745	4549	39
22	9339	8936	5810	9938	1297	9865	5622	38
23	.886 0688	.894 0240	7068	.909 1150	2462	.923 0984	6694	37
24	2036	1542	8325	2361	3627	2102	7765	36
25	3383	2844	9582	3572	4791	3220	8835	35
26	4730	4146	.902 0838	4781	5955	4336	9906	34
27	6075	5446	2092	5990	7118	5452	.930 0974	33
28	7420	6746	3347	7199	8279	6567	2042	32
29	8765	8045	4600	8406	9440	7682	3109	31
30	.887 0108	9344	5853	9613	.917 0601	8795	4176	30
31	1451	.895 0641	7105	.910 6819	1760	9908	5241	29
32	2793	1938	8356	2924	2919	.924 1020	6306	28
33	4134	3234	9606	3228	4077	2131	7370	27
34	5475	4529	.903 0856	4432	5234	3242	8434	26
35	6815	5824	2105	5635	6391	4351	9496	25
36	8154	7118	3353	6837	7546	5460	.931 0558	24
37	9492	8411	4600	8038	8701	6568	1619	23
38	.888 0830	9703	5847	9238	9855	7676	2679	22
39	2166	.896 0994	7093	.911 0438	.918 1009	8782	3739	21
40	3503	2285	8338	1637	2161	9888	4797	20
41	4838	3575	9582	2835	3313	.925 0993	5855	19
42	6172	4864	.904 0825	4033	4404	2097	6912	18
43	7506	6153	2068	5229	5614	3201	7969	17
44	8839	7440	3310	6425	6763	4303	9024	16
45	.889 0171	8727	4551	7620	7912	5405	.932 0979	15
46	1503	.897 0014	5792	8815	9060	6506	1133	14
47	2834	1299	7032	.912 0008	.919 0207	7606	2186	13
48	4164	2584	8271	1201	1353	8706	3238	12
49	5493	3868	9509	2393	2499	9805	4290	11
50	6822	5151	.905 0746	3584	3644	.926 0902	5340	10
51	8149	6433	1983	4775	4788	2000	6390	9
52	9476	7715	3219	5965	5931	3006	7439	8
53	.890 0803	8996	4451	7154	7073	4192	8488	7
54	2128	.898 0276	5683	8342	8215	5286	9535	6
55	3453	1555	6922	9529	9356	6380	.933 0582	5
56	4777	2834	8154	.913 0716	.920 0496	7474	1628	4
57	6100	4112	9386	1902	1635	8566	2673	3
58	7423	5389	.906 0618	3087	2774	9658	3718	2
59	8744	6665	1848	4271	3912	.927 0748	4761	1
60	.891 0065	7940	3078	5455	5049	1839	5804	0
/'	27°	26°	25°	24°	23°	22°	21°	/'

	69°	70°	71°	72°	73°	74°	75°	
0	.933 5804	.939 6926	.945 5186	.951 0565	.956 3048	.961 2617	.965 9258	60
1	6846	7921	6132	1464	3898	3418	.966 0011	59
2	7888	8914	7078	2361	4747	4219	0762	58
3	8923	9907	8023	3258	5595	5019	1513	57
4	9968	.940 0899	8968	4154	6443	5818	2263	56
5	.934 1007	1891	9311	5050	7290	6616	3012	55
6	2045	2881	.946 0854	5944	8136	7413	3761	54
7	3082	3871	1795	6838	8981	8210	4508	53
8	4119	4980	2736	7751	9825	9005	5255	52
9	5154	5848	3677	8623	.957 0569	9800	6001	51
10	6189	6835	4616	9514	1512	.962 0594	6746	50
11	7223	7822	5555	.952 0404	2374	1387	7490	49
12	8257	8808	6493	1294	3195	2180	8234	48
13	9289	9793	7430	2183	4035	2972	8977	47
14	.935 0321	.941 0777	8366	3071	4875	3763	9718	46
15	1352	1760	9301	3958	5714	4532	.967 0459	45
16	2382	2743	.947 0236	4844	6552	5342	1200	44
17	3412	3721	1170	5730	7389	6130	1939	43
18	4440	4705	2103	6615	8225	6917	2678	42
19	5468	5686	3035	7499	9060	7704	3415	41
20	6495	6665	3966	8382	9895	8490	4152	40
21	7521	7644	4897	9264	.958 0729	9275	4888	39
22	8547	8621	5827	.953 0148	1562	.963 0060	5624	38
23	9571	9598	6756	1027	2394	0843	6358	37
24	.936 0595	.942 0575	7684	1907	3226	1626	7092	36
25	1618	1550	8612	2786	4056	2408	7825	35
26	2641	2525	.9538	3664	4886	3189	8557	34
27	3662	3498	.948 0464	4542	5715	3969	9288	33
28	4683	4471	1389	5418	6543	4748	.968 0018	32
29	5703	5444	2318	6294	7371	5527	0748	31
30	6722	6415	3237	7170	8197	6305	1476	30
31	7740	7386	4159	8044	9023	7081	2204	29
32	8758	8355	5081	8917	9848	7858	2931	28
33	9774	9324	6002	9790	.959 0672	8633	3658	27
34	.937 0790	.943 0293	6922	.954 0662	1496	9407	4383	26
35	1806	1260	7842	1533	2318	.964 0181	5108	25
36	2820	2227	8760	2403	3140	0954	5832	24
37	3833	3192	9678	3273	3961	1726	6555	23
38	4846	4157	.949 0595	4141	4781	2497	7277	22
39	5858	5122	1511	5009	5600	3208	7998	21
40	6869	6085	2126	5876	6418	4037	8719	20
41	7880	7048	3341	6743	7236	4806	9438	19
42	8889	8010	4255	7608	8053	5574	.969 0157	18
43	9898	8271	5168	8473	8869	6341	0875	17
44	.938 0906	9931	6080	9336	9684	7108	1593	16
45	1913	.944 0890	6991	.955 0199	0499	7873	2309	15
46	2920	1849	7902	1062	.960 1312	8638	3025	14
47	3925	2807	8812	1923	2125	9402	3740	13
48	4930	3764	9721	2784	2937	.965 0165	4453	12
49	5934	4720	.950 0629	3643	3748	0927	5167	11
50	6938	5675	1536	4502	4558	1689	5879	10
51	7940	6630	2443	5361	5368	2449	6591	9
52	8942	7584	3348	6218	6177	3209	7301	8
53	9943	8537	4253	7074	6984	3968	8011	7
54	.930 0943	9489	5157	7930	7792	4726	8720	6
55	1942	.945 0441	6061	8785	8598	5484	9428	5
56	2940	1391	6963	9639	9403	6240	.970 0135	4
57	3938	2341	7865	.956 0492	.961 0208	6996	0842	3
58	4935	3290	8766	1345	1012	7751	1548	2
59	5931	4238	9666	2197	1815	8505	2253	1
60	6926	5186	.951 0566	3048	2617	9258	2957	0
/	20°	19°	18°	17°	16°	15°	14°	/

	76°	77°	78°	79°	80°	81°	82°	
0	.970 2957	.974 3701	.978 1476	.981 6272	.984 8 078	.987 6 883	.990 2 681	60
1	36 70	4355	2080	6823	.582	.9877 338	.9903 085	59
2	4363	5008	2684	7380	.9849 086	792	489	58
3	5065	5660	3287	7923	589	.9878 245	591	57
4	5766	6311	3889	8486	.9850 091	697	.9904 293	56
5	6466	6962	4490	9027	593	.9879 148	694	55
6	7165	7612	5090	9587	.9851 093	599	.9905 095	54
7	7863	8261	5689	.982 0137	593	.9880 048	494	53
8	8561	8909	6288	0686	.9852 092	497	893	52
9	9258	9556	6886	1234	590	945	.9906 290	51
10	9953	.975 0203	7483	1781	.9853 087	.9881 392	687	50
11	.971 0649	0849	8079	2327	583	838	.9907 083	49
12	1343	1444	8674	2873	.9854 079	.9882 284	478	48
13	2036	2135	9268	3417	574	728	873	47
14	2729	2781	9862	3961	.9855 068	.9883 172	.9908 266	46
15	3421	3423	.979 0455	4504	561	615	659	45
16	4112	4095	1047	5046	.9856 053	.9884 057	.9909 051	44
17	4802	4706	1638	5587	544	498	442	43
18	5491	5345	2228	6128	.9857 035	939	832	42
19	6180	5985	2818	6668	524	.9885 378	.9910 221	41
20	687	6623	3406	7206	.9858 013	817	610	40
21	7554	7260	3994	7744	501	.9886 255	997	39
22	8240	7897	4581	8282	988	692	.9911 384	38
23	8926	8533	5167	8818	.9859 475	.9887 128	770	37
24	9610	9168	5752	9353	960	564	.9912 155	36
25	.972 0294	9802	6337	9888	.9860 445	998	540	35
26	0976	.976 0435	6921	.983 0422	929	.9888 432	923	34
27	1658	1067	7504	0955	.9861 412	865	.9913 306	33
28	2339	1699	8086	1487	894	.9889 297	688	32
29	3020	2330	8667	2019	.9862 375	728	.9914 069	31
30	3699	2960	9247	2549	856	.9890 159	449	30
31	4378	3589	9827	3079	.9863 336	588	828	29
32	5056	4217	.980 0405	3608	815	.9891 017	.9915 206	28
33	5733	4845	0983	4136	.9864 293	445	584	27
34	6409	5472	1560	4663	770	872	961	26
35	7084	6098	2136	5189	.9865 246	.9892 298	.9916 337	25
36	7759	6723	2712	5715	722	723	712	24
37	8432	7347	3286	6239	.9866 196	.9893 148	.9917 086	23
38	9105	7970	3860	6763	670	572	459	22
39	9777	8593	4433	7286	.9867 143	994	832	21
40	.973 0449	9215	5005	7808	615	.9894 416	.9918 204	20
41	1119	9836	5576	8330	.9868 087	838	574	19
42	1789	.977 0456	6147	8850	557	.9895 258	944	18
43	2458	1075	6716	9370	.9869 027	677	.9919 314	17
44	3125	1693	7285	9889	496	.9896 096	682	16
45	3793	2311	7853	.984 0407	964	514	.9920 049	15
46	4458	2923	8420	0924	.9870 431	931	416	14
47	5124	3544	8986	1441	897	.9897 347	782	13
48	5789	4159	9552	1956	.9871 363	762	.9921 147	12
49	6453	4773	.981 0116	2471	827	.9898 177	511	11
50	7116	5386	0680	2985	.9872 291	590	874	10
51	7778	5999	1243	3498	754	.9899 003	.9922 237	9
52	8439	6611	1805	4010	.9873 216	415	599	8
53	9100	7222	2366	4521	678	826	959	7
54	9760	7832	2927	5032	.9874 138	.9900 237	.9923 319	6
55	.974 0419	8441	3486	5542	598	646	679	5
56	1077	9050	4045	6050	.9875 057	.9901 055	.9924 037	4
57	1734	9658	4603	6558	514	462	394	3
58	2390	.978 0265	5160	7066	472	809	751	2
59	3046	0871	5716	7572	.9876 428	.9902 275	.9925 107	1
60	3701	1476	6272	8078	883	681	462	0
/	13°	12°	11°	10°	9°	8°	7°	/

	83°	84°	85°	86°	87°	88°	89°	
0	·9925 462	·9945 219	·9961 947	·9975 641	·9986 295	·9993 008	·9998 477	0
1	816	523	·9962 200	843	447	·9994 009	127	59
2	·9926 169	825	452	·9976 045	598	110	177	68
3	521	·9946 127	704	245	748	209	125	57
4	873	428	954	445	898	208	173	56
5	·9927 224	729	·9963 204	145	·9987 046	405	720	55
6	573	·9947 028	453	143	194	102	766	54
7	922	327	701	·9977 040	340	198	812	53
8	·9928 271	625	948	237	486	193	856	52
9	618	921	·9964 195	433	631	788	900	51
10	965	·9948 217	440	627	775	881	942	50
11	·9929 310	513	685	821	919	974	984	49
12	665	807	929	·9978 015	·9988 061	·9995 066	·9999 026	48
13	999	·9949 101	·9965 172	207	203	157	065	47
14	·9930 342	393	414	399	344	247	106	46
15	685	685	655	589	484	336	143	45
16	·9931 020	976	895	779	123	424	181	44
17	367	·9950 266	·9966 135	968	761	512	218	43
18	706	556	374	·9979 156	199	599	254	42
19	·9932 045	844	612	343	·9989 035	184	289	41
20	384	·9951 132	849	530	171	770	223	40
21	721	419	·9967 085	716	306	854	257	39
22	·9933 057	705	321	900	440	937	389	38
23	393	990	555	·9980 084	573	·9996 020	421	37
24	728	·9952 274	789	267	706	101	452	36
25	·9934 062	567	·9968 022	450	137	182	482	35
26	395	840	254	631	968	262	511	34
27	727	·9953 122	485	811	·9990 098	341	139	33
28	·9935 058	403	715	991	227	419	567	32
29	389	683	945	·9981 170	355	497	593	31
30	719	962	·9969 173	348	482	573	619	30
31	·9936 047	·9954 240	401	525	609	649	644	29
32	375	517	628	701	734	724	668	28
33	703	794	854	877	859	798	692	27
34	·9937 029	·9955 070	·9970 080	·9982 052	983	871	714	26
35	355	345	304	225	·9991 106	943	736	25
36	679	620	528	398	223	·9997 015	756	24
37	·9938 003	893	750	570	350	086	776	23
38	326	·9956 165	972	742	470	156	795	22
39	648	437	·9971 193	912	590	224	813	21
40	969	708	413	·9983 082	709	292	831	20
41	·9939 290	978	633	260	827	360	847	19
42	610	·9957 247	851	118	944	426	863	18
43	928	515	·9972 069	585	·9992 000	492	878	17
44	·9940 246	783	286	751	176	556	892	16
45	563	·9958 049	502	917	290	620	905	15
46	880	315	717	·9984 081	404	683	917	14
47	·9941 195	580	931	245	517	745	928	13
48	510	844	·9973 145	408	629	807	939	12
49	823	·9959 107	357	570	740	867	949	11
50	·9942 136	370	569	731	851	927	958	10
51	448	631	780	891	960	986	966	9
52	760	892	990	·9985 050	·9993 069	·9998 044	973	8
53	·9943 070	·9960 152	·9974 199	209	177	101	979	7
54	379	411	408	367	284	157	985	6
55	688	669	615	524	390	213	989	5
56	966	926	822	680	495	267	993	4
57	·9944 303	·9961 183	·9975 028	835	600	321	996	3
58	609	438	233	989	704	374	998	2
59	914	693	437	·9986 143	806	426	1·0000 000	1
60	·9945 219	947	641	295	968	477	000	0
	6°	5°	4°	3°	2°	1°	0°	

	0°	1°	2°	3°	4°	5°	6°	7°	
0	000 0000	017 4551	034 9208	052 4078	069 9268	087 4887	105 1042	122 7846	60
1	2909	7460	035 2120	6995	070 2191	7818	3983	123 0798	59
2	5818	018 0370	5033	9912	5115	088 0749	6925	3752	58
3	8727	3280	7945	053 2829	8038	3681	9866	6705	57
4	001 1636	6190	036 0858	5746	071 0961	6612	106 2808	9658	56
5	4544	9100	3771	8663	3885	9544	5750	124 2612	55
6	7453	019 2010	6683	054 1581	6809	089 2476	8692	5566	54
7	002 0362	4920	9596	4498	9733	5408	107 1634	8520	53
8	3271	7830	037 2500	7416	072 2657	8341	4576	125 1474	52
9	6186	020 0740	5422	055 0333	5581	090 1273	7519	4429	51
10	9089	3650	8335	3251	8505	4200	108 0462	7384	50
11	003 1998	6560	038 1248	6169	078 1430	7138	3405	126 0339	49
12	4907	9470	4161	9087	4354	091 0371	6348	3294	48
13	7816	021 2380	7074	056 2005	7279	3004	9231	6249	47
14	004 0725	5291	9988	4923	074 0203	5938	109 2234	9205	46
15	3634	8201	039 2901	7841	3128	8871	5178	127 2161	45
16	6542	022 1111	5814	057 0759	6053	092 1804	8122	5117	44
17	9451	4021	8728	3678	8979	4738	110 1060	8073	43
18	005 2360	6932	040 1641	6596	075 1904	7672	4010	128 1030	42
19	5269	9842	4555	9515	4829	093 0066	6955	3986	41
20	8178	023 2753	7469	058 2434	7755	3540	9899	6943	40
21	006 1087	5663	041 0383	5352	076 0680	6474	111 2844	9900	39
22	3996	8574	3296	8271	3606	9409	5780	129 2858	38
23	6905	024 1484	6210	059 1190	6532	094 2344	8734	5815	37
24	9814	4395	9124	4109	9458	5278	112 1680	8773	36
25	007 2725	7305	042 2038	7029	077 2384	8213	4625	130 1731	35
26	5632	025 0216	4952	9948	5311	095 1148	7571	4690	34
27	8541	3127	7866	060 2867	8237	4084	113 0517	7648	33
28	008 1456	6038	043 0781	5787	078 1164	7019	3463	131 0607	32
29	4300	8948	3695	8706	4090	9955	6410	3566	31
30	7269	026 1859	6609	061 1626	7017	096 2800	9356	6525	30
31	009 0178	4770	9524	4546	9944	5826	114 2303	9484	29
32	3087	7681	044 2438	7466	079 2871	8763	5250	132 2444	28
33	5996	027 0592	5353	062 0386	5798	097 1699	8197	5404	27
34	8905	3503	8268	3306	8726	4635	115 1144	8364	26
35	010 1814	6414	045 1183	6226	080 1653	7572	4092	133 1324	25
36	4724	9325	4097	9147	4581	098 0509	7039	4284	24
37	7633	028 2236	7012	063 2067	7509	3446	9987	7246	23
38	011 6542	5148	9927	4988	081 0437	6383	116 2336	134 0207	22
39	3451	8059	046 2842	7908	3365	9320	5884	3168	21
40	6361	029 0970	5757	064 0829	6293	099 2257	8832	6129	20
41	9270	3882	8673	3750	9221	5194	117 1781	8091	19
42	012 2179	6793	047 1588	6671	082 2150	8133	4730	135 2053	18
43	5088	9705	4503	9592	5078	100 1071	7679	5015	17
44	7998	030 2616	7419	065 2513	8007	4009	118 0628	7978	16
45	013 0907	5528	048 0334	5435	083 0936	6947	3578	136 0940	15
46	3817	8439	3250	8356	3865	9886	6528	3903	14
47	6726	031 1351	6166	066 1278	6794	101 2824	9478	6866	13
48	9635	4263	9082	4199	9723	5763	119 2428	9830	12
49	014 2547	7174	049 1997	7121	084 2653	8702	5378	137 2793	11
50	5454	032 0086	4913	067 0043	5583	102 1641	8329	5757	10
51	8364	2998	7829	2965	8512	4580	120 1279	8721	9
52	015 1273	5910	050 0746	5887	085 1442	7520	4230	138 1685	8
53	4183	8822	3662	8809	4372	103 0460	7182	4650	7
54	7093	033 1734	6578	068 1732	7302	3399	121 0133	7615	6
55	016 0002	4646	9495	4654	086 0233	6340	3085	139 0580	5
56	2912	7558	051 2411	7577	3163	9280	6036	3545	4
57	5821	034 0471	5328	069 0499	6094	104 2220	8988	6510	3
58	8731	3383	8244	3422	9025	5161	122 1941	9476	2
59	017 1641	6295	052 1161	6345	087 1956	8101	4893	140 2442	1
60	4551	9208	4078	9268	4887	105 1042	7846	5408	0
/	89°	88°	87°	86°	85°	84°	83°	82°	/

	8°	9°	10°	11°	12°	13°	14°	15°	
0	140 5408	158 3844	176 3270	194 3803	212 5566	230 8682	249 3280	237 9492	60
1	8375	6826	6269	6822	8606	231 1746	6370	268 2610	59
2	141 1342	9809	9269	9841	213 1647	4811	9460	5726	58
3	4308	159 2791	177 2269	195 2861	4688	7876	250 2551	8847	57
4	7276	5774	5270	5881	7730	232 0941	5642	269 1967	56
5	142 0243	8757	8270	8901	214 0772	4007	8734	5087	55
6	3211	160 1740	178 1271	196 1922	3814	7073	251 1826	8207	54
7	6179	4724	4273	4943	6857	223 0140	4919	270 1328	53
8	9147	7708	7274	7964	9900	3207	8012	4449	52
9	143 2115	161 0692	179 0276	197 0986	215 2944	6274	252 1106	7571	51
10	5084	3677	3279	4008	5988	9342	4200	271 0694	50
11	8053	6662	6281	7031	9032	234 2410	7294	3817	49
12	144 1022	9647	9284	198 0053	216 2077	5479	253 0389	6940	48
13	3931	162 2632	180 2287	3076	5122	8548	3484	272 0064	47
14	6961	5618	5291	6100	8167	235 1617	6580	3188	46
15	9931	8603	8295	9124	217 1213	4687	9676	6313	45
16	145 2901	163 1590	181 1299	199 2148	4259	7758	254 2773	9488	44
17	5872	4576	4303	5172	7306	236 0829	5870	273 2564	43
18	8842	7563	7308	8197	218 0353	3900	8968	5690	42
19	146 1813	164 0550	182 0313	200 1222	3400	6971	255 2066	8817	41
20	4784	3537	3319	4248	6448	237 0044	5165	274 1945	40
21	7756	6525	6324	7274	9496	3116	8264	5072	39
22	147 0727	9513	9330	201 0300	219 2544	6189	256 1363	8201	38
23	3639	165 2501	183 2337	3327	5593	9262	4463	275 1330	37
24	6672	5489	5343	6354	8643	238 2336	7564	4459	36
25	9644	8478	8350	9381	220 1692	5410	257 0664	7589	35
26	148 2617	166 1467	184 1358	202 2409	4742	8485	3766	276 0719	34
27	5590	4456	4365	5437	7793	239 1560	6865	3850	33
28	8563	7446	7373	8465	221 0844	4635	9970	6981	32
29	149 1536	167 0436	185 0382	203 1494	3895	7711	258 3073	277 0113	31
30	4510	3426	3390	4523	6947	240 0788	6176	3245	30
31	7484	6417	6399	7552	9999	3864	9280	6378	29
32	150 0458	9407	9409	204 0582	222 3051	6942	259 2384	9512	28
33	3433	168 2398	186 2418	3612	6104	241 0019	5488	278 2646	27
34	6408	5390	5428	6643	9157	3097	8593	5780	26
35	9383	8381	8439	9674	223 2211	6176	260 1699	8915	25
36	151 2358	169 1373	187 1449	205 2705	5265	9255	4805	279 2050	24
37	5333	4366	4460	5737	8319	242 2334	7911	5186	23
38	8309	7358	7471	8769	224 1374	5414	261 1018	8322	22
39	152 1285	170 0351	188 0483	206 1801	4429	8494	4126	280 1459	21
40	4262	3344	3495	4834	7485	243 1575	7234	4597	20
41	7238	6338	6507	7867	225 0541	4656	262 0342	7735	19
42	153 0215	9331	9520	207 0900	3597	7737	3451	281 0873	18
43	3192	171 2325	189 2533	3934	6654	244 0819	6560	4012	17
44	6170	5320	5546	6968	9711	3902	9670	7152	16
45	9147	8314	8559	208 0003	226 2769	6984	263 2780	282 0292	15
46	154 2125	172 1309	190 1573	3038	5827	245 0068	5891	3432	14
47	5103	4304	4587	6073	8885	3151	9002	6573	13
48	8082	7300	7602	9109	227 1944	6236	264 2114	9715	12
49	155 1061	173 0296	191 0617	209 2145	5003	9320	5226	283 2857	11
50	4040	3292	3632	5181	8063	246 2405	8339	5999	10
51	7019	6288	6648	8218	228 1123	5491	265 1452	9143	9
52	9998	9285	9664	210 1255	4184	8577	4566	284 2286	8
53	156 2978	174 2282	192 2680	4293	7244	247 1663	7680	5430	7
54	5958	5279	5696	7331	229 0306	4750	266 0794	8575	6
55	8939	8277	8713	211 0369	3367	7837	3909	285 1720	5
56	157 1919	175 1275	193 1731	3407	6429	248 0925	7025	4866	4
57	4900	4273	4748	6446	9492	4013	267 0141	8012	3
58	7881	7272	7766	9486	230 2555	7102	3257	288 1159	2
59	158 0863	176 0271	194 0784	212 2525	5619	249 0191	6374	4306	1
60	3844	3270	3803	5566	8682	3280	9492	7454	0
	81°	80°	79°	78°	77°	76°	75°	74°	

°	16°	17°	18°	19°	20°	21°	22°	23°	'
0	286 7454	305 7307	324 9197	344 3276	363 9702	383 8640	404 0262	424 4748	60
1	287 0602	306 0488	325 2413	345 6530	364 2997	384 1978	405 3646	425 8182	59
2	3751	3670	5630	9785	6292	5317	7031	425 1616	58
3	6900	6852	8848	345 3040	9588	8656	405 0417	5051	57
4	288 0050	307 0034	326 2066	346 6296	365 2888	385 1996	406 3804	426 8487	56
5	3201	3218	5284	9553	6188	5337	7191	426 1924	55
6	6352	6402	8504	346 2810	9480	8679	406 0579	5361	54
7	9503	9586	327 1724	6068	366 2776	386 2021	3968	8800	53
8	289 2655	308 2771	4944	9327	6078	5364	7358	427 2239	52
9	5808	5957	8165	347 2586	9978	8708	407 0748	5680	51
10	8961	9143	328 1387	5846	367 2680	387 2058	4139	9121	50
11	290 2114	309 2330	4610	9107	5981	5398	7531	428 2563	49
12	5269	5517	7833	348 2368	9284	8744	408 0924	6005	48
13	8423	8705	329 1056	5630	368 2587	388 2091	4318	9449	47
14	291 1578	310 1893	4281	8893	5890	5439	7713	429 2894	46
15	4734	5083	7505	349 2156	9198	8787	409 1108	6339	45
16	7890	8272	330 0731	5420	369 2500	389 2136	4504	9785	44
17	292 1047	311 1462	3957	8685	5800	5486	7901	430 3232	43
18	4205	4653	7184	350 1950	9112	8837	410 1299	6680	42
19	7363	7845	331 0411	5216	370 2420	390 2189	4697	431 0129	41
20	293 0521	312 1036	3639	8483	5728	5541	8097	3579	40
21	3680	4229	6868	351 1750	9030	8894	411 1497	7030	39
22	6839	7422	332 0097	5018	371 2340	391 2247	4898	432 0481	38
23	9999	313 0616	3327	8287	5650	5602	8300	3933	37
24	294 3160	3810	6557	352 1556	8967	8957	412 1703	7386	
25	6321	7005	9788	4820	372 2278	392 2313	5106	433 0840	
26	9483	314 0200	333 3020	8096	5590	5670	8510	429	
27	295 2645	3396	6252	353 1368	8902	9027	413 1915	77	
28	5808	6593	9485	4640	373 2217	393 2386	5321	434 1	
29	8971	9790	334 2719	7912	5582	5745	8728		
30	296 2135	315 2988	5953	354 1186		9105	414 2136		
31	5299	6186	9188	4460	374	394 2465	5544	435	
32	8464	9385	335 2424	7734		5827	8953		
33	297 1630	316 2585	5660	355 1010		9189	415 2363		
34	4796	5785	8896	4286	375	5252	5774		
35	7962	8986	336 2134	7562		5916	9186		
36	298 1129	317 2187	5372	356 0840		9280	416 2598		
37	4297	5389	8610	4118		6245	6012		
38	7465	8591	337 1850	7397		6011	9426		
39	299 0634	318 1794	5090	357 0676		9378	417 2841		
40	3803	4998	8330	3950		72746	6257		
41	6973	8202	338 1571	7237		6114	967		
42	300 0144	319 1407	4813	358 0518		9483	418 30		
43	3315	4613	8056	3801		982853	65		
44	6486	7819	339 1299	7083		6224	9		
45	9658	320 1025	4543	359 0367		9595	419 3		
46	301 2831	4232	7787	365		92968			
47	6004	7440	340 1032	693		6341	420		
48	9178	321 0649	4278	360 022		9715			
49	302 2352	3858	7524	350		93089			
50	5527	7067	341 0771	67		6465	42		
51	8703	322 0278	4019	361 00		9841			
52	303 1879	3489	7267	337		3218			
53	5055	6700	342 0516	666		6596			
54	8232	9912	3765	994		9974			
55	304 1410	323 3125	7015	362 324		9354			
56	4588	6338	343 0266	653					
57	7767	9552	3518	982					
58	305 0946	324 2766	6770	363 311					
59	4126	5981	344 0023	640					
60	7307	9197	3276	97					
°	73°	72°	71°	70°					

	24°	25°	26°	27°	28°	29°	30°	31°	
0	445 2287	466 3077	487 7326	509 5254	531 7094	554 3091	577 3503	600 8606	60
1	5773	6618	488 0927	8919	532 0826	6894	7382	601 2566	59
2	9260	467 0161	4530	510 2585	4559	555 0698	578 1262	6527	58
3	446 2747	3705	8133	6252	8293	4504	5144	602 0490	57
4	6236	7250	489 1737	9919	533 2029	8311	9027	4454	56
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37	9366	8178	690 2832	716 3698	743 1170	5672	7659	7620	23
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9	61350	09659	87264	96966	41921	25705	52391	51
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12	88114	37822	16963	28349	75156	60984	89932	48
13	97049	47225	26880	38829	86256	72768	1.82 02473	47
14	1.44 05991	56637	36806	49320	97367	84564	15026	46
15	14940	66058	46741	59820	1.68 08489	96371	27593	45
16	23897	75480	56685	70330	19621	1.75 08191	40173	44
17	32862	84923	66639	80850	30765	20023	52767	43
18	41834	94367	76601	91380	41919	31866	65374	42
19	50814	1.50 03821	86572	1.62 01920	53085	43722	77994	41
20	59801	13282	96552	12469	64261	55590	90628	40
21	68796	22751	1.56 06542	23029	75449	67470	1.83 03275	39
22	77798	32229	16540	33599	86647	79392	15936	38
23	86808	41710	26548	44178	97856	91267	28610	37
24	95825	51210	36564	54768	1.69 09077	1.76 03183	41297	36
25	1.45 04850	60713	46590	65368	20308	15112	53999	35
26	13883	70224	56625	75977	31550	27053	66713	34
27	22923	79743	66689	86597	42804	39007	79442	33
28	31971	89271	76722	97227	54069	50972	92184	32
29	41027	98807	86784	1.63 07867	65344	62950	1.84 04940	31
30	50090	1.51 08352	96856	18517	76631	74940	17709	80
31	59161	17905	1.57 06936	29177	87929	86943	30492	29
32	68240	27466	17026	39847	99238	98958	43289	28
33	77326	37036	27123	50528	1.70 10559	1.77 10985	56099	27
34	86420	46614	37234	61218	21890	23024	68923	26
35	95522	56201	47352	71919	33233	35076	81761	25
36	1.46 04632	65796	57479	82630	44587	47141	94613	24
37	13749	75400	67615	93351	55953	59218	1.85 07479	23
38	22874	85012	77760	1.64 04082	67329	71307	20358	22
39	32007	94632	87915	14824	78717	83409	33252	21
40	41147	1.52 04261	98079	25576	90116	95524	46159	20
41	50296	13899	1.58 08253	36338	1.71 01527	1.78 07651	59080	19
42	59452	23545	18436	47111	12949	19790	72015	18
43	68610	33200	28628	57893	24382	31943	84965	17
44	77788	42863	38830	68687	35827	44107	97928	16
45	86967	52535	49041	79490	47283	56285	1.86 10905	15
46	96155	62215	59261	90304	58751	68475	22896	14
47	1.47 05350	71904	69491	1.65 01128	70230	80678	30902	13
48	14553	81602	79731	11963	81720	92893	49921	12
49	23764	91308	89979	22808	93222	1.79 05121	62955	11
50	32983	1.53 01023	1.59 00238	33663	1.72 04736	17362	76003	10
51	42210	10746	10505	44529	16261	29616	98065	9
52	51445	20479	20783	55405	27797	41883	1.87 02141	8
53	60688	30219	31070	66292	39346	54162	15231	7
54	69938	39969	41366	77189	50905	66454	28336	6
55	79197	49727	51672	88097	62477	78759	41455	5
56	88463	59494	61987	99016	74060	91077	54588	4
57	97738	69270	72312	1.66 09945	85654	1.80 03408	67736	3
58	1.48 07021	79054	82647	20884	97260	15751	80898	2
59	16311	88848	92991	31834	1.73 08878	28108	94074	1
60	25610	98650	1.60 03345	42795	20508	40478	1.88 07266	0
	84°	83°	82°	81°	80°	79°	28°	

	62°	63°	64°	65°	66°	67°	68°	
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1	20470	40227	18185	61366	77962	77590	71212	59
2	33690	54364	33349	77683	95580	96683	92386	58
3	46924	68518	48531	94021	2-25 13221	2-36 15801	2-48 13190	57
4	60172	82688	63732	2-15 10378	30885	34946	34023	56
5	73436	96874	78950	26757	48572	54118	54887	55
6	86713	1-97 11077	94187	43156	66283	73316	75781	54
7	1-89 00006	25296	2-06 09442	59575	84016	92540	96706	53
8	13313	39531	24716	76015	2-26 01773	2-37 11791	2-49 17660	52
9	26635	53782	40008	92476	19554	31068	38645	51
10	39971	68050	55318	2-16 08958	37357	50372	59661	50
11	53322	82334	70646	25400	55184	69703	80709	49
12	66688	96635	85994	41983	73035	89060	2-50 01784	48
13	80068	1-98 10952	2-07 01359	58527	90909	2-38 08444	22891	47
14	93464	25286	16743	75091	2-27 08807	27855	44029	46
15	1-90 06874	39636	32146	91677	26729	47293	65198	45
16	20299	54003	47567	2-17 08283	44674	66758	86398	44
17	33738	68387	63007	24911	62643	86250	2-51 07629	43
18	47193	82787	78465	41559	80636	2-39 05769	28890	42
19	60663	97204	93942	58229	98653	25316	50183	41
20	74147	1-99 11637	2-08 09438	74920	2-28 16693	44889	71507	40
21	87647	26087	24953	91631	34758	64490	92863	39
22	1-91 01162	49554	40487	2-18 08364	52846	84118	2-52 14249	38
23	14691	55038	56039	25119	70959	2-40 03774	35667	37
24	28236	69539	71610	41894	89096	23457	57117	36
25	41795	84056	87200	58691	2-29 07257	43168	78598	35
26	55370	98590	2-09 02809	75510	25442	62906	2-53 00111	34
27	68960	2-00 13142	18437	92349	43651	82672	21655	33
28	82565	27710	34085	2-19 09210	61885	2-41 02465	43231	32
29	96186	42295	49751	26093	80143	22286	64839	31
30	1-92 09821	56897	65436	42997	98425	42136	86479	30
31	23472	71516	81140	59923	2-30 16732	62013	2-54 08151	29
32	37138	86153	96864	76871	35064	81918	29855	28
33	50819	2-01 00806	2-10 12607	93840	53420	2-42 01851	51591	27
34	64516	15477	28369	2-20 10831	71801	21812	73359	26
35	78228	30164	44150	27843	90206	41801	95160	25
36	91956	44869	59951	44878	2-31 08637	61819	2-55 16992	24
37	1-93 05699	59592	75771	61934	27092	81864	36858	23
38	19457	74331	91611	79012	45571	2-43 01938	60756	22
39	33231	89088	2-11 07470	96112	64076	22041	82686	21
40	47020	2-02 03862	23348	2-21 13234	82606	42172	2-56 04649	20
41	60825	18654	39246	30379	2-32 01160	62331	26645	19
42	74645	33462	55164	47545	19740	82519	48674	18
43	88481	48289	71101	64733	38345	2-44 02736	70735	17
44	1-94 02333	63133	87057	81944	56975	22982	92830	16
45	16200	77994	2-12 03034	99177	75630	43256	2-57 14957	15
46	30083	92873	19030	2-22 16432	94311	63559	37118	14
47	43981	2-03 07769	35046	33709	2-33 13017	83891	59312	13
48	57896	22683	51082	51009	31748	2-45 04252	81539	12
49	71826	37615	67137	68331	50505	24642	2-58 03500	11
50	85772	52565	83213	85676	69287	45061	26094	10
51	99733	67532	99308	2-23 03043	88095	65510	48421	9
52	1-95 13711	82517	2-13 15423	20433	2-34 06928	85987	70782	8
53	27704	97519	31559	37845	25787	2-46 06494	92177	7
54	41713	2-04 12540	47714	55280	44672	27030	2-59 15606	6
55	55739	27578	63890	72738	63582	47596	38068	5
56	69780	42634	80085	90218	82519	68191	60564	4
57	89837	57708	96301	2-24 07721	2-35 01481	88816	83095	3
58	97910	72800	2-14 12537	25247	20469	2-47 09470	2-60 05659	2
59	1-96 12006	87910	28793	42796	39483	30155	28258	1
60	26105	2-05 03038	45069	60368	58524	50869	50591	0
/	27°	26°	25°	24°	23°	22°	21°	/

/	69°	70°	71°	72°	73°	74°	75°	/
0	2-60 50891	2-74 74774	2-90 42109	3-07 76835	3-27 08526	3-48 74144	3-73 20508	60
1	73558	99661	69576	3-08 07325	42588	3-49 12470	63980	59
2	96259	2-75 24588	97089	37869	76715	50874	3-74 07546	58
3	2-61 18995	49554	2-91 24649	68468	3-28 10907	89356	51207	57
4	41766	74561	52256	99122	45164	3-50 27916	94963	56
5	64571	99608	79909	3-09 29831	79487	66555	3-75 38815	55
6	87411	2-76 24695	2-92 07610	60596	3-29 15376	3-51 05273	82763	54
7	2-62 10286	49822	35358	91416	48330	44070	3-76 26807	53
8	33196	74990	63152	3-10 22291	82851	82946	70947	52
9	56141	2-77 00199	90995	53223	3-30 17438	3-52 21902	3-77 15185	51
10	79121	25448	2-93 18885	84210	52091	60938	59519	50
11	2-63 02136	50738	46822	3-11 15254	86811	3-53 00054	3-78 03951	49
12	25186	76069	74807	46353	3-31 21598	39251	48481	48
13	48271	2-78 01440	2-94 02340	77509	56452	78528	93109	47
14	71392	26853	30921	3-12 08722	91373	3-54 17886	3-79 37835	46
15	94549	52307	59050	39991	3-32 26362	57325	82661	45
16	2-64 17741	77802	87227	71317	61419	96846	3-80 27585	44
17	40969	2-79 03339	2-95 15453	3-13 02701	96543	3-55 36449	72609	43
18	64232	28917	43727	34141	3-33 31736	76133	3-81 17733	42
19	87531	54537	72050	65639	66997	3-56 15900	62957	41
20	2-65 10867	80198	2-96 00422	97194	3-34 02326	55749	3-82 08281	40
21	34238	2-80 05901	28842	3-14 28807	37724	95681	53707	39
22	57645	31646	57312	60478	73191	3-57 35696	99233	38
23	81089	57433	85831	92207	3-35 08728	75794	3-83 44861	37
24	2-66 04569	83263	2-97 14399	3-15 23994	44333	3-58 15975	90591	36
25	28085	2-81 09134	43016	55840	80008	56241	3-84 36424	35
26	51638	35048	71683	87744	3-36 15753	96590	82358	34
27	75227	61004	2-98 00400	3-16 19706	51568	3-59 37024	3-85 28396	33
28	98853	87003	29167	51728	87453	77543	74527	32
29	2-67 22516	2-82 13045	57983	83808	3-37 23408	3-60 18146	3-86 20782	31
30	46215	39129	86850	3-17 15948	59434	58835	67131	30
31	69951	65256	2-99 15766	48147	95531	99609	3-87 13584	29
32	93725	91426	44734	80406	3-38 31699	3-61 40469	60142	28
33	2-68 17535	2-83 17639	73751	3-18 12724	67938	81415	3-88 06805	27
34	41333	43896	3-00 02820	45102	3-39 04249	3-62 22447	53574	26
35	65267	70196	51939	77540	40631	63566	3-89 00448	25
36	89190	96539	61109	3-19 10039	77085	3-63 04771	47429	24
37	2-69 13149	2-84 22926	90330	42598	3-40 13612	46064	94516	23
38	37147	49356	3-01 19603	75217	50210	87444	3-90 41710	22
39	61181	75831	48926	3-20 07897	86882	3-64 28911	89011	21
40	85254	2-85 02349	78301	40638	3-41 23626	70467	3-91 36420	20
41	2-70 09364	28911	3-02 07728	73440	60443	3-65 12111	83937	19
42	33513	55517	37207	3-21 06304	97333	53844	3-92 31563	18
43	57699	82168	66737	39228	3-42 34297	95665	79297	17
44	81923	2-86 08863	96320	72215	71334	3-66 37575	3-93 27141	16
45	2-71 06186	35602	3-03 25954	3-22 05263	3-43 08446	79575	75094	15
46	30487	62386	55641	38373	45631	3-67 21665	3-94 23157	14
47	54826	89215	85381	71546	82891	63845	71331	13
48	79204	2-87 16088	3-04 15173	3-23 04780	3-44 20226	3-68 06115	3-95 19615	12
49	2-72 03620	43007	45018	38078	57635	48475	68011	11
50	28076	60970	74915	71438	95120	90927	3-96 16518	10
51	52569	96979	3-05 04866	3-24 04860	3-45 32679	3-69 33469	65137	9
52	77102	2-88 24033	34870	38346	70315	76104	3-97 13868	8
53	2-73 01674	51132	64928	71896	3-46 08026	3-70 18830	62712	7
54	26284	78277	95038	3-25 05508	45813	61648	3-98 11669	6
55	50934	2-89 05467	3-06 25203	39184	83676	3-71 04558	60739	5
56	75623	32704	55421	72924	3-47 21616	47561	3-99 09924	4
57	2-74 00352	59986	85694	3-26 06728	59632	90658	59223	3
58	25120	87314	3-07 16020	40596	97726	3-72 33847	4-00 08636	2
59	40927	2-90 14688	46400	74529	3-48 35896	77131	58165	1
60	74774	42109	76835	3-27 08526	74144	3-73 20508	4-01 07809	0
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NAT. TAN.

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000 0000	·017 4551	·034 9208	·052 4078	·069 9268	·087 4887	·105 1042	·122 7846	60
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5818	·018 0370	5033	9912	5115	·088 0749	6925	3752	58
8727	3280	7945	·053 2829	8038	3681	9866	6705	57
·001 1636	6190	·036 0859	5746	·071 0961	6612	·106 2808	9658	56
4544	9100	3771	8663	3885	9544	5750	·124 2612	55
7453	·019 2010	6683	·054 1581	6809	·089 2476	8692	5566	54
·002 0362	4920	9596	4498	9733	5408	·107 1634	8520	53
3271	7830	·037 2500	7416	·072 2657	8341	4576	125 1474	52
6180	·020 0740	5422	·055 0333	5581	·090 1273	7519	4429	51
9089	3650	8335	3251	8505	4200	·108 0462	7384	50
·003 1998	6560	·038 1248	6169	·073 1430	7138	3405	·126 0339	49
4907	9470	4161	9087	4354	·091 0371	6348	3294	48
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·004 0725	5291	9988	4923	·074 0203	5938	·109 2234	9205	46
3634	8201	·039 2901	7841	3128	8871	5178	·127 2161	45
6542	·022 1111	5814	·057 0759	6053	·092 1804	8122	5117	44
9451	4021	8728	3678	8979	4738	·110 1060	8073	43
·005 2360	6932	·040 1641	6596	·075 1904	7672	4010	·128 1030	42
5269	9842	4555	9515	4829	·093 0606	6955	3986	41
8178	·023 2753	7469	·058 2434	7755	3540	9899	6943	40
·006 1087	5663	·041 0383	5352	·076 0680	6474	·111 2844	9900	39
3990	8574	3296	8271	3606	9409	5789	·129 2858	38
6906	·024 1484	6210	·059 1190	6532	·094 2344	8734	5815	37
9814	4395	9124	4109	9458	5278	·112 1680	8773	36
·007 2721	7305	·042 2038	7029	·077 2384	8213	4625	·130 1731	35
5632	·025 0216	4952	9948	5311	·095 1148	5571	4690	34
8541	3127	7866	·060 2867	8237	4084	·113 0517	7648	33
·008 1450	6038	·043 0781	5787	·078 1164	7019	3463	·131 0607	32
4300	8948	3095	8706	4090	9955	6410	3566	31
7269	·026 1859	6609	·061 1626	7017	·096 2890	9356	6525	30
·009 0178	4770	9524	4546	9944	5826	·114 2303	9484	29
3087	7681	·044 2438	7466	·079 2871	8763	5250	·132 2444	28
5996	·027 0592	5353	·062 0386	5798	·097 1699	8197	5404	27
8905	3503	8268	3306	8726	4635	·115 1144	8364	26
·010 1814	6414	·045 1183	6226	·080 1653	7572	4092	·133 1324	25
4724	9325	4097	9147	4581	·098 0509	7039	4284	24
7633	·028 2236	7012	·063 2067	7509	3446	9987	7246	23
·011 0542	5148	9927	4988	·081 0437	6383	·116 2936	·134 0207	22
3451	8059	·046 2842	7908	3365	9320	5884	3168	21
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9270	3882	8673	3750	9221	5194	·117 1781	8091	19
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5088	9705	4503	9592	5078	·100 1071	7679	5015	17
7998	·030 2616	7419	·065 2513	8007	4009	·118 0628	7978	16
·013 0907	5528	·048 0334	5435	·083 0936	6947	3578	·136 0940	15
3817	8439	3250	8356	3865	9886	6528	3903	14
6726	·031 1351	6166	·066 1278	6794	·101 2824	9478	6866	13
9635	4263	9082	4199	9723	5763	·119 2428	9830	12
·014 2541	7174	·049 1997	7121	·084 2653	8702	5378	·137 2793	11
5454	·032 0086	4913	·067 0043	5583	·102 1641	8329	5757	10
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·015 1271	5910	·050 0746	5887	·085 1442	7520	4230	·138 1685	8
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2912	7558	·051 2411	7577	3163	9280	6036	3545	4
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8731	3383	8244	3422	9025	5161	·122 1941	9476	2
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89°	88°	87°	86°	85°	84°	83°	82°	/

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2	141 1342	9809	9209	9841	213 1647	4811	9460	5726	58
3	4308	159 2791	177 2269	195 2861	4688	7876	250 2551	8847	57
4	7276	5774	5270	5881	7730	232 0941	5642	269 1967	56
5	142 0243	8757	8270	8901	214 0772	4907	8734	5087	55
6	3211	160 1740	178 1271	196 1922	3814	7073	251 1826	8207	54
7	6179	4724	4273	4943	6857	223 0140	4919	270 1328	53
8	9147	7708	7274	7964	9900	3207	8012	4449	52
9	143 2115	161 0692	179 0276	197 0986	215 2944	6274	252 1106	7571	51
10	5084	3677	3279	4008	5988	9342	4200	271 0694	50
11	8053	6662	6281	7031	9032	234 2410	7294	3817	49
12	144 1022	9647	9284	198 0053	216 2077	5479	253 0389	6940	48
13	3991	162 2632	180 2287	3076	5122	8548	3484	272 0064	47
14	6961	5618	5291	6100	8167	235 1617	6580	3188	46
15	9931	8603	8295	9124	217 1213	4687	9676	6313	45
16	145 2301	163 1590	181 1299	199 2148	4259	7758	254 2773	9488	44
17	5872	4576	4303	5172	7306	236 0829	5870	273 2564	43
18	8842	7563	7308	8197	218 0353	3900	8968	5690	42
19	146 1813	164 0550	182 0313	200 1222	3400	6971	255 2066	8817	41
20	4784	3537	3319	4248	6448	237 0044	5165	274 1945	40
21	7756	6525	6324	7274	9496	3116	8264	5072	39
22	147 0727	9513	9330	201 0300	219 2544	6189	256 1363	8201	38
23	3639	165 2501	183 2337	3327	5593	9262	4463	275 1330	37
24	6672	5489	5343	6354	8643	238 2336	7564	4459	36
25	9644	8478	8350	9381	220 1692	5410	257 0664	7589	35
26	148 2617	166 1467	184 1358	202 2409	4742	8485	3766	276 0719	34
27	5590	4456	4365	5437	7793	239 1560	6868	3850	33
28	8563	7446	7373	8465	221 0844	4635	9970	6981	32
29	149 1536	167 0436	185 0382	203 1494	3895	7711	258 3073	277 0113	31
30	4510	3426	3390	4523	6947	240 0788	6176	3245	30
31	7484	6417	6399	7552	9999	3864	9280	6378	29
32	150 0458	9407	9409	204 0582	222 3051	6942	259 2384	9512	28
33	3433	168 2398	186 2418	3612	6104	241 0019	5488	278 2646	27
34	6408	5390	5428	6643	9157	3097	8593	5780	26
35	9383	8381	8439	9674	223 2211	6176	260 1699	8915	25
36	151 2358	169 1373	187 1449	205 2705	5265	9255	4805	279 2050	24
37	5333	4366	4460	5737	8319	242 2334	7911	5186	23
38	8309	7358	7471	8769	224 1374	5414	261 1018	8322	22
39	152 1285	170 0351	188 0483	206 1801	4429	8494	4126	280 1459	21
40	4262	3344	3495	4834	7485	243 1575	7234	4597	20
41	7238	6338	6507	7867	225 0541	4656	262 0342	7735	19
42	153 0215	9331	9520	207 0900	3597	7737	3451	281 0873	18
43	3192	171 2325	189 2533	3934	6654	244 0819	6560	4012	17
44	6170	5320	5546	6968	9711	3902	9670	7152	16
45	9147	8314	8559	208 0003	226 2769	6984	263 2780	282 0292	15
46	154 2125	172 1309	190 1573	3038	5827	245 0068	5891	3432	14
47	5103	4304	4587	6073	8855	3151	9002	6573	13
48	8082	7300	7602	9109	227 1944	6236	264 2114	9715	12
49	155 1061	173 0296	191 0617	209 2145	5003	9320	5226	283 2857	11
50	4040	3292	3632	5181	8063	246 2405	8339	5999	10
51	7019	6298	6648	8218	228 1123	5491	265 1452	9143	9
52	9398	9285	9664	210 1255	4184	8577	4566	284 2286	8
53	156 2378	174 2282	192 2580	4293	7244	247 1663	7680	5430	7
54	5958	5279	5696	7331	229 0306	4750	266 0794	8575	6
55	8939	8277	8713	211 0369	3367	7837	3909	285 1720	5
56	157 1919	175 1275	193 1731	3407	6429	248 0925	7025	4866	4
57	4900	4273	4748	6446	9492	4013	267 0141	8012	3
58	7881	7272	7766	9486	230 2555	7102	3257	286 1159	2
59	158 0863	176 0271	194 0784	212 2525	5618	249 0191	6374	4306	1
60	3844	3270	3803	5566	8682	3280	9492	7454	0
	81°	80°	79°	78°	77°	76°	75°	74°	

	16°	17°	18°	19°	20°	21°	22°	23°	
0	286 7454	305 7307	324 9197	344 3276	363 9702	383 8640	404 0262	424 4748	60
1	287 0602	306 0488	325 2413	345 6530	364 2997	384 1978	405 3646	425 1816	59
2	3751	3670	3630	346 9785	365 6292	385 5317	406 7031	426 1816	58
3	6900	6852	6848	347 3040	366 9588	386 8656	407 0417	427 5051	57
4	288 0050	307 0034	326 2066	348 6296	367 2881	387 1996	408 3804	428 8487	56
5	3201	3218	3234	349 9553	368 6182	388 5337	409 7191	429 1924	55
6	6352	6402	6504	350 2810	369 9489	389 8679	410 0579	430 5361	54
7	9503	9586	327 1724	351 6068	370 2779	390 2021	411 3968	431 8806	53
8	289 2655	308 2771	328 4944	352 9327	371 6079	391 5364	412 7358	432 2239	52
9	5808	5957	6165	353 2586	372 9371	392 8708	413 0748	433 5686	51
10	8961	9143	329 1387	354 5846	373 2680	393 2053	414 4139	434 9121	50
11	290 2114	309 2330	330 4610	355 9107	374 5981	394 5398	415 7531	435 2563	49
12	5269	5517	5733	356 2368	375 9284	395 8744	416 0924	436 6005	48
13	8423	8705	329 1056	357 5630	376 2587	396 2091	417 4318	437 9449	47
14	291 1578	310 1893	330 4281	358 8893	377 5890	397 5439	418 7713	439 2894	46
15	4734	5083	5505	359 2150	378 9193	398 8787	419 1108	440 6339	45
16	7890	8272	330 0731	360 5420	379 2500	399 2136	420 4504	441 9785	44
17	292 1047	311 1462	331 3957	361 8685	380 5800	400 5486	421 7901	443 3232	43
18	4205	4653	5184	362 1950	381 9112	401 8837	422 1299	444 6680	42
19	7363	7845	331 0411	363 5210	382 2420	402 2189	423 4697	445 0129	41
20	293 0521	312 1036	332 3639	364 8483	383 5728	403 5541	424 8097	446 3579	40
21	3680	4229	4868	365 1750	384 9030	404 8894	425 1497	447 7030	39
22	6839	7422	332 0097	366 5018	385 2340	405 2247	426 4898	448 0481	38
23	9999	313 0616	333 3327	367 8287	386 5650	406 5602	427 8300	449 3933	37
24	294 3160	314 3810	334 6557	368 1556	387 8967	407 8957	428 1703	450 7386	36
25	6321	7005	7878	369 4820	388 2278	408 2313	429 5106	451 0840	35
26	9483	314 0200	335 3020	370 8096	389 5590	409 5670	430 8510	452 4295	34
27	295 2645	315 3396	336 6252	371 1368	390 8903	410 9027	431 1915	453 7751	33
28	5808	6593	7485	372 4640	391 2217	411 2386	432 5321	454 1208	32
29	8971	9790	337 2719	373 7912	392 5532	412 5745	433 8728	455 4665	31
30	296 2135	316 2988	338 5953	374 1186	393 8847	413 9105	434 2136	456 8124	30
31	5299	6186	7188	375 4460	394 2163	414 2465	435 5544	457 1583	29
32	8464	9385	339 2424	376 7734	395 5479	415 5827	436 8953	458 5043	28
33	297 1630	317 2585	340 5660	377 1010	396 8797	416 9189	437 2363	459 8504	27
34	4796	5785	6896	378 4286	397 2115	417 2552	438 5774	460 1966	26
35	7962	8986	340 2134	379 7562	398 5433	418 5916	439 9186	461 5429	25
36	298 1129	318 2187	341 5372	380 0840	399 8753	419 9280	440 2598	462 8893	24
37	4297	5389	6610	381 4118	400 2073	420 2645	441 6012	463 2357	23
38	7465	8591	342 1850	382 7397	401 5394	421 6011	442 9426	464 5823	22
39	299 0634	319 1794	343 5090	383 0676	402 8710	422 9378	443 2841	465 9289	21
40	3803	4998	6330	384 3950	403 2038	423 2746	444 6257	466 2756	20
41	6973	8202	344 1571	385 7237	404 5361	424 6114	445 9673	467 6224	19
42	300 0144	319 1407	345 4813	386 0518	405 8685	425 9483	446 3091	468 9693	18
43	3315	4613	6060	387 3801	406 2010	426 2853	447 6509	469 3163	17
44	6486	7819	346 1299	388 7083	407 5335	427 6224	448 9928	470 6634	16
45	9658	320 1025	347 4543	389 0367	408 8661	428 9595	449 3348	471 0105	15
46	301 2831	321 4232	348 7787	390 3651	409 1988	429 2968	450 6769	472 3578	14
47	6004	7440	349 1032	391 6936	410 5315	430 6341	451 0190	473 7051	13
48	9178	321 0649	350 4278	392 0222	411 8644	431 9715	452 3613	474 0526	12
49	302 2352	322 3858	351 7524	393 3508	412 1973	432 3089	453 7036	475 4001	11
50	5527	7067	352 0771	394 6795	413 5302	433 6465	454 0460	476 7477	10
51	8703	322 0278	353 4019	395 0082	414 8633	434 9841	455 3885	477 0954	9
52	303 1879	323 3489	354 7267	396 3371	415 1964	435 3218	456 7311	478 4432	8
53	5055	6700	355 0516	397 6660	416 5296	436 6596	457 0738	479 7910	7
54	8232	9912	356 3765	398 9949	417 8629	437 9974	458 4165	480 1390	6
55	304 1410	324 3125	357 7015	399 3240	418 1962	438 3354	459 7594	481 5071	5
56	4588	6338	358 0266	400 6531	419 5296	439 6734	460 1023	482 8352	4
57	7767	9552	359 3518	401 9823	420 8631	440 0115	461 4453	483 1834	3
58	305 0946	325 2766	360 6770	402 3115	421 1967	441 3496	462 7884	484 5318	2
59	4126	5981	361 0023	403 6408	422 5303	442 6879	463 1316	485 8802	1
60	7307	9197	362 3276	404 9702	423 8640	443 0262	464 4748	486 2287	0
	73°	72°	71°	70°	69°	68°	67°	66°	

	24°	25°	26°	27°	28°	29°	30°	31°	
0	445 2287	466 3077	487 7326	509 5254	531 7094	554 3091	577 3503	600 8606	60
1	5773	6618	488 0927	8919	532 0826	6894	7382	601 2566	60
2	9260	467 0161	4530	510 2585	4559	555 0698	578 1262	6527	58
3	446 2747	3705	8133	6252	8293	4504	5144	602 0490	57
4	6236	7250	489 1737	9919	533 2029	8311	9027	4454	56
5	9726	468 0796	5343	511 3588	5765	556 2119	579 2912	8419	55
6	447 3216	4342	8949	7259	9503	5929	6797	603 2386	54
7	6708	7890	490 2557	512 0930	534 3242	9739	580 0684	6354	53
8	448 0200	469 1439	6166	4602	6981	557 3551	4573	604 0323	52
9	3693	4988	9775	8275	535 0723	7364	8462	4294	51
10	7187	8539	491 3386	513 1950	4465	558 1179	581 2353	8266	50
11	449 0682	470 2090	6997	5625	8208	4994	6245	605 2240	49
12	4178	5643	492 0610	9302	536 1953	8811	582 0139	6215	48
13	7675	9196	4224	514 2980	5699	559 2629	4034	606 0192	47
14	450 1173	471 2751	7838	6658	9446	6449	7930	4170	46
15	4672	6306	493 1454	515 0338	537 3194	560 0269	583 1828	8149	45
16	8171	9863	5071	4019	6943	4091	5726	607 2130	44
17	451 1672	472 3420	8689	7702	538 0694	7914	9627	6112	43
18	5173	6978	494 2308	516 1385	4445	561 1738	584 3528	608 0095	42
19	8676	473 0538	5928	5069	8198	5564	7431	4080	41
20	452 2179	4098	9549	8755	539 1952	9391	585 1335	8067	40
21	5683	7659	495 3171	517 2441	5707	562 3219	5241	609 2054	39
22	9188	474 1222	6794	6129	9404	7048	9148	6043	38
23	453 2694	4785	496 0418	9818	540 3221	568 0879	586 3056	610 0034	37
24	6301	8349	4043	518 3508	6980	4710	6965	4026	36
25	9709	475 1914	7669	7199	541 0740	8543	587 0876	8019	35
26	454 3218	5481	497 1297	519 0891	4501	564 2378	4788	611 2014	34
27	6728	9048	4925	4584	8263	6213	8702	6011	33
28	455 0238	476 2616	8554	8278	542 2027	565 0050	588 2616	612 0008	32
29	3750	6185	498 2185	520 1974	5791	3888	6533	4007	31
30	7263	9755	5816	5671	9557	7728	589 0450	8008	30
31	456 0776	477 3326	9449	9368	543 3324	566 1568	4369	613 2010	29
32	4290	6899	499 3082	521 3067	7092	5410	8289	6013	28
33	7806	478 0472	6717	6767	544 0862	9254	590 2211	614 0018	27
34	457 1322	4046	500 0352	522 0468	4632	567 3098	6134	4024	26
35	4839	7821	3989	4170	8404	6944	591 0058	8032	25
36	8357	479 1197	7627	7874	545 2177	568 0791	3984	615 2041	24
37	458 1877	4774	501 1266	523 1578	5951	4639	7910	6052	23
38	5397	8352	4906	5284	9727	8488	592 1839	616 0064	22
39	8918	480 1932	8547	8990	546 3503	569 2339	5768	4077	21
40	459 2439	5512	502 2189	524 2098	7281	6191	9699	8092	20
41	5962	9093	5832	6407	547 1060	570 0045	593 3632	617 2108	19
42	9486	481 2675	9476	525 0117	4840	3899	7565	6126	18
43	460 3011	6258	503 3121	3829	8621	7755	594 1501	618 0145	17
44	6387	9842	6768	7541	548 2404	571 1612	5437	4166	16
45	461 0063	482 3427	504 0415	526 1255	6188	5471	9375	8188	15
46	3591	7014	4063	4969	9973	9331	595 3314	619 2211	14
47	7119	483 0601	7713	8685	549 3759	572 3192	7255	6236	13
48	462 0649	4189	505 1363	527 2402	7547	7054	596 1196	620 9263	12
49	4179	7778	5015	6120	550 1335	573 0918	5140	4291	11
50	7710	484 1368	8668	9839	5125	4783	9084	8320	10
51	463 1243	4959	506 2322	528 3560	8916	8649	597 3030	621 2351	9
52	4776	8552	5977	7281	551 2708	574 2516	6978	6383	8
53	8310	485 2145	9633	529 1001	6502	6385	598 0926	622 0417	7
54	464 1845	5739	507 3290	4727	552 0297	575 0255	4877	4452	6
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56	8919	486 2931	508 0607	530 2178	7890	7999	599 2781	623 2527	4
57	465 2457	6528	4297	5906	558 1688	576 1873	6735	6566	3
58	5996	487 0126	7929	9634	5488	5748	600 0691	624 0607	2
59	9536	3726	509 1591	531 3364	9288	9625	4648	4650	1
60	466 3077	7326	5254	7094	554 3091	577 3503	8606	8694	0
/	65°	64°	63°	62°	61°	60°	59°	58°	/

	32°	33°	34°	35°	36°	37°	38°	39°	
0	624 8694	649 4076	674 5085	700 2075	726 5425	753 5541	781 2856	809 7840	60
1	625 2739	8212	9318	6411	9871	754 0102	7542	810 2658	59
2	6780	650 2350	675 3553	701 0749	727 4318	4666	782 2229	7478	58
3	626 0834	6490	7790	5089	8707	9232	6919	811 2300	57
4	4884	651 0631	676 2028	9430	728 3218	755 3799	783 1611	7124	56
5	8935	4774	6268	702 3773	7671	8369	6305	812 1951	55
6	627 2988	8918	677 0509	8118	729 2125	756 2941	784 1002	6780	54
7	7042	652 3064	4752	703 2464	6582	7514	5700	813 1611	53
8	628 1098	7211	8997	6813	730 1041	757 2090	785 0400	6444	52
9	5155	653 1300	678 3243	704 1163	5501	6668	5103	814 1280	51
10	9214	5511	7492	5515	9963	758 1248	9808	6118	50
11	629 3274	9663	679 1741	9869	731 4428	5829	786 4515	815 0958	49
12	7336	654 3817	5993	705 4224	8894	759 0413	9224	5801	48
13	630 1390	7972	680 0246	8581	732 3362	4999	787 3935	816 0646	47
14	5464	655 2129	4501	706 2940	7832	9587	8649	5493	46
15	9530	6287	8758	7301	733 2303	760 4177	788 3304	817 0343	45
16	631 3598	656 0447	681 3016	707 1664	6777	8769	8082	5195	44
17	7667	4609	7276	6028	734 1253	761 3363	789 2802	818 0049	43
18	632 1738	8772	682 1537	708 0395	5730	7959	7524	4905	42
19	5810	657 2937	5801	4762	735 0210	762 2557	790 2248	9764	41
20	9883	7103	683 0066	9133	4691	7157	6975	819 4625	40
21	633 3959	658 1271	4333	709 8504	9174	763 1759	791 1703	9488	39
22	8035	5441	8601	7878	736 3660	6363	6434	820 4354	38
23	634 2113	9612	684 2871	710 2252	8147	764 0969	792 1167	9222	37
24	6193	659 3785	7143	6630	737 2636	5577	5902	821 4093	36
25	635 0274	7960	685 1416	711 1009	7127	765 0188	793 0640	8965	35
26	4357	660 2136	5632	5393	738 1620	4800	5379	822 3840	34
27	8441	6313	9969	9772	6115	9414	794 0121	8718	33
28	636 2527	661 0492	686 4247	712 4157	739 0611	766 4031	4865	823 3597	32
29	9614	4673	8528	8543	5110	8649	9611	8479	31
30	637 0703	8856	687 2810	713 2931	9611	767 3270	795 4359	824 3364	30
31	4793	662 3040	7093	7320	740 4113	7893	9110	8251	29
32	8885	7225	688 1379	714 1712	8618	768 2517	796 3862	825 3140	28
33	638 2978	663 1413	5666	6106	741 3124	7144	8617	8031	27
34	7073	5601	9955	715 0501	7633	769 1773	797 3374	826 2925	26
35	639 1169	9792	689 4246	4898	742 2143	6404	8134	7821	25
36	5267	664 3984	8538	9297	6655	770 1037	798 2895	827 2719	24
37	9366	8178	690 2832	716 3698	743 1170	5672	7659	7620	23
38	640 3467	665 2373	7128	8100	5686	771 0309	799 2425	828 2523	22
39	7569	6569	691 1425	717 2505	744 0204	4948	7193	7429	21
40	641 1673	666 0769	5725	6911	4724	9589	800 1963	829 2337	20
41	5779	4969	692 0026	718 1319	9246	772 4233	6736	7247	19
42	9886	9171	4328	5729	745 3770	8878	801 1511	830 2160	18
43	642 3994	667 3374	8633	719 0141	8206	773 3526	6288	7075	17
44	8105	7580	693 2939	4554	746 2824	8176	802 1067	831 1992	16
45	643 2216	668 1786	7247	8970	7354	774 2927	5849	6912	15
46	6329	5995	694 1557	720 3387	747 1886	7481	803 0632	832 1834	14
47	644 0444	669 0205	5868	7806	6420	775 2137	5418	6759	13
48	4560	4417	695 0181	721 2227	748 0956	6795	804 0206	833 1886	12
49	8678	8630	4496	6650	5494	776 1455	4997	6615	11
50	645 2797	670 2845	8813	722 1075	749 0033	6118	9790	834 1547	10
51	6918	7061	696 3131	5502	4575	777 0782	805 4584	6481	9
52	646 1041	671 1280	7451	9930	9119	5448	9382	835 1418	8
53	5165	5500	697 1773	723 4361	750 3665	778 0117	806 4181	6357	7
54	9290	9721	6097	8793	8212	4788	8983	836 1298	6
55	647 3417	672 3944	698 0422	724 3227	751 2762	9460	807 3787	6242	5
56	7546	8169	4749	7663	7314	779 4135	8593	837 1188	4
57	648 1676	673 2396	9078	725 2101	752 1867	8812	808 2401	6136	3
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59	9941	674 0854	7741	726 0982	753 0981	8173	809 3025	6041	1
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	57°	56°	55°	54°	53°	52°	51°	50°	

	40°	41°	42°	43°	44°	45°	46°	47°
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1	5955	7970	9309	933 0591	966 2511	05819	61333	29943 59
2	840 0915	870 3087	901 4580	934 1479	967 3787	11642	67367	36203 58
3	5878	8200	9854	934 1479	967 3787	17469	73404	42467 57
4	841 0844	871 3310	902 5131	935 2380	968 5035	23298	79445	48734 56
5	5812	8435	903 0411	935 2380	968 5035	29131	85489	55006 55
6	842 0782	872 3550	904 0979	936 3292	969 0674	34968	91538	61282 54
7	5755	8680	904 0979	936 3292	969 0674	40807	97589	67561 53
8	843 0730	873 3806	905 1557	937 4216	970 1962	46651	1-04 03645	73845 52
9	5708	8935	905 1557	937 4216	970 1962	52497	09704	80132 51
10	844 0688	874 4067	906 2147	938 5153	971 3262	58348	15767	86423 50
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12	845 0655	875 4338	907 2748	939 0625	972 4575	70058	27904	99018 48
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9	56141	2-77 00199	90995	53223	3-30 17438	3-52 21902	3-77 15185	51
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20	2-65 10867	80198	2-96 00422	97194	3-34 02326	55749	3-82 08281	40
21	34238	2-80 05901	28842	3-14 28807	37724	95681	53707	39
22	57645	31646	57312	60478	73191	3-57 35696	99233	38
23	81089	57433	85831	92207	3-35 08728	75794	3-83 44861	37
24	2-66 04569	83263	2-97 14399	3-15 23994	44333	3-58 15975	90591	36
25	28085	2-81 09134	43016	55840	80008	56241	3-84 36424	35
26	51638	35048	71683	87744	3-36 15753	96590	82358	34
27	75227	61004	2-98 00400	3-16 19706	51568	3-59 37024	3-85 28396	33
28	98853	87003	29167	51728	87453	75443	74527	32
29	2-67 22516	2-82 13045	57983	83808	3-37 23408	3-60 18146	3-86 20782	31
30	46215	39129	86850	3-17 15948	59434	58835	67131	30
31	69951	65256	2-99 15766	48147	95531	99609	3-87 13584	29
32	93723	91426	44734	80406	3-38 31699	3-61 40469	60142	28
33	2-68 17535	2-83 17639	73751	3-18 12724	67938	81415	3-88 06805	27
34	41383	43896	3-00 02820	45102	3-39 04249	3-62 22447	53574	26
35	65267	70196	51939	77540	40631	63506	3-89 00448	25
36	89190	96539	61109	3-19 10039	77085	3-63 04771	47429	24
37	2-69 13149	2-84 22926	90330	42598	3-40 13612	46064	94516	23
38	37147	49356	3-01 19603	75217	50210	87444	3-90 41710	22
39	61181	75831	48926	3-20 07897	86882	3-64 28911	89011	21
40	85254	2-85 02349	78301	40638	3-41 23626	70467	3-91 36420	20
41	2-70 09364	28911	3-02 07728	73440	60443	3-65 12111	83937	19
42	33513	55517	37207	3-21 06304	97333	53844	3-92 31563	18
43	57099	82168	66737	39228	3-42 34297	95665	79297	17
44	81923	2-86 08863	96320	72215	71334	3-66 37575	3-93 27141	16
45	2-71 06186	35602	3-03 25954	3-22 05263	3-43 08446	79575	75094	15
46	30487	62386	55641	38373	45631	3-67 21665	3-94 23157	14
47	54826	89215	85381	71546	82891	63845	71331	13
48	79204	2-87 16058	3-04 15173	3-23 04780	3-44 20226	3-68 06115	3-95 19615	12
49	2-72 03620	43007	45018	38078	57635	48475	68011	11
50	28076	60970	74915	71438	95120	90927	3-96 16518	10
51	52569	96979	3-05 04866	3-24 04860	3-45 32679	3-69 33469	65137	9
52	77102	2-88 24033	34870	38346	70315	76104	3-97 13868	8
53	2-73 01674	51132	64928	71895	3-46 08026	3-70 18830	62712	7
54	26254	78277	95038	3-25 05508	45813	61648	3-98 11669	6
55	50934	2-89 05467	3-06 25203	39184	83676	3-71 04558	60739	5
56	75623	32704	55421	72924	3-47 21616	47561	3-99 09924	4
57	2-74 00352	59986	85694	3-26 06728	59632	90658	59223	3
58	25120	87314	3-07 16020	40596	97726	3-72 33847	4-00 08636	2
59	49927	2-90 14688	46400	74529	3-48 35896	77131	58165	1
60	74774	42109	76835	3-27 08526	74144	3-73 20508	4-01 07809	0
/	20°	19°	18°	17°	16°	15°	14°	/

	76°	77°	78°	79°	80°	81°	82°	
0	401 07809	433 14759	470 46301	5-1 445540	5-6 712818	6-3 137515	7-1 153607	60
1	57570	72316	471 13686	525557	809446	256601	304190	59
2	402 07446	434 36018	81256	605813	906394	376126	455308	58
3	57440	87866	472 49012	686311	5-7 003663	496092	607056	57
4	403 07550	435 45861	473 16954	767051	101256	616502	759437	56
5	57779	436 04003	85083	848035	199173	737359	912456	55
6	404 08125	62293	474 53401	929264	297416	858665	7-2 066116	54
7	58590	437 20731	475 21907	5-2 010738	395988	980422	220422	53
8	405 09174	79317	90603	092459	494889	6-4 102633	375378	52
9	59877	438 38054	476 59490	174428	594122	225301	530987	51
10	406 10700	96940	477 28568	256647	693688	348428	687255	50
11	61643	439 55977	97837	339116	793588	472017	844184	49
12	407 12707	440 15164	478 67300	421836	893825	596070	7-3 001780	48
13	63892	74504	479 36957	504809	994400	720591	160047	47
14	408 15199	441 33996	480 06808	588035	5-8 095315	845581	318989	46
15	66627	93641	76854	671517	196572	971043	478610	45
16	409 18178	442 53439	481 47096	755255	298172	6-5 096981	638916	44
17	69852	443 13392	482 17536	839251	400117	223396	799909	43
18	410 21649	73500	88174	923505	502410	350293	961595	42
19	73569	444 33762	483 59010	5-3 008018	605051	477672	7-4 123978	41
20	411 25614	94181	484 30045	092793	780842	605538	287064	40
21	77784	445 54756	485 01282	177830	811386	733892	450855	39
22	412 30079	446 15489	72719	263131	915084	862739	615357	38
23	82499	76379	486 44359	348696	5-9 019138	992080	786576	37
24	413 35046	447 37428	487 16201	434527	123550	6-6 121919	946514	36
25	87719	98636	88248	520626	228322	252258	7-5 113178	35
26	414 40519	448 60004	488 60499	606993	332455	383100	280571	34
27	93446	449 21532	489 32956	693630	438952	514449	448699	33
28	415 46501	83221	490 05620	780538	544815	646307	617567	32
29	99685	450 45072	73491	867718	651045	778677	787179	31
30	416 52998	451 07085	491 51570	955172	757644	911562	957541	30
31	417 06440	69261	492 24859	5-4 042901	864614	6-7 044966	7-6 128657	29
32	60011	452 31601	93358	130906	971957	178891	300533	28
33	418 13713	94105	493 72068	219188	6-0 079676	133341	473174	27
34	67546	453 56773	494 45990	307750	187772	448318	646584	26
35	419 21510	454 19608	495 20125	396592	296247	583826	820769	25
36	75606	82608	94474	485715	405103	719567	995735	24
37	420 29835	455 45776	496 69037	575121	514343	856446	7-7 115486	23
38	84196	456 09111	497 43817	664812	623967	993565	348028	22
39	421 38690	72615	498 18813	754788	733979	6-8 131227	525366	21
40	93318	457 36287	94027	845052	844381	269437	703506	20
41	422 48080	458 00129	499 69459	935604	955174	408196	882453	19
42	423 02977	64141	500 45111	5-5 026446	6-1 066360	547508	7-8 062212	18
43	58009	459 28325	501 20984	117579	177943	687378	242790	17
44	424 13177	92680	97078	209005	289923	827807	421191	16
45	68482	460 57207	502 73395	300724	402303	968799	606423	15
46	425 23923	461 21908	503 49935	392740	515085	6-9 110359	739459	14
47	79501	86783	504 26700	485052	628272	252489	973396	13
48	426 35218	462 51832	505 03690	577663	741865	395192	7-9 158151	12
49	91072	463 17056	80907	670574	855867	538473	343758	11
50	427 47066	82457	506 58352	763786	970279	682335	530224	10
51	428 03199	464 48034	507 36025	857302	6-2 085106	826781	717555	9
52	59472	465 13788	508 13928	951121	200347	971806	905756	8
53	429 15885	79721	92061	5-6 045247	316007	7-0 117441	8-0 094835	7
54	72440	466 45832	509 70426	139690	432086	263662	284796	6
55	430 29136	467 12124	510 49024	234421	548588	410482	475647	5
56	85974	78595	511 27855	329474	665515	557905	667394	4
57	431 42955	468 45248	512 06921	424838	782868	705934	860042	3
58	432 00079	469 12083	86224	520516	900651	854573	8-1 053599	2
59	57347	79100	513 65763	616509	6-3 018866	7-1 003826	248071	1
60	433 14759	470 46301	514 45540	712818	137515	153697	443464	0
/	13°	12°	11°	10°	9°	8°	7°	/

	83°	84°	85°	86°	87°	88°	89°	
0	81 443464	95 143645	11.430052	14 200666	19 081137	28 636253	57 289962	60
1	639786	410613	468474	360696	187930	877089	58 261174	59
2	837041	679068	507154	421230	295922	29 123006	59 265872	58
3	8 2 035239	949022	546093	482273	405133	371106	60 305820	57
4	234384	9 6 220486	585294	543833	515684	624499	61 382905	56
5	434485	493475	624761	605916	627296	822299	62 499154	55
6	635547	768000	664495	668529	740291	30 144619	63 666741	54
7	837579	9 7 044075	704500	731679	854591	411580	64 868008	53
8	8 3 040586	321713	744779	795372	970219	683307	66 105473	52
9	244577	600927	785333	859616	20 087199	959928	67 401854	51
10	449558	881732	826167	924417	205553	31 241577	68 750087	50
11	655536	9 8 164140	867282	989784	325308	528392	70 153346	49
12	862519	448166	908682	15 055723	446486	820516	71 615070	48
13	8 4 070515	733823	950370	122242	569115	32 118099	73 138991	47
14	270531	9 9 021125	992349	189349	693220	421295	74 729165	46
15	489573	310088	12.034622	257052	818828	730265	76 390009	45
16	700651	600724	077192	325358	945966	33 045173	78 126342	44
17	912772	893050	120062	394276	21 074664	366194	79 943430	43
18	8 5 125943	10 0 18708	163236	463814	204949	693509	81 847041	42
19	340172	048283	206716	533981	336851	34 027303	83 843507	41
20	555468	078031	250505	604784	470401	367771	85 939791	40
21	771838	107954	294609	676233	605630	715115	88 143572	39
22	989290	138054	339028	748337	742569	35 069546	90 463336	38
23	8 6 207833	168332	383738	821105	881251	431282	92 908487	37
24	427 475	198789	428831	894545	22 021710	800553	95 489475	36
25	648223	229428	474221	968667	163980	36 177596	98 217943	35
26	870088	260249	519942	16 043482	308097	562659	101 10690	34
27	8 7 093077	291255	565997	118998	454096	956001	104 17094	33
28	317198	322447	612390	195225	602015	37 357892	107 42648	32
29	642461	353827	659125	272174	751892	768613	110 89205	31
30	768874	385397	706205	349855	903768	38 188459	114 58865	30
31	996446	417158	753634	428279	23 057677	617738	118 54018	29
32	8 8 225186	449112	801417	507456	213666	39 056771	122 77396	28
33	455103	481261	849557	587396	371777	505895	127 32134	27
34	686206	513607	898058	668112	532052	956460	132 21851	26
35	918505	546151	946924	749614	694537	40 435837	137 50745	25
36	8 9 152009	578895	996160	831915	859277	917412	143 23712	24
37	3867 26	611841	13 045769	915025	24 026320	41 410588	149 46502	23
38	622668	644992	095757	998957	195714	915790	156 25908	22
39	859843	678348	146127	17 083724	367509	42 433464	163 70019	21
40	9 0 098261	711913	196883	169337	541758	964077	171 88540	20
41	337933	745687	248031	255809	718512	43 608122	180 93220	19
42	578867	779673	299574	343155	897826	44 066113	190 98419	18
43	821074	813872	351518	431385	25 079757	638596	202 21875	17
44	9 1 064564	848288	403867	520516	264361	45 226141	214 85762	16
45	309348	882921	456625	610559	451700	829351	229 18166	15
46	555436	917775	509799	701529	641832	46 448862	245 55198	14
47	802838	952850	633391	793442	834823	47 085343	264 44080	13
48	9 2 051564	988150	617409	886310	26 030736	739501	286 47773	12
49	301627	11 023676	671856	980150	229638	48 412084	312 52137	11
50	553035	059431	726738	18 074977	431600	49 102881	343 77371	10
51	805802	095416	782060	170807	636690	815726	381 97099	9
52	9 3 059936	131635	837827	267654	844984	50 548506	429 71757	8
53	315450	168089	894045	365537	27 065557	51 303157	491 10600	7
54	57 2355	204780	950719	464471	271486	52 080673	572 95721	6
55	830663	241712	14 007856	504473	489853	882109	687 54887	5
56	9 4 090384	278885	065459	665562	711740	53 708587	859 43630	4
57	351531	316304	123536	767754	937233	54 561300	1145 9153	3
58	614116	353970	182092	871068	28 166422	55 441517	1718 8732	2
59	878149	391885	241134	975523	399397	56 350590	3437 7407	1
60	9.5 143645	430052	300666	19 081137	636253	57 289962	Infinite.	0
	6°	5°	4°	3°	2°	1°	0°	

116 COMPARISON OF FRENCH AND ENGLISH BAROMETERS.

Milli-metres.	English inches.	Milli-metres.	English inches.	Milli-metres.	English inches.	Milli-metres.	English inches.	Milli-metres.	English inches.	Milli-metres.	English inches.
501	19-725	551	21-693	601	23-662	651	25-630	701	27-599	751	29-567
502	764	552	733	602	701	652	670	702	638	752	606
503	803	553	772	603	741	653	709	703	677	753	646
504	843	554	811	604	780	654	748	704	717	754	685
505	882	555	851	605	819	655	788	705	756	755	725
506	921	556	890	606	859	656	827	706	795	756	764
507	961	557	930	607	898	657	867	707	835	757	803
508	20-000	558	21-969	608	937	658	906	708	874	758	843
509	040	559	22-009	609	23-977	659	945	709	914	759	882
510	079	560	048	610	24-016	660	25-985	710	953	760	921
511	118	561	087	611	056	661	26-024	711	27-992	761	29-961
512	158	562	126	612	095	662	063	712	28-032	762	30-000
513	197	563	166	613	134	663	103	713	071	763	040
514	236	564	205	614	174	664	142	714	110	764	079
515	276	565	244	615	213	665	181	715	150	765	118
516	315	566	284	616	252	666	221	716	189	766	158
517	354	567	323	617	292	667	260	717	229	767	197
518	394	568	363	618	331	668	300	718	268	768	236
519	433	569	402	619	371	669	339	719	307	769	276
520	473	570	441	620	410	670	378	720	347	770	315
521	512	571	481	621	449	671	418	721	386	771	355
522	551	572	520	622	489	672	457	722	425	772	394
523	591	573	559	623	528	673	496	723	465	773	433
524	630	574	599	624	567	674	536	724	504	774	473
525	670	575	638	625	607	675	575	725	543	775	512
526	709	576	678	626	646	676	615	726	583	776	551
527	748	577	717	627	685	677	654	727	622	777	591
528	788	578	756	628	725	678	693	728	662	778	630
529	827	579	796	629	764	679	733	729	701	779	670
530	867	580	835	630	804	680	772	730	740	780	709
531	906	581	875	631	843	681	811	731	780	781	748
532	945	582	914	632	882	682	851	732	819	782	788
533	20-985	583	953	633	922	683	890	733	858	783	827
534	21-024	584	22-993	634	961	684	930	734	898	784	866
535	063	585	23-032	635	25-000	685	26-969	735	937	785	906
536	103	586	071	636	040	686	27-008	736	28-977	786	945
537	142	587	111	637	079	687	048	737	29-016	787	30-984
538	181	588	150	638	118	688	087	738	055	788	31-024
539	221	589	189	639	158	689	126	739	095	789	063
540	266	590	229	640	197	690	166	740	134	790	103
541	300	591	268	641	237	691	205	741	173	PROP'L PARTS.	
542	339	592	308	642	276	692	245	742	213	0-1	0-0039
543	378	593	347	643	315	693	284	743	252	2	0-0079
544	417	594	386	644	355	694	323	744	292	3	0-0118
545	457	595	426	645	394	695	363	745	331	4	0-0157
546	496	596	465	646	433	696	402	746	370	5	0-0197
547	536	597	504	647	473	697	441	747	410	6	0-0236
548	575	598	544	648	512	698	481	748	449	7	0-0276
549	614	599	583	649	552	699	520	749	488	8	0-0315
550	654	600	622	650	591	700	559	750	528	9	0-0354

1 Metre = 39-3707 English inches = 443-296 Paris lines.
 1 English foot = 0-304794 metre = 135-114 Paris lines.
 1 French foot = 1-0658 English feet = 0-32484 metre.

TABLE OF CHORDS TO A RADIUS OF UNITY. 11

D. M.	Chords.	D. M.	Chords.	D. M.	Chords.	D. M.	Chords.	D. M.	Chords.
5	·0015	9	·1569	18	·3129	27	·4669	36	·6180
10	·0029	10	·1598	19	·3157	10	·4697	10	·6208
20	·0058	20	·1627	20	·3186	20	·4725	20	·6236
30	·0087	30	·1656	30	·3215	30	·4754	30	·6263
40	·0116	40	·1685	40	·3244	40	·4782	40	·6291
50	·0145	50	·1714	50	·3272	50	·4810	50	·6318
1	·0175	10	·1743	19	·3301	28	·4838	37	·6346
10	·0204	10	·1772	10	·3330	10	·4867	10	·6374
20	·0233	20	·1801	20	·3358	20	·4895	20	·6401
30	·0262	30	·1830	30	·3387	30	·4923	30	·6429
40	·0291	40	·1859	40	·3416	40	·4951	40	·6456
50	·0320	50	·1888	50	·3444	50	·4979	50	·6484
2	·0349	11	·1917	20	·3473	29	·5008	38	·6511
10	·0378	10	·1946	10	·3502	10	·5036	10	·6539
20	·0407	20	·1975	20	·3530	20	·5064	20	·6566
30	·0436	30	·2004	30	·3559	30	·5092	30	·6594
40	·0465	40	·2033	40	·3587	40	·5120	40	·6621
50	·0494	50	·2062	50	·3616	50	·5148	50	·6649
3	·0523	12	·2091	21	·3645	30	·5176	39	·6676
10	·0553	10	·2119	10	·3673	10	·5204	10	·6703
20	·0582	20	·2148	20	·3702	20	·5233	20	·6731
30	·0611	30	·2177	30	·3730	30	·5261	30	·6758
40	·0640	40	·2206	40	·3759	40	·5289	40	·6786
50	·0669	50	·2235	50	·3788	50	·5317	50	·6813
4	·0698	13	·2264	22	·3816	31	·5345	40	·6840
10	·0727	10	·2293	10	·3845	10	·5373	10	·6866
20	·0756	20	·2322	20	·3873	20	·5401	20	·6895
30	·0785	30	·2351	30	·3902	30	·5429	30	·6922
40	·0814	40	·2380	40	·3930	40	·5457	40	·6950
50	·0843	50	·2409	50	·3959	50	·5485	50	·6977
5	·0872	14	·2437	23	·3987	32	·5513	41	·7004
10	·0901	10	·2466	10	·4016	10	·5541	10	·7031
20	·0931	20	·2495	20	·4044	20	·5569	20	·7059
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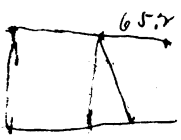
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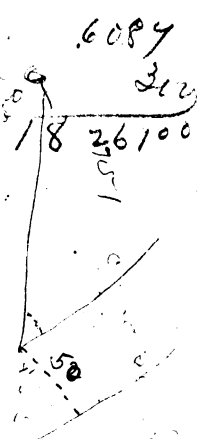
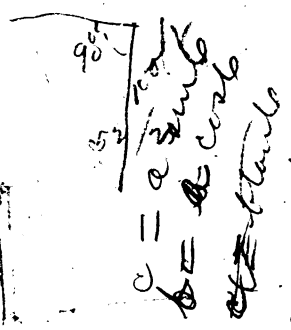
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