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Colson, Nathaniel, active 1674
London: printed for W. and J. Mount, T. Page & Son, 1761

Dominy Shop

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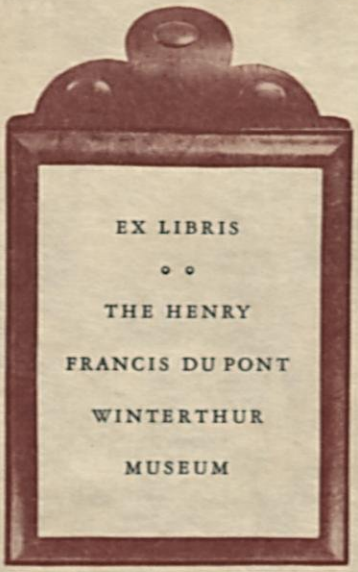

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The Description and Use of the Sea-Quadrant, Fore-Staff and Nocturnal: Necessary Problems in Plane-Sailing and Astronomy, wrought by the Logarithms, and by *Gunter's* Scale: A Tide Table: The Courses and Distances on the Coast of *Great Britain*, *Ireland*, *France*, &c. And the Soundings at coming into the Channel: With Directions for sailing into some Principal Harbours.

BY

NATHANIEL COLSON, *Student in the Mathematic*.

The whole revis'd, and adjusted to the NEW STILE,
By WILLIAM MOUNTAINE, *F.R.S.*

London: Printed for W. and J. MOUNT, T. PAGE & SON, on *Tower-Hill*, 1761.

Where you may have all Sorts of Mathematical Books.

To the Ingenious MARINER.

HEre preſent thee with a New Calendar, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practiſed) but to make Things plain and practicable: Here is nothing obſcure or difficult to diſcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainneſs (both as to Matter and Method) as poſſible; and I aſſure thee was I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done: I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd bigneſs of the Volume. The Contents are as follow:

The Principles of Arithmetic, with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted Navigation before they have underſtood ſomething of it; the Extraction of the Square and Cube Roots; In all which I have endeavoured to apply the Examples to Sea Affairs: Some neceſſary Geometric Problems, uſeful in Navigation; Directions for finding the Prime, Epact, Moon's Age, and the Time of Full Sea (both according to the ordinary and a more accurate Way) with Tables for the ſame.

Tables of the Sun's Place and Declination, with Directions and Examples to every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of London, for which the ſaid Tables of Declination are calculated: A Table of the Sun's Right Aſcenſion: A Table of the Right Aſcenſion and Declination of ſome of the principal fixed Stars, with the uſe of the ſaid Tables in finding the time of a Stars coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the Sea-Quadrant, Fore-ſtaff and Nocturnal: A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt, collected from the beſt Information. Problems in Plane Sailing and Aſtronomy, (which that the Practitioners might learn two things at once) are wrought both by the Logarithms, and Gunter's Scale: A large and very uſeful Table of Difference of Latitude and Departure to every Degree and Quarter Point of the Compaſs; With its uſe in working a Traverſe in order to keep a Reckoning at Sea: A Rutter for the Coaſt of Great-Britain, France, Ireland, Spain, Portugal, &c. Shewing the Bearing and Diſtance from one Place to another: A Table of the Soundings coming into the Channel, giving the Depth of Water, and Quality of the Ground; Laſtly, Directions for ſailing into ſome principal Harbours; By all, or any of which, if thou art by any means profited (as I know thou mayeſt, if thou wanteſt Information in any of theſe Things, and doſt but carefully animadvert upon what thou readeſt) I have my End; And thy kind Acceptance hereof will further oblige

Thy ſincere Friend,

Nathaniel Colſon.

The Principles of Arithmetic briefly and plainly demonstrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Usefulness and Necessity of some Knowledge of *Arithmetic*, in the Art of *Navigation*, it is requisite to begin with that, without which no orderly Procedure can be made; and first of

Numeration.

Numeration is that part of *Arithmetic*, whereby one may rightly express the Value of any Number proposed.

All *Numbers* are expressed by these Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	*Two*,	*Three*,	*Four*,	*Five*,	*Six*,	*Seven*,	*Eight*,	*Nine*,	*Cypher*;

Altho' Cyphers signify nothing by themselves, yet being put before (or to the Right-Hand of) other Figures, they increase their Value as much as if they were all Figures, as may plainly be seen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thousands	1000
12345	X Thousands	10000
123456	C Thousands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are set in, as 1 in the first Place, or Places of *Units*, is *One*; in the second Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thousand*; in the fifth Place *Ten Thousand*, &c.

The Table directs how properly to express any given *Number*; As 123, which *Number* consisting of three Places, is thus numbred, *One Hundred Twenty Three*; this *Number* 123456, consisting of six Places, is thus expressed, *One Hundred Twenty Three Thousand, Four Hundred fifty-six*; and this *Number* 123456789, consisting of nine Places, is thus numbred, *One Hundred twenty-three Millions, Four Hundred Fifty-six Thousands, Seven Hundred Eighty-Nine.*

Addition

Addition is that which makes but one Sum of several *Example.* Suppose four Men (A. B. C. D.) owe me several Sums of Money, I would know how much is due to me in the whole: I begin at the first Row towards the Right-Hand and say, 3 and 6 is 9 and 2 is 11, and 4 is 15; setting down the 5 under the Row added up; then I carry the 1 ten to the next Row, saying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; set down 9 under the Row, added up, and carry 1 to the next row, saying 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; set down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which because this is the first row, I set down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thousand, Nine Hundred, Ninety-five Pounds.*

A oweth	3564
B ——	5432
C ——	3156
D ——	1843
	13995

Characters used in Arithmetic.

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

Exam. 2. Suppose I have several Creditors to whom I owe several Sums of Money, I desire to know the whole.

Beginning again (as before in *Addition*) at the Right-hand, I say 11 and 10 is 21, and 4 is 25, and 6 is 31; now considering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* whereof I set down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, saying 2 and 4 is 6, and 8 is 14 and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* set down 14*s.* and carry the 1*l.* to the next row, saying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1: Lastly, 1 and 1 is 2; so that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppose at Sea, keeping my Reckoning in Degrees and Minutes, having six Days Difference of Longitude, I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, set down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; saying 1 that I carried and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7, so that the whole Difference of Longitude made these 6 Days, is 7 Degrees and 26 Minutes.

		°	′
1	Day	1	06
2	——	0	56
3	——	1	09
4	——	2	00
5	——	1	02
6	——	1	13
0	——	7	26

Subtract-

Subtraction is the taking of a leſs Sum out of a greater, and finding the Remainder.

	l.	*s.*	*d.*
Example. Suppoſe a Man oweth me —— —— ——	376	13	06
And hath paid me —— —— —— —— ——	211	05	08
I deſire to know what remains unpaid, which is —— ——	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 1, I go to the next Row, and ſay, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3, there remains 1: ſo there remains due of the ſaid Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppoſe the Diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to ſail.

Placing 396, under the 1000, I ſay, 6 from 0 I cannot, but 6 from 10 there remains 4; proceeding to the next Figure I ſay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

	Miles
	1000
	396
	604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. N. and another in the Latitude of 42 Deg. 10 Min. N. I would know the Difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11, there remains 9; then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

	d.	m.
	51	32
	42	10
	9	22

So the Difference of Latitude is 9 Deg. 22 Min.

MULTIPLICATION.

Multiplication is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, Shillings into Pence, and Pence into Farthings; Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by that number of the leſſer which is contained in one of the greater; as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts.

1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the following Table which is firſt to be committed to Memory. The

The Multiplication TABLE.

2 times	2	is	4	4 times	4	is	16	7 times	7	is	49		
	3		6		5		20		8		56		
	4		8		6		24		9		63		
	5		10		7		28						
	6		12		8		32	8 times	8	is	64		
	7		14		9		36		9		72		
	8		16										
	9		18	5 times	5	is	25	9 times 9 is 81					
3 times	3	is	9		6		30						
	4		12		7		35	10 times 10 is 100					
	5		15		8		40						
	6		18		9		45						
	7		21	6 times	6	is	36						
	8		24		7		42						
	9		27		8		48						
					9		54						

Example 1. I demand how many Shillings there are in 5648*l.*

To Anſwer this, multiply the given Number of Pounds by 20, Thus; The firſt being o Cypher, ſet down o underneath the firſt Figure; and then proceed to the next Figure, and ſay 2 times 8 is 16; ſet down 6 under the ſecond Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, ſet down 2, and carry 1; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648*l.* multiplied by 20, makes 112960 Shillings.

l.
5648
20
112960

Ex. 2. In 276 Degrees how many Minutes?

Firſt ſet down	276
Then (becauſe 60 Minutes make a Degree) multiply by	60
The Product is	16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Ex. 3. Multiply 8765437 By 32

	17530874
	26296311
Product	280493984

Multiply 47632867 By 4352

95265734
238164335
142898601
190531468
207298237184

DIVISION.

Diviſion is that which ſerves inſtead of many *Subtractions*, and is uſeful in reducing all Numbers of a leſſer Denomination into a greater; as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, *(viz.) Dividend* or the Num-

Number to be divided; the Divisor, or the Number to divide by; and the Quotient; also if any Number remain, it is called the Remainder.

Example 1. To divide 7834 by 23; first say, how many times 2 in 7; Or how often 23 in 78, the Answer will be 3 times, which place in the Quotient; then multiply the Divisor 23 by 3, the Figure placed in the Quotient, saying 3 times 3 is 9, and 3 times 2 is 6, place these under the two first Figures of the Dividend, and draw a Line; subtracting 69 from 78, there rests 9, which set underneath, and place a Point under 3, to shew that it is brought down; place it to the 9, then proceed, saying, how many times 23 in 93, or how many times 2 in 9, which will be 4 times; place 4 in the Quotient, by which multiply the Divisor: Again, placing the Product which is 92 under 93, draw a Line and subtract it therefrom, the Remainder 1 put under the Line, and set down 4 the last Figure in the Dividend, putting a Point under it, and place it to the Remainder 1; then because there remains but 14, being less than the Divisor 23, and so cannot be taken out of it, place a Cypher in the Quotient, and the Work is finished.

Divis.	*Divid.*	*Quot.*
23)	7834	(340
	69··	
	93	
	92	
	14 Rem.	

Example 2. In 360 Minutes how many Degrees? Here I divide by 60, because 60 Minutes make a Degree, and because the last Figure of the Divisor is a Cypher, I cut it off, and with it the last Figure of the Dividend, which is here also a Cypher, and divide 36 by 6, which is the same Thing as to divide 360 by 60) but because 6 cannot be taken out of 3, therefore I say, how many times 6 in 36? The answer is 6 times: Which I place in the Quotient, and proceed to multiply the Divisor 6, by the 6 placed in the Quotient, which produceth 36, which subtracted leaves 0; so that by this Work it appears, that in 360 Minutes there are 6 Degrees just.

Divis.	*Divid.*	*Quot.*
6|0	36|0	(6
	36 ··	
	00	

Example 3. A Ship taken by 253 Men, is valued at 59875*l.* I demand each Man's Share, being equally divided?

Divisor.	*Dividend.*	*Quotient.*	
253)	59875	(236	253
	506··		236
	927		1518
	759		759
	1685		506
	1518		167
	167 Remains		Proof 59875

First, say, how many times 2 in 5? The answer is two times, which place in the Quotient; then multiply the Divisor 253 by 2, the Figure placed in the Quotient, saying 2 times 3 is 6, 2 times 5 10, set down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which set down under the 3 first

Figures of the *Dividend*, from whence being subtracted, set the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and set it after 92, the Remainder; then say, how often 2 in 9? Answer 3 times (for four will prove too many.) Then multiply the *Divisor* 253, as before, by 3. the Figure last placed in the Quotient, and the Product will be 759, which being subtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, setting it after 168, the last Remainder: And again, ask the Question how often 2 is contained in 16? Answer 6 times; by which 6, which set in the Quotient, multiply the *Divisor* 253; and the Product is 1518, which place under the last *Dividend*, and subtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finished, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may easily be done by multiplying 167 by 240, and dividing the Product by 253. give each Man's Share in Pence. The Proof is by multiplying 253 the *Divisor* by 236 the *Quotient*; then taking in 167 the Remainder, under the 3 last Figures, the Product will make the same with the *Dividend*, as you see in the Operation.

The Rule of THREE,

IS that which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the first, and the Quotient of the said Division is the Answer to the Question.

Example 1. If in 24 Hours a Ship sails 130 Miles; how many Miles will she sail with the same Gale in 192 Hours or eight Days;

Hours		Miles		Hours
24	———	130	———	192

130
5760
192
24960

24)24960(1040 Miles in 192 Hours
24....
96
96
00

Here 24 is the first Number, 130 the second, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the second and third Numbers together, and divide the Product thereof 24960, by 24 the first Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours, the Time proposed.

Example 2. If 1 lb. of Tobacco cost 6*d.* what will 112 lb. cost?

112
6
12)672 Pence (or 56 Shillings.

Here the first Number being an Unit, which neither multiplies nor divides, it saves the Labour of Division, and the Answer is 672*d.* for the Answer

Anſwer will be of the ſame Name with the ſecond Number (which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 lb. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards: How high is that Caſtle whoſe Shadow is 100 Feet?

Which Queſtion for the more ready Solution, ſtate thus:

If 6 Feet (which is two Yards) give 9 Feet, what will 100 Feet give?

By the Operation it appears the ſaid Caſtle muſt be 150 Feet high.

```
                9
6)900(150 Feet
  6
 ---
 30
 30
 --
 00
```

Example 4. If 564 *l.* 12 *s.* 6 *d.* is to be divided between 165 Men, how much is one Man's Share.

Firſt, Reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292, multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564 *l.* 12 *s.* 6 *d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but in this Caſe it is 1, which wil neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 Remaining are 5 Pence to each Man's Share.

Note, The 45 Remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing.

The Operation follows.

564 *l.* 12 *s.* 6 *d.*

```
  20
-----
11292
   12
-----
22590
11292
-----
165)135510(821 Pence
1320..
------
 351
 330
------
 210
 165
------
  45
```

```
12)821(68 Shillings, equal
72.    to 3l. 8s. 5d.
---
101
 96
---
  5
```

Note, That in the *Rule of Three*, the first and third Numbers must be both of one Denomination, and the second must be brought into the lowest Value expressed therein; as in the foregoing Example, I work not the Question as it was first stated, but transposing the Numbers, I put the Denomination of Men first and last, and the Money in the Midst, to answer to that Part of the Rule, which requires the first and third Numbers to be both of one Name. The Answer whereof in the preceding Question, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68*s.* and 5*d.* or 3*l.* 8*s.* 5*d.* one Man's Share, as was required.

The next thing I shall briefly treat of it is, *The Extraction of the* Square and Cube Roots, as also somewhat of their Use.

The Extraction of the Square Root.

Ex. 1. TO Extract the Square Root of 7056 proceed thus: First, Point the given Numbers (that is, put a Prick over every other Figure, beginning at the first Figure at the Right-hand) and note by the Way, that so many Points as the said Number admits over it, of so many Figures consists the Root of the said Number; then proceed, seeking the greatest Square Number (which is a Number multiplied by itself) in the first Point towards the Left-hand (70) which is 64 constituted of 8 multiplied into itself; for 8 times 8 is 64. The Root of the Square Number which is 8, place in the Quotient, and subscribe the Square Number (64) under the said first Point, subtracting it therefrom, and setting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place (*viz.* 16.) therein calling it the Divisor, seek how often the Divisor is contained in all the Figures of the Dividend, save the last to the Right-hand: (*viz.*) How many times 16 in 65? The answer is 4 times, which place in the Quotient, and also on the Right-hand of the Divisor (16) then multiply the Divisor (164) by the 4 last placed in the Quotient, and put the Product, which is 656, under the Dividend, subtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

. .
7056(84 Root.
64
164)656 Divisor.
656
000

The Square Root is applied to Navigation as follows:

Any two Sides of a Right-angled Plane Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppose a Ship hath made 87 Miles Differencce of Latitude, and 71 Miles Departure, and the Distance to be required, the said Distance is found by the Extraction of the Square Root, as follows:

The Rule. Square the Difference of Latitude and Departure severally (that is, multiply each by itself) and from the Sum of both the Squares added together, extract the Square Root, which will be the Distance required.

Example

Example.

Difference of Lat. 87. Multiplied by itself 87.

609
696

The Square = 7569

The Departure 71. Multip. by itself 71.

71
497

The Square = 5041

Square Diff. Lat. 7569
Square Departure 5041
their Sum 12610

12610(112 the Distance req.
1
21)26
21
222) 510
444
66

By the Operation it appears, that the Distance, omitting the Fraction, is 112 Miles.

Example 2. Suppose a Ship's Distance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required; the said Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Distance subtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Distance —— 111
Multipled by itself —— 111

111
111
111

Square of the Distance 12321
Square of Dep. subtract 3249
Remains — 9072

The Departure = 57
Multiplied by itself = 57

399
285

Sq. of Departure = 3249

9072(95 Diff. Lat. required
81
185)972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Distance, subtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Brevity-sake is omitted.

Having proceeded thus far in shewing the *Practitioner* how to find the Distance, Difference of Latitude and Departure (any two of them being given, without Trigonometry) I shall shew the Manner of finding the Course exact enough for common Use, without the said Operation, which is done as follows.

The Proportion to find the Course; As the Sum of the Hypotenuse (or Distance) and half the greater of the other two Legs (*viz.*) if the Difference

of

of Latitude be most, half that, but if the Departure be most, half that; I say; As the Sum of these two, is in Proportion to the lesser (or remaining) Leg; so is 86, to the Angle (in Degrees) opposite to the less Leg; which is the Course, when the Departure is less than the Difference of Latitude, otherwise 'tis the Complement of the Course.

Example. Admit a Ship's Distance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Course required.

First, Add the Distance, and half the greater Leg into one Sum.

The Distance is —— 110
Half the greater Leg (88) is —— 44
The Sum —— 154

Having thus done, say, by the Rule of THREE.

As the said Sum 154, is to 66 the lesser Leg; so is 86, to the Course.

To bring out the odd Minutes, multiply the Remainder of the Division 132 by 60, (the Number of Min. contained in a Degree) and divide the Product by the Divisor (154) and the Quotient of the said *Division* gives for the Answer 51 Minutes: So that the Course required is 36 deg. 51 min.

66
516
516
154)5076(36 deg. 51 min.
462
1056
924
132

132
60
154)7920(51
770
220

Example 3. Extraction of the Square Root. Suppose a Rope 5 Inches Compass, and another Rope of double the Strength is required. The Dimensions of the said required Rope are found by the *Extraction of the Square Root*: For should it be supposed that a Rope of 10 Inches Compass, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifestly false, for the said Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compass of the given Rope, (*viz.* 5.) and multiply that by itself; which Product (because the other Rope is to be twice as strong, multiply by 2, and the Square Root of the Product is the Compass of the Rope required.

Example. The given Ropes Compass 5 Inches, Extract the Root

Inch.
50(7
49
1

Multiplied by itself —— 5
The Square —— 25
Multiplied by —— 2
50

So by this Operation it appears that a Rope must be 7 Inches and a little better, to be twice the Strength of the given Rope of 5 Inches Compass.

If it's desired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compass of the one Rope is to the Square of the Compass of the other; so is the Weight of the one to the Weight of the other, Length for Length. *Ex.* Suppose a Cable of 10 Inch. to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say,

as

as 100 (the Square of 10) is to 64 the Square of 8: So is 25 C. the Weight of one Cable to 16 C. the Weight of the other required.

Extraction of the Cube Root.

I Shall first, as neceſſary, inſert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

Cube of the Nine Digits.

1	—	001	4	—	064	7	—	343
2	—	008	5	—	125	8	—	512
3	—	027	6	—	216	9	—	729

Example 1. Extract the Cube Root of 12167.

Firſt, Point the given Number, (*i. e.*) put a Prick over every third Figure (beginning at the Right-hand) then ſeek the greateſt Cube in the firſt Point, (*viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend, then draw a Line underneath it, then ſquare the Quotient 2, which is 4; multiply the ſaid Square (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two (*viz.*) Triple Square and Triple Quotient into one Sum, and call it the Diviſor; ſeek how often this Diviſor is contained in the Reſolvend, which is three times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the Diviſor; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product; Cube the Figure (3) laſt placed in the Quotient, and place it under the preceding Product. Laſtly, add theſe three Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder, had there been any more Figures, the next Point muſt have been brought down, and the preceding Work repeated from the ſquaring of the Quotient, until all the Figures are ſo brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

12167	(23 Root
8	
4167	Reſolvend
1200	Triple Square
60	Triple Quot.
1260	Diviſor
3600	
540	
27	
4167	
000	

Example 2. *Applied*, Suppoſe a Ship of 300 Tun, 75 Feet by the Keel, 29 Feet and an half by the Beam, and 14 Feet Depth in the Hold; another Ship is deſired of the ſame Mould aud Shape of 500 Tuns; the ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. Firſt, Cube the Length of the given Keel, which is done by multiplying it into itſelf, and then multiply the Product by it again.

Then

Then say by the Rule of Three: As 300 Tuns the one Ship's Burthen, to 500 Tuns the other Ship's Burthen; so is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length; Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction three Cyphers are added to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ Parts.

Thus, having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three.

Thus, suppose the next Thing I would find be her Breadth by the Beam, say, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*; so 29 $\frac{1}{2}$ Feet the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Feet. In the same manner you may find the Depth in the Hold, *&c.*

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9 lb. and the Diameter of a Shot of any other Weight, suppose of 72lb. required. This is also done by the Extraction of the Cube Root, as follows:

First, say, by the Rule of Three.

As 9lb. the Weight of one Shot, to 72lb. the Weight of the other; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter, which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

But if it was required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

As the Cube of one Shot's Diameter to the Cube of the other; so is the Weight of the one Shot, to the Weight of the other required?

And thus much for the *Arithmetic Part* of this Treatise.

75 given Keel
75

375
525

5625
75

28125
39375

421875 Cube given Keel

703125 (88 $\frac{9}{10}$ Root
512

191125 Resolvend
19200 Triple Square
240 Triple Quotient

19440 Divisor

153600
15360
512

169472

21653000 Resolvend

2323200 Triple sq.
2640 Trip. Quot.

2325840 Divisor

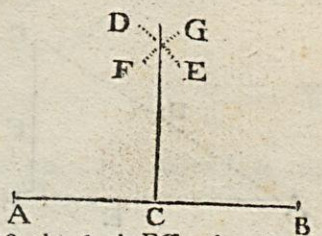
20908800
213840
729

21123369

52963 Remainder.

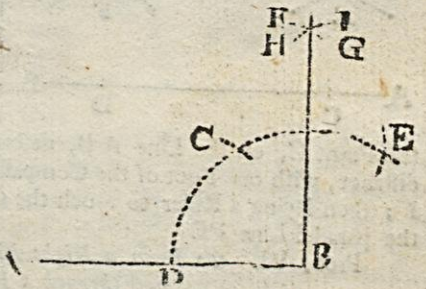
Some

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*



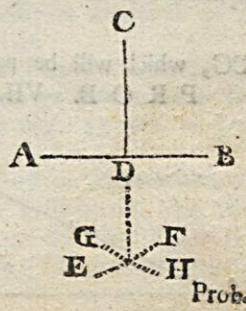
LET the Line given be A B, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances C A and CB. Then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch D E; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, thro' the Interſection, (or cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*



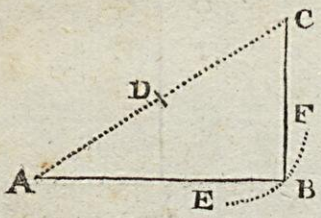
Let the Line given be AB, the Perpendicular to be raiſed from the Point B; to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E, then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch F G; and placing the Compaſſes in the Point E, deſcribe the Arch H I; then from the Point B, and through the Interſection of the two Arches F G and H I, draw the Perpendicular which was required.

Prob. III. *To let fall a Perpendicular from a Point aſſigned, over a given Right Line.*



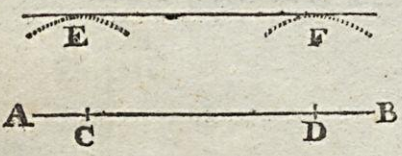
Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch G H; then from the Point C, and through the Interſection of the ſaid two Arches, draw the Perpendicular CD, which was required.

Prob. IV. *Another way to let fall a Perpendicular from a given Point, on a given Right Line.*



Let the Line given be AB, upon which it is required to let fall a Perpendicular from the Point C; to do which, from the Point aſſigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compaſſes reſting in the Point D, with the ſame diſtance, (*viz.* of half the Line AC) deſcribe the Arch EF: Then from the point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

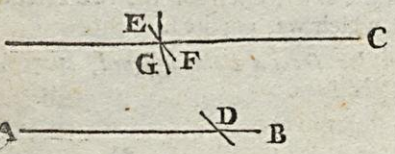
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel, to do which, firſt take in the Compaſſes the diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

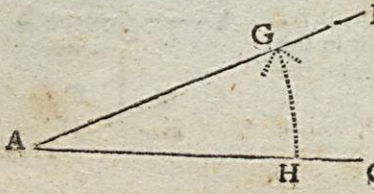
Prob. VI. *To draw a Right Line Parallel to a given one, that ſhall paſs through a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line Parallel thereto, that ſhall paſs thro' a given Point, as C.



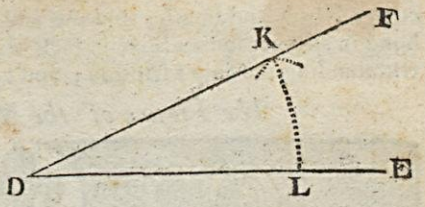
Set one Foot of the Compaſſes in C, with the other at any diſtance, croſs AB in D, and with that diſtance from any Point as A, in the Line AB deſcribe the Arch EF; then from C with the diſtance AD croſs the Arch EF in G, and draw the Line CG, which will be parallel to the given Line AB, as was required.

PROB. VII. *To make an Angle equal to any Angle given.*



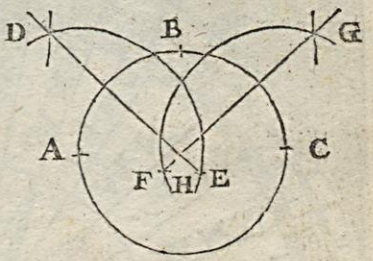
Suppoſe BAC an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line DE, then with any convenient Diſtance leſs than AC, deſcribe the Arch GH, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the Arch

Arch GH ſweep the Arch KL; take the Arch GH in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle BAC, as was required.



Prob. VIII. *To bring any three Points not ſituate in a Right Line, into the Circumference of a Circle.*

Let the three Points thro' which the Circle is to paſs be A, B, C: Take above half the Diſtance between the two Points A and B in the Compaſſes; and one Foot of the Compaſſes being in the Point A, with the ſaid Diſtance deſcribe the Arch ED; and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch ED in the Points E and D, and draw the Right Line ED; then take above half the diſtance between the Points C and B in the Compaſſes, and one Foot of the Compaſſes being in the Point C, with the ſaid Diſtance deſcribe the Arch F G; and with the ſame diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line F G: Now where the two Right Lines DE and FG, being continued, interſect each other (*viz.* in the Point H) is the Center of the Circle required.



The Deſcription of the Mariner's Compaſs.

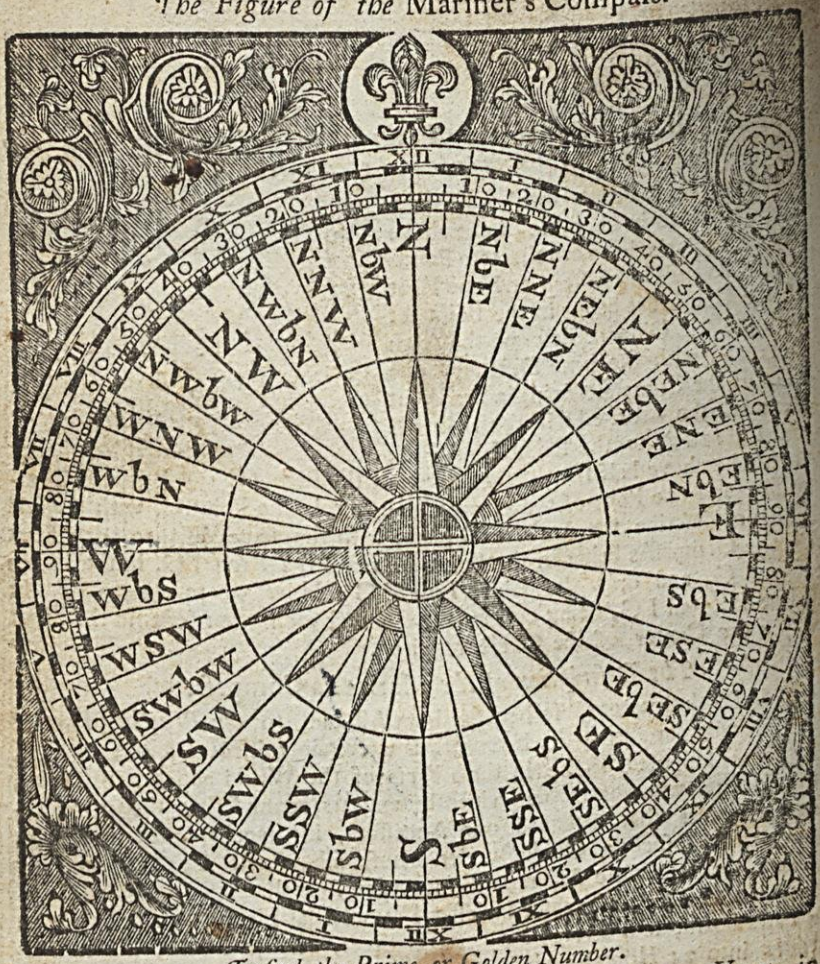
THIS Inſtrument, ſo beneficial an Aſſiſtant to the *Practical Part* of Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe Parts of the World about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniencies that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of a greater or leſſer Diameter at Pleaſure, deſcribed upon a Paſte-board, and divided into 360 Degrees, and 32 Points, (and ſometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Card or Paſte-board, there are paſted on the other Side of the ſaid Card or Paſte-board, two Wires, which Wires being touched with a Loadſtone, and the Card hung at the Center upon a Pin, fix'd in a Box, its Poſition (Variation excepted) be-

comes North and South; and the ſaid Box being cover'd with a Glaſs, is hung in another ſquare Box, in ſuch Manner that the Card may traverſe, notwithſtanding the Ship's Motion; and being thus fixed, it is ready for Uſe.

The Figure of the Mariner's Compaſs.



To find the Prime or Golden Number.

THE *Prime or Golden Number*, is a Revolution of Nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains, the Prime is 19. *Exampl*

Example. To find the Golden Number for the Year 1762, add 1, which makes 1763; which divided by 19, the Quotient will be 92, and the Remainder 15, which is the Golden Number for the Year 1762.

N.B. The Golden Number is the same in both the Julian and Gregorian Account of Time.

To find the Epact.

THE Epact is the Number of Days which the Solar Year consisting of 365 Days, exceeds the Lunar (or twelve Revolutions of the Moon to the Sun) containg 354 Days, the Difference being 11 Days. When the Prime is 1, the Epact is 0; when 2, the Epact is 11; when 3, twice 11, or 22; when 4, thrice 11, or 33, or 3, omitting 30, (which must constantly be done when it exceeds 30;) and may be found in the following Manner.

Subtract 1 from the Prime, Multiply the Remainder by 11, and divide that Product (if it exceed 30) by 30; the Remainder will be the Epact.

Example. Suppose it were to find the Epact for the Year 1762,

The Prime for the Year 1762 is —— —— —— 15
From which subtract —— —— —— —— 1
The Remainder is — — — —— —— —— 14
Which multiplyed by — — — — — — — 11
The Product is— — — — — — — —— 154

This Product being divided by 30, the Quotient will be 3, and the Remainder 4, which is the Epact required.

Note; After the Year 1799, there will require a different Method to find the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *August* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: These three Sums added together, if less than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age subtracted from 30, leaves the Day of the Change. Again, 15 added to, or subtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppose it was required to find the Moon's Age for the first Day of *April*, 1764.

First set down the Epact for that Year — — — — 26
To which add the Number for the Month, which is — 2
To that add the Day of the Month, which is — — 1
Sum, gives the Moon's Age — —— 29

Then out of —— 30
Take —— —— 29 The Moon's Age.
Remains —— —— 1 Day to the next Change.
Add —— —— 15
Makes— —— —— 16 Days to next Full Moon.

To

To find the Moon's Southing, and Time of Full-Sea, or High-Water The Reader is here referr'd to the Tide-Table, Page 32, *&c.* and the Uſe thereof immediately following.

To find the Dominical Letter.

DIvide the Year and its fourth Part by 7, the Remainder ſubtracted from 7 gives the Dominical Letter; reckoning A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe it was required to find the Dominical Letter for the Year 1762.

Firſt, Set down the Year	1762
Then the 4th Part, (the remainder 2 omitted, which denominates it to be the Second Year after Leap-Year,) is	440
The Sum is	2202

This Sum being divided by 7, the Quotient will be 314, and the Remainder 4, which being ſubtracted from 7, leaves 3; and conſequently the Dominical Letter is C: But when it is Leap-Year, there will be two Dominical Letters, and then the Letter thus found ſerves from the laſt of *February* to the End of the Year; and the Letter before that, reckoning them backwards from G, is the Sunday Letter for the former part of the Year, to that Time.

N.B. After the Year 1799, the Order of the Dominical Letters, as they now range, will be diſturbed, and conſequently to find them, another Method muſt then take Place.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year	1762
Then add	9
Divided by	28)1771(63
	168
	91
	84
	7

By the Operation it appears that 7 is the Cycle of the Sun for the Year 1762, being the Remainder after the Diviſion.

Note, *Hillary* Terms begins *Jan.* 23. and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends nineteen Days after.

Michaelmas Term begins *November* 6, and ends *November* 28.

A

Months		D.	H.
January	Full moon	2	4 A
	Laſt quart.	10	6M
	New moon	18	6M
	Firſt quart.	25	8M
February	Full moon	1	6M
	Laſt quart.	9	3M
	New moon	16	8 A
	Firſt quart.	23	3 A
March	Full moon	1	9 A
	Laſt quart.	10	mid.
	New moon	17	8M
	Firſt quart.	23	11 A
	Full moon	31	1 M
April	Laſt quart.	8	5 A
	New moon	15	5 A
	Firſt quart.	22	8M
	Full moon	30	6M
May	Laſt quart.	7	8M
	New moon	15	1M
	Firſt quart.	21	8 A
	Full moon	29	9 A
June	Laſt quart.	6	6 A
	New moon	13	8M
	Firſt quart.	20	8M
	Full moon	28	noon
July	Laſt quart.	6	1M
	New moon	12	3 A
	Firſt quart.	19	11 A
	Full moon	28	1M
Auguſt	Laſt quart.	4	7M
	New moon	11	1M
	Firſt quart	18	1 A
	Full moon	26	1 A
September	Laſt quart.	2	11M
	New moon	9	noon
	Firſt quart.	17	10M
	Full moon	25	1M
October	Laſt quart.	1	5 A
	New moon	9	2M
	Firſt quart.	17	6M
	Full moon	24	11M
	Laſt quart.	31	2M
November	New moon	7	7 A
	Firſt quart	15	10 A
	Full moon	22	9 A
	Laſt quart.	29	noon
December	New moon	7	1 A
	Firſt quart.	15	3 A
	Full moon	22	7M
	Laſt quart.	31	5M

Four Eclipſes this Year, two of the Sun, and two of the Moon.

The firſt is of the Moon, *May* the 29th, viſible 1 digit.

The ſecond is of the Sun, *June* the 13th, viſible 4 digits.

The third is of the Moon, *November* the 22d, viſible 6 digits.

The fourth is of the Sun, *December* the 7th, inviſible.

Months		D.	H.
January	New moon	6	9 M
	First quart.	14	3 M
	Full moon	20	6 A
	Last quart.	27	11 A
February	New moon	5	3 M
	First quart.	12	1 A
	Full moon	19	6 M
	Last quart.	26	7 A
March	New moon	6	7 A
	First quart	13	8 A
	Full moon	20	7 A
	Last quart.	28	3 A
April	New moon	5	8 M
	First quart.	12	2 M
	Full moon	19	8 M
	Last quart.	27	11 M
May	New moon	4	6 A
	First quart.	11	9 M
	Full moon	18	11 A
	Last quart.	27	3 M
June	New moon	3	1 M
	First quart.	9	5 A
	Full moon	17	1 A
	Last quart	25	3 A
July	New moon	2	8 M
	First quart.	9	2 M
	Full moon	17	4 M
	Last quart	24	mid.
	New moon	31	3 A
August	First quart.	7	3 A
	Full moon	15	7 A
	Last quart.	23	8 M
	New moon	28	11 A
September	First quart	6	7 M
	Full moon	14	10 M
	Last quart.	21	2 A
	New moon	28	10 M
October	First quart.	6	2 M
	Full moon	13	11 A
	Last quart.	20	9 A
	New moon	27	10 A
November	First quart.	4	11 A
	Full moon	12	11 M
	Last quart.	19	5 M
	New moon	26	2 A
December	First quart.	4	7 A
	Full moon	11	11 A
	Last quart.	18	2 A
	New moon	26	8 M

Six Eclipses this Year, four of the Sun, and two of the Moon.

The first is of the Sun, *May* the 4th, invisible.
The second is of the Moon, *May* the 18th, visible 17 digits.
The third is of the Sun, *June* the 3d, invisible.
The fourth is of the Sun, *October* the 27th, invisible.
The fifth is of the Moon, *November* the 12th, invisible.
The sixth is of the Sun, *November* the 26th, invisible.

Months		D.	H.
January	First quart	3	1 A
	Full moon	11	10 M
	Laſt quart.	17	3 M
	New moon	25	4 M
February	First quart.	2	3 M
	Full moon	8	8 A
	Laſt quart.	15	6 A
	New moon	23	11 A
March	First quart.	3	3 A
	Full moon	10	7 M
	Laſt quart.	17	noon
	New moon	25	4 A
April	First quart.	1	11 A
	Full moon	8	5 A
	Laſt quart.	16	7 M
	New moon	24	6 M
May	First quart.	1	6 M
	Full moon.	8	4 M
	Laſt quart.	16	1 M
	New moon	23	4 A
	First quart.	29	11 A
June	Full moon	6	5 A
	Laſt quart.	14	6 A
	New moon	22	1 M
	First quart.	28	4 A

Months		D.	H
July	Full moon	6	5 A
	Laſt quart.	14	9 M
	New moon	20	8 A
	First quart.	27	mid.
Auguſt	Full moon	4	8 A
	Laſt quart.	12	9 A
	New moon	19	4 A
	First quart.	26	10 M
Septem.	Full moon	3	noon
	Laſt quart.	11	8 M
	New moon	17	mid
	First quart.	24	mid.
October	Full moon	3	4 M
	Laſt quart.	10	6 A
	New moon	17	9 M
	First quart.	24	6 A
November	Full moon	1	8 A
	Laſt quart.	9	2 M
	New moon	15	9 A
	First quart	23	3 A
	Full moon	31	11 M
December	Laſt quart.	7	9 M
	New moon	15	11 M
	First quart.	23	noon
	Full moon	31	mid.

Four Eclipſes this Year, two of the Sun, and two of the Moon.

The firſt is of the Sun, *April* the 24th, inviſible.

The ſecond is of the Moon, *May* the 8th, viſible 10 digits.

The third is of the Sun, *October* the 17th, viſible 6 digits.

The fourth is of the Moon, *November* the 1ſt, viſible 7 digits.

Months		D.	H.
January	Last quart.	6	5 A
	New moon	14	4M
	First quart.	22	8M
	Full moon	29	noon
February	Last quart.	5	4M
	New moon	12	10 A
	First quart.	21	1M
	Full moon	27	11 A
March	Last quart.	6	3 A
	New moon	14	5 A
	First quart.	22	4 A
	Full moon	29	8M
April	Last quart.	5	6M
	New moon	13	10M
	First quart.	21	2M
	Full moon	27	4 A
May	Last quart.	4	10 A
	New moon	13	1M
	First quart.	20	8M
	Full moon	27	1M
June	Last quart.	3	3 A
	New moon	11	2 A
	First quart.	18	1A
	Full moon	25	11M

Months		D.	H.
July	Last quart.	3	8M
	New moon	10	mid.
	First quart.	17	5 A
	Full moon	24	11 A
August	Last quart.	2	1M
	New moon	9	8M
	First quart	15	mid.
	Full moon	23	1 A
	Last quart.	31	5 A
September	New moon	7	5 A
	First quart.	14	8M
	Full moon	22	5M
	Last quart.	30	7M
October	New moon	7	1M
	First quart.	13	8 A
	Full moon	21	10 A
	Last quart.	29	6 A
November	New moon	5	10M
	First quart.	12	noon
	Full moon	21	4 A
	Last quart.	28	5 A
December	New moon	4	9 A
	First quart.	12	7M
	Full moon	20	9M
	Last quart.	27	2 A

Only Two Eclipses this Year, and they are both of the Sun, and both invisible.

The first is on the 13th of *April*, at 10 in the Morning.
The second is on the 7th of *October*, at 1 in the Morning.

Months		D.	H.
January	New moon	3	10 M
	First quart	11	4 M
	Full moon	19	1 M
	Last quart.	25	10 A
February	New moon	2	1 M
	First quart.	10	2 M
	Full moon	17	1 A
	Last quart.	24	6 M
March	New moon	2	5 A
	First quart.	10	10 A
	Full moon	17	mid.
	Last quart.	24	3 A
April	New moon	1	10 M
	First quart.	9	2 A
	Full moon	16	9 M
	Last quart.	24	2 M
May	New moon	1	3 A
	First quart.	9	1 M
	Full moon.	15	5 A
	Last quart.	22	3 A
	New moon	30	7 A
June	First quart.	7	9 M
	Full moon	13	mid.
	Last quart.	21	5 M
	New moon	29	9 M

Months		D.	H
July	First quart.	6	3 A
	Full moon	13	9 M
	Last quart.	20	10 A
	New moon	28	9 A
August	First quart.	4	8 A
	Full moon	11	6 A
	Last quart.	19	3 A
	New moon	27	7 M
Septem.	First quart.	3	1 M
	Full moon	10	7 M
	Last quart.	18	10 M
	New moon	25	5 A
October	First quart	2	8 M
	Full moon	9	10 A
	Last quart.	18	3 M
	New moon	25	2 M
	First quart	31	6 A
November	Full moon	8	4 A
	Last quart.	16	7 A
	New moon	23	1 A
	First quart	30	8 A
December	Full moon	8	noon
	Last quart.	16	7 M
	New moon	22	11 A
	First quart.	30	1 M

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Moon, *March* the 17th, visible 8 digits.
The second is of the Sun, *April* the 1st, visible 10 digits.
The third is of the Moon, *September* the 10th, invisible.
The fourth is of the Sun, *September* the 25th, invisible.

Months		D.	H.
January	Full moon	7	6 M
	Laſt quart.	14	6 A
	New moon	21	11 M
	Firſt quart.	28	9 A
February	Full moon	5	11 A
	Laſt quart.	13	2 M
	New moon	19	11 A
	Firſt quart.	27	6 A
March	Full moon	7	1 A
	Laſt quart	14	10 M
	New moon	21	1 A
	Firſt quart.	29	3 A
April	Full moon	6	1 M
	Laſt quart.	12	5 A
	New moon	20	4 M
	Firſt quart	28	8 M
May	Full moon	5	10 M
	Laſt quart.	12	10 M
	New moon	19	8 A
	Firſt quart.	27	10 A
June	Full moon	3	5 A
	Laſt quart.	10	10 M
	New moon	18	11 M
	Firſt quart.	26	8 M
July	Full moon	2	mid.
	Laſt quart.	9	10 A
	New moon	18	2 M
	Firſt quart.	25	4 A
Auguſt	Full moon	1	7 M
	Laſt quart.	8	1 A
	New moon	16	4 A
	Firſt quart.	23	11 A
	Full moon	30	4 A
Septem.	Laſt quart.	7	6 M
	New moon	15	4 M
	Firſt quart	22	5 M
	Full moon	29	3 M
October	Laſt quart.	7	2 M
	New moon	14	5 A
	Firſt quart.	21	11 M
	Full moon	28	6 A
November	Laſt quart.	5	9 A
	New moon	13	4 M
	Firſt quart.	19	7 A
	Full moon	27	11 M
December	Laſt quart.	5	3 A
	New moon	12	3 A
	Firſt quart.	19	(M
	Full moon	27	(M

Six Eclipſes this Year, four of the Sun, and two of the Moon.

The firſt is of the Sun, *February* the 19th, inviſible.
The ſecond is of the Moon, *March* the 7th, inviſible.
The third is of the Sun, *March* the 21ſt, inviſible.
The fourth is of the Sun, *Auguſt* the 16th, viſible 3 digits.
The fifth is of the Moon, *Auguſt* the 30th, inviſible.
The ſixth is of the Sun, *September* the 15th, inviſible.

Months		D.	H.
January	Last quart.	4	8M
	New moon	11	1M
	First quart.	17	9A
	Full moon	26	1M
February	Last quart.	2	9 A
	New moon	9	noon
	First quart.	16	3A
	Full moon	24	7 A
March	Last quart.	4	7M
	New moon	10	10 A
	First quart.	18	10M
	Full moon	26	11M
April	Last quart.	2	3 A
	New moon	9	10M
	First quart.	17	5M
	Full moon	24	mid.
May	Last quart.	1	7 A
	New moon	8	11 A
	First quart.	16	mid.
	Full moon	24	10M
	Last quart.	31	1M
June	New moon	7	noon
	First quart.	15	4 A
	Full moon	22	5 A
	Last quart.	29	8M

Months		D.	H.
July	New moon	7	2M
	First quart.	15	5M
	Full moon	22	1M
	Last quart.	28	5 A
August	New moon	5	6 A
	First quart	13	4 A
	Full moon	20	7M
	Last quart.	27	6M
September	New moon	4	9M
	First quart.	12	1M
	Full moon	18	3 A
	Last quart.	25	10 A
October	New moon	4	1M
	First quart.	11	3M
	Full moon	18	2M
	Last quart.	25	5 A
November	New moon	2	4 A
	First quart	9	3 A
	Full moon	16	3 A
	Last quart.	24	2 A
December	New moon	2	5M
	First quart.	8	11 A
	Full moon	16	6M
	Last quart.	24	11M
	New moon	31	5 A

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Sun, *February* the 9th, invisible.

The second is of the Moon, *February* 24th, visible 4 digits.

The third is of the Sun, *August* the 5th, visible 11 digits.

The fourth is of the Moon, *August* the 20th, invisible.

Months	D.	H.	
January First quart.	7	8	M
Full moon	15	1	M
Last quart.	23	7	M
New moon	30	3	M
February First quart.	5	8	A
Full moon	13	7	A
Last quart.	21	9	A
New moon	28	2	A
March First quart	7	10	M
Full moon	15	2	A
Last quart	23	9	M
New moon	29	mi	d.
April First quart.	6	3	M
Full moon	14	7	M
Last quart.	21	5	A
New moon	28	9	M
May First quart.	5	8	A
Full moon	13	9	A
Last quart.	20	11	A
New moon	27	7	A
June First quart.	4	2	A
Full moon	12	9	M
Last quart.	19	3	M
New moon	26	6	M

Months	D.	H.	
July First quart.	4	7	M
Full moon	11	4	A
Last quart.	14	8	M
New moon	25	7	A
August First quart	2	11	A
Full moon	10	1	M
Last quart.	16	3	A
New moon	24	9	M
September First quart.	1	1	M
Full moon	8	8	M
Last quart.	15	1	M
New moon	23	2	M
October First quart.	1	1	M
Full moon	7	5	A
Last quart	14	3	A
New moon	22	7	A
First quart.	30	11	M
November Full moon	6	3	M
Last quart.	13	9	M
New moon	21	1	A
First quart.	28	7	A
December Full moon	5	2	A
Last quart.	13	6	M
New moon	21	4	M
First quart.	28	4	M

Three Eclipses this Year, two of the Sun, and one of the Moon.

The first is of the Sun, *February* the 9th, invisible.
The second is of the Moon, *July* the 11th, visible.
The third is of the Sun, *July* the 25th, invisible.

Months		D.	H
January	Full moon	4	4 M
	Laſt quart.	12	4 M
	New moon	19	6 A
	Firſt quart.	26	noon
February	Full moon	2	8 A
	Laſt quart.	11	mid.
	New moon	18	6 M
	Firſt quart.	24	9 A
March	Full moon	4	2 A
	Laſt quart.	11	6 A
	New moon	18	4 A
	Firſt quart.	25	8 M
April	Full moon	2	8 M
	Laſt quart.	10	8 M
	New moon	17	1 M
	Firſt quart	23	9 A
May	Full moon	2	1 M
	Laſt quart.	9	6 A
	New moon	16	9 M
	Firſt quart.	23	noon
	Full moon	31	3 A
June	Laſt quart.	8	1 M
	New moon	14	5 A
	Firſt quart.	22	4 M
	Full moon	30	4 M
July	Laſt quart.	7	6 M
	New moon	14	2 M
	Firſt quart.	21	9 A
	Full moon	29	2 A
Auguſt	Laſt quart	5	11 M
	New moon	12	1 A
	Firſt quart.	20	3 A
	Full moon	28	1 M
Septem.	Laſt quart.	3	4 A
	New moon	11	3 M
	Firſt quart	19	7 M
	Full moon	26	9 M
October	Laſt quart.	2	mid.
	New moon	10	8 A
	Firſt quart.	18	11 A
	Full moon	25	6 A
November	Laſt quart.	1	noon
	New moon	9	2 A
	Firſt quart.	17	noon
	Full moon	24	4 M
December	Laſt quart.	1	4 M
	New moon	9	8 M
	Firſt quart.	16	11 A
	Full moon	23	3 A
	Laſt quart.	30	11 A

Six Eclipſes this Year, three of the Sun, and three of the Moon.

The firſt is of the Moon, *January* the 4th, viſible.
The ſecond is of the Sun, *January* the 19th, inviſible.
The third is of the Moon, *June* the 30th, inviſible.
The fourth is of the Sun, *July* the 14th, inviſible.
The fifth is of the Sun, *December* the 9th, inviſible.
The ſixth is of the Moon, *December* the 23d, inviſible.

The Use of the foregoing Tables of the Moon's Age.

IN the said Tables the one half Page contains the first six Months of the Year, the other half the following six Months; in the first Column of each half, towards the Left-hand are the Months; in the second the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the said New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A signifying Afternoon, M Morning: At the Bottom of each Table are the Eclipses for the respective Year.

The Use of the Tables is, readily by Inspection, to find the Day and Hour of the New, Full, or Quarters of the Moon.

Examp. 1. Suppose it was desired to find the Time of New Moon, *Jan.* 1764. First look for the Year 1764 on the Top of the Leaf, which having found, look for *January* in the first Column towards the Left-hand; then in the next Column in the same Month is found New Moon; and in the two following Columns against New Moon stands 3d. 10h. M. which shews that the New-moon in *January* 1764 is the 3d Day at 10 o'Clock in the Morning. The same Directions serve for the Full Moon, or first and last Quarter.

To find the Moon's Age subtract the Day of the Change or New Moon from the Day proposed, the Remainder is the Moon's Age: Suppose therefore it was required to find the Moon's Age for *December* 27, 1764.

Looking in the Year 1764, the Table gives the New Moon for *Dec.* to be on the twenty-second Day, therefore 22 being subtracted from 27, there remains 5, whereby it appears the Moon is 5 Days old on the 27th of *December* in the Year 1764.

Example. Suppose it were required to find the Moon's Age on the 1st of *November*, 1765.

The last New Moon before *Nov.* 1st was *Oct.* 14th, but because you cannot take 14 from 1, you must add 31 (the Number of Days in *Oct.*) and from the Sum 32 subtract 14; The Remainder 18 is the Moon's Age required.

A TIDE-TABLE *for the Sea Coasts of* Great-Britain, Ireland, Norway, Holland, Flanders, France, Biscay, *&c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, rang'd in Alphabetic Order.*

	H	M
A		
AT *Army* NNE. and SSW.	01	30
At *Amsterdam* & *Armentiers*, NE. and SW.	03	00
At *Abarwark*, ENE. and WSW.	04	30
At *Albatmorich* & *Antwerp*, East and West	06	00
At *Alborough*, SE. by S. and NW. by N.	09	45

At

B	H.	M
At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, or *Blanchart*, N and S.	12	00
Thwart of *Beachy* in the *Offing*, N by E. and S by W.	00	45
At *Blackneſs*, in *Bluet*, at *Bell*-Iſle, NNE. and SSW.	01	30
Without *Bluet*, and at *Berwick*, NE by N. & SW by S.	02	15
The River of *Bourdeaux*, the South Coaſt of *Bretagne*, the Coaſt of *Biſcay*, and at *Bochneſs*, NE. and SW.	03	00
At *Breſt*, before the *Baſe*, the River of *Bourdeaux* within the Haven, NE by E. & SW by W.	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, ENE. and WSW.	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, E. and W.	06	00
At *Briſtol* Key, E by S. and W by N.	06	45
At *Bridgwater*, E S E. and W N W.	07	30
At *Boulogne-deep*, SSE & NNW	10	30
C		
In *Condado*, N. and S.	12	00
In the *Chamber of Rye*, N by E. and S by W.	00	45
Without *Calais*, at *Corpus Chriſti* Point, before and at *Camfer*, NNE. and SSW.	01	30
Between *Calais* and *Dover*, before *Conquet*, and at the North Cape, NE. and SW.	03	00
At *Cork*, *Calais*, C. *Clear* and in the *Creek*, ENE. and WSW.	04	30
At *Caldy*, and in the Bay of *Carmarthen*, E by N & W by S.	05	15
At *Concale*, E. and W.	06	00
Without the *Caſkets*, in the Channel, SE by S. and NW by W.	08	15

	H.	M
Between *Guernſey*, and the *Caſkets*, before *Cromer*, before the *Caſkets* and *Guernſey*, *Seven Clifts*, and at *Catneſs*, SE. and NW.	09	00
At the *Caſkets*, and at *Chamberneſs*, SE by S. & NW by N.	09	45
At *Cows*, in the *Foſs of Caen*, in *Calais-Road*, and in *Chamberneſs-Road*, SSE and NNW.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripplesand* and the *Creyl*, and at *Calſhot*, S by E. and N by W.	11	15
D		
At *Dover-Pier*, and before *Dunkirk*, N and S.	12	00
At *Denbeigh* & *Downs* in the Road, NE by N. & SW by S.	02	15
At *Dort*, NE and SW.	03	00
At *Dungervan*, ENE. and WSW.	04	30
At *Dartmouth*, E. and W.	06	00
At *Dublin*, SE by E. and NW by W.	08	15
At *Dunbar*, SE. and NW.	09	00
At *Dungeneſs* and *Dunneſe*, SE by S. and NW by N.	09	45
At *Dover*, *Dieppe*, and in the *Downs* a-ſhore S S E. and N NW.	10	30
E		
At *Embden*, before the *Elb*, before the *Eyder*, and before *Enckuſan*, N. and S.	12	00
At *Edam*, NNE. and SSW.	01	30
Before the Eaſtern & Weſtern *Emes*, and at *Engomonts*, SE. and NW.	09	00
F		
On the Coaſt of *Flanders*, N. and S.	12	00
At *Fluſhing*, N by E. and S by W.	00	45

	H.	M
Before the *Fen*, in the Channel, NNE. and SSW.	01	30
Without *Fountny*, NE by N. and SW by S.	02	15
Without the Banks of *Flanders*, NE. and SW.	03	00
At *Flamborough* and *Bridlington*, ENE and WSW.	04	30
At the *Forn* in *Foy*, at *Falmouth*, E by N. and W by S.	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, E by S. and W by N.	06	45
Before the Coaſt of *Frizeland* and the *Fly*, ESE. and WNW.	07	30
Without the *Fly*, SE by E. and NW by W.	08	15
At *Frize* and *Fair-Iſle*, NW. and SE.	09	00
At the *Frith*, and at the *South Foreland*, SSE. and NNW.	10	30
In *Fair Iſle Roads*, and at the *North Foreland*, S by E. and N by W.	11	15
G		
In the Road of *Gibralter*, at *Graveling*, and before *Cherburg*, N and S.	12	00
Before *Goeree*, at *Guernſey*, and at *Graveſend*, NNE. and SSW.	01	30
At *Groin*, at *Gaſcoign*, and the Coaſt of *Galicia*, NE. and SW.	03	00
Between *Guernſey* & *Caſkets*, SE. and NW.	09	00
Thwart of *Guernſey* in the Channel, SE by S. and NW. by N.	09	45
In the *Chamber* and *Goereeend*, S by E. and N by W.	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton*-Key, N and S.	12	00
Under *Holy* Iſland, and at *Horn*, NNE. and SSW.	01	30
Before *Hartlepool*, NE. and SW.	03	00
At *Huntcliff-foot*, NE by E. and SW by W.	03	45
At *Humber*, E by N. & W by S.	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, E and W.	06	00
At *Harlem*, *Havre de Grace*, and *Homehead*, SE and NW.	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich*, SSE. and NNW.	10	30
At *Harwich* within, S by E. and N by W.	11	15
I		
At *Jutland* Iſlands, N. and S.	12	00
On the Weſt Coaſt of *Ireland*, NE. and SW.	03	00
In all the Havens of the South Coaſt of *Ireland*, E by N and W by S.	05	15
K		
Kentiſh Knock, N. and S.	12	00
At *Kelliers*, NE. and SW.	03	00
At *Kingſale*, ENE & WSW.	04	30
At *Kilduyn*, ESE & WNW.	07	30
At *Keldive*, SE and NW.	09	00
L		
At *Leith*, North and South	12	00
At *Liſbon*, NE by N. and SW by S.	02	15
At *London*, NE and SW.	03	00
Thwart of *Londey*, and before *Lynn*, E by N. and W by S.	05	15
At *Lynn* Half-Tide, at *Londey*, Eaſt and Weſt	06	00
At *Lynn*, E by S. and W by N.	06	45

	H.	M
At the *Lizard* by the Land, ESE. and WNW.	07	30
At *Lambay*, SE. by E. and NW by W.	08	15
At *Leoſtaff*, and thwart of it without the Banks, SE by S. and NW by N.	09	45
In *Leoſtaff-Road* and at *Longſand-head*, SSE. and NNW.	10	30
M.		
Within the *Maes*, at *Maldon*, N by E. and S by W.	00	45
Before the *Maes*, NNE. and SSW.	01	30
At the *Maes*, and before St. *Matthew*'s Point, NEby E. and SW by W.	03	45
In *Mouſehole*, at St. *Matthew*'s, and within *Mount's-bay*, ENE. and WSW.	04	30
In *Milford*, at *Moonleſs*, at St. *Maloes*, E by N. and W by S.	05	15
Between *Mouſehole* and *Falmouth*, and in *Milford-Haven*, ESE. and WNW.	07	30
In St. *Magnes* Sound, and at *Magnes* Caſtle, SE. by E. and NW by W.	08	15
At the *Iſle of Man*, SE & NW	09	00
Before *Maregate*, S by E. and N by W.	11	15
N.		
At *Newport* Half-tide, N & S	12	00
At the Weſt-end of the *Nore*, N by E. and S by W.	00	45
Before the River of *Nantz*, NE. and SW.	03	00
At *Newcaſtle*, EbyN & WbyS.	05	15
Before St. *Nicholas*, E by S. and W by N.	06	45
At the *Needles*, at the Iſle of *Wight*, SE by E. & NW by W.	08	15
All the Coaſt of *Normandy*, and *Picardy*, SSE. and NNW.	10	30

	H	M
Between the *Naze* and *Warhead* of *Lower*, S by E & N by W.	11	15
O		
At *Orkneſs*, NE and SW.	03	00
At *Orkney*, SE and NW.	09	00
At *Orfordneſs*, SE by S. and NW by N.	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell Waves*, SSE. & NNW.	10	30
At *Orfordneſs*, within the *Sands*, S by E. and N by W.	11	15
At *Oſtend*, N and S.	12	00
P		
At *Portſmouth* Half-Tide, N by W. and S by E.	11	15
At the *Pens*, *Porthus*, and *Poictu*, NE and SW.	03	00
On the Coaſt of *Portugal*, NE by E. and SW by W.	03	45
In *Plymouth*, and before St. *Paul*'s, E by N. and W by S.	05	15
At St. *Paul*'s, in the Haven, E and W.	06	00
Before *Podeſſemeck*, E by S. and W by N.	06	45
Thwart of *Plymouth*, ESE. and WNW.	07	30
At the Race of *Portland*, SE and NW.	09	00
Q		
At *Queenborough*, N. and S.	12	00
R		
At *Rocheſter*, N by E & S by W	00	45
At *Ramkins*, NNE. & SSW.	01	30
At *Rotterdam* in *Robin-Hood's* Bay, and from the Race to the *Pole-head*, NE. and SW.	03	00
At *Rouen*, and before *Rochel*, NE by E. and SW by W.	03	45
In *Ramſey*, E by N & W by S.	05	15
S		
In the *Sleeve*, between *Uſhant* and *Scilly*, at the *Shoe*, at the		

	H	M
Spits, at *Southampton*, and along the *Swin*, North and South —	12	00
Upon the Coaſt of *Spain*, and in *Shetland*, NE. and SW. —	03	00
At *Scilly*, the *Sound*, *Scarborough* & at *Staples*, NE by E & SW by W	03	45
At *Seven Iſles*, without the Haven, in the *Broad Sound*, ENE. and WSW. ——	04	30
At the *Mouth* of *Severn* between *Scilly* & the *Lizard*, at the *Spurn* and *Stockton*, E by N. & W by S.	05	15
Without *Scilly*, in the Channel, and at *Saleomb*, E. and W.	06	00
At *Sedmouth*, and at the *Start*, E by S. and W by N. ——	06	45
Off the *Start* in the Channel, ESE. and WNW. ——	07	30
Within the *Seine*, and before *Shelbergh*, at *Clifts*, SE & NW.	09	00
At *Shoram*, SE by S & NW by N	09	45
At *Seine-head*, SSE. & NNW.	10	30
T		
Within *Tervere*, N by E. & S by W. ——	00	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE. and SSE. ——	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, NE. and SW. ——	03	00
At the Cliffs off the *Texel*, ENE. and WSW. ——	04	30
In *Torbay*, and before the *Texel*, E. and W. ——	06	00
In the Road of the *Texel*, ESE. and WNW. ——	07	30
At *Torgen*, SE. by S. and NW by N. ——	09	45
U		
Before *Ureck*, N. and S.	12	00
At *Uſe*, NE. and S.W ——	03	00
Between *Uſhant*, and the Main, NE by E. & SW by W.	03	45
In the *Vourd*, at the Bay, within *Uſhant*, ENE & WSW.	04	30
Without *Uſhant*, E and W.	06	00
St. *Vallery*, SSE. & NNW.	10	30
W		
At *Winchelſea*, N by E. and S by W. ——	00	45
At the *Weilings*, and from the Weſt-end of the *Wight*, NNE. and SSW. ——	01	30
Before the *Weilings*, NE by N. and SW by S. ——	02	15
At *Whitby*, NE. and SW.	03	00
In the Sea of *Wales*, and *Severn*, ENE. and WSW. ——	04	30
In *Wales*, E by N & W by S.	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E. and W. ——	06	00
At *Weymouth* Key, E by S. and W by N. ——	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, ESE. and WNW.	07	30
Thwart of the Iſle of *Wight*, in the Channel, all within the Iſle of *Wight*, between the Iſle of *Wight*, and *Beachy*, by the ſhore, SE by E. & NW by W.	08	15
At the E. end of the *Wight*, and on *Wieringhen* Flats, SE and NW. ——	09	00
Y		
Before *Yarmouth*, NNE. & SSW. ——	01	00
At *Youghall*, ENE. and W. SW. ——	04	30
At *Yarmouth*, SE by E. and NW by W. ——	08	15
In *Yarmouth* Road, in *Yarmouth* Haven, SSE. & NNW.	10	30
Z		
On the Coaſt of *Zealand*, NNE. and SSW. ——	01	30
In the *Zurick-ſea*, NE & SW.	03	00

THE

THE foregoing Table shews the Time of Full Sea at the several Places therein contained, upon the Full and Change Days of the Moon, which for more ready Use it is put in Alphabetic Order.

Example, Admit the Time of Full Sea at *London*, upon the Full and Change Days, be required.

Look into the Table under the Letter (L) it is found to flow at *London* North East and South West; that is, when it is Full Sea at *London*, the Moon will be, as it is vulgarly said, upon the North East and South West Points of the Compass, which is four Points, or 3 Hours.

The Use of this, together with the Moon's Southing, to find the Time of Full Sea at any Time, at any of the said Places is shewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, the Quotient is the Time of Southing in Hours, and the Remainder is so many 12 min. of an Hour.

Note, If the Moons Age exceeds 15, reject the said 15, and take the Remainder, with which proceed instead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppose the Time of the Moon's Southing be required on the 25th of *December*, 1763. The Moon's Age found to be 21 Days, rejecting 15, the Remainder 6, which multiplied by 4 makes 24, which divided by 5, gives the Quotient 4 Hours 06 Minutes, which is the Time of the Moon's Southing, as was required, and the Remainher 4, is 48 in the Morning.

I shall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.	Time H.	M.
1 — 16	0 —	48
2 — 17	1 —	36
3 — 18	2 —	24
4 — 19	3 —	12
5 — 20	4 —	00
6 — 21	4 —	48
7 — 22	5 —	36
8 — 23	6 —	24
9 — 24	7 —	12
10 — 25	8 —	00
11 — 26	8 —	48
12 — 27	9 —	36
13 — 28	10 —	24
14 — 29	11 —	12
15 — 30	12 —	00

The Use of the TABLE.

The first and second Columns shews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old and her Southing required.

In the first Column under the Title Moon's Age stands 9; over against it in the last Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note also, The same Southing serves for 24 Days old which serves for 9 Days, as the Table shews; only observe that if the Moon be under 15 Days old, her Southing is in the Afternoon, but if above that Age, then in the Morning.

Thus

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppose the Moon to be 9 Days old, the Time of Full Sea in the *Downs* a-shore, is required.

By the foregoing Table it appears that a NNW. and SSE. Moon makes Full Sea, which as the said Table shews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes (rejecting 12 Hours) in the Morning.

But to be more exact use the following Table and Directions.

Moon's Age.	Time. H.	M.
1 — 16	0 —	43
2 — 17	1 —	20
3 — 18	1 —	52
4 — 19	2 —	22
5 — 20	2 —	52
6 — 21	3 —	26
7 — 22	4 —	7
8 — 23	4 —	55
9 — 24	5 —	50
10 — 25	6 —	53
11 — 26	7 —	59
12 — 27	9 —	4
13 — 28	10 —	8
14 — 29	11 —	5
15 — 30	00 —	0

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpose, enter this Table with the Moon's Age: Against which in the last Column are the Hours and Minutes to be added for the Time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* a-shore is required.

A NNW. and SSE. Moon makes Full Sea upon the Full and Change Days, which is 10 Hours 30 Minutes, this found enter the opposite Table with the Moon's Age 9 Days, against which stands 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact CALENDAR

OF

The Golden Number, Epact and Moveable Feasts, until the Year 1785; *as also of the Sun's Place and Declination to every Day of the Year, for the First, Second, Third, and Leap-Year, calculated for, and from the Year* 1760, *and made to serve (without any considerable Error) till the Year* 1775: *Likewise the Sun's Rising, whereby may be found the Time of the Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.*

A

A TABLE of the Dominical-Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feasts, *for* 26 *Years to come.*

Years.	Dom. Letter	Cycle of ⊙	Prime	Epact	Shrove-Sunday.		Easter-Sunday.		Whit-Sunday.	
1760	F E	5	13	12	*February*	17	*April*	6	*May*	25
1761	D C	6	14	23		1	*March*	22		10
1762	B A	7	15	4		21	*April*	11		30
1763	G F	8	16	15		13		3		22
1764	E D	9	17	26	*March*	4		22	*June*	10
1765	C	10	18	7	*February*	17		7	*May*	26
1766	B A	11	19	18		9	*March*	30		18
1767	G F	12	1	0	*March*	1	*April*	19	*June*	7
1768	E D	13	2	11	*February*	14		3	*May*	22
1769	C B	14	3	22		5	*March*	26		14
1770	A	15	4	3		25	*April*	15	*June*	3
1771	G F	16	5	14		10	*March*	31	*May*	19
1772	E D	17	6	25	*March*	1	*April*	19	*June*	7
1773	C B	18	7	6	*February*	21		11	*May*	30
1774	A	19	8	17		13		3		22
1775	G	20	9	28		26		16	*June*	4
1776	F E	21	10	9		18		7	*May*	26
1777	D C	22	11	20		9	*March*	30		18
1778	B A	23	12	1	*March*	1	*April*	19	*June*	7
1779	G F	24	13	12	*February*	14		4	*May*	23
1780	E D	25	14	23		6	*March*	26		14
1781	C B	26	15	4		25	*April*	15	*June*	3
1782	A G	27	16	15		10	*March*	31	*May*	19
1783	F E	28	17	26	*March*	2	*April*	20	*June*	8
1784	D C	1	18	7	*February*	22		11	*May*	30
1785	B A	2	19	18		6	*March*	27		15

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap Year 1760 1768 ☉ pla D M	☉ dec D M	First Year 1761 1769 ☉ pla D M	☉ dec D M	Second Year 1762 1770 ☉ pla D M	☉ dec D M	Third Year 1763 1771 ☉ pla D M	☉ dec D M
			♍	South	♍	South	♍	South	♍	South
1	♃	Circumcision.	10 41	23 03	11 26	22 59	11 11	23 02	10 56	23 02
2	♄	Sun r. 8. 5.	11 42	22 57	12 27	22 54	12 12	22 56	11 57	22 57
3	♂		12 44	22 51	13 28	22 48	13 13	22 50	12 58	22 51
4	☉		13 45	22 45	14 29	22 42	14 14	22 43	13 59	22 45
5	♀		14 46	22 39	15 30	22 35	15 15	22 36	15 01	22 38
6	☿	Epiphany.	15 47	22 33	16 31	22 27	16 17	22 29	16 02	22 31
7	☽		16 48	22 26	17 33	22 19	17 18	22 21	17 03	22 23
8	♃	Castor&Polux	17 49	22 18	18 34	22 11	18 19	22 13	18 04	22 15
9	♄	Procyon.	18 51	22 10	19 35	22 03	19 20	22 05	19 05	22 07
10	♂		19 52	22 01	20 36	21 54	20 21	21 56	20 06	21 59
11	☉	Sun r. 7. 56.	20 53	21 52	21 37	21 45	21 22	21 47	21 07	21 50
12	♀		21 54	21 42	22 38	21 35	22 23	21 37	22 08	21 40
13	☿		22 55	21 32	23 39	21 25	23 25	21 27	23 10	21 30
14	☽		23 56	21 22	24 40	21 15	24 26	21 16	24 11	21 19
15	♃		24 57	21 11	25 41	21 05	25 27	21 05	25 12	21 08
16	♄		25 58	21 00	26 43	20 54	26 28	20 54	26 13	20 57
17	♂		26 59	20 48	27 44	20 42	27 29	20 42	27 14	20 45
18	☉		28 00	20 36	28 45	20 29	28 30	20 30	28 15	20 33
19	♀		29 02	20 23	29 46	20 16	29 31	20 18	29 16	20 20
20	☿	Sol in Aqua.	♒ 03	20 10	♒ 47	20 02	♒ 32	20 05	♒ 17	20 07
21	☽		01 04	19 57	01 48	19 48	01 33	19 51	01 18	19 54
22	♃	Sun r. 7. 44.	02 05	19 44	02 49	19 34	02 34	19 37	02 20	19 40
23	♄		03 06	19 30	03 50	19 20	03 35	19 23	03 21	19 26
24	♂		04 07	19 16	04 51	19 05	04 36	19 09	04 22	19 12
25	☉	Conv. St. Paul	05 08	19 01	05 52	18 50	05 37	18 55	05 23	18 58
26	♀		06 09	18 46	06 53	18 35	06 38	18 40	06 23	18 43
27	☿		07 10	18 31	07 54	18 20	07 39	18 24	07 24	18 27
28	☽		08 11	18 15	08 55	18 04	08 40	18 08	08 25	18 11
29	♃		09 11	17 59	09 56	17 48	09 41	17 52	09 26	17 55
30	♄	K. Charles M.	10 12	17 43	10 57	17 31	10 42	17 36	10 27	17 39
31	♂		11 13	17 26	11 57	17 14	11 43	17 19	11 28	17 22

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ⊙ pla		Year 1764 1772 ⊙ dec		First 1761 1769 ⊙ pla		Year 1765 1773 ⊙ dec		Second 1762 1770 ⊙ pla		Year 1766 1774 ⊙ dec		Third 1763 1771 ⊙ pla		Year 1767 1775 ⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
1	♑				South				South				South				South	
2	♒	Sun r. 7. 28.	12	14	17	09	12	58	16	57	12	44	17	01	12	29	17	05
3	♓	Purif. Mary	13	15	16	52	13	59	16	40	13	44	16	44	13	30	16	48
4	♈		14	16	16	35	15	00	16	22	14	45	16	26	14	31	16	31
5	♉		15	16	16	17	16	01	16	04	15	46	16	08	15	31	16	13
6	♊		16	17	15	59	17	01	15	56	16	47	15	50	16	32	15	55
7	♋		17	18	15	41	18	02	15	27	17	47	15	32	17	33	15	36
8	♌		18	19	15	23	19	03	15	08	18	48	15	13	18	33	15	18
9	♍		19	19	15	04	20	03	14	49	19	49	14	54	19	34	14	59
10	♎		20	20	14	45	21	04	14	30	20	50	14	35	20	35	14	40
11	♏		21	21	14	25	22	05	14	11	21	50	14	15	21	35	14	20
12	♐		22	22	14	05	23	05	13	52	22	51	13	56	22	36	14	00
13	♑		23	22	13	45	24	06	13	32	23	51	13	36	23	37	13	40
14	♒		24	23	13	25	25	06	13	12	24	52	13	16	24	37	13	20
15	♓	Valentine.	25	23	13	05	26	07	12	51	25	52	12	55	25	38	13	00
16	♈	Lyon's Heart Lyon's Neck.	26	24	12	45	27	08	12	30	26	53	12	34	26	38	12	40
17	♉		27	24	12	24	28	08	12	09	27	53	12	13	27	39	12	19
18	♊	Sun r. 7. 6.	28	25	12	03	29	09	11	48	28	54	11	52	28	40	11	58
19	♋		29	25	11	42	♓	09	11	27	29	54	11	31	29	40	11	37
20	♌	Sol in Piſces	♓	25	11	21	01	09	11	05	♓	55	11	10	♓	40	11	17
21	♍		01	26	10	59	02	10	10	43	01	55	10	49	01	41	10	54
22	♎		02	26	10	38	03	10	10	22	02	55	10	27	02	41	10	32
23	♏	Sun r. 6. 49.	03	27	10	16	04	10	10	00	03	56	10	05	03	41	10	10
24	♐	St. Matthias	04	27	09	54	05	11	09	38	04	56	09	43	04	41	09	48
25	♑		05	27	09	31	06	11	09	16	05	56	09	21	05	42	09	26
26	♒		06	27	09	09	07	11	08	54	06	57	08	59	06	42	09	04
27	♓	Lower of the	07	28	08	47	08	11	08	31	07	57	08	37	07	42	08	42
28	♈	two Foremoſt in □ of Great	08	28	08	25	09	11	08	09	08	57	08	14	08	42	08	20
29	♉	Bear.	09	28	08	02	10	12	07	46	09	57	07	51	09	42	07	57
			10	28	07	39												
			When		it is		Leap-		Year,		Feb.		hath 29		Days			

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla D M	Year 1764 1772 ☉ dec D M	First 1761 1769 ☉ pla D M	Year 1765 1773 ☉ dec D M	Second 1762 1770 ☉ pla D M	Year 1766 1774 ☉ dec D M	Third 1763 1771 ☉ pla D M	Year 1767 1775 ☉ dec D M
			♓	South	♓	South	♓	South	♓	South
1			11 28	07 16	11 12	07 24	10 57	07 28	10 43	07 34
2		David.	12 28	06 53	12 12	07 01	11 57	07 05	11 43	07 11
3			13 28	06 30	13 12	06 38	12 57	06 42	12 43	06 48
4		Sun r. 6. 29.	14 28	06 07	14 12	06 14	13 57	06 19	13 43	06 25
5			15 28	05 44	15 12	05 51	14 57	05 56	14 43	06 02
6			16 28	05 21	16 12	05 28	15 57	05 33	15 43	05 39
7			17 28	04 58	17 12	05 05	16 57	05 10	16 43	05 16
8			18 28	04 54	18 12	04 41	17 57	04 46	17 43	04 52
9			19 28	04 11	19 12	04 18	18 57	04 23	18 42	04 29
10			20 28	03 47	20 11	03 54	19 57	03 59	19 42	04 05
11			21 27	03 24	21 11	03 30	20 57	03 36	20 42	03 42
12		Sun r. 6. 14	22 27	03 00	22 11	03 06	21 56	03 12	21 42	03 18
13			23 27	02 37	23 11	02 42	22 56	02 49	22 42	02 55
14		Lyon's Tail.	24 26	02 13	24 10	02 19	23 56	02 25	23 41	02 31
15		Lower of two	25 26	01 49	25 10	01 55	24 56	02 01	24 41	02 07
16		latter in □ of	26 26	01 25	26 09	01 32	25 55	01 37	25 41	01 43
17		Great Bear.	27 25	01 01	27 09	01 08	26 55	01 14	26 40	01 20
18			28 25	00 38	28 09	00 44	27 54	00 50	27 40	00 56
19			29 24	00 14	29 08	00 21	28 54	00 26	28 39	00 33
20			♈ 24	Nor. 09	♈ 08	Nor. 02	29 53	00 02	29 39	00 09
21		Sol in Aries.	01 23	00 33	01 07	00 26	♈ 53	Nor. 21	♈ 38	Nor. 14
22			02 23	00 56	02 06	00 50	01 52	00 44	01 38	00 38
23		Upper of two	03 22	01 20	03 06	01 14	02 51	01 08	02 37	01 02
24		latter in □ of	04 21	01 44	04 05	01 37	03 51	01 32	03 36	01 26
25		great Bear.	05 21	02 08	05 04	02 01	04 50	01 56	04 36	01 50
26			06 20	02 31	06 04	02 24	05 49	02 19	05 35	02 13
27		Lady-Day.	07 19	02 54	07 03	02 48	06 48	02 43	06 34	02 37
28			08 18	03 17	08 02	03 11	07 48	03 06	07 33	03 00
29			09 17	03 41	09 01	03 35	08 47	03 30	08 33	03 24
30		Sun r. 5. 38	10 16	04 04	10 00	03 58	09 46	03 53	09 32	03 47
31			11 16	04 27	11 00	04 21	10 45	04 16	10 31	04 10

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☉ pla		Year 1765 1773 ☉ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		North		♈		North		♈		North		♈		North	
1	♃	Last but two	12	15	04	50	11	59	04	44	11	44	04	39	11	30	04	33
2	♄	in great Bear's	13	14	05	13	12	58	05	07	12	43	05	02	12	29	04	56
3	♂	Tail.	14	13	05	36	13	57	05	31	13	42	05	25	13	28	05	19
4	☉	Sun. r. 5. 31	15	12	05	59	14	56	05	54	14	41	05	48	14	27	05	42
5	♀																	
6	☿		16	10	06	22	15	55	06	17	15	40	06	11				
7	☽		17	09	06	45	16	53	06	39	16	39	06	33	15	26	06	05
8	♃	Virgin's Spike	18	08	07	08	17	52	07	02	17	38	06	56	16	25	06	28
			19	07	07	30	18	51	07	24	18	37	07	18	17	24	06	51
9	♄	Last but one	20	06	07	52	19	50	07	46	19	35	07	41	18	22	07	13
10	♂	in great Bear's	21	05	08	14	20	49	08	08	20	34	08	03				
11	☉	Tail.	22	03	08	36	21	48	08	30	21	33	08	25	19	21	07	35
12	♀	Sun r. 5. 12.	23	02	08	58	22	46	08	52	22	32	08	47	20	20	07	57
13	☿														21	19	08	20
14	☽		24	01	09	20	23	45	09	14	23	30	09	09	22	17	08	42
15	♃	Last in great	24	59	09	42	24	43	09	35	24	29	09	30	23	16	09	04
16	♄	Bear's Tail.	25	58	10	03	25	42	09	57	25	28	09	52	24	15	09	25
			26	56	10	24	26	41	10	18	26	26	10	13	25	13	09	47
17	♂	Sun r. 5. 6.													26	12	10	08
18	☉		27	55	10	45	27	39	10	39	27	25	10	34				
19	♀		28	53	11	06	28	38	11	00	28	23	10	55	27	10	10	29
20	☿	Sol in Taurus	29	52	11	27	29	36	11	21	29	22	11	16	28	09	10	50
			♉	50	11	47	♉	35	11	41	♉	20	11	37	29	07	11	11
21	☽	Sun r. 4. 55													♉	06	11	31
22	♃	Dragon's Tail	01	49	12	07	01	33	12	02	01	18	11	58				
23	♄	St. George.	02	47	12	27	02	31	12	22	02	17	12	18	01	04	11	52
24	♂	Arcturus.	03	45	12	47	03	30	12	42	03	15	12	37	02	03	12	12
			04	44	13	07	04	28	13	02	04	10	12	57	03	01	12	32
25	☉	St. Mark Evan													03	59	12	52
26	♀		05	42	13	27	05	26	13	21	05	12	13	17				
27	☿		06	40	13	46	06	24	13	40	06	10	13	36	04	58	13	12
28	☽	Day inc. 6.55	07	38	14	05	07	23	14	00	07	08	13	55	05	56	13	31
			08	37	14	24	08	21	14	19	08	06	14	14	06	54	13	50
29	♃														07	52	14	09
30	♄		09	35	14	31	09	19	14	38	09	05	14	33	08	51	14	28
			10	33	15	01	10	17	14	56	10	03	14	51	09	49	14	47

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap Year 1760 1768 ☉ pla		☉ dec		First Year 1761 1769 ☉ pla		☉ dec		Second Year 1762 1770 ☉ pla		☉ dec		Third Year 1763 1771 ☉ pla		☉ dec	
			D	M		M	D	M		M	D	M		M	D	M		M
			♉		North		♉		Nor.h		♉		North		♉		North	
1		Phil. & Jacob	11	31	15	19	11	15	15	14	11	01	15	09	10	47	15	05
2			12	29	15	37	12	13	15	32	11	59	15	27	11	45	15	23
3		Sun r. 4. 38.	13	27	15	54	13	11	15	50	12	57	15	45	12	43	15	41
4			14	25	16	11	14	09	16	07	13	55	16	03	13	41	15	59
5		Upper of two	15	23	16	28	15	07	16	24	14	53	16	20	14	39	16	16
6		foremoſt in □	16	21	16	45	16	05	16	41	15	51	16	37	15	37	16	33
7		of Little Bear	17	19	17	02	17	03	16	58	16	49	16	53	16	35	16	50
8		N. Scale of ♎	18	17	17	18	18	01	17	14	17	47	17	09	17	33	17	06
9			19	15	17	34	18	59	17	30	18	45	17	25	18	31	17	22
10			20	12	17	50	19	57	17	45	19	43	17	41	19	29	17	38
11			21	10	18	05	20	55	18	01	20	40	17	57	20	26	17	54
12			22	08	18	20	21	53	18	16	21	38	18	12	21	24	18	09
13			23	06	18	35	22	51	18	31	22	36	18	27	22	22	18	24
14		Sun r. 4. 17.	24	04	18	49	23	48	18	45	23	34	18	42	23	20	18	38
15		Brighteſt in	25	01	19	03	24	46	19	00	24	31	18	56	24	18	18	53
16		the Crown.	25	59	19	17	25	42	19	14	25	29	19	10	25	16	19	07
17		Brighteſt in	26	57	19	31	26	41	19	27	26	27	19	24	26	14	19	20
18		Serpent's neck	27	54	19	44	27	39	19	40	27	25	19	37	27	11	19	33
19			28	52	19	57	28	37	19	53	28	22	19	50	28	08	19	46
20			29	50	20	09	29	34	20	06	29	20	20	03	29	06	19	59
21		Scorpion's Forehead.	♊	47	20	21	♊	32	20	18	♊	18	20	15	♊	04	20	12
22		Sol in Gemini	01	45	20	33	01	29	20	30	01	15	20	27	01	01	20	24
23		Sun r. 4. 5.	02	42	20	44	02	27	20	41	02	13	20	38	01	59	20	36
24			03	40	20	55	03	24	20	52	03	10	20	49	02	56	20	47
25		Scorpion's Heart.	04	38	21	06	04	22	21	03	04	08	21	00	03	54	20	58
26			05	35	21	16	05	20	21	14	05	06	21	11	04	51	21	09
27			06	32	21	26	06	17	21	24	06	03	21	21	05	49	21	19
28			07	30	21	36	07	15	21	34	07	00	21	31	06	46	21	29
29		K.C.II.B&R.	08	27	21	45	08	12	21	43	07	58	21	40	07	44	21	39
30		Sun r. 3. 55	09	25	21	54	09	09	21	52	08	55	21	49	08	41	21	48
31			10	22	22	02	10	07	22	01	09	53	21	58	09	39	21	56

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768		Year 1764 1772		First 1761 1769		Year 1765 1773		Second 1762 1770		Year 1766 1774		Third 1763 1771		Year 1767 1775	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
1			♊		North		♊		North		♊		North		♊		North	
2		Sun r. 3. 52.	11	20	22	10	11	04	22	09	10	50	22	06	10	36	22	04
3			12	17	22	18	12	02	22	17	11	47	22	14	11	33	22	12
4			13	14	22	25	12	59	22	24	12	45	22	22	12	30	22	20
5			14	12	22	32	13	56	22	31	13	42	22	29	13	28	22	28
6			15	09	22	39	14	54	22	38	14	39	22	36	14	26	22	35
7		Sun r. 3. 50.	16	06	22	45	15	51	22	44	15	37	22	42	15	23	22	41
8			17	04	22	51	16	48	22	50	16	34	22	48	16	20	22	47
9			18	01	22	56	17	46	22	55	17	31	22	54	17	18	22	53
10			18	58	23	01	18	43	23	00	18	29	22	59	18	15	22	58
11			19	56	23	06	19	40	23	05	19	26	23	04	19	12	23	03
12		Sun r. 3. 48.	20	53	23	10	20	38	23	09	20	23	23	08	20	10	23	07
13			21	50	23	13	21	35	23	13	21	21	23	12	21	07	23	11
14			22	47	23	17	22	32	23	17	22	18	23	15	22	04	23	14
15			23	45	23	20	23	29	23	20	23	15	23	18	23	01	23	17
16			24	42	23	23	24	27	23	22	24	12	23	21	23	58	23	20
17			25	39	23	25	25	24	23	24	25	10	23	23	24	56	23	23
18			26	36	23	27	26	21	23	26	26	07	23	25	25	53	23	25
19			27	33	23	28	27	18	23	27	27	04	23	27	26	50	23	27
20			28	31	23	29	28	15	23	28	28	01	23	28	27	47	23	28
21			29	28	23	29	29	13	23	29	28	58	23	29	28	45	23	29
22		Sol in Cancer	♋	25	23	29	♋	10	23	29	29	56	23	29	29	42	23	29
23		Sun r. 3. 47.	01	22	23	29	01	07	23	29	♋	53	23	29	♋	39	23	29
24		John Baptist	02	20	23	28	02	04	23	28	01	50	23	28	01	36	23	28
25			03	17	23	27	03	02	23	27	02	47	23	27	02	33	23	27
26			04	14	23	25	03	59	23	25	03	44	23	26	03	31	23	26
27		Brighteſt in	05	11	23	23	04	56	23	23	04	42	23	24	04	28	23	24
28		the Harp.	06	08	23	20	05	53	23	21	05	39	23	22	05	25	23	22
29			07	06	23	17	06	50	23	18	06	36	23	19	06	22	23	20
30		Peter Apoſtle	08	03	23	14	07	47	23	15	07	33	23	16	07	19	23	17
			09	00	23	11	08	45	23	11	08	30	23	13	08	17	23	13

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla D M	Year 1764 1772 ☉ dec D M	First 1761 1769 ☉ pla D M	Year 1765 1773 ☉ dec D M	Second 1762 1770 ☉ pla D M	Year 1766 1774 ☉ dec D M	Third 1763 1771 ☉ pla D M	Year 1767 1775 ☉ dec D M
			♑	North	♑	North	♑	North	♑	North
1	♑		09 58	23 07	09 42	23 07	09 28	23 07	09 14	23 09
2	♒		10 55	23 02	10 39	23 03	10 25	23 04	10 11	23 05
3	♓		11 52	22 57	11 36	22 59	11 22	22 59	11 08	23 01
4	♈		12 49	22 52	12 33	22 54	12 19	22 54	12 05	22 56
5	♉		13 46	22 46	13 30	22 48	13 16	22 49	13 02	22 51
6	♊		14 43	22 40	14 28	22 42	14 13	22 43	14 00	22 45
7	♋	Sun r. 3. 53.	15 40	22 34	15 25	22 35	15 11	22 37	14 57	22 39
8	♌		16 38	22 27	16 22	22 23	16 08	22 30	15 54	22 32
9	♍		17 35	22 20	17 19	22 21	17 05	22 23	16 51	22 25
10	♎		18 32	22 12	18 16	22 14	18 02	22 16	17 48	22 18
11	♏		19 29	22 04	19 14	22 06	18 59	22 08	18 40	22 10
12	♐	Sun r. 3. 58.	20 26	21 55	20 11	21 58	19 57	22 00	19 43	22 02
13	♑		21 23	21 46	21 08	21 49	20 54	21 51	20 40	21 53
14	♒		22 21	21 37	22 05	21 40	21 51	21 42	21 37	21 44
15	♓		23 18	21 28	23 03	21 31	22 48	21 33	22 34	21 35
16	♈		24 15	21 18	24 00	21 21	23 46	21 23	23 32	21 26
17	♉		25 12	21 08	24 57	21 11	24 43	21 13	24 29	21 16
18	♊		26 10	20 57	25 54	21 00	25 40	21 03	25 26	21 05
19	♋		27 07	20 46	26 52	20 49	26 37	20 52	26 24	20 54
20	♌		28 04	20 35	27 49	20 38	27 35	20 41	27 21	20 43
21	♍		29 02	20 24	28 46	20 27	28 33	20 29	28 18	20 32
22	♎		29 59	20 12	29 43	20 15	29 30	20 17	29 15	20 20
23	♏	Sun r. 4 4	♌ 56	19 59	♌ 41	20 03	♌ 27	20 05	♌ 13	20 08
24	♐	Sol in Leo	01 53	19 46	01 38	19 50	01 24	19 53	01 10	19 56
25	♑	James Apostle	02 51	19 33	02 35	19 37	02 21	19 40	02 07	19 43
26	♒		03 48	19 20	03 33	19 24	03 19	19 27	03 05	19 30
27	♓	Sun r. 4. 16.	04 46	19 06	04 30	19 10	04 16	19 14	04 02	19 17
28	♈	Swan's Tail.	05 43	18 52	05 29	18 56	05 13	19 00	04 59	19 03
29	♉		06 40	18 33	06 25	18 42	06 11	18 46	05 57	18 49
30	♊	Dog days be	07 38	18 23	07 22	18 28	07 08	18 31	06 54	18 35
31	♋		08 35	18 08	08 20	18 13	08 06	18 16	07 52	18 20

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ⊙	pla	Year 1764 1772 ⊙	dec	First Year 1761 1769 ⊙	pla	Year ⊙	dec	Second Year 1762 1770 ⊙	pla	Year 1766 1774 ⊙	dec	Third Year 1763 1771 ⊙	pla	Year 1767 1775 ⊙	dec
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
1	♌				North		♌		North		♌		North		♌		North	
2	♍	Lammas.	09	33	17	53	09	17	17	58	09	03	18	01	08	49	18	05
3	♎	Sun r. 4. 20.	10	30	17	38	10	15	17	43	10	01	17	46	09	47	17	50
4	♏		11	28	17	22	11	12	17	27	10	05	17	30	10	44	17	34
5	♐		12	25	17	06	12	10	17	11	11	55	17	14	11	42	17	18
6	♑		13	23	16	50	13	07	16	55	12	53	16	58	12	39	17	02
7	♒		14	20	16	33	14	05	16	38	13	51	16	42	13	37	16	46
8	♓		15	18	16	16	15	02	16	21	14	48	16	25	14	34	16	29
9	♈		16	15	15	59	16	00	16	04	15	46	16	08	15	32	16	12
10	♉		17	13	15	42	16	58	15	47	16	43	15	51	16	29	15	55
11	♊		18	11	15	24	17	55	15	29	17	41	15	33	17	27	15	38
12	♋	Sun r. 4. 35.	19	08	15	06	18	53	15	11	18	38	15	16	18	24	15	20
13	♌		20	06	14	48	19	50	14	53	19	36	14	58	19	22	15	02
14	♍	Sun r. 5. 39.	21	04	14	30	20	48	14	35	20	34	14	40	20	20	14	44
15	♎		22	01	14	11	21	46	14	17	21	31	14	21	21	18	14	26
16	♏		22	59	13	53	22	44	13	58	22	29	14	02	22	15	14	07
17	♐		23	57	13	34	23	41	13	39	23	27	13	43	23	13	13	48
18	♑		24	55	13	15	24	39	13	20	24	25	13	24	24	11	13	29
19	♒		25	52	12	55	25	37	13	00	25	22	13	05	25	09	13	10
20	♓		26	50	12	36	26	35	12	41	26	20	12	45	26	06	12	50
21	♈		27	48	12	16	27	33	12	21	27	18	12	25	27	04	12	30
22	♉	Sun r. 4. 53.	28	46	11	56	28	30	12	01	28	16	12	05	28	02	12	10
23	♊	Sol in Virgo	29	44	11	35	29	28	11	41	29	14	11	45	29	00	11	51
24	♋	Barthol. Ap.	♍	42	11	15	♍	26	11	21	♍	12	11	25	29	58	11	30
25	♌		01	40	10	54	01	24	11	00	01	10	11	05	♎	56	11	09
26	♍		02	38	10	33	02	22	10	39	02	08	10	44	01	54	10	49
27	♎		03	36	10	12	03	20	10	18	03	06	10	23	02	52	10	28
28	♏		04	34	09	51	04	18	09	57	04	04	10	02	03	50	10	07
29	♐		05	32	09	30	05	16	09	36	05	02	09	41	04	48	09	46
30	♑	Sun r. 5. 13.	06	30	09	09	06	14	09	15	06	0	09	20	05	46	09	25
31	♒		07	28	08	47	07	12	08	53	06	58	08	58	06	44	09	04
			08	26	08	25	08	10	08	31	07	56	08	36	07	42	08	42

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap 1760 1768 Year 1764 1772 ☉ pla D M	☉ dec D M	First 1761 1769 Year 1765 1773 ☉ pla D M	☉ dec D M	Second 1762 1770 Year 1766 1774 ☉ pla D M	☉ dec D M	Third 1763 1771 Year 1767 1775 ☉ pla D M	☉ dec D M
			♏	North	♏	North	♏	North	♏	North
1	F	Fomelhaut	09 24	08 03	09 09	08 09	08 54	08 14	08 40	08 20
2	G	London b. 66	10 22	07 41	10 07	07 47	09 53	07 52	09 38	07 58
3	A	First in Pegasus's Wing.	11 21	07 19	11 05	07 25	10 51	07 30	10 37	07 36
4	B		12 19	06 57	12 03	07 03	11 49	07 08	11 35	07 13
5	C		13 17	06 35	13 02	06 41	12 47	06 46	12 33	06 51
6	D		14 16	06 12	14 00	06 19	13 46	06 24	13 32	06 29
7	E	Sun r. 5. 28.	15 14	05 50	14 58	05 56	14 44	06 01	14 30	06 07
8	F	Dog days end	16 12	05 27	15 57	05 33	15 42	05 38	15 28	05 44
9	G		17 11	05 04	16 55	05 10	16 41	05 16	16 27	05 22
10	A		18 09	04 41	17 54	04 47	17 39	04 53	17 25	04 59
11	B		19 08	04 18	18 52	04 24	18 38	04 30	18 24	04 36
12	C	Sun. r. 5. 35	20 06	03 55	19 51	04 01	19 36	04 07	19 22	04 13
13	D		21 05	03 32	20 49	03 38	20 35	03 44	20 21	03 50
14	E		22 04	03 09	21 48	03 15	21 33	03 21	21 19	03 27
15	F		23 02	02 46	22 46	02 52	22 32	02 58	22 18	03 04
16	G		24 01	02 23	23 45	02 29	23 30	02 35	23 16	02 40
17	A	Sun r. 5. 49.	24 59	02 00	24 44	02 06	24 29	02 11	24 15	02 17
18	B		25 58	01 36	25 42	01 43	25 28	01 47	25 14	01 53
19	C		26 57	01 13	26 41	01 20	26 26	01 24	26 12	01 30
20	D	Andro. head	27 56	00 49	27 40	00 56	27 25	01 01	27 11	01 07
21	E		28 55	00 26	28 38	00 33	28 24	00 38	28 10	00 44
22	F	Mathew Evan	29 53	00 02	29 37	00 09	29 23	00 14	29 09	00 20
23	G	Sun r. 6. 07 Sol in Libra ♎	00 ♎ 52	Sou. 21	00 ♎ 36	Sou. 14	00 ♎ 22	Sou. 09	00 ♎ 07	Sou. 03
24	A	End of Pegasus's Wing.	01 51	00 44	01 35	00 38	01 21	00 32	01 06	00 26
25	B		02 50	01 08	02 34	01 01	02 20	00 56	02 05	00 50
26	C		03 49	01 31	03 33	01 25	03 19	01 19	03 04	01 13
27	D		04 48	01 55	04 32	01 48	04 18	01 43	04 03	01 37
28	E	Sun r. 6. 9.	05 47	02 18	05 31	02 12	05 17	02 06	05 02	02 00
29	F	St. Michael.	06 46	02 41	06 30	02 36	06 16	02 29	06 01	02 23
30	G		07 45	03 05	07 29	03 59	07 15	02 52	07 01	02 46

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla D	M	Year 1764 1772 ☉ dec D	M	First 1761 1769 ☉ pla D	M	Year 1765 1773 ☉ dec D	M	Second 1762 1770 ☉ pla D	M	Year 1766 1774 ☉ dec D	M	Third 1763 1771 ☉ pla D	M	Year 1767 1775 ☉ dec D	M
1	♉	Sun r. 6. 13.	♎		South		♎		South		♎		South		♎		South	
2	♊		08	45	03	28	08	28	03	23	08	14	03	16	08	00	03	10
3	♋		09	44	03	52	09	28	03	46	09	13	03	39	08	59	03	34
4	♌		10	43	04	15	10	27	04	09	10	12	04	03	09	58	03	57
5	♍	Pole Star.	11	42	04	38	11	26	04	32	11	12	04	26	10	57	04	20
6	♎		12	42	05	01	12	25	04	55	12	11	04	49	11	57	04	44
7	♏		13	41	05	24	13	25	05	18	13	10	05	12	12	56	05	07
8	♐	Southermost in Andromeda's Girdle.	14	40	05	47	14	24	05	41	14	10	05	35	13	55	05	30
9	♑		15	40	06	10	15	23	06	04	15	09	05	58	14	55	05	53
10	♒	Sun r. 6. 29.	16	39	06	33	16	23	06	27	16	08	06	21	15	54	06	16
11	♓		17	39	06	56	17	22	06	49	17	08	06	44	16	53	06	39
12	♈	Sun r. 6. 35	18	38	07	19	18	22	07	12	18	07	07	07	17	53	07	02
13	♉		19	37	07	42	19	21	07	35	19	07	07	30	18	52	07	25
14	♊		20	37	08	04	20	21	07	58	20	06	07	53	19	52	07	48
15	♋		21	37	08	26	21	20	08	20	21	06	08	15	20	52	08	10
16	♌		22	36	08	48	22	20	08	42	22	06	08	37	21	51	08	32
17	♍		23	36	09	10	23	20	09	04	23	05	08	59	22	51	08	54
18	♎	Luke Evan.	24	36	09	32	24	19	09	26	24	05	09	21	23	50	09	16
19	♏		25	35	09	54	25	19	09	48	25	05	09	43	24	50	09	38
20	♐		26	35	10	16	26	19	10	10	26	04	10	05	25	50	10	00
21	♑		27	35	10	38	27	19	10	32	27	04	10	27	26	50	10	22
22	♒	Sun r. 6. 52.	28	35	10	59	28	19	10	54	28	04	10	48	27	50	10	43
23	♓	Andromeda's Southermost Foot.	29	35	11	20	29	18	11	15	29	04	11	09	28	49	11	04
24	♈	Sol in Scorpio	♏	35	11	41	♏	18	11	36	♏	04	11	30	29	49	11	25
25	♉	Sun r. 7. 4.	01	35	12	02	01	18	11	57	01	04	11	51	♐	49	11	46
26	♊		02	35	12	23	02	18	12	18	02	04	12	12	01	49	12	07
27	♋		03	35	12	44	03	18	12	38	03	04	12	33	02	49	12	28
28	♌	Simon & Jude	04	35	13	04	04	18	12	59	04	04	12	53	03	49	12	49
29	♍		05	35	13	24	05	18	13	29	05	04	13	13	04	49	13	09
30	♎	Sun r. 7. 10.	06	35	13	44	06	18	13	39	06	04	13	33	05	49	13	29
31	♏		07	35	14	04	07	18	13	58	07	04	13	53	06	49	13	49
			08	35	14	23	08	18	14	17	08	04	14	13	07	49	14	08

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap Year 1760 1768		Year 1764 1772		First Year 1761 1769		Year 1765 1773		Second Year 1762 1770		Year 1766 1774		Third Year 1763 1771		Year 1767 1775	
			☉ pla		☉ dec		☽ pla		☽ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♏		South		♏		South		♏		South		♏		South	
1	☽	All Saints	09	35	14	42	09	19	14	37	09	04	14	32	08	50	14	27
2	☿	Sun r. 2. 14.	10	35	15	01	10	19	14	56	10	04	14	51	09	50	14	47
3	♀		11	36	15	20	11	19	15	15	11	05	15	10	10	50	15	06
4	☉	K. Will. Nat.	12	36	15	39	12	19	15	34	12	05	15	29	11	50	15	25
5	☾		13	36	15	57	13	20	15	52	13	05	15	47	12	51	15	43
6	♂	Powder Plot	14	37	16	15	14	20	16	10	14	05	16	05	13	51	16	01
7	♃		15	37	16	33	15	20	16	28	15	06	16	23	14	51	16	19
8	♄		16	37	16	50	16	21	16	45	16	06	16	41	15	52	16	37
9	♅		17	38	17	07	17	21	17	02	17	07	16	58	16	52	16	54
10	♆		18	38	17	24	18	22	17	19	18	07	17	15	17	52	17	11
11	☽	Sun r. 7. 29. Martin B.	19	39	17	40	19	22	17	36	19	07	17	32	18	53	17	28
12	☿		20	39	17	56	20	23	17	52	20	08	17	48	19	53	17	44
13	♀		21	40	18	12	21	23	18	08	21	08	18	04	20	54	18	00
14	☉		22	40	18	28	22	24	18	24	22	09	18	20	21	54	18	16
15	☾	Sun r. 7. 34.	23	41	18	43	23	24	18	39	23	10	18	35	22	55	18	32
16	♂		24	41	18	58	24	25	18	54	24	10	18	50	23	55	18	47
17	♃		25	42	19	13	25	25	19	09	25	11	19	05	24	56	19	02
18	♄		26	43	19	27	26	25	19	24	26	11	19	20	25	57	19	16
19	♅		27	43	19	41	27	26	19	38	27	12	19	34	26	57	19	30
20	♆		28	44	19	54	28	27	19	51	28	13	19	48	27	58	19	44
21	☽		29	45	20	07	29	28	20	04	29	14	20	01	28	59	19	58
22	☿	Sol in Sagit.	♐	46	20	20	♐	29	20	17	♐	14	20	14	29	59	20	11
23	♀		01	46	20	32	01	30	20	30	01	15	20	27	01	♐ 00	20	24
24	☉	Sun. r. 7. 47	02	47	20	44	02	30	20	42	02	16	20	39	02	01	20	36
25	☾		03	48	20	56	03	31	20	54	03	17	20	51	03	02	20	48
26	♂		04	49	21	08	04	32	21	05	04	17	21	02	04	03	20	59
27	♃		05	50	21	19	05	33	21	16	05	18	21	13	05	03	21	10
28	♄		06	51	21	30	06	34	21	26	06	19	21	24	06	04	21	21
29	♅	Aldebaran.	07	51	21	40	07	35	21	36	07	20	21	34	07	05	21	31
30	♆	Andrew Ap.	08	52	21	49	08	36	21	46	08	21	21	44	08	06	21	41

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☉ pla		Year 1765 1773 ☉ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
1	♑		♐		South		♐		South		♐		South		♐		South	
2	♒	Sun r. 7. 58.	09	53	21	58	09	37	21	55	09	22	21	53	09	07	21	51
3	♓		10	54	22	07	10	38	22	04	10	23	22	02	10	08	22	00
4	♈		11	55	22	15	11	38	22	13	11	24	22	11	11	09	22	09
5	♉		12	56	22	23	12	39	22	21	12	25	22	19	12	10	22	17
6	♊		13	57	22	31	13	40	22	29	13	26	22	27	13	11	22	25
7	♋		14	58	22	38	14	41	22	36	14	27	22	34	14	12	22	32
8	♌		15	59	22	45	15	42	22	43	15	28	22	41	15	13	22	39
	♍		17	00	22	51	16	43	22	49	16	29	22	47	16	14	22	46
9	♎		18	01	22	56	17	44	22	55	17	30	22	53	17	15	22	52
10	♏		19	02	23	01	18	45	23	00	18	31	22	59	18	16	22	58
11	♐	Sun r. 8. 5.	20	03	23	06	19	47	23	05	19	32	23	04	19	17	23	03
12	♑	First in Orion's Belt.	21	04	23	10	20	48	23	10	20	33	23	09	20	18	23	08
13	♒		22	05	23	14	21	49	23	14	21	34	23	13	21	19	23	12
14	♓		23	07	23	18	22	50	23	17	22	35	23	16	22	20	23	16
15	♈	Last in Orion's Belt.	24	08	23	21	23	51	23	20	23	36	23	19	23	21	23	19
16	♉		25	09	23	23	24	52	23	23	24	37	23	22	24	23	23	22
17	♊		26	10	23	25	25	53	23	25	25	38	23	24	25	24	23	24
18	♋	Orion's right shoulder and Auriga's right shoulder.	27	11	23	27	26	54	23	27	26	39	23	26	26	25	23	26
19	♌		28	12	23	28	27	55	23	28	27	41	23	27	27	26	23	28
20	♍		29	13	23	29	28	57	23	29	28	42	23	28	28	27	23	29
21	♎	Sun r. 8. 9. Thomas Ap.	♈	15	23	29	29	58	23	29	29	43	23	29	29	28	23	29
22	♏	Sol in Capri.	01	16	23	29	♈	59	23	29	♈	44	23	29	♈	29	23	29
23	♐		02	17	23	28	02	00	23	28	01	45	23	28	01	31	23	28
24	♑	Foot of g. Dog	03	18	23	26	03	01	23	27	02	47	23	27	02	32	23	27
25	♒	Nat of Christ	04	19	23	24	04	02	23	25	03	48	23	25	03	33	23	26
26	♓	St. Stephen.	05	20	23	22	05	04	23	23	04	49	23	23	04	34	23	24
27	♈	St. John Evan	06	22	23	20	06	05	23	20	05	50	23	21	05	35	23	22
28	♉	Innocents.	07	23	23	17	07	06	23	17	06	51	23	18	06	36	23	19
29	♊	Mouth of the	08	24	23	13	08	07	23	14	07	52	23	14	07	38	23	16
30	♋	great Dog or	09	25	23	09	09	08	23	10	08	54	23	10	08	39	23	12
31	♌	Syrius.	10	26	23	04	10	10	23	06	09	55	23	06	09	40	23	08

A TABLE of the Variation of the Sun's Declination to every 15 Degrees of Longitude, from the Meridian of *London*.

Degrees of Longitude from the Meridian of LONDON.

Daily Vari.	Deg. 15.	Deg 30	Deg. 45	Deg 60	Deg 75	Deg. 90	Deg. 105	Deg. 120	Deg. 135	Deg. 150	Deg. 165	Deg. 180
Min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	02	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	03	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	02	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

In

IN every Page there is 11 Columns, the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters, A, B, C, &c. the third the Southing of ſeveral Stars at Midnight, at which Time the ſaid Stars may (in the Abſence of the Moon, and Weather permitting) be obſerved, thereby to find the Latitude; in the ſame Column is given the Time of Sun-riſing, (and by ſubtracting the Time of riſing from 12 Hours, gives the time of ſetting) the eight following Columns ſhew the Sun's Place and Declination for Leap-Year, Firſt, Second, and Third, according to their reſpective Titles.

For the more ready knowing of Leap-Year, the following Table is inſerted, where it is found by Inſpection, and then follow the Firſt, Second, and Third Years after Leap-Year.

Leap-Year.	Firſt Year.	Second Year.	Third Year.
1760	1761	1762	1763
1764	1765	1766	1767
1768	1769	1770	1771
1772	1773	1774	1775
1776	1777	1778	1779
1780	1781	1782	1783
1784	1785	1786	1787
1788	1789	1790	1791

The Uſe of the CALENDAR.

To find the Day of the Week or Month for any Time paſt, or to come, by the Calendar.

Firſt, Find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppoſe it is required to find what Day of the Month will be the third *Wedneſday* in *March*, 1763.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be B, turn to the Month of *March*, and account B for *Sunday*, then the Letter E is for *Wedneſday*, and the Third *Wedneſday* is the 16th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1772.

This Year being Leap-Year has two Dominical Letters, E and D; the firſt Letter, to wit E, ſerving from the firſt of *January* to the End of *February*; the laſt Letter, to wit D, ſerves from thence to the Years End. Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Wedneſday*, the Day of the Week required.

To

To find the Sun's Place and Declination by the Calendar.

Example 1. Suppose the Sun's Place and Declination be required on the 10th of *January*, 1764, being Leap-Year.

In the Month of *January* in the first Column look the Day of the Month, over against which, under Leap-Year stands 19.52, that is, the Sun's Place is in 19deg. 52 min. of *Capricornus*: In the next Column under the said Year stands 22.01, under the Title South, which shews the Declination to be 22deg. 01 min. Southerly; and this also will practically serve for the Year 1768, for the said 10th of *January*, being Leap-Year.

Example 2. Suppose the Sun's Place and Declination is required on the 10th of *March*, 1766, being the second after Leap-Year.

In the Month of *March*, in the first Column find the Day of the Month, over-against which, under Second Year, stands 19.57 which shews the Sun's Place to be in 19 deg. 57 min. of *Pisces*; and in the next Column under Second Year, stands 03 59, which shews the Declination to be 03d. 59m. Southerly, which was required.

Although it is common to take the Declination as it is in the Calendar, yet if the Difference of Longitude be considerable from *London*, it is requisite the Declination should be corrected, because in the Calendar it is calculated for the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Calendar, is added; the Use and Explanation whereof follows.

IN the first Column of this Table is the daily Variation, which is found by subtracting the Declination of the given Day of the Month found in the Calendar, from the Declination for the Day following: or contrarily this from that, that is, the lesser from the greater, and the Difference is the daily Variation: In the Head of the other Columns are Degrees of Longitude from *London*, either Easterly or Westerly, and in those Columns under the respective deg of Longitude, are the Minutes of the Declination, answerable to the daily Variation: As suppose the daily Variation was 10 min. and the Difference of Longitude 90 deg. against 10 in the first Column, and under 90 deg. at the Head of the Table, stands 2 Minutes answering thereunto, and are to be used as follows.

The Use of the Table of the Variation of the Sun's Declination.

The Rule. First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Calendar; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted; but the Declination decreasing, it must be added.

Example 1. *April* the 19th, 1764, being at Sea, the Difference of Longitude from the Meridian of *London*, 90 degrees Westerly, I find the Decli-

Declination in the Calendar to be 11 deg. 27 min. North; and the 20th Day, the Declination is 11 deg. 47 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 20 min. which is the daily Increaſe: Then in the Table under 90 deg. and over againſt 20, ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 11 deg. 27 min. before found which makes the true Declination 11 deg. 32 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 5 min. found in the Table muſt have been ſubtracted.

Note, It is eaſily diſcerned, whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer: For if it be greater, then it increaſes; but if leſs, then it decreaſes.

Example 2. *January* the 25th, 1763, being at Sea, the Difference of Longitude from *London*, 120 deg. Weſterly: I find the Declination in the Calendar to be 18 deg. 58 min. South, and the 26th Day it is 18 deg. 43 min. therefore ſubtracting the leſſer from the greater, the Difference is 15 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 15 ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 18 deg. 53 min. South: If the Difference of Longitude had been Eaſterly, the 5 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Knowledge of the Sun's Declination at any Time, and in any Longitude, is of great Importance at Sea, for by this, and the Complement of the Sun's Meridian Altitude (commonly called the Zenith Diſtance) taken with a Quadrant or Croſs-ſtaff, is found the Latitude of the Place the Ship is then in; to perform which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude, North.

Example. Suppoſe at Sea, the 10th of *April*, 1764, the Declination found by the Table is 08 deg. 14 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is	23	10 South
Declination of the Sun is	08	14 North
The Latitude of the Place is	31	24 North

Rule 2. If the Sun comes to the Meridian in the North, and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude, North: But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude, South.

Example 1. Suppoſe at Sea, *May* 20, 1764, the Declination being 20 deg. 09 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant the Sun's Zenith Diſtance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's

Sun's Declination is	20d. : 09m. North
The Sun's Zenith Distance	18d. : 42m. North
The Latitude is	1d. : 27m. North

Example 2. At Sea, *June* 10th, 1761, the Sun's Declination by the Table is 23 deg. 5 min. North, the Complement of the Meridian Altitude, by Observation is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude is	33d. : 10m. North
Sun's Declination	23d. : 05m. North
The Latitude is	10d. : 05m. South

Rule 3. If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude, South.

Example 3. At Sea, *January* 29th, 1764, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22d. 10. min. What is the Latitude?

Complement of the Sun's Meridian Altitude is	22d. : 10m. North
Sun's Declination is	17d. : 59m. South
The Latitude is	40d. : 09m. South

Rule 4. If the Sun comes to the Meridian in the South, and hath South Declination, subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South: But if the Complement of the Meridian Altitude exceeds the Declination, subtract the Declination therefrom, the Remainder is the Latitude, North.

Example 1. At Sea, *January* 1st, 1764, the Sun cometh to the Meridian in the South: The Complement of the Altitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination	23d. : 03m. South
Complement of Meridian Altitude	10d. : 36m. South
Latitude of the Place	12d. : 27m. South

Example 2. At Sea, *February* 18th, 1762, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement of the Sun's Meridian Altitude	25d. : 20m. South
Sun's Declination	11d. : 31m. South
Latitude	13d. : 49m. North

Rule 5. If the Star be in the Zenith (that is, right over Head) and has either North or South Declination, that Declination is the Latitude either North or South, agreeable to the Name.

Rule 6. If the Sun hath no Declination, the Complement of the Meridian Altitude, is the Latitude, and is North or South, according as the Ship is to the Northward or Southward of the Sun.

A

Days	*Jan.* ☉ Right Ascen. h.	m.	*Feb.* ☉ Right Ascen. h.	m.	*March* ☉ Right Ascen. h.	m.	*April* ☉ Right Ascen. h.	m.	*May* ☉ Right Ascen. h.	m	*June* ☉ Right Ascen. h.	m
1	18	49	21	01	22	50	00	43	02	34	04	37
2	18	53	21	05	22	54	00	47	02	38	04	41
3	18	58	21	09	22	57	00	50	02	42	04	45
4	19	02	21	13	23	01	00	54	02	46	04	49
5	19	06	21	17	23	05	00	58	02	50	04	53
6	19	11	21	21	23	08	01	01	02	53	04	57
7	19	15	21	25	23	12	01	05	02	57	05	01
8	19	19	21	29	23	16	01	09	03	01	05	06
9	19	24	21	33	23	19	01	12	03	05	05	10
10	19	28	21	37	23	23	01	16	03	09	05	14
11	19	32	21	41	23	27	01	20	03	13	05	18
12	19	37	21	44	23	31	01	24	03	17	05	22
13	19	41	21	49	23	34	01	27	03	21	05	26
14	19	45	21	53	23	38	01	31	03	25	05	31
15	19	50	21	56	23	41	01	34	03	29	05	35
16	19	54	22	00	23	45	01	38	03	33	05	39
17	19	58	22	04	23	49	01	42	03	37	05	43
18	20	02	22	08	23	53	01	45	03	40	05	47
19	20	07	22	12	23	56	01	49	03	44	05	51
20	20	11	22	16	24	00	01	53	03	48	05	56
21	20	15	22	20	00	03	01	57	03	53	06	00
22	20	19	22	23	00	07	02	00	03	56	06	04
23	20	24	22	27	00	11	02	04	04	00	06	08
24	20	28	22	31	00	14	02	08	04	05	06	12
25	20	32	22	35	00	18	02	12	04	09	06	16
26	20	36	22	39	00	21	02	15	04	13	06	20
27	20	40	22	42	00	25	02	19	04	17	06	25
28	20	44	22	46	00	29	02	23	04	21	06	29
29	20	49			00	32	02	27	04	25	06	33
30	20	53			00	36	02	30	04	29	06	37
31	20	57			00	40			04	33		

Days	July ☉ Right Ascen. h.	m.	August ☉ Right Ascen. h.	m.	Septem. ☉ Right Ascen. h.	m.	October ☉ Right Ascen. h.	m.	Novem. ☉ Right Ascen. h.	m.	Decemb. ☉ Right Ascen. h.	m.
1	06	41	08	46	10	42	12	30	14	27	16	31
2	06	45	08	50	10	46	12	34	14	31	16	35
3	06	49	08	54	10	49	12	38	14	35	16	39
4	06	54	08	57	10	53	12	41	14	39	16	44
5	06	58	09	01	10	57	12	45	14	43	16	48
6	07	02	09	05	11	00	12	49	14	46	16	52
7	07	06	09	09	11	04	12	52	14	50	16	57
8	07	10	09	13	11	07	12	56	14	54	17	01
9	07	14	09	17	11	11	13	00	14	58	17	06
10	07	18	09	21	11	15	13	03	15	03	17	10
11	07	22	09	24	11	18	13	07	15	07	17	13
12	07	26	09	31	11	22	13	11	15	11	17	18
13	07	30	09	32	11	25	13	14	15	15	17	22
14	07	35	09	36	11	29	13	18	15	19	17	27
15	07	39	09	39	11	33	13	22	15	23	17	32
16	07	43	09	43	11	36	13	25	15	27	17	36
17	07	47	09	47	11	40	13	29	15	31	17	41
18	07	51	09	51	11	43	13	33	15	35	17	45
19	07	55	09	54	11	47	13	37	15	40	17	50
20	07	59	09	58	11	51	13	41	15	44	17	54
21	08	03	10	02	11	54	13	44	15	48	17	59
22	08	07	10	06	11	58	13	48	15	52	18	03
23	08	11	10	09	12	01	13	52	15	56	18	08
24	08	15	10	13	12	05	13	56	16	01	18	12
25	08	19	10	17	12	09	14	00	16	05	18	17
26	08	23	10	20	12	12	14	03	16	09	18	21
27	08	27	10	24	12	16	14	07	16	13	18	25
28	08	30	10	28	12	19	14	11	16	18	18	30
29	08	34	10	31	12	23	14	15	16	22	18	34
30	08	38	10	35	12	27	14	19	16	26	18	39
31	08	42	10	39			14	23			18	43

A TABLE shewing the Right Ascension, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit.	Right Ascen. h.	Right Ascen. m.	Declination d.	Declination m.
END of Pegasus's Wing, Algenib	2	00	01	13	50 N
Pole Star	2	00	44	88	00 N
Girdle of Andromeda	2	00	56	34	19 N
Bright Star in Aries	2	01	53	22	18 N
Medusa's Head, Algol	2	02	52	40	00 N
Bright side of Perseus	2	03	07	48	58 N
Aldebaran, or Bull's Eye	1	04	22	16	00 N
Capella, or the Goat	1	04	59	45	43 N
Bright Foot of Orion. Rigel	1	05	02	08	30 S
Middle Star in Orion's Belt	3	05	23	01	23 S
Orion's Right Shoulder	1	05	41	07	20 N
Auriga's Right Shoulder	2	05	40	44	54 N
Bright Foot of Gemini	2	06	23	16	35 N
Syrius, or the Great Dog	1	06	34	16	23 S
Castor, or Northermost Twin	2	07	18	32	24 N
Procyon, or the Little Dog	2	07	26	05	51 N
Pollux, or Southermost Twin	2	07	29	28	36 N
Hydra's Heart	1	09	14	07	36 S
Lyon's Heart, or Regulus	1	09	54	13	10 N
The Lower of the Pointers	2	10	45	57	42 N
The Upper of the Pointers	2	10	47	63	03 N
Lyon's Tail, Deneb	1	11	35	15	56 N
Upper of the two last in □ of the Great Bear	2	12	01	58	23 N
Last but two in the Great Bear's Tail	2	12	41	57	18 N
Virgin's Spike	1	13	10	09	53 S
Last but one in the Great Bear's Tail	2	13	12	56	13 N
Last in the Great Bear's Tail	2	13	35	50	33 N
Arcturus	1	14	02	20	28 N
South Ballance	2	14	35	15	01 S
Foremost Guard	2	14	49	75	10 N
Brightest of the Crown	2	15	22	27	34 N
Brightest in the Serpent's Neck	2	15	30	07	13 N
Antares, the Scorpion's Heart	1	16	12	25	52 S
Head of Hercules	3	17	01	14	42 N
Ophinous, or Serpent's Head	3	17	21	12	46 N
Lyræ, or the Harp	1	18	26	38	34 N
Swan's Bill	3	19	19	27	29 N
Vulture, or Eagle's Heart	2	19	36	08	14 N

Swan's Tail	2	20	30	44 25	N
Mouth of Pegasus	3	21	29	8 45	N
Fomelhaut	1	22	41	30 54	S
Marchab, or Pegasus's Wing	2	22	49	13 53	N
Scheat, or Pegasus's Leg	2	22	48	26 45	N
Cepheus's Knee	3	23	20	76 7	N
Andromeda's Head	2	23	52	27 43	N

The Explanation and Use of the Table *of the* Sun's-Right-Ascension, *and of the* Table *of the* Star's Right Ascension *and* Declination.

IN the Table of the Sun's Right Ascension, the first Page contains the first six Months of the Year; the next Page the other six Months; at the Head of the Table are the Months; in the first Column towards the Left-hand are the Days of the Month, and in the opposite Column is the Right Ascension in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the first towards the Left-hand, are the Names of the Stars; in the second, the Star's Magnitude; in the third, the Right Ascension in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

First, To find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 Hours, and then subtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the Time that *Fomelhaut* comes upon the Meridian on the 21st of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 41 min. and the Sun's to be 13 Hours 44 min. which subtracted from the Star's Right Ascension, leaves 8 Hours 57 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 26th of *October* was required.

I find the Star's Right Ascension to be 4 Hours 22 min. the Sun's 14 Hours 3 min. Now because the Sun's Right Ascension is more than the Stars, add to the Star's Right Ascension 24 Hours, which makes 28 Hours 22 min. from which subtracting the Sun's Right Ascension 14 Hours 3 min. there remains 14 Hours 19 min. from which subtracting 12 Hours, there remains 2 Hours 19 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the same Time? *The*

The Rule. To the Sun's Right Ascension, add the Time from Noon, at which the Star's coming to the Meridian is desired; the Sum is the Right Ascension of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Ascension and Declination, where look what Star's Right Ascension agrees with the Right Ascension before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *April* the 7th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 hour 5 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Aſcenſion, makes 9 Hours 5 Minutes; the neareſt in the Table is *Hydra's-Heart*, whoſe Right Aſcenſion is 9 Hours 14 Minutes, and therefore Souths at 8 Hours 9 Minutes nearly, and ſo in others.

Directions for Obſerving the Stars, to find the Latitude of the Place:

Having before ſhewn how to find the Time of the Star's coming to the Meridian, I ſhall now ſhew by the Stars Altitude how to find the Latitude.

Note, In North Latitude, thoſe Stars whoſe North Declination exceed the Complement of that Latitude may be obſerved under the Pole, and the ſame may be performed by the Southern Stars in South Latitude.

Particular Directions for finding the Latitude, by the Meridian Altitude of the fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination the Complement of the Meridian Altitude or Zenith Diſtance, (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination, gives the Latitude North.

Example. On the 21ſt of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's-Heart* comes to the Meridian in the South, at 1 Hour 39 min. after Midnight; the Meridian Altitude by Obſervation was 63 Degrees; which ſubtracted from 90 deg. there remains 27 deg. the Complement of the Altitude; to which adding 13 deg. 10 min. the Declination of the Star North, gives 40 deg. 10 min. the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North: But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 21ſt of *July*, being at Sea, the Star *Fomelhaut* cometh to the Meridian in the South, at 2 Hours 38m. after Midnight, the Merid. Alt. 35 deg. 50 min. the Comp. whereof is 54 deg. 10 min. the Star's Declination is 30 deg. 54 min. South, which ſubtracted from the Complement of the Alt. leaves 23d. 16m. which is the Latitude North.

Example

Example 2. Suppose on the 1st of *July*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 31 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 deg. 52 min. South, from which subtracting the Complement of the Altitude, there remains 20 deg. 25 min. which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, subtract the Declination from the Complement of the Altitude, the Remainder is the Latitude South: But if the Declination exceeds the Complement of the Altitude, subtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 22d of *June* the *brigheſt in the Harp* comes to the Meridian in the North at 22 min. after Midnight, the Complement of the Altitude is 79 deg. from which subtracting the Declination, which is 38 deg. 34 min. North, there remains 40 deg. 26 min. which is the Latitude South.

Example 2. On the 22d of *September*, *Andromeda*'s-*Head* comes to the Meridian in the North at 11 hours 54 minutes at Night, the Complement of the Altitude is 7 deg. 10 min. which subtracted from the Declination 27 deg. 43 min. gives 20 deg. 33 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 23d of *December*, (*Syrius or the great Dog's Mouth*) comes to the Meridian in the North at 26 Minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 23 min. the Declination South, gives 46 deg. 23 min. the Latitude South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Star's Declination.

Example. On the 21st of *March*, the Pole Star comes to the Meridian under the Pole at 41 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 0 min. which added together, gives 46 deg. 30 min. which is the Latitude, North.

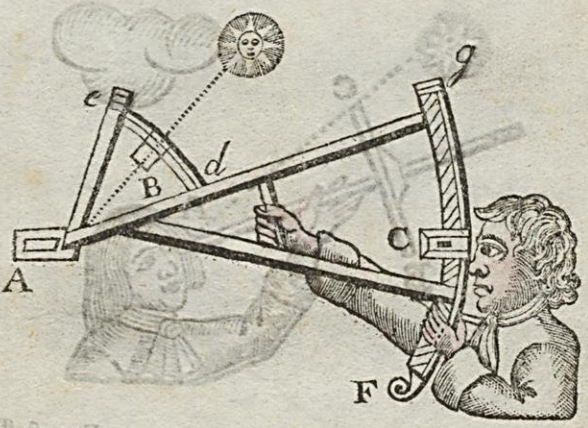
Rule 6. If a Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star has no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward of the Observer.

The Description and Use of the Sea-Quadrant.

THIS Instrument consists of three Vanes and two Arches, the Horizon Vane, which in Observing, respects the Horizon, as at A; the Shade Vane, so called because of its giving the Shadow upon the Horizon Vane, in Time of Observation, as at B; besides this Shade Vane, there is another now in Use, having a Convex Glass properly fixed therein, which throws a lucid Point upon the Line of Direction in the Horizon Vane, and is

is of great Service in gloomy Weather, when the Rays of the Sun are too weak to produce a distinct Shadow, by the former; (But the only Instrument for this purpose, and far superior to any other now in Practice, is HADLEY'S Quadrant;) Lastly, the Sight Vane, which in Time of Observation is placed at the Eye, through which the Shadow (or lucid Point) and Horizon are seen, as at C. The lesser of the Arches mark'd with *d e*, is called the Sixty-Arch, because it contains 60 (or more commonly of late 65) Degrees: In Time of Observation the Shade Vane is placed upon this Arch always to an even Degree; it is numbered from the upper end at *e*, downwards to *d*, with 5, 10, 15, 20, *&c.* The bigger Arch marked with *g* F, is called the Thirty-Arch, because it contains 30 (or rather 25) Degrees, and is divided into Degrees and Minutes.

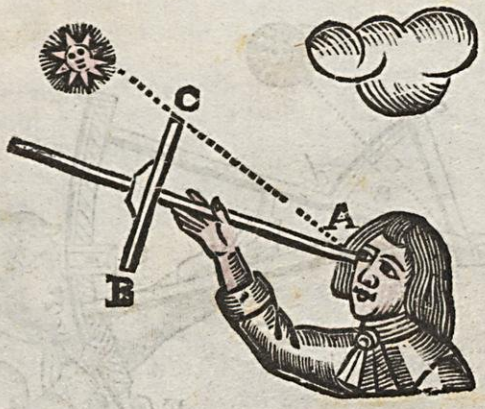


The Use of this Instrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or lesser Arch) to a Number of Degrees, less than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty-Arch: The Vanes being thus fixed upon the Quadrant, your Back being turned to the Sun, and the Sight Vane placed to the Eye, look thro' the said Sight Vane, and cause the Shadow of the upper Edge of the Shade Vane (or lucid Point in the Glass Vane) to fall upon the upper Part of the Slit in the Horizon Vane, where usually (for Perspicuity Sake) there is drawn a black Line or Line of Direction; and if at the same Time the Horizon appear tho' the said Slit in the Horizon Vane, you have then the Sun's present Altitude, or Zenith Distance; but if the Sea appear instead of the Horizon, then slide the Sight Vane lower towards F; if the Sky appear instead of the Horizon, then slide the Sight Vane a little higher until the Horizon appear thro' the Horizon Vane: But to obtain the Meridian

Altitude

Altitude, (which is the greatest Altitude the Sun will have that Day, and is the Thing used to find the Latitude,) continue observing, and as the Sun rises, the Sea will appear through the Horizon Vane; then must the Sight Vane be removed lower; And thus continue observing, as often as may be convenient till the Sun be at the highest, which is the Meridian Altitude: When the Sun begins to fall, the Sky will appear instead of the Horizon, and then it's Time to give over observing for that Day: Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude; the Use of which for finding the Latitude, is sufficiently shewed in the preceding Rules.



Description and Use of the Cross-staff, *or* Fore-staff.

THIS Instrument consists of a Staff and four Crosses, the first and shortest is called the Ten Cross, and belongs to that Side of the Staff which is Numbered from about 3 Degrees to 10 Degrees; Sometimes the Thirty Cross, and the rest of the Crosses are so made, as that the Breadth of any of them may serve instead of this Ten-Cross.

The second Cross is called the Thirty-Cross, and belongs to that Side of the Staff which is numbered from about 10 Degrees to 30.

The Third Cross is called the Sixty-Cross, and belongs to that Side of the Staff which is numbered from about 20 to 60 Degrees.

The Fourth and last Cross is called the Ninety-Cross, and belongs to that Side of the Staff, which is numbered from about 30 to 90 Degrees.

This Staff is likewise numbered with the Complement to 90 Degrees, (*viz.*) at 10 stands 80, at 20 stands 70, at 30 stands 60; and so of the rest.

The Use of this Instrument is to take the Meridian Altitude of the Sun or Star, which is performed as followeth. First,

First, Consider how great the Sun's Meridian Altitude will be that Day; and accordingly use the Cross most suitable, *(viz.)* if the Meridian Altitude be judged to be under 10 deg. use the Ten Cross; if between 10 and 30, the Thirty Cross; if between 30 and 60, the Sixty Cross; if between 60 and 90, the Ninety Cross, which is seldom used.

Having put on the Cross, place the flat or square End of the Staff at A, to the Outside of the Eye, as near as may be, without hindering the Sight; thus the Face being towards the Sun or Star, hold the Cross upright; then look at the upper End of the Cross, at C, for the Sun or Star, and at the lower End at B, for the Horizon, and if the Sea appear instead of the Horizon, remove the Cross a little further from the Eye; but if the Sky appear instead of the Horizon, remove the Cross a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Cross then in Use, will be found the deg. and min. of Altitude of the Sun or Star. But the greatest Altitude being that which is required, Observation must be continued as frequently as Judgment shall direct, until the Sun or Star be at the highest; and as the Sun or Star rises, the Sky will appear instead of the Horizon; but when the Sun or Star is past the Meridian, and begins to fall, the Sea will appear instead of the Horizon, and then is the Observation finished; and upon the Side of the Staff proper to the Cross used, are found the Degrees and Minutes of the Sun's Meridian Altitude; which subtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbered with the Complement as is shewed before) with which to proceed in finding the Latitude of the Place, observe the Rules and Directions foregoing.

The Description and Use of the Nocturnal.

IT consists of three Parts, the first and unmoveable Part, on which is the Handle, by which to hold it in Time of Observation, upon the foreside of which, in the outermost Circles are the Days of the Month, upon the innermost are set off the 24 Hours, and upon the Back-side are the 32 Points of the Compass.

There are two sorts of *Nocturnals*, the one made for the *Great-Bear*, the other for the *Little-Bear*. Those that are made for the *Great-Bear* have *February* at the Top, but those that are made for the *Little-Bear* have *April*, but now they are commonly made for both *Bears*, having two Indices.

The second, or middle Part contains two Circles, and the aforesaid Indices, one marked G, for the *Great-Bear*, and the other marked L, for the *Little-Bear*. The outermost Circle is divided into 29 Days and an half, the Moon's Age; the innermost into 24 Hours, the Index belonging to the *Bear*, you intend to observe by, is to be set to the Day of the Month at pleasure.

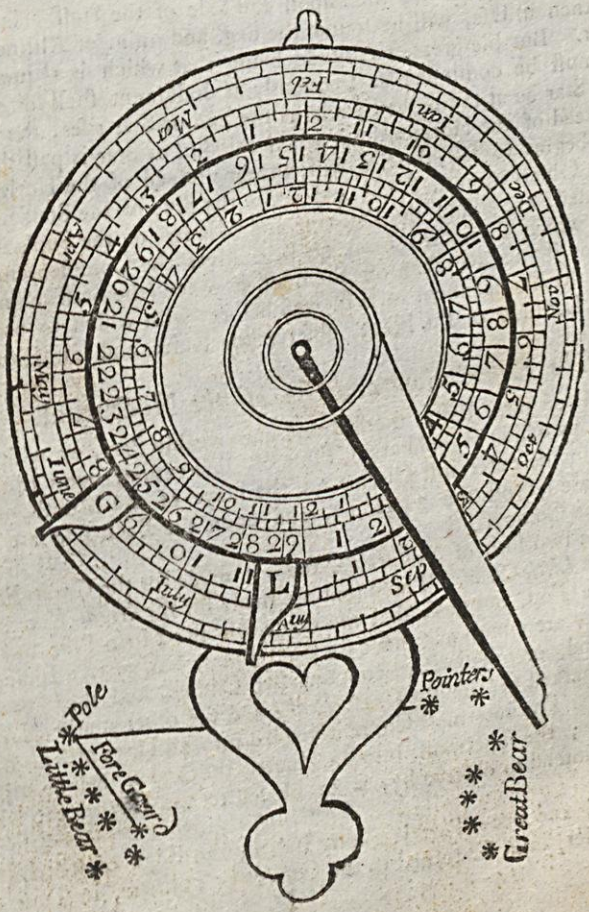
The third and upper Part is a long Index; the Edge of which (respecting the Center) must be turned to the Guards or Pointers, in Time of Observation.

Note, That by the Alteration of the Stile, the present Nocturnals are render'd erroneous, in such Examples as refer to the Days of the Month; but these Errors are easily adjusted, by reckoning and fixing the Index of the Instrument eleven Days backwards from the Day of Observation; in like Manner as is directed, and done in the Example following.

To find the Hour of the Night, and upon what Point of the Compass the Guards are.

To do this, First, set the Index of the middle Part to the Day of the Month, then hold the Instrument upright, which may be discerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Mid-

The Figure of the NOCTURNAL.



dle

dle of the *Nocturnal*, for the North Star; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you observe by the *Little* or *Great Bear*, then shall the Edge of the Index (upon the innermost Circle of the middle Part) give the Hour of the Night.

Also in *Nocturnals* made for both Bears, you have on the Back-side two Circles mark'd at the Bottom, the outermost with L, and the innermost with G; and numbered round with Degrees and Minutes, for finding how much the *Pole*-Star is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed; observe what Figures on the Back-side fall under the Edge of the long Index, in the Circle belonging to the Bear by which you observe, and that is the deg. and min. that the Star is above or under the Pole, as is distinguished by the Words *Abo.* and *Und.*

Ex. To observe by the *Gr. Bear*, *July* 6. *New-Stile*, which answers to *June* 25th, *Old-Stile*, reckoning eleven Days backwards, I set the Index marked G to *June* 25, and looking through the Hole to the Pole, I turn the long Index, till it lie just over the two Pointers, as you see in the Figure of the *Nocturnal*, and find on the innermost Circle of the middle Part of the *Nocturnal*, that it is Two o'Clock in the Morning; and on the Back-side in the Circle mark'd G, I find the Pole Star is 2 deg. 26 min. above the Pole, on the 6th of *July*, *New Stile*, or according to the present Established Account: But the Bearings known, the Elevation or Depression of the North Star, above or below the Pole, is found by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermost Circle find the Moon's Age; and opposite to it in the innermost Circle of the same Piece stands the Southing.

Ex. Suppose the Moon 25 Days old, and the Time of her Southing req.

Look for 25 the Moon's Age in the outermost Circle, opposite to which in the innermost Circle stands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change Days at any Place, and that gives the Time of Full Sea when required. But this has been sufficiently shewed in another Place, and therefore needs no Example.

The Use of the following Table of the Declination of the North Star.

THE Use of the Table is this: Having taken the Alt. of the Pole Star, then observe with the *Nocturnal* upon what Point of the Compass the Guards are; opposite to which in this Table stands the Declination (so called) which if the Star be below the Pole, is to be added to the Altitude, but if the Star be above the Pole, to be subtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by those other Directions for the Stars before given, which is to be depended upon preferable to this last Method, but solar Meridional Observations superior to all.

A Table of the Declination of the North Star, *on every Point of the Compaſs the Guards bear, and for both Sorts of* Nocturnals.

	Points of the Compaſs.	For the Fore-Guard of the Little Bear. D.	M.			For the Guards of the Great Bear, called the two Pointers. D.	M	
If the former of the Guards be aſcending from the North or lower Part of the Meridian.	North	2	9	Above the Pole	If the after Wheel, or two Pointers be aſcending from the North, or lower Part of the Meridian.	2	20	Above the Pole
	N by E	1	52			2	30	
	N N E	1	29			2	35	
	N E by N	1	2			2	33	
	North Eaſt	0	35			2	26	
	NE by E	0	6			2	13	
	E N E	0	22	The North Star is under the Pole		1	55	
	Eaſt by North	0	52			1	33	
	Eaſt	1	18			1	7	
	Eaſt by South	1	41			0	38	
	E S E	2	01			0	8	
	S E by E	2	16			0	22	The North Star is under the Pole.
	South Eaſt	2	25			0	52	
	S E by S	2	30			1	20	
	S S E	2	29			1	44	
	South by Eaſt	2	22			2	4	
If the former of the Guards be deſcending from the South, or upper Part of the Merid.	South	2	11			2	20	
	South by Weſt	1	55		If the two Pointers be deſcending from the South or upper Part of the Merid.	2	30	
	S S W	1	34			2	29	
	S W by S	1	10			2	27	
	South Weſt	0	43			2	23	
	S W by W	0	14			2	13	
	W S W	0	15	Above the Pole		1	55	
	Weſt by South	0	44			1	33	
	Weſt	1	11			1	07	
	Weſt by North	1	36			0	38	
	W N W	1	58			0	8	
	N W by W	2	14			0	22	Ab. the Pole
	North Weſt	2	25			0	52	
	NW by N	2	30			1	20	
	N N W	2	29			1	44	
	North by Weſt	2	22			2	04	

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Islands in the World; Corrected by the latest and best Observations; the Longitude reckoned from the Meridian of LONDON.

Note, *When the Latitude and Longitude of an Island is given, the middle of the Island is meant, except some particular Part of it is expressed.*

Places Names.	Latitude North.		Longit E or W.		
The Coast of England.	D.	M.	D.	M	
BErwick	55	48	01	45	W
Newcastle	55	12	01	30	W
Stockton	54	33	01	25	W
Spurn	53	45	00	13	E
Yarmouth	52	40	01	38	E
LONDON	51	31	00	00	E
North Foreland	51	25	01	24	E
Beachy	50	46	00	25	E
Dunnose Isle Wight	50	38	01	24	
Portland	50	30	02	44	
Start Point	50	07	03	47	
LIZARD	49	57	05	14	
Land's-end	50	06	06	00	
St. Mary Scilly	50	00	06	46	
Hartland Point	51	06	04	35	
Lundy Isle	51	20	04	40	
Bristol	51	33	04	35	
St. David's Head	51	00	05	22	
Barseyor Bardsey Isle	52	44	05	00	
Holy-head	53	24	04	50	
Liverpool	53	20	03	00	
Whitehaven	54	17	03	30	
Carlisle	54	47	03	05	
The Coast of Scotland.					
Glascow	55	52 N	04	05	W
N. Part of Sky Isle	57	45 N	05	45	W
North Part of Lewis Island	58	20	07	20	
St. Kilday	57	52	09	45	
Farro Head	58	34	05	10	
Northern Isles of Orkney	59	10	03	22	
Shetland S. Point	60	04	02	00	
Buchaness	57	45	01	18	
Aberdeen	57	22	01	40	
Dundee	56	28	02	40	
Edenburgh	55	58	02	59	
The Coast of Ireland.					
Dublin	53	12	06	56	
Wexford	52	13	07	27	
Waterford	52	09	08	40	
Cork	51	49	09	30	
Cape Clear	51	17	11	10	
Limrick	52	23	09	35	
Galway	53	07	09	40	
Sline Head	53	20	11	15	
Londonderry	55	00	07	50	
Bellfast	54	39	06	30	
The Coast of Holland and Flanders					
Scaw	57	30 N	10	20	E
Helighland	54	24 N	08	35	E

North Latitude. West Longitude.

Ham

Places Names.	Latitude North D.	M	Longit. E or W. D.	M
Hambrough	53	41	10	35
Emden	53	05	07	35
The Fly	53	15	05	30
The Texel	53	15	05	10
Amſterdam	52	23	05	04
Rotterdam	51	55	04	30
The Brill	52	00	04	00
Sluys	51	14	03	43
Calais	50	58	01	54

North Latitude. East Longitude.

The Coaſt of France and Portugal.

Dieppe	49	56	01	09 E
Cape de Hogue	49	47	02	00
Caskets	49	50	02	20
Guernſey	49	33	02	40
St. Maloes	48	39	01	57
Morlaix	48	33	03	49
Uſhant	48	30	05	02
Breſt	48	23	04	25
Penmark	47	48	04	24
Bell Iſle	47	18	03	16
Nantz	47	14	01	39
Iſland Dieu	46	34	02	13
Iſland Ree	46	10	01	30
Rochel	46	10	01	11
Bourdeaux	44	50	00	38
Bilboa	43	29	02	58
Cape Ortegal	44	04	07	48
Cape Finiſter	43	12	09	40
Port a Port	41	10	09	25
Burlings	39	35	09	24
Rock of Lisbon	38	52	09	50
Lisbon	38	42	08	53
Cape *St.* Vincent	36	53	09	06
Cadiz	36	33	06	01
Cape Trefalgar	36	10	06	01

North Latitude. Weſt Longitude.

The Coaſt on the Main Continent within the Straits

Gibraltar	36	12 N	04	53 W
Cape de Gat	36	40 N	01	40 W

Places Names.	Latitude North D.	M.	Longit. E. or W. D.	M.
Cape Paul	38	13	00	05
Cape St. Martin	38	46	00	40
Barcelona	41	26	02	18
Marſeilles	43	18	05	27
Toulon	43	07	06	02
Genoa	44	25	08	43
Leghorn	43	28	10	35
Rome	41	54	12	45
Naples	40	51	14	46
Cape Spartavento	37	55	16	55
Cape Collonne	38	56	18	05
Gallipoli	39	56	18	43
Cape *St.* Mary	39	45	19	00
Ancona	43	40	14	26
Venice	45	25	12	10
Lepanto	38	10	22	52
Cape Matapan	36	33	22	41
Cape *St.* Angelo	36	32	23	56
Athens	37	58	24	05
Cape Martelo S. P of Negropont	38	07	25	03
Cape Monte Sanct	40	26	25	02
Salonica	40	41	23	13
Gallipoli	40	33	27	20
Conſtantinople	40	59	28	56
Smyrna	38	28	27	25
Epheſus	38	01	27	53
Antiochetta	36	30	32	46
Scandaroon	36	34	36	30
Aleppo	35	42	37	24
Tripoli	34	38	36	15
Alexandria	31	10	30	19
Cape Ruſato	32	48	21	25
Cape Meſurato	32	21	16	17
Tripoly	32	54	13	19
Cape Bona	37	03	11	04
Bona	36	52	08	19
Algier	36	50	03	16
Cape de tres forcas	35	30	02	04 W
Tetuan	35	27	05	06 W
Ceuta	35	54	04	45 W
Tangier	35	42	05	22 W

North Latitude. East Longitude.

Aboran

Places Names.	Latitude North		Longit E. or W	
Islands within the Straits.	D.	M.	D.	M.
Alboran	35	54	02	29 W
Formentura	38	33	01	55
Yvica	38	50	01	40
Majorca	39	30	03	03
Minorca City	39	51	04	52
Port Mahon Minorca	39	42	04	12
Gallitta	37	41	08	44
Sardinia South End	38	46	09	12
Corsica North End	42	56	09	50
Gorgona	43	34	09	38
Captia	43	03	10	17
Lilboa, or Elba	42	45	11	00
Messina	38	07	16	20
Maritimo	38	12	17	09
Cape Passaro	36	38	15	40
Malta	35	53	14	32
Corfu	39	42	20	06
Chephalonia	38	15	21	00
Zante	37	46	21	14
Modon or Morea	36	52	21	32
Lemnos	39	59	25	37
Scio	38	22	26	12
Lissa	43	05	16	40
C. St. John West end of Candy	35	15	24	00
Cape Solomon, E end of Candy	35	00	27	08
Rhodes City	36	42	28	05
West end of Cyprus	34	57	32	23
East-end of Cyprus	35	31	35	00

North Latitude — East Longitude

The Coast of Barbary and Guinea.

Cape Spartel	35	50	05	49
Sallee	33	51	06	25
Cape Cantin	32	36	09	10
Cape de Geer	30	27	10	06
Cape Bajadore	26	04	15	35
Cape Olcrado	23	41	15	50
Cape Blanco	20	32	17	35
Senegall	15	28	16	25

North Latitude — West Longitude

Places Names	Latitude N. or S		Lonitg E. or W	
	D.	M.	D.	M
Cape de Verde	14	43	17	20
River Gambia	13	08	15	31
Sierraleona	08	36	12	57
Mezfurado	06	05	10	02
Cape Palmas	04	13	06	45
Jaque Jaque	04	16	09	47
Assene	04	15	07	17
Cape 3 Points	04	28	01	50
River Volta	05	55	03	25
River Formosa	07	00	07	20
Cape Formosa	04	15	06	40
New Calabar	04	42	08	33
Old Calabar	04	10	09	45
River Camerones	03	25	10	10
River de Angra	00	50	10	01
C. Lopas	00	55	09	55
River Congo	05	40	15	25
Angola	08	57	15	56
Cape Negro	16	08	12	31
Cape St. Thomas	24	10	14	43
Secos	29	00	15	56
C. Bona Esperance	34	07	19	35

North Latitude — South Latitude — West Longitude — East Longitude.

Western Islands.

Corvo	39	54	30	55
Flores	39	32	30	54
Fyal	38	53	28	15
Pico	38	40	27	20
St. George	38	52	26	03
Tercera	38	57	25	34
St. Michael	38	06	23	36
St. Maries	36	50	23	38

North Latitude — West Longitude

The Canary Islands.

Ferro	27	54	17	45
Palma	28	40	17	36
Gomero	28	06	17	05
Teneriff	28	23	16	28
Madeira West end	32	44	17	26
Porto Sancto	33	12	15	54
Canaria	27	52	15	10
Forteventura SW.	28	05	13	36
Lancerota	29	02	12	45

North Latitude — West Longitude.

Cape

Places Names.	Latitude N. or S.		Longit. E. or W	
Cape de Verde Islands.	D.	M.	D.	M.
St. Antonio	17	35	24	40
St. Vincent	17	15	24	25
St Lucia	17	07	24	20
St. Nicholas	17	00	23	38
Brava's	14	28	23	54
Fuego	14	50	23	35
St. Jago	15	08	22	45
Isle of May	15	14	22	08
Isle of Sal	16	50	22	08
Bonavista	16	05	22	08

North Latitude. — West Longitude.

Southern Islands.

St. Matthew's	01	30	S	06	01 W
Ascention	07	40	S	14	05 W
St Helena	16	00	S	06	04 W
Fernande Poo	02	40	N	10	30 E
Princeps	01	40	N	09	15 E
St. Thomas	00	00		08	20 E
Annabona	02	10	S	07	27 E

The Coast on the Main Continent in the East-Indies.

Cape Lagullas	34	54	S	21	20
Cape Bon Esperance	34	07	S	19	35
Cape Corientes	23	40	S	36	17
Mosambique	15	04	S	41	10
River de Fuegos	00	41	S	41	15
Cape Bassos	04	06		47	38
Cape Guardefoy	11	44		51	20
Cape Rasulgat	22	41		59	45
C. Muca or Muscat	23	32		59	45
Busero	29	45		49	20
Surat	21	10		72	25
Goa	15	31		73	50
Callecut	11	16		75	39
Cochin	09	54		75	55
Cape Comerine	07	50		77	25
Fort St. George	13	11		80	32

North Latitude. — East Longitude

Places Names.	Latitude N. or S.		Longit. East	
	D.	M.	D.	M.
Diu Point	16	08	81	32
Visagapatam	17	43	83	57
Cape Palmiras	20	42	87	52
Ballasore Road	21	16	87	48
Bengal	22	17	92	21
Cape Negrais	26	23	93	00
Malacca	02	12	102	10
Siam Entrance	14	18	100	55
Cambodia Entrance	10	28	105	00
Cochin	14	05	107	56
Macao	22	13	113	51
Canton	23	14	113	06
Amoy or Quemoy	24	35	116	50
Laimpo	29	59	120	35
Nanquin	33	07	120	01

North Latitude. — East Longitude

Islands in the East-Indies.

Madagascar S end	25	47		46	10
St Laurence N end	12	10		51	05
Mayetta	13	10		45	38
Mohilla	12	05		44	23
Comero	11	40		43	50
Juan de Nova	09	30		52	40
Mauritius	20	10		52	55
Diego Royes	19	50		61	30
Romeras de Castela-	28	45		67	17
Amsterdam [mas	38	40		72	45
St. Brandon	16	38		64	30
Diego Gratiosa	08	40		68	25
Quabella	03	53		52	36
Bassas de Chagos	06	55		68	45
Yas de Diego Reys	00	20		72	00
Maldivia N end	07	14		73	04
Maldivia S. end	00	25		76	22
Malique	00	00		72	58
Sacatra	09	21		54	05
Abdeleur	12	04		53	04
C. Gallode Zeylone	06	08		81	15

South Latitude. — East Longitude.

Yas

Places Names.	Latitude N. or S			Longit. E. or W	
	D.	M		D	M.
Yas de Amber	00	00	N. Latitude.	52	30
Andaman	11	10		73	19
Nicobar	07	11		93	40
Sumatra NW. End	05	22		94	50
Verkin's Island	02	22		94	07
Naffau Island	02	54		99	32
Bencola	03	55		104	08
Sumatra SE. End	05	22		105	10
Engano or Trompeus	05	50		101	43
Selam	08	20		102	13
Princes Island	06	30	South Latitude.	104	02
Bantam in Java	06	11		105	55
Batavia	06	16		106	46
Java East End	08	32		113	30
Straits of Sundy	06	02		105	46
Banca South End	03	20		106	45
Borneo South Point	03	54		113	37
Banda Isles	04	55		127	17
Celebes { South end	05	10		119	07
Celebes { N. end	01	40		121	20
Mindano West point	06	40		119	15
Borneo North Point	07	40		113	05
Luconia { SW. poi.	12	30	North Latitude.	120	10
Luconia { NE. poi.	18	55		120	05
Anian { NW point	19	30		107	00
Anian { NE. point	19	55		109	55
Formosa { S. point	22	00		119	56
Formosa { N. point	25	30		120	45
Piscadore Isles	23	30		118	35
Island Chusan	30	38		120	35
Japan { S.E. point	35	30		140	30
Japan { S. W. point	35	00		128	30

East Longitude.

The Coast of America in the South Sea, from California to Cape Horn.

Cape St. Sebastian	42	45	North Latitude.	127	55
Cape S Lucas or Lucar	23	20		111	46
Cape Corientes	18	50		110	30
Aquapulco	17	05		104	18
Aquatulco	15	27		102	03
Guatimala	14	25		101	00
Panama	08	50		81	52

West Longitude.

Places Names.	Latitude N or S.			Longit West	
	D.	M.		D.	M.
Bay Bonaventuro	03	24	N	78	06
Island Gallopega	00	00		90	10
Cape del Ajuga	06	30		84	50
Lima	12	15	South Latitude.	77	30
Arica	18	29		73	10
La Serena	29	00		76	22
I. Juan Fernandes	33	15		83	18
Baldivia	39	35		81	10
Port Steven	46	50		82	36
Cape Victory	52	00		83	10
Cape Horn	56	35		79	55

West Longitude.

The Coast of Brazile in South America, from Cape Horn to Cape Roque.

Magellan E. entran.	52	00		75	05
River Julian	48	40		74	34
Cape Blanco near R. Camarones	46	50		72	07
Buenos Aires R. Plata	34	35		57	54
River Grand	31	55	South Latitude.	52	00
St. Catherine's	27	50		49	00
Cape Frio	23	00		42	20
Spirito Sancto	19	59		42	10
P. Segura	16	31		40	35
Bay Todos Sanctos	12	46		41	00
R. St. Francisco	10	50		37	50
Olinda or Pernambuco	07	48		35	30
Cape St. Auguftine	08	35		35	20
Cape Roque	05	00		35	47
Triftian D' Acunha	37	05		13	50
Trinidada	20	30		30	00

West Longitude.

The Coaft of the Main Continent in the Weft-Indies.

R. Amazones Entr.	00	00		49	56
North Cape	02	05	North Latitude.	49	56
Suranam	06	25		56	50
Oronoque	08	15		59	25
C. Conquibaca	12	40		70	42
Carthagena	10	28		75	21
Scot's Settlement	08	30		78	45
Nicaragua Entrance	11	25		84	15
Cape Catocha	21	20		86	01

West Longitude.

Places Names.	Latitude North D.	M.	Longit. West. D.	M.
Campecha	19	30 N	92	10 W
La Vera Cruz	19	12 N	97	48 W
Mexico	20	00 N	103	35 W
Escondido	30	20 N	89	30 W
Cape Florida	24	57 N	80	30 W
The Caribbee Islands.				
Trinidada	10	15	60	17
Tobago W. End	11	10	59	10
Granado	11	57	60	20
Barbadoes	12	58	58	50
St. Vincent	13	12	60	12
St. Lucia	13	55	60	04
Martinico	14	43	60	54
Dominico	15	23	60	30
Marigallante	15	58	60	20
Guardalupa	16	10	61	15
Monserat	16	45	62	15
Antegua	17	05	61	45
Nevis	17	05	62	32
St. Christopher's	17	17	62	40
Barbuda	17	56	60	40
St. Bartholomew	17	52	62	06
St. Martin's	18	06	62	10
Anguilla	18	17	62	13
Virgin's	18	30	63	25
St. Cruize	17	52	63	30
Bieque	18	00	63	15
Porto Rico St John's	18	30	65	37
St Domingo Hispan.	18	25	69	30
P. Roval Jamaica	17	40	76	32
East End of Cuba	20	15	73	55
Havanna	22	40	82	55
Bay Hondy	22	45	83	40
Cape St Antonio	21	45	85	32
Bahama Islands.				
Bermudas	32	25 N	63	40 W
N. Point Bahama Bank	27	50 N	78	35 W

North Latitude. West Longitude.

Places Names.	Latitude North D.	M.	Longit West D.	M.
Bahama Island	26	50	79	36
Abaco S. Point	26	00	73	46
Harbour Island	25	37	76	47
Andros N. Point	25	10	78	50
Providence	25	00	77	20
Eleuthera S. point	24	40	75	56
Cat Island	24	25	75	09
Watling's Island	24	03	74	35
Rum Key	23	45	74	50
Exuma	23	22	75	55
Crooked Isle N. point	22	56	74	12
Atkin's Key	22	17	74	05
Meraparvouz	21	58	74	45
Atwood Keys	23	10	73	35
French Keys	22	40	73	40
Mayaguana	22	35	72	46
Hogsties	21	17	73	55
Hyneago W. End	20	52	73	46
Caicos Bank N. point	20	50	71	15
Turk's Island	21	35	70	08
Abrolho N. point	21	35	69	06
Platewrack	20	10	68	15

North Latitude. West Longitude.

The Coast of Carolina, Virginia, Maryland, Pensylvania, New-England, and New-foundland.

Charles Town upon Asshly River	32	45	78	46
Cape Hatteras	35	15	74	20
Cape Henry	37	00	75	24
Cape Charles	37	16	74	16
Cape Hinlopen	38	50	74	56
Long Island	40	50	72	45
New York	40	58	73	53

North Latitude. West Longitude. Cape

Places Names	Latitude North		Longit. West	
	D.	M.	D.	M
Cape Cod	42	12	68	55
Boston Entrance	42	30	69	23
Cape Sable	43	50	64	58
Island Sable	44	20	59	01
Cape Britain	46	00	58	30
Quebeck	46	55	69	48
Bay of Breſt	52	10	56	57
Bell Iſland	52	07	55	35
Cape St. John	50	25	52	48
Cape Bonaviſta	49	15	52	12
Trinity Bay Entr.	48	52	52	20
Conception Bay En.	48	20	52	08
St. John's Harbour	48	00	51	39
Bay of Bulls	47	50	51	29
Cape Race	46	40	51	52
Cape St. Mary	47	10	53	23
Placentia Bay	47	45	53	58
Cape Roy	48	00	57	40

North Latitude. West Longitude.

The Coaſt of Hudſon's Bay and the Straits.

Buttons Iſles	60	25	66	27
Cape Charles	62	10	75	35
Cape Walſingham	62	35	77	55
Mansfield Iſle	61	42	80	30
Cape Jones	54	55	78	58
Rupert's River	51	30	79	26
Albany Fort	52	26	84	50
The Cubb's	54	10	82	40
C. Henrietta Maria	55	07	84	30
Port Nelſon	57	10	93	58
Cape Churchil	59	00	95	20
C. Southampton	61	55	86	48
Shark Point	64	30	82	55
Nottingham Iſle	63	30	79	53
Q. Ann's Foreland	63	48	74	45
Reſolution Iſle	61	50	65	04
Cape Farewell	59	45	46	45

North Latitude. West Longitude.

Places Names.	Latitude North		Longit. E or W.	
	D.	M	D.	M

The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.

Sound Royal	66	22	24	33
Bargarer's Point	66	20	16	35
Whales Back	65	27	20	33
Merchants Foreland	63	25	17	05
Halliford	64	30	34	43
Fair Foreland	66	20	26	27
Grim's Iſland	67	15	22	34
Weſtmania Iſles	63	30	22	54
Iſles of Fero	62	06	05	00
Beerenberg, or John Main's Iſle	71	45	04	30
Point Lookout	76	25	15	36
Horn Sound	76	45	13	36
Fair Foreland	79	20	10	52
Hacluit's Headland	79	55	11	00
Helie's Sound	78	55	21	50
Lee's Foreland	78	05	23	25
Whale's Head	77	18	21	30
Hope Iſland	76	18	23	45
Cherry or Bear Iſle	74	30	18	08
Admiralty Iſland	75	05	55	50
Fretum Borough	70	00	61	20
Cape Candenoſe	69	05	42	35
Catnoſe	65	43	35	14
Archangel	64	30	40	30
Croſs Iſland	66	31	36	33
Sweetnoſe	68	10	34	45
Kilduyn	69	30	31	20
North Cape	71	23	23	02
Surroy Iſle	71	05	16	40
Tromſound	70	25	15	30
Loefort SW. Point	68	15	09	40
Dronten	63	40	10	15
Stadland	62	10	04	38
North-bergen	60	10	05	40
Naze of Norway	57	45	07	24

North Latitude. East Longitude.

Places Names. Sea-Coast in the Sound, & Baltic Sea.	Latitude North. D.	M.	Longit. East. D.	M.	Places Names.	Latitude North. D.	M.	Longit. East. D.	M.
Maerden, or Mardel	58	19	08	57	Narva	59	27	28	25
Larwic	58	54	09	20	Revel	59	27	24	51
Chriſtiana	59	40	10	00	Riga	57	04	25	15
Maeſterland	57	53	11	45	Derwinda	57	15	22	06
Gottenberg Gat	57	50	12	15	Coningsburg	54	43	21	35
Elſenore	56	22	12	42	Dantzic	54	22	18	30
Roſtock	54	37	18	40	Wisby in Gotland	57	30	18	30
Copenhagen	55	41	12	50	Bornholm	55	15	14	45
Valſterborn	55	28	13	00	Straelſund	54	25	13	16
Uraniburg	55	54	12	58	Lubec	54	06	09	55
Calmer	56	40	16	35	Anout, or Anholt	56	50	11	06
Stockholm	59	20	19	30	Leſou, or Leſnou	57	05	10	30
Wyburg	60	52	29	16	Scaw	57	30	10	20
Petersburg	60	00	30	25					

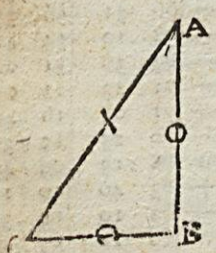
North Latitude. East Longitude. North Latitude. East Longitude.

Problems of Plane Sailing, wrought by Logarthms, *and by* Gunter's-Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſails South Weſt by South 382 Minutes, and the Difference of Latitude and Departure are required.



In the Right-angled Triangle ABC.
AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe.
ACB (or the Angle at C) the Complement of the Courſe to 90 deg.

Characters

Characters used in Navigation *and* Astronomy.

S. ſtands for Sine.
T. for Tangent.
S. c. Sine Complement. T. c. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a daſh (′).
The required Sides and Angles with a Cypher thus (°).

The Operation by Logarithms. *For the Difference of Latitude.*

As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is the S. c. of the Courſe 56d. 15m.	9.919846
To the Difference of Latitude 317.6 Minutes	2.501909

For the Departure.

As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is the S. of the Courſe 33d. 45m.	9.744739
To the Departure 212.2 Minutes	2.326802

The Operation by Gunter's Scale.

One Foot of the Compaſſes being in the Radius, or S. of 8 Points; extend the other to the Diſtance 382 Minutes, the ſaid Extent laid from S. Courſe 3 Points will reach to 212.2 Minutes, the Departure from the Meridian, and the Compaſſes kept at the ſame Diſtance will reach from the S. c. Courſe 5 Points to 317.6 Minutes, the Difference of Latitude as above.

PROB. II. The Courſe and Difference of Latitude given, to find the Diſtance and Departure.

Suppoſe a Ship ſails WSW. until the Difference of Latitude be 219 Leagues, and the Diſtance and Departure required.

The Operation by Logarithms. *For the Diſtance.*

As the S. c. of the Courſe 22d. 30m.	9.582840
To the Difference of Latitude 219 Leagues	2.340444
So is Radius	10.000000
To the Diſtance, which is 572.2 Leagues	2.757604

For

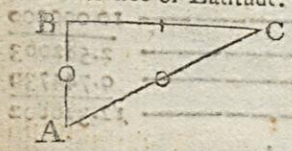
For the Departure.

As Radius	10.000000
To the Distance 572.2 Leagues found before	2.757548
So is the Sine of the Course 67 deg. 30 min.	9.965615
To the Departure 528.6 Leagues	12.723163

By Gunter.

The Compasses being extended from the S. of 2 Points, the Complement of the Course to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572.2 Leagues, the Distance, and the same Extent of the Compasses from the Sine of the Course 6 Points, will reach to 528.6 Leagues, the Departure.

PROB III. The Course and Departure given, to find the Distance and Difference of Latitude.



Suppose a Ship sails North East by East, and her Departure be 220 Minutes, the Distance and Difference of Latitude required.

By Logarithms. *For the Distance.*

As the S. of the Course 56 deg. 15 min.	9.919846
To the Departure 220 Minutes	2.342423
So is Radius	10.000000
To the Distance 264.6 Minutes	2.422577

For the Difference of Latitude.

As Radius	10.000000
To the Distance 264.6 Minutes	2.422590
So is the S. c. of the Course 33 deg. 45 min.	9.744739
To the Difference of Latitude 147 Minutes	12.167329

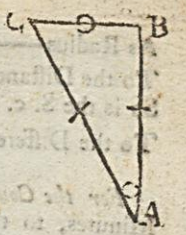
By Gunter.

The Exrent of the Compasses from the S. of the Course 5 Points to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 264.6 the Distance; and the same Extent of the Compasses from S. 3 Points the Complement of the Course, will reach to the Difference of Latitude 147 Minutes, as above.

PROB. IV. The Distance and Difference of Latitude given, to find the Course and Departure.

Sup-

Suppose a Ship sails between the North and the West 206 Miles, until the Difference of Latitude be 197 Miles, the Course and Departure required.



By Logarithms. *For the Course.*

As the Distance 206 Miles	2.313867
To the Radius	10.000000
So is the Difference of Latitude 197 Miles	2.294466
To the S. c. of the Course; which is N. 17d. 00m. West	9.980599

For the Departure.

As the Radius	10.000000
To the Distance 206 Miles	2.313867
So is the S. of the Course 17 deg. 00 min.	9.465935
To the Departure 60.23 Miles	1.779802

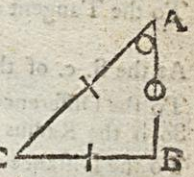
By Gunter.

For the Course. The Extent from the Distance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Course, which subtracted from 90d. is 17d. 00m. the Course N. Westerly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90d. to the Sine of the Course 17 deg. 00 min. will reach from the Distance 206 Minutes, to the Departure 60.23 Minutes as above.

PROB. V. the Distance and Departure given, to find the Course and Difference of Latitude.

Suppose a Ship sails between the South and the West 247 Minutes, until the Departure be 197 Minutes, required the Course and Difference of Latitude.



The Operation by Logarithms. *For the Course.*

As the Distance 247 Minutes	2.392697
To the Radius	10.000000
So is the Departure 197 Minutes	2.294466
To the Sine of the Course S. 52 deg. 54 min. Westerly	9.901769

For

For the Difference of Latitude.

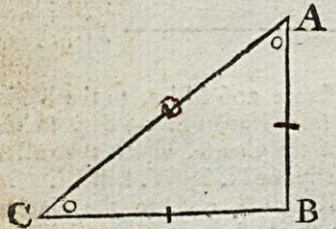
As Radius	10.000000
To the Distance 247 Minutes	2.392697
So is the S. c. of the Course 37 deg. 6 min.	9.780467
To the Difference of Latitude 149 min.	2.173164

By Gunter.

For the Course. The Extent of the Compasses from the Distance 247 Minutes, to the Departure 197 Minutes, will reach the same way from Radius S. 90 deg. to the Sine of the Course 52 deg. 54 min. South Westerly, or South West three quarters West.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to S. 37 deg. 6 min. the Complement of the Course, will reach the same way from the Distance 247 min. to the Difference of Latitude 149 min.

PROB. VI. The Difference of Latitude and Departure given, to find the Course and Distance.



Suppose a Ship sails between the South and the West, until the Difference of Latitude be 154 Leagues, and her Departure 200 Leagues; required the Course and Distance.

The Operation by Logarithms. *For the Course.*

As the Difference of Latitude 154 Leagues	2.187521
To Radius	10.000000
So is the Departure 200 Leagues	2.301030
To the Tangent of the Course 52d. 24m. South W.erly	10.113509

For the Distance.

As the S. c. of the Course 37 deg. 36 min.	9.785433
To the Difference of Latitude 154 Leagues	2.187521
So is the Radius	10.000000
To the Distance 252.5 Leagues	2.402088

By Gunter.

For the Course. The Extent of the Compasses from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, will reach from Radius or Tangent of 45 deg. to the Tangent of the Course, 52 deg. 24 min. South Westerly, or South West three quarters West.

For the Distance. The Extent from the S. 37 deg. 36 min. the Complement of the Course, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Distance 252.5 Leagues.

PROB.

PROB. VII.

This Problem ſhews the manner of working a Traverſe; and is very uſeful in keeping a Reckoning by Plane Sailing.

Example.

Suppoſe a Ship bound to a certain Port, and ſails firſt SSW. 40 minutes, then SW. 60 min. then S. by E. 63 min. then WSW. 49 min. then S. E. by S. 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance is required.

The Operation by Logarithms.

For the Difference of Latitude for the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the S.c. of the Courſe 67d. 30m.	9.965615
To the Difference of Latitude 36.95 min.	11.567675

For the Departure of the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the S. of the Courſe 22d. 30m.	9.582840
To the Departure 15.31 min.	11.184900

By Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Diſtance 40 min. that Extent in the Compaſſes laid from the Sine of the Courſe 2 Points will reach to 15.3 min. the Departure, and the Compaſſes being kept to the ſame Extent, and laid from the S. 6 Points, the Complement of the Courſe, will reach to 36.9 min. the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

The TRAVERSE-TABLE.

Courſes.	*Diſtance.*	*North.*	*South.*	*Eaſt.*	*Weſt.*
S S W.	40		37.0		15.3
S W.	60		42.4		42.4
S by E.	63		61.8	12.3	
W S W.	49		18.8		45.3
SE by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the TABLE.

In placing the Difference of Latitude and Departure in their proper Columns, obſerve, that if the Courſe be Northerly, the Difference of Latitude is put in the North Column; if it be Southerly, in the South Column: and if the Courſe be Eaſterly, the Departure is put in the Eaſt Column; if Weſterly, in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the Difference of Latitude appears to be 206.6 Minutes South, becauſe there is nothing in the North Column; The Departure 59.6 Minutes Weſt, becauſe by ſo much the Weſt Column exceeds the Eaſt: then by this Difference of Latitude and Departure, find the Direct Courſe and Diſtance as follows.

The Operation by the Logarithms. *For the direct Courſe.*

As the Difference of Latitude 206.6 min.	2.315130
To the Radius	10.000000
So is the Departure 59.6 min.	1.775246
To the T. of the Courſe 16d. 5m. South Weſterly, becauſe the South and Weſt Columns exceeds the North and Eaſt	9.460116

For the Diſtance.

As the S.c. of the Courſe 16d. 5m.	9.982660
To the Difference of Latitude 206.6 min.	2.315130
So is Radius	10.000000
To the Diſtance required 215 min.	2.332470

By

By Gunter. *For the direct Course.*

The Extent of the Compasses from the Difference of Latitude 206.6m. to the Departure 59.6m. will reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Course required.

For the Distance.

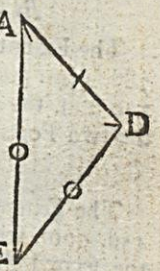
The Extent from S. 73 deg. 55 min. the Complement of the Course, to S. 90d. *viz.* Radius, will reach from the Difference of Latitude 206.6m. to the Distance 215 Minutes.

Oblique-angled Plane Triangles, applied in PROBLEMS *of* Plane - Sailing, *and wrought by* Logarithms, *and* Gunter's-Scale.

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian, a Ship sails from the Northermost SE. 206 Miles, another Ship sails from the Southermost North East by North, a certain Number of Miles, and meets with the first Ship; the Distance between these two Ports, and the Distance sailed by the second Ship is required.



In the Triangle ADE.

A and E represents the two Ports. AD the first Ship's Distance. E D the second Ship's Distance. A E the Distance between the two Ports.

The Operation by Logarithms. *For the Distance between the two Ports.*

As S. AED 33d. 45m.	—— Co. Ar.	0.255261
To AD the first Ship's Distance 206 min.	——	2.313867
So is S. ADE 101d. 15m. which subtracted from 180d.	——	9.991574
To AE the Distance between the two Ports 363.7 min.	——	2.560702

In all Proportions where Radius is not one of the three given Terms, to save the Labour of subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm

rithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarithm Sine found in the Table is, 9.744739, wherefore beginning at the Left-hand, ſay 9 from 9 there remains 0; 7 from 9 there remains 2; 4 from 9 there remains 5; 4 from 9 there remains 5; 7 from 9 there remains 2; 3 from 9 there remains 6; 9 from 10 there remains 1; So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which added to the other two Logarithms, and from that Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. ſubtract the Degree and Minute from 180d. the Sine of the Remainder (called the Supplement) is the Sine required.

For the Second Ship's Diſtance.

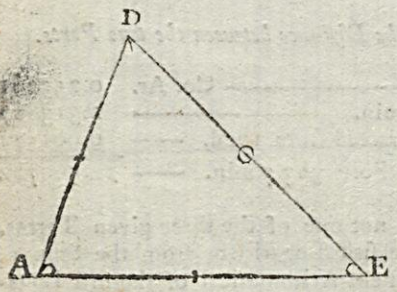
As S. AED. 33d. 45m.	Co. Ar.	0.255261
To AD the firſt Ship's Diſtance 206 min.		2.313867
So is S. DAE 45d. 00m.		9.849485
To DE the ſecond Ship's Diſtance, 262.2 min.		2.418613

By Gunter. *For the Diſtance between the two Ports.*

The Extent of the Compaſſes from S. of 33 deg 45 min. to the S. ADE 78d. 45m. (*viz.* the Supplement of 101d. 15m. to 180d.) will reach from 206 min. the firſt Ship's Diſtance, to 363.7 min. the Diſtance between the two Ports, as above.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33d. 45m. to the S. of 45d. 00m. will reach from 206 min. the firſt Ship's Diſtance, to 262.2 min. the ſecond Ship's Diſtance required.



PROB. II.

Two Sides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third Side.

Example.

Suppoſe two Ports, whoſe Bearing is North Eaſt and South Weſt, diſtant 396 Miles, a Ship at the northermoſt ſails South South Eaſt, and another Ship at the ſouthermoſt ſails thence 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ship's Diſtance are required.

In

In the Triangle A D E.

A repreſents the Southermoſt Port, D the Northermoſt.
AD the Diſtance between the two Ports.
DE the Courſe and Diſtance ſailed by the firſt Ship.
AE the Courſe and Diſtance ſailed by the ſecond Ship.

The Operation by Logarithms. *For the ſecond Ship's Courſe.*

As AE the ſecond Ship's Diſtance 518 min. —— Co. Ar. 7.285671
To S. ADE 67d. 30m. —— 9.965615
So is AD the Diſtance between the two Ports 396 min. —— 2.597695
To S. AED 44 deg. 56 min. —— 19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and ſubtracted from 180d. gives 67d. 34m. the Angle at A, which makes neareſt 6 Points, and 6 Points reckon'd from the North Eaſt to the Southward gives ESE. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. ADE 67d. 30m. —— Co. Ar. 0.034385
To AE the ſecond Ship's Diſtance 518m. —— 2.714330
So is S. DAE 67 deg. 34 min. —— 9.965824
To DE the firſt Ship's Diſtance 518.3 min. —— 12.714539

By Gunter. *For the ſecond Ship's Courſe.*

The Extent of the Compaſſes from 518 min. to S. 67d. 30m. will reach from 396 min. to S. 44 deg. 56 min. which added to the Angle at D, and the Sum ſubtracted from 180d. gives 67d. 34m. the Angle at A, as above.

For the firſt Ship's Diſtance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34m. to 518.3 m. the Ship's Diſtance, as above.

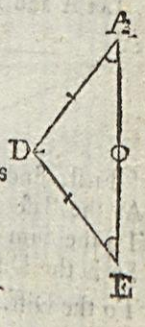
PROB. III.

Two Sides and the contained Angle given, to find the other Angles and Side.

Example.

Suppoſe two Ships ſail from one Port; one ſails NE. 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships is required.

Let D repreſent the Port, DA the firſt Ship's diſtance, and DE the ſecond.



	Miles
	140
	115
	255
Diff.	25

The Operation by Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 min. —— Co. Ar. 7.593460
To the Difference of the said Sides 25 min. ——— — —— 1.397940
So is the T. of half the Sum of their opposite Angles 50d. 37m. 10.085698
To the T. of half their Difference, which is 6d. 48m. —— 19.077098

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference subtracted from it gives 43d. 49m. the lesser Angle DAE. Wherefore the Bearing of the two Ships is N. Easterly, and South Westerly 1d. 11m. *For the Distance of the two Ships.*

As S. AED 57d. 25m. ——————————— Co. Ar. 0.074374
To AD the first Ship's Distance 140 min. ——————— 2.146128
So is S. ADE 78d. 45m. ——————————— 9.991574
To AE the Distance of the Ships, 163 min. ———————12.212076

By Gunter. *For the Bearing of the two Ships.*

The Extent of the Compasses from the Sum of the Sides 255m. to their Difference 25m. will reach from the T. of the Half Sum of the required Angles 50d. 37m. to the T. of half the Diff. of the said Angle 6d. 48m.

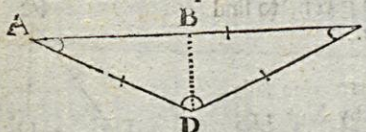
In this Proportion by *Gunter*, the Practitioner may be at a Loss, because the Point T. 50d. 37m. would fall beyond the T. of 45d. was the Tangent Line continued; To remedy which, place the Extent from 255 to 25, from the T. 45d. and it will reach to the T. of 5d. 37m. then letting one Point stand at 5d 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. will fall on the T. 6d. 48m. required. *For the Distance of the Ships.*

The Extent from the Sine of 57d. 25m. to the Sine of 78d. 45m. will reach from 140m. to 163m.

PROB. IV. Three Sides being given, to find the Angles.

Example. Suppose there are two Ports both in one Latitude, distant 536 Miles; a Ship sails from the Eastermost 306 Miles between the South and the West; Another Ship sails from the Westermost 290 Miles, and meets with the first Ship. The Course that each Ship hath steered is required.

Let A and E represent the two Ports, D the Place where the Ships meet.



This Question is resolv'd by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles A B D and EBD, then the Operation is as follows;

First, find the Segment of the Base BE, thus,

As the Base AE, 536 Miles —— —— —— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596 Miles — — — 2.775246
So is the Difference of the said Sides 16 Miles —— —— 1.204120
To the Diff. of the Segments of the Base, which is 17.8 Miles 11.250201

The

The whole Base ——— 536 min.
The Difference of the Segment is —— 17.8
Sum is ——— 553.8
Half Sum ——— 276.9 the greater Segment BE.

Then say, *For the first Ship's Course.*

As DE the first Ship's Distance 306 min. ——— 2.485721
To Radius ——— 10.000000
So is the greatest Segment BE 276.9 min. ——— 2.442323
To S.c. BED 25d. 9m. ——— 9.956602

The Angle at E is the Course from the West Southerly, so the first Ship steers South 64d. 51m. West, or SW. by W. three quarters West almost.

For the second Ship's Course.

As AD the second Ship's Distance 290 min. ——— Co. Ar. 7.537602
To Sine AED 25d. 9m. ——— 9.628378
So is DE the first Ship's Distance 306 ——— 2.485721
To Sine DAE 26d. 39m. ——— 9.651701

The Angle at A is the Course from the East Southerly, so the second Ship steers South 63d. 21m. East, or SE. by E. 3 quarters E. nearly.

By Gunter. *For the Difference of the Segments of the Base.*

The Extent of the Compasses from the Base AE 536 min. to the Sum of the Sides 596m. will reach from the Difference of the Sides 16, to the Difference of the Segments of the Base 17.8, with which proceed as before.

For the first Ship's Course.

The Extent from the Distance 306 min. to the greater Segment 276.9 min. will reach from Radius or Sine 90d. to Sine 64d. 51m. the Complement of BED 25d. 9m. required.

For the second Ship's Course.

The Extent from 290m. the second Ship's Distance, to 306 min. the first Ship's Distance, will reach from the Sine 25d. 9m. to the Sine 26d. 39m. the Angle at A required.

PROB. V.

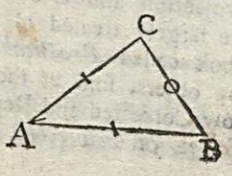
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships sails from one Port at A; the first sails East 335 Miles to B, the second sails East 14d. 40m. North, 271 Miles to C; I demand how far they are asunder, and what is the Course from the Ship at C, to that at B?

In the Triangle ABC,
there is given,

AB 335
AC 271
BAC 14d. 40m. } BC required.



This

This Case requires a double Operation ——— AB 335
1. By the third Case to find the Angles ——— AC 271
2. By the first Case to find the Side required ——— Sum is 606
Diff. is 64

The first Operation.

As the Sum of the Sides AB and AC 606 Miles — Co. Ar. 7.217527
To their Difference ——— 64 ——— 1.806180
So is the T. of half Sum of the Angles 82d. 40m. ——— 10.890441
To T. half their Difference ——— 39d. 22m. ——— 9.914148

By which you will find the Angle ABC, to be 43d. 18m.

The second Operation.

As S. ABC 43d. 18m. ——— Co. Ar. 0.163791
To the Side AC 271 Miles ——— 2.432969
So is S. BAC 14d. 40m. ——— 9.403455
To the Side BC 100 Miles ——— 12.000215

The Angle at B is found to be 43d. 18m. and the Line AB lying East and West, the Course from C to B is East 43d. 18m. South, or South East 1d. 42m. Easterly; and the Distance 100 Miles.

By Gunter. *For the Angle at* B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the Sides, will reach from the Tangent of 82d. 40m. half the Sum of the unknown Angles; To the Tangent of 39d. 22m. half their Difference, which being found, proceed according to former Directions, to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the Side AC, to 100 Miles, the Side BC, as above.

Thus much for sailing by the *Plane Chart*; which being of some Use in short Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit; but nevertheless would advise all that take Charge of Ships never to content themselves with the Use of the *Plane Chart* only; being so apparently false in itself, and so unsafe for Practice: Nor are we under any Necessity to trust to it, the Defect thereof being now sufficiently supplied by Mr. *Wright*'s True Chart, commonly called *Mercator*'s, the Projection and Use of which (both in single Questions and Traverses) are largely treated of and rendered as easy as the *Plane Chart*, in the Book called *Practical Navigation*, (and at this Time treated of by many others, sold at the same Place) first set forth by Mr. *John Seller*, and now Corrected and Reprinted for W. and J. MOUNT, T. PAGE and SON, on *Tower-hill*, with many useful Additions.

A Large and very useful

TABLE
OF
DIFFERENCE
OF
Latitude and *Departure*
IN
MINUTES and Tenth Parts,
TO
Every *Degree* and *Quarter-Point*
OF THE
COMPASS,
For the Exact Working of a
TRAVERSE.

LONDON: Printed for W. and J. MOUNT,
T. PAGE and SON, on *Tower-Hill*.

Diff.	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	0 .0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.1	02.0	00.1	02.0	00 1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04 0	00.1	04.0	00.2	04.0	00.2	04 0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05 0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06 0	00.3	06.0	00 4	06.0	00.5	6
7	07.0	00.1	07 0	00.2	07.0	00.3	07.0	00 4	07 0	00.5	07 0	00.6	7
8	08 0	00.1	08 0	00 3	08.0	00.4	08 0	00.4	08 0	00.6	08.0	00.7	8
9	09.0	00 2	09.0	00 3	09.0	00 4	09.0	00 5	09 0	00.6	09.0	00 8	9
10	10 0	00 2	10.0	00 4	10.0	00.5	10.0	00.5	10.0	00 7	10.0	00.9	10
11	11.0	00 2	11.0	00 4	11.0	00.5	11.0	00.6	11 0	00 8	11.0	01.0	11
12	12 0	00 2	12.0	00.4	12.0	00 6	12 0	00.6	12.0	00 8	12.0	01.0	12
13	13 0	00 2	13.0	00.5	13 0	00.6	13 0	00 7	13.0	00.9	12 9	01.1	13
14	14.0	00.2	14 0	00.5	14.0	00.7	14.0	00.7	14 0	01.0	13 9	01 2	14
15	15 0	00 3	15.0	00 5	15.0	00.7	15.0	00 8	15 0	01.0	14.9	01.3	15
16	16.0	00.3	16 0	00 6	16 0	00 8	16.0	00 8	16 0	01.1	15.9	01 4	16
17	17.0	00.3	17 0	00 6	17.0	00.8	17.0	00 9	17 0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00 6	18 0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19 0	00 3	19 0	00 7	19.0	00 9	19 0	01 0	19.0	01.3	18.9	01.7	19
20	20 0	00.4	20.0	00.7	20.0	01 0	20 0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21 0	00.7	21.0	01.0	21.0	01 1	20 9	01.5	20.9	01 8	21
22	22.0	00 4	22.0	00 8	22.0	01 1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23 0	00.4	23.0	00 8	23 0	01.1	23 0	01.2	22.9	01 6	22.9	02.0	23
24	24 0	00 4	24 0	00 8	24 0	01 2	24 0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25 0	00.9	25.0	01.2	25 0	01.3	24.9	01 7	24.9	02.2	25
26	26.0	00.5	26 0	00.9	26.0	01.3	26 0	01 4	25 9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00 9	27.0	01 3	27.0	01 4	26 9	01.9	26.9	02.4	27
28	28.0	00.5	28 0	01.0	28.0	01 4	28 0	01 5	27.9	02.0	27.9	02.4	28
29	29 0	00 5	29.0	01.0	29.0	01.4	29.0	01.5	28 9	02.0	28.9	02 5	29
30	30 0	00 5	30 0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02 6	30
31	31.0	00.5	31 0	01 1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00 6	32 0	01 1	32.0	01.6	32.0	01.7	31.9	02 2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02 9	33
34	34 0	00 6	34 0	01.2	34 0	01 7	34.0	01.8	33 9	02.4	33.9	03 0	34
35	35.0	00.6	35.0	01.2	35 0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36 0	00.6	36.0	01.3	36.0	01 8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01 3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03 2	37
38	38 0	00.7	38.0	01.3	38 0	01.9	37.9	02.0	37 9	02.7	37.9	03 3	38
39	39 0	00.7	39 0	01.4	39.0	01.9	38.9	02.0	38 9	02.7	38.9	03.4	39
40	40 0	00 7	40 0	01.4	40.0	02 0	39.9	02.1	39.9	02 8	39.8	03.5	40
41	41 0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42 0	00 7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43 0	00 8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44 0	00.8	44 0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00 8	45.0	01.6	44 9	02.2	44 9	02.4	44.9	03.1	44.8	03 9	45
46	46.0	00 8	46.0	01 6	45.9	02 3	45 9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00 8	47.0	01 6	46.9	02.3	46.9	02.5	46 9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49 0	00.9	49.0	01.7	48 9	02.4	48 9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01 7	49.9	02.5	49.9	02.6	49.9	03 5	49.8	04 4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	89 Deg.		88 Deg.		7½ Point		87 Deg		86 Deg		85 Deg.		

Dist.	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.8	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.1	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7½ Point		87 Deg.		86 Deg.		85 Deg.		

Diff.	½ Point		6 Deg.		7 Deg.		8 Deg.		¼ Point		9 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00 1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02 0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03 0	00.4	03.0	00.4	03.0	00.4	03 0	00.5	3
4	04.0	00.4	04.0	00.4	04 0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05 0	00.5	05.0	00.5	05 0	00.6	05.0	00.7	04 9	00.7	04.9	00.8	5
6	06.0	00.6	06 0	00.6	06 0	00.7	05.9	00.8	05 9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06 9	00.9	06 9	01.0	06.9	01.0	06 9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08 9	01 2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01 2	09.9	01.4	09 9	01.5	09 9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01 3	10.9	01 5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01 5	11.9	01 7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12 9	01 6	12.9	01.8	12.9	01 9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02 2	14 8	02.3	15
16	15.9	01.6	15.9	01.7	15 9	01 9	15 8	02.2	15 8	02 3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16 9	02.1	16 8	02.4	16 8	02.5	16 8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02 6	17.8	02 8	18
19	18 9	01.9	18.9	02.0	18 9	02 3	18.8	02.6	18 8	02.8	18 8	03 0	19
20	19.9	02.0	19.9	02.1	19.8	02 4	19 8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20 8	02 6	20 8	02.9	20.8	03 1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02 4	22 8	02 8	22.8	03.2	22.8	03 4	22.7	03 6	23
24	23.9	02.4	23.9	02.5	23.8	02 9	23.8	03.3	23.7	03.5	23.7	03 8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24 8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25 9	02.7	25.8	03 2	25.7	03.6	25.7	03 8	25.7	04 1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04 2	27
28	27.9	02.7	27.8	02.9	27.8	03 4	27 7	03.9	27 7	04.1	27.7	04 4	28
29	28 9	02.8	28.8	03 0	28 8	03.5	28 7	04 0	28 7	04.3	28 6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03 7	29.7	04.2	29.7	04.4	29 6	04.7	30
31	30 8	03.0	30.8	03.2	30 8	03.8	30 7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03 3	31.8	03 9	31.7	04 5	31 7	04.7	31 6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32 6	05.2	33
34	33 8	03.3	33.8	03.6	33.7	04.1	33.7	04 7	33.6	05 0	33.6	05.4	34
35	34 8	03.4	34.8	03.7	34.7	04 3	34.7	04.9	34 6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03 8	35.7	04.4	35.6	05 0	35.6	05 3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04 5	36 6	05 1	36 6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37 6	05.6	37.5	05 9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38 6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39 6	05 6	39.6	05.9	39 5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43 8	04.6	43.7	05 4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05 5	44 6	06.3	44.5	06 6	44 4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05 6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07 3	47
48	47.8	04.7	47.7	05.0	47.6	05 9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06 0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	7½ Points		84 Deg.		83 Deg.		82 Deg.		7 ¼ Point		81 Deg.		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¼ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50 8	05.0	50 7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05 4	51.6	06 3	51.5	07 2	51.4	07.6	51.4	08 1	52
53	52.7	05 2	52 7	05.5	52.6	06.5	52.5	07.4	52 4	07.8	52.3	08 3	53
54	53.7	05 3	53.7	05.6	53.6	06.6	53 5	07.5	53 4	07.9	53.3	08.4	54
55	54.7	05 4	54.7	05.7	54 6	06.7	54 5	07.7	54.4	08.1	54.3	08 6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55 5	07 8	55.4	08 2	55 3	08.8	56
57	56.7	05.6	56.7	06 0	56.6	06 9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05 7	57.7	06.1	57.6	07.1	57.4	08 1	57 4	08 5	57.3	09.1	58
59	58.7	05 8	58.7	06 2	58.6	07 2	58 4	08.2	58 4	08 7	58.3	09.2	59
60	59.7	05 9	59.7	06 3	59.5	07.3	59 4	08.4	59 4	08 8	59.3	09 4	60
61	60 7	06 0	60 7	06.4	60 5	07.4	60 4	08.5	60.3	08 9	60.2	09 5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61 3	09 1	61.2	09.7	62
63	62.7	06.2	62 7	06.6	62.5	07.7	62.4	08.8	62.3	09 2	62.2	09 9	63
64	63.7	06 3	63.6	06.7	63 5	07.8	63.4	08.9	63 3	09 4	63 2	10 0	64
65	64.7	06 4	64 6	06.8	64 5	07.9	64 4	09.0	64.3	09.5	64 2	10.2	65
66	65 7	06 5	65.6	06.9	65 5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09 3	66.3	09 8	66.2	10.5	67
68	67.7	06 7	67 6	07.1	67.5	08.3	67.3	09 5	67.3	10.0	67.2	10.6	68
69	68 7	06 8	68.6	07.2	68.5	08.4	68 3	09.6	68.3	10.1	68.2	10.8	69
70	69 7	06.9	69 6	07 3	69.5	08.5	69.3	09 7	69..	10 3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70 3	09.9	70.2	10 4	70.1	11 1	71
72	71.7	07.1	71 6	07.5	71.5	08.8	71 3	10.0	71.2	10.6	71 1	11 3	72
73	72.6	07.2	72 6	07.6	72.5	08.9	72.3	10.2	72.2	10 7	72.1	11 4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73 3	10.3	73 2	10 9	73.1	11.6	74
75	74.6	07.3	74 6	07.8	74.4	09.1	74 3	10.4	74.2	11.0	74.1	11.7	75
76	75 6	07 4	75.6	07 9	75.4	09.3	75 3	10.6	75.2	11.1	75.1	11.9	76
77	76 6	07.5	76.6	08.0	76 4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07 6	77 6	08.1	77 4	09.5	77.2	10.9	77.2	11 4	77 0	12.2	78
79	78.6	07.7	78 6	08.3	78.4	09.6	78 2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08 4	79.4	09.8	79 2	11.1	79.1	11 7	79.0	12.5	80
81	80.6	07 9	80 6	08 5	80 4	09.9	80.2	11.3	80 1	11.9	80.0	12.7	81
82	81.6	08 0	81.5	08.6	81 4	10.0	81.2	11.4	81 1	12.0	81 0	12 8	82
83	82.6	08 1	82.5	08.7	82.4	10 1	82 2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83 5	08.8	83.4	10 2	83.2	11.7	83.1	12 3	83.0	13.1	84
85	84.6	08.3	84 5	08.9	84 4	10.4	84.2	11 8	84.1	12 5	84.0	13.3	85
86	85.6	08.4	85 5	09.0	85.4	10 5	85.2	12.0	85 1	12 6	84 9	13.4	86
87	86.6	08 5	86 5	09.1	86.3	10 6	86.2	12.1	86.0	12.8	85 9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10 7	87.1	12 2	87.0	12.9	86 9	13.8	88
89	88 6	08 7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13 9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13 2	88.9	14 1	90
91	90.6	08.9	90.5	09.5	90 3	11.1	90 1	12 7	90.0	13.3	89.9	14 2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12 8	91 0	13 5	90.9	14.4	92
93	92 6	09.1	92 5	09.7	92 3	11.3	92 1	12 9	92.0	13 6	91.9	14.5	93
94	93.5	09.2	93 5	09.8	93.3	11 5	93.1	13.1	93 0	13 8	92 8	14.7	94
95	94.5	09 3	94.5	09 9	94.3	11.6	94 1	13.2	94 0	13 9	93.8	14 9	95
96	95 5	09 4	95.5	10.0	95 3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96 0	14 2	95.8	15 2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97 0	13.6	96 9	14 4	96.8	15 3	98
99	98 5	09 7	98.5	10.3	98.3	12.1	98 0	13.8	97.9	14.5	97 8	15 5	99
100	99.5	09.8	99 4	10.4	99.2	12.2	99.0	13.9	98 9	14.7	98.8	15.6	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		

Diff.	10 Deg.		11 Deg.		1 Point		12 Deg		13 Deg		14 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	10.9	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Diff.	10 Deg.		11 Deg		1 Point		12 Deg.		13 Deg.		14 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	85.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	95.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.6	97.0	24.2	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	80 Deg.		79 Deg		7 Points		78 Deg.		77 Deg.		76 Deg.		

Diff.	1¼ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	0 .9	00 6	01.9	00.6	01.9	00 6	2
3	02.9	00 7	02.9	00 8	02.9	00 8	02.9	00.6	02.9	00.9	02.9	00.9	3
4	03 9	01.0	03 9	01.0	03 8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01 2	04 8	01 3	04.8	01.4	04.8	01.5	04 8	01.5	04.8	01 5	5
6	05.8	01 5	05 8	01.5	05 8	01.7	05.7	01.7	05.7	01.8	05.7	01 9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02 2	07.7	02.3	07 6	02.3	07.6	02.5	8
9	08 7	02 2	08 7	02.3	08.7	02.5	08 6	02.6	08 6	02.6	08.6	02.8	9
10	09.7	02 4	09.7	02 6	09.6	02.8	09.6	02.9	09 6	02 9	09.5	03.1	10
11	10 7	02 7	10.6	02.8	10.6	0 ,0	10.5	03 2	10 5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11 5	03.3	11 5	03 5	11.5	03.5	11.4	03.7	12
13	12 6	03 2	12.6	03 4	12.5	03.6	12 4	03.8	12.4	03.8	12 4	04.0	13
14	13.6	03 4	13 5	03 6	13 5	03.9	13.4	04.1	13 4	04 1	13 3	04.3	14
15	14.5	03.6	14 5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15 5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04 1	16 4	04.4	16 3	04 7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17 4	04.7	17 3	05 0	17.2	05.2	17.2	05 3	17 1	05.6	18
19	18.4	04 6	18.4	04.9	18.3	05.2	18.2	05 5	18.2	05.6	18.1	05 9	19
20	19 4	04 9	19 3	05.2	19.2	05 5	19 1	05.8	19.1	05 8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06 1	20.1	06 1	20,0	06 5	21
22	21.3	05.3	21.2	05 7	21.1	06 1	21.1	06.4	21.0	06 4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23 3	05 8	23.2	06.2	23.1	06.6	23.0	07 0	22.9	07.0	22.8	07.4	24
25	24 2	06.1	24 1	06.5	24 0	06.9	23.9	07.3	23.9	07.3	23 8	07 7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24 9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	20.0	07.4	25,8	07.8	25 8	07.9	25.7	08.3	27
28	27.2	06 8	27.0	07 2	26.9	07.7	26 8	08.1	26 8	08 2	26.6	08 7	28
29	28.1	07.0	28.0	07.5	27.9	08 0	27.8	08.4	27 7	08.5	27.6	09.0	29
30	29 1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08 8	28.5	09.3	30
31	30.1	07.5	29 9	08.0	29.8	08 5	29.7	09 0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30 9	08.3	30.8	08 8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08 0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08 3	32 8	08.8	32.7	09.4	32.5	09 9	32.5	09.9	32.3	10.5	34
35	33 9	08.5	33.8	09.1	33,6	09.6	33.5	10.2	33 5	10.2	33.3	10.8	35
36	34 9	08.7	34 8	09 3	34 6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.5	37
38	36.9	09.2	36.7	09.8	36 5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37 3	11.4	37.1	12.0	39
40	38.8	09.7	38 6	10 4	38 5	11 0	38.3	11.6	38 3	11.7	38 0	12.4	40
41	39.8	10.0	39 6	10.6	39 4	11.3	39.2	11 9	39.2	12.0	39.0	12.7	41
42	40.7	10,2	40 6	10 9	40.4	11.6	40 2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42 1	12.8	42.1	12 9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43 0	13.1	42.8	13.9	45
46	44 6	11.2	44 4	11.9	44 2	12.7	44.0	13.4	44 0	13.4	43 7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45 0	13.6	44.9	13.7	44.7	14.5	47
48	46 6	11 7	46.4	12.4	46.1	13 2	45.9	13.9	45.9	14 0	45.7	14 8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	6¼ Point		75 Deg.		74 Deg.		6½ Point		73 Deg		72 Deg.		

Dist.	1½ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53 6	16.2	53 5	16.4	53.3	17.3	56
57	55.3	13 9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14 3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64 1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65 4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66 0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20 3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68 6	18.4	68.3	19 6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20 9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	18.9	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75 9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.3	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79 2	21 2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79 4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22 3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84 6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26 1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88 9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91 3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6½ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		

Diff.	19 Deg.		1¼ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.5	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.2	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.9	06.8	18.7	07.2	18.5	07.5	18.3	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.5	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	71 Deg.		6½ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Diff.	19 Deg.		1¼ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.0	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.8	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.8	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21 6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63 0	22.9	62.6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66 3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.2	26 2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26 9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71 9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28 0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	25.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29 4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.3	27.7	80.0	28.6	79.9	29.1	79 4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29 0	80.8	29 4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29 8	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.7	82.9	29.6	82.7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	87.9	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.6	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	71 Deg.		64 Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

100 A TABLE of DIFFERENCE

Diff.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.8	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.6	22.7	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	67 Deg.		66 Deg.		65 Deg.		5½ Point		64 Deg.		63 Deg.		

Diff.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46,9	19,9	46,6	20,7	46,2	21,6	46,1	21,8	45 8	22 4	45 4	23 2	51
52	47,9	20,3	47,5	21,1	47,1	22,0	47,0	22,2	46,7	22.8	46.3	23 6	52
53	48,8	20,7	48,4	21,6	48,0	22,4	47,9	22,7	47.6	23 2	47.2	24.1	53
54	49,7	21,1	49,3	22,0	48,9	22,8	48,8	23,1	48,5	23 7	48.1	24 5	54
55	50,6	21,5	50,2	22,4	49,8	23,2	49,7	23,5	49,4	24.1	49.0	25 0	55
56	51,5	21,9	51,2	22,8	50,8	23,7	50,6	23.9	50.3	24 5	49 9	25.4	56
57	52,5	22,3	52,1	23,2	51,7	24,1	51,5	24,4	51.2	25 0	50.8	25.9	57
58	53,4	22,7	53,0	23,6	52,6	24,5	52,4	24,8	52,1	25.4	51.7	26.3	58
59	54,3	23,1	53,9	24,0	53,5	24,9	53,3	25,2	53,0	25 9	52.6	26.8	59
60	55,2	23,4	54,8	24,4	54,4	25,4	54,2	25,7	53,9	26.3	53.5	27.2	60
61	56,1	23,8	55,7	24,8	55,3	25,8	55,1	26,1	54,8	26 7	54 4	27.7	61
62	57,1	24,2	56,6	25,2	56,2	26,2	56,0	26,5	55.7	27.2	55.2	28.1	62
63	58,0	24,6	57,5	25,6	57,1	26,6	57,0	26,9	56.6	27.6	56.1	28 6	63
64	58,9	25.0	58,5	26,0	58,0	27,0	57,9	27,4	57.5	28.1	57.0	29.1	64
65	59,8	25,4	59,4	26,4	58,9	27,5	58,8	27,8	58.4	28.5	57.9	29.5	65
66	60,8	25,8	60,3	26,8	59,8	27,9	59,7	28,2	59,3	28 9	58 8	30.0	66
67	61,7	26,2	61,2	27,2	60,7	28,3	60,6	28,6	00.2	29.4	59.7	30.4	67
68	62,6	26,6	62,1	27,7	61,6	28,7	61,5	29,1	61,1	29.8	60.6	30.9	68
69	63,5	27,0	63,0	28,1	62,5	29,2	62,4	29,5	62,0	30.2	61.5	31.3	69
70	64,4	27,3	63,9	28,5	63 4	29,6	63,3	29,9	62,9	30.7	62.4	31.8	70
71	65,4	27,7	64,9	28,9	64,3	30,0	64,2	30,4	63.8	31 1	63 3	32.2	71
72	66,3	28,1	65,8	29,3	65,3	30,4	65,1	30,3	64 7	31.6	64 2	32.7	72
73	67,2	28,5	66,7	29,7	66,2	30,8	66,0	31,2	65.6	32.0	65.0	33.1	73
74	68,1	28,9	67,6	30,1	67,1	31,3	66,9	31,6	66,5	32.4	65 9	33.6	74
75	69,0	29,3	68,5	30,5	68,0	31,7	67,8	32,1	67,4	32.9	66.8	34.1	75
76	70,0	29,7	69,4	30,9	68,9	32,1	68,7	32,5	68,3	33.3	67.7	34 5	76
77	70,9	30,1	70,3	31,3	69,8	32,5	69,6	32,9	69,2	33.8	68.6	35.0	77
78	71,8	30,5	71,3	31,7	70,7	33,0	70,5	33,3	70,1	34.2	69.5	35.4	78
79	72,7	30,9	72,2	32,1	71,6	33,4	71,4	33,8	71.0	34.6	70 4	35.9	79
80	73,6	31,3	73,1	32,5	72,5	33,8	72,3	34,2	71.9	35.1	71.3	36 3	80
81	74,6	31,6	74,0	32,9	73,4	34,2	73,2	34,6	72.8	35 5	72.2	36.8	81
82	75,5	32,0	74,9	33,3	74,3	34,7	74,1	35,1	73.7	35.9	73.1	37.2	82
83	76,4	32,4	75,8	33,7	75,2	35,1	75,0	35,5	74.6	36.4	74.0	37.7	83
84	77,3	32,8	76,7	34,1	76,1	35,5	75,9	35,9	75.5	36.8	74.8	38.1	84
85	78,2	33,2	77,6	34,6	77,0	35,9	76,8	36,3	76,4	37.3	75.7	38.6	85
86	79,2	33,6	78,6	35,0	77,9	36,3	77,7	36,8	77,3	37 7	76.6	39.0	86
87	80,1	34,0	79,5	35,4	78,8	36,8	78,6	37,2	78,2	38.1	77.5	39 5	87
88	81,0	34,4	80,4	35,8	79,8	37,2	79,6	37,6	79.1	38.6	78.4	40.0	88
89	81,9	34,8	81,3	36,2	80,7	37,6	80,5	38,1	80,0	39.0	79.3	40.4	89
90	82,8	35,2	82,2	36,6	81,6	38,0	81,4	38,5	80,9	39.5	80.2	40 9	90
91	83,8	35,6	83,1	37,0	82,5	38,5	82,3	38,9	81,8	39.9	81.1	41.3	91
92	84,7	35,9	84.0	37,4	83,4	38,9	83,2	39,3	82,7	40.3	82.0	41.8	92
93	85,6	36,3	85,0	37,8	84,3	39,3	84,1	39,8	83.6	40.8	82.9	42.2	93
94	86,5	36,7	85,9	38,2	85,2	39,7	85,0	40,2	84,5	41.2	83 8	42.7	94
95	87,4	37,1	86,8	38,6	86,1	40,1	85,9	40,6	85.4	41.6	84.6	43.1	95
96	88,3	37,5	87,7	39,0	87,0	40,6	86,8	41,0	86.3	42.1	85.5	43.6	96
97	89,3	37,9	88,6	39,4	87,9	41,0	87,7	41,5	87.2	42.5	86 4	44 0	97
98	90,2	38,4	89,5	39,9	88,8	41,4	88,6	41,9	88.1	43.0	87.3	44.5	98
99	91,2	39,7	90,4	40,3	89,7	41,8	89,5	42,3	89,0	43.4	89.2	44.9	99
100	92,0	39,1	91,4	40,7	90,6	42,3	90,4	42,8	89.9	43.8	89.1	45.4	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	67 Deg.		66 Deg.		65 Deg.		5¼ Point		64 Deg.		63 Deg.		

Diff.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16.6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.3	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.6	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist.	28 Deg.		2¼ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.3	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.1	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.1	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	63.9	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¾ Point		59 Deg.		

Diff.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		

Diff.	32 Deg. Lat	32 Deg. Dep	33 Deg. Lat	33 Deg. Dep	3 Point. Lat	3 Point. Dep	34 Deg. Lat	34 Deg. Dep	35 Deg. Lat	35 Deg. Dep	36 Deg. Lat	36 Deg. Dep	Diff.
51	43,2	27,0	42,8	27,8	42,4	28,3	42,3	28,5	41,8	29,3	41.3	30.0	51
52	44,1	27,6	43,6	28,3	43,2	28,9	43,1	29,1	42,6	29.8	42.1	30,6	52
53	44,9	28,1	44,5	28,9	44,1	29,4	43,9	29,6	43.4	30.4	42.9	31.2	53
54	45,8	28,6	45,3	29,4	44,9	30,0	44,8	30,2	44,2	31.0	43.7	31.7	54
55	46,6	29,1	46,1	30,0	45,7	30,6	45,6	30,8	45.1	31.5	44 5	32 3	55
56	47,5	29,7	47,0	30,5	46,6	31,1	46,4	31,3	45 9	32.1	45 3	32 9	56
57	48,3	30,2	47,8	31,0	47.4	31,7	47,3	31,9	40,7	32.7	46.1	33.5	57
58	49,2	30,7	48,6	31,6	48,2	32,2	48,1	32,4	47.5	33.3	46.9	34.1	58
59	50,0	31,3	49,5	32,1	49,1	32,8	48,9	33,0	48,3	33.8	47.7	34 7	59
60	50,9	31,8	50,3	32,7	49,9	33,3	49,7	33,6	49,2	34 4	48.5	35.3	60
61	51,7	32,3	51,2	33,2	50,7	33,9	50,6	34,1	50.0	35.0	49 3	35.9	61
62	52,6	32,8	52,0	33,8	51,6	34,4	51,4	34,7	50.8	35.6	50.2	36.4	62
63	53,4	33,4	52,8	34,3	52,4	35,0	52,2	35,2	51.6	36.1	51.0	37.0	63
64	54,3	33,9	53,7	34,9	53,2	35,6	53,1	35,8	52.4	36.7	51 8	37.6	64
65	55,1	34,4	54,5	35,4	54,0	36,1	53,9	36,3	53,2	37.3	52 6	38,2	65
66	56,0	35,0	55,4	35,9	54,9	36,7	54,7	36,9	54,1	37 9	53.4	38.8	66
67	56,8	35,5	56,2	36,5	55,7	37,2	55,5	37,5	54,9	38.4	54 2	39 4	67
68	57,7	36,0	57,0	37,0	56,5	37,8	56,4	38,0	55.7	39.0	55.0	40.0	68
69	58,5	36,6	57,9	37,6	57,4	38,3	57,2	38,6	56.5	39.6	35.8	40.6	69
70	59,4	37,1	58,7	38,1	58,2	38,9	58,0	39,1	57.3	40.2	56.6	41.1	70
71	60,2	37,6	59,5	38,7	59,0	39,4	58,9	39,7	58 2	40.7	57.4	41.7	71
72	61,1	38,2	60,4	39,2	59,9	40,0	59,7	40,3	59,0	41.3	58.2	42.3	72
73	61,9	38,7	61,2	39,8	60,7	40,6	60,5	40,8	59.8	41.9	59.1	42.9	73
74	62,8	39,2	62,1	40,3	61,5	41,1	61,3	41,4	60.6	42.4	59 9	43 5	74
75	63,6	39,7	62,9	40,8	62,4	41,7	62,2	41,9	61,4	43.0	60.7	44.1	75
76	64,4	40,3	63,7	41,4	63 2	42,2	63,0	42,5	62,3	43.6	61.5	44.7	76
77	65,3	40,8	64,6	41,9	64,0	42,8	63,8	43,1	63,1	44.2	62.3	45.3	77
78	66,1	41,3	65,4	42,5	64,9	43,3	64,7	43,6	63.9	44 7	63.1	45.8	78
79	67,0	41,9	66,3	43,0	65,7	43,9	65,5	44,2	64 7	45.3	63.9	46.4	79
80	67,8	42,4	67,1	43,6	66,5	44,4	66,3	44,7	65.5	45.9	64.7	47.0	80
81	68,7	42,9	67,9	44,1	67,4	45,0	67,1	45,3	66,4	46.5	65 5	47.6	81
82	69,5	43,4	68,8	44,7	68,2	45,6	68,0	45,9	67,2	47.0	66.3	48.2	82
83	70,4	44,0	69,6	45,2	69,0	46,1	68,8	46,4	68,0	47.6	67.1	48 8	83
84	71,2	44,5	70,5	45,7	69,8	46,7	69,6	47,0	68 8	48.2	68.0	49.4	84
85	72,1	45,0	71,3	46,3	70,7	47,2	70,5	47,5	69,6	48.8	68.8	50.0	85
86	72,9	45,6	72,1	46,8	71,5	47,8	71,3	48,1	70,5	49.3	69 6	50.5	86
87	73,8	46,1	73,0	47,4	72,3	48,3	72,1	48,6	71.3	49.9	70 4	51.1	87
88	74,6	46,6	73,8	47,9	73,2	48,9	73,0	49,2	72.1	50.5	71.2	51.7	88
89	75,5	47,2	74,6	48,5	74,0	49,4	73,8	49,8	72.9	51.0	72.0	52.3	89
90	76,3	47,7	75,5	49,0	74,8	50,0	74,6	50,3	73.7	51.6	72.8	52.9	90
91	77,2	48,2	76,3	49,6	75,7	50,6	75,4	50,9	74.5	52.2	73.6	53.5	91
92	78,0	48,7	77,2	50,1	76,5	51,1	76,3	51,4	75.4	52.8	74.4	54.1	92
93	78,9	49,3	78,0	50,6	77,3	51,7	77,1	52,0	76,2	53.3	75.2	54 7	93
94	79,7	49,8	68,8	51,2	78,2	52,2	77,9	52,6	77,0	53.9	76.0	55 3	94
95	80,6	50,3	79,7	51,7	79,0	52,8	78,8	53,1	77.8	54.5	76.9	55.8	95
96	81,4	50,9	80,5	52,3	79,8	53,3	79,6	53,7	78,6	55.1	77.7	56.4	96
97	82,3	51,4	81,4	52,8	80,7	53,9	80,4	54,2	79.5	55.6	78.5	57.0	97
98	83,1	51,9	82,2	53,4	81,5	54,4	81,2	54,8	80,3	56.2	79.3	57.6	98
99	84,0	52,5	83,0	53,9	82,3	55,0	82,1	55,4	81,1	56.8	80.1	58.2	99
100	84,8	53,0	83,9	54,5	83,1	55,6	82,9	55,9	81,9	57.4	80.9	58.8	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		

Diff.	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	4¼ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Diff	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39 4	32 4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41 0	32.0	40 4	32 7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41 0	33.6	40.6	34 1	53
54	43 4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34 7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35 9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46 3	34.9	45.7	35 7	45.1	36.5	44 8	36.8	44.4	37.3	58
59	47.4	35 1	47.1	35.5	46 5	36.3	45.8	37.1	45.6	37 4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36 7	48.1	37.6	47.4	38.4	47.2	38 7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39 9	62
63	50.6	37.5	50.3	37.9	49.6	38 8	49.0	39 6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50 4	39.4	49.7	40 3	49 5	40 6	49.0	41 1	64
65	52.2	38.7	51 9	39.1	51.2	40 0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53 5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43 4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44 7	54 9	45 0	54.4	45.6	71
72	57.8	42 9	57.5	43.3	56.7	44 3	56.0	45 3	55.7	45 7	55.2	46.3	72
73	58.6	43.5	58 3	43.9	57 5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57 2	46.9	56.7	47.6	74
75	60.2	44.7	59 9	45.1	59.1	46 2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60 7	45.7	59.9	46.8	59 1	47.8	58.7	48.2	58.2	48 9	76
77	61.8	45 9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62 3	46.9	61.5	48.0	60 6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64 3	47.7	63 9	48.1	63 0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64 7	48.7	63.8	49 9	62 9	51 0	62.6	51.4	62.0	52 1	81
82	65.9	48.8	65.5	49.3	64 6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49 4	66 3	49 9	65.4	51.1	64.5	52 2	64 2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64 3	54 0	84
85	68.3	50.6	67 9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67 8	52.9	66.8	54.1	66.5	54.6	65 9	55 3	86
87	69.9	51.8	69.5	52 4	68.6	53.6	67.6	54 7	67.3	55.2	66 6	55 9	87
88	70.7	52 4	70.3	53.0	69.3	54 2	68.4	55 4	68.0	55 8	67.4	56.6	88
89	71.5	53.0	71.1	53 6	70.1	54.8	69.2	56.0	68 8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56 6	69 6	57.1	68 9	57.9	90
91	73.1	54 2	72.7	54.8	71.7	56 0	70.7	57.3	70.3	57.7	69.7	58.3	91
92	73.9	54 8	73.5	55 4	72 5	56.6	71.5	57 9	71.1	58.4	70.5	59 1	92
93	74.7	55.4	74 3	56 0	73.3	57.3	72.3	58.5	71.9	59 0	71.2	59 8	93
94	75.5	56.0	75.1	56 6	74.1	57.9	73 0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75 9	57.2	74 9	58.5	73.8	59 8	73.4	60.3	72.8	61 1	95
96	77.1	57.2	76.7	57.8	75 6	59 1	74.6	60.4	74 2	60 9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75 4	61 0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78 3	59.0	77.2	60 3	76 2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76 9	62.3	76.5	62.8	75.8	63 6	99
100	80.3	59.6	79 9	60.2	78 8	61.6	77.7	62.9	77.3	63.4	76.6	64 3	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	4¼ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Diff.	41 Deg.		42 Deg.		3¼ Point		43 Deg.		44 Deg.		4 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00 8	00.7	00.7	00 7	00.7	00 7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01 3	01.5	01.4	01 4	01.4	01.4	01 4	2
3	02 3	02 0	02 2	02 0	02.2	02.0	02.2	02.0	02 2	02.1	02.1	02.1	3
4	03 0	02.6	03.0	02 7	03.0	02.7	03 0	02.7	02 9	02.8	02.8	02.8	4
5	03.8	03.3	03 7	03 3	03.7	03 4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04 5	03 9	04.5	04 0	04.4	04 0	04 4	04.1	04.3	04 2	04.2	04.2	6
7	05.3	04 6	05 2	04 7	05.2	04.7	05.1	04 8	05.0	04.9	04.9	04.9	7
8	06,0	05.2	05.9	05 4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05 7	8
9	06.8	05 9	06.7	06 0	06.7	06.0	06 6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06 6	07 4	06 7	07 4	06.7	07.3	06 8	07.2	06.9	07.1	07.1	10
11	08 3	07.2	08 2	07.4	08 2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07 9	08.9	08 0	08,9	08.1	08.8	08 2	08,6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	03.7	09 6	08.7	09.5	08,9	09 3	09 0	09.2	09 2	13
14	10 6	09 2	10.4	09.4	10 4	09 4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12 1	10 5	11.9	10.7	11.9	10.7	11 7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12 6	11.4	12.4	11.6	12.2	11.8	12 0	12 0	17
18	13.6	11.8	13.4	12 0	13.3	12 1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13 9	13.0	13.7	13 2	13.4	13 4	19
20	15.1	13.1	14 9	13.4	14 8	13 4	14.6	13.6	14 4	13.9	14.1	14.1	20
21	15.8	13 8	15.6	14 0	15 6	14 1	15 4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14 4	16 3	14 7	16 3	14 8	16 1	15.0	15 8	15.3	15.6	15 6	22
23	17.4	15.1	17 1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15 7	17.8	16.1	17.8	16.1	17.6	16 4	17.3	16.7	17.0	17.0	24
25	18 9	16 4	18 6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17 1	19 3	17 4	19.3	17 5	19.0	17 7	18 7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20 0	18.1	19 7	18.4	19 4	18.8	19.1	19.1	27
28	21.1	18 4	20 8	18.7	20.7	18.8	20 5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20 9	20.1	20.5	20 5	29
30	22 6	19.7	22.3	20 1	22.2	20.1	21 9	20.5	21.6	20 8	21.2	21.2	30
31	23 4	20 3	23 0	20.7	23.0	20.8	22.7	21 1	22,3	21.5	21.9	21.9	31
32	24.1	21 0	23 8	21.4	23.7	21.5	23 4	21 8	23.0	22.2	22 6	22.6	32
33	24 9	21.7	24.5	22.1	24.5	22.2	24 1	22.5	23 7	22 9	23.3	23 3	33
34	25.7	22.3	25 3	22.7	25 2	22.8	24.8	23.2	24.5	23 6	24.0	24 0	34
35	26 4	23.0	26 0	23 4	25.9	23 5	25 6	23.9	25 2	24.3	24 7	24.7	35
36	27 2	23 6	26 8	24.1	26 7	24.2	26.3	24 6	25 9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27 4	24 8	27 0	25.2	26.6	25.7	26 2	26.2	37
38	28 7	24 9	28.2	25.4	28 2	25 5	27.8	25.9	27.3	26 4	26.9	26.9	38
39	29.4	25 6	29.0	26.1	28.9	26.2	28.5	26 6	28.1	27.1	27.6	27.6	39
40	30.2	26 2	29 7	26 8	29.6	26.9	29 3	27.3	28 8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30 4	27 5	30 0	28 0	29.5	28.5	29.0	29.0	41
42	31.7	27 6	31.2	28.1	31.1	28.2	30 7	28 6	30.2	29 2	29.7	29.7	42
43	32.5	28.2	32.0	28 8	31.8	28 9	31.4	29 3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29 4	32 6	29.5	32.2	30.0	31.6	30 6	31.1	31.1	44
45	34 0	29 5	33.4	30 1	33.3	30.2	32.9	30.7	32.4	31 3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33 6	31 4	33.1	32.0	32.5	32.5	46
47	35 5	30 8	34.9	31.4	34 8	31 6	34 4	32.1	33.8	32 6	33 2	33.2	47
48	36.2	31.5	35.7	32 1	35 6	32,2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32 9	35.8	33 4	35.2	34.0	34 6	34.6	49
50	37.7	32.8	37.2	33.5	37 0	33 6	36 6	34.1	36.0	34.7	35.4	35 4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	D.p	Lat	Dep	Lat	Diff.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Points		

Diff.	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg.		4 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36 8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41 0	38.2	40.3	38.9	39.6	39.6	56
57	43 0	37 4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43 8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40 9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42 0	47.6	42.8	47.4	43.0	46.8	43 6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43 3	49 0	44.2	48.9	44 3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44 6	50.5	45.5	50.4	45.7	49.7	46 4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52 8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47 7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50 9	72
73	55.1	47.9	54.2	48.8	54.1	49 0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52 2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53 1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54 2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60 7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63 0	57.1	62.2	58 0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57 8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65 2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60 4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61 6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61 0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64 8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Points		

The Use and Explanation of the Table of Difference *of* Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, it gives the Difference of Latitude and Departure in Minutes and Tenths, to any Distance not exceeding 100 Miles, and to every Degree and Quarter Point of the Compass; and may be used to a greater Distance being taken out at twice or thrice, according to the Quantity of the Distance, as shall be shewn in the Use.

The Course stands at the Head and Foot of the Table, to every Deg. and Quarter Point of the Compass; at the Head it begins at 1 deg. so 2 deg. $\frac{1}{4}$ Points, *&c.* encreasing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, so 46 deg. 47 deg. $4\frac{1}{4}$ Points, *&c.* encreasing backwards to 90 deg. or 8 Points. The Distance stands in the two outmost Columns under the Title *Dist.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure stands under the Course at the Head, and over it at the Foot of the Table.

The Use of the TABLE.

This Table is very useful in Navigation, especially in working a *Traverse*.

Example. 1. The Course and Distance given, to find the Difference of Latitude and Departure by the Table.

Suppose a Ship sails NNE. 3 quarters E. 95 Miles, the Difference of Latitude and Departure are required?

On the Right-hand Page (because the Distance is above 50) and at the Top (because it is less than 4 Points) look for 2 $\frac{1}{4}$ Points, which is the Course; under which, and against 95 the Distance, and under the Title *Lat.* stands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* stands 48.8, which is 48 min. $\frac{8}{10}$ the Departure required?

Example 2. Suppose a Ship sails South 56 deg. Westerly 48 Miles, the Difference of Latitude and Departure required?

On the Left-hand Page (because the Distance is less than 50) and at the Bottom (because it is more than 45d.) look for 56d. the Course; over which, and against 48 the Distance, over the Title *Lat.* stands 26.8, that is 26 min $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* stands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required?

Example 3. Suppose a Ship sails North West by North 160 Miles, the Difference of Latitude and Departure are required by the Table?

On the Right-hand Page at the Top, look for 3 Points the Course. Now because the Table goes but to 100, take for 100 first; therefore under 3 Points, and against 100, under the Title *Lat.* stands 83.1, that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* stands 55.6 that

that is 55 min. 6 tenths the Departure; then for 60 under 3 Points, against 60 under the Title *Lat.* ſtands 49·9, that is 49 min. 9 tenths the Difference of Latitude, and under the Title *Dep.* ſtands 33·3 that is 33 min. 3 tenths the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88.9 tenths, the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plane Sailing*, which for Brevity-ſake are ommitted here, being taught at large, in the laſt Edition of *Practial Navigation*; but the general Uſe of it is in the exact Working of a Traverſe.

Example 1. Suppoſe a Ship bound to a certain Port, ſails S. E. by S. 49 min. then ESE. half E. 52 min. then E. by N. half E. 62 min. then SSW. half W. 57 min. then S. half E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Leeway, if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column; if Southerly in the South Column; if Weſterly in the Weſt Column, as was before put in the Eaſt Column; if Eaſterly it muſt be directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, the Remainder is the general Difference of Latitude and Departure.

The TABLE.

Courſes.	*Diſtances*	*Diff. of Lat.*		*Departure*	
		North	*South*	*Eaſt*	*Weſt*
S. E. by S.	49		40.7	27.2	
ESE. half E.	52		15.1	49.7	
E. by N. ½ E.	62	06.1		61.7	
S.S.W. ½ W.	57		50.3		26.9
S. half E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The general Diff. of Lat. is 138.8 tenths S. the Dep. 115.5 tenths E. then to find the Courſe and Diſtance, find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4. and half the Dep. 57.7, the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which at the Top I find 3½ Point for the Courſe South Eaſterly, or South Eaſt half South, and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example

Example 2. The Course given in Degrees, which often happens, by reason of Allowance for the Variation of the Compass, and in the like Cases.

Suppose a Ship bound to a certain Port, sails 65 Miles North, 34 deg. Westerly. Then 56 Miles North, 67 deg. Westerly. Then 48 Miles South, 78 deg. Westerly. Then 54 Miles North, 23 deg. Easterly. Then 36 Miles North, 6 deg. Easterly, the Difference of Latitude and Departure are required?

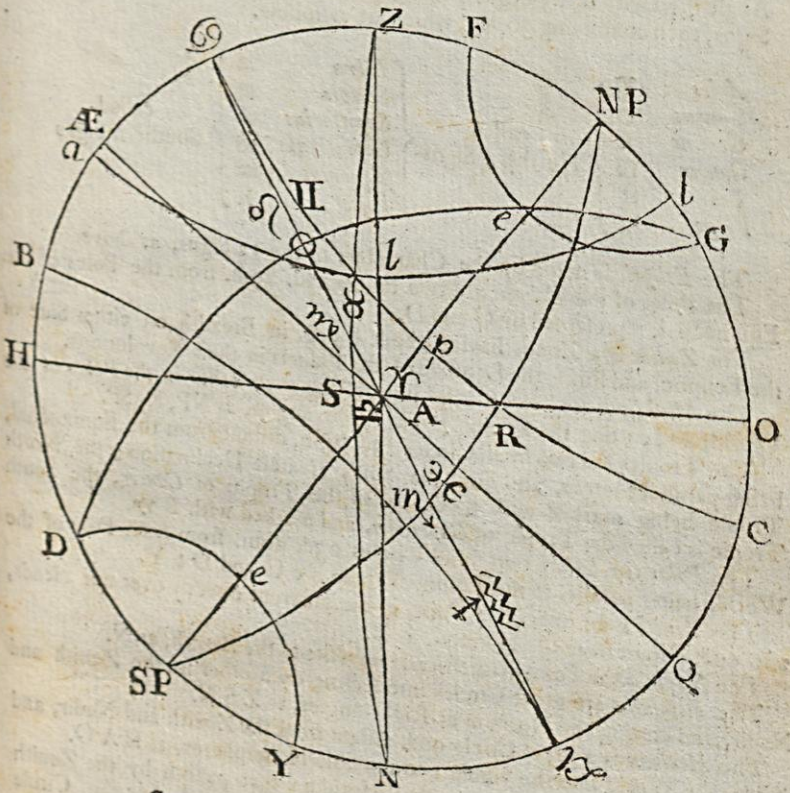
Courses.		*Distances*	*Diff of Latitude* North.	*Diff of Latitude* South	*Departure* East	*Departure* West
						36.3
NW	34°	65	53.9			51.5
NW	67°	56	21.9			47.0
SW	78°	48		10.0	21.1	
NE	23°	54	49.7		03.8	
NE	6°	36	35.8			
			161.3	10.0	24.9	134.8
			10.0			24.9
			151.3			109.9

The general Difference of Latitude is 151.3 North, the Departure 109.9 West. The Course and Distance is found as in the last Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may also find the Difference of Longitude by the *Traverse Table*, (according to the *Middle Latitude* Sailing) thus, find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right against that in the Column of Distance, you have the Difference of Longitude; if your Departure is too large for the Table, take one half or one third thereof, and proceed as before.

Example. Suppose in the last Instance of a *Traverse*, the Ship hath sailed from Latitude 50 deg. 00 min. North, then because the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is 52 deg. 31 min. and consequently the Middle Latitude is 51 deg. 16 min. it's Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding so far, I take its half, *viz.* 55, the neareſt to which in the Table, is 54.7 (being less) against which, in the Column of Distance is 87, which doubled (because I took half the Departure) the Sum 174 min. or 2d. 54m. is the Difference of

Longitude required, which is sufficiently exact for common Practice, only I would advise all Persons for avoiding as much as possible any Error, that every Time the Reckoning is corrected by an Observation, the Longitude be also corrected according to *Mercator's Sailing*, as you are taught in the last Edition of *Practical Navigation*.



Some necessary Astronomic Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, opposite one to the other; the one visible to us, called the North Pole, marked with the Letters N.P.; the other not visible to us, called the South Pole, marked with S.P.

The *Axis* of the World is a Line imagined to pass from Pole to Pole, about which is performed the diurnal Revolution, as the Line, NP, A, SP.

The *Equinoctial* is a great Circle 90d. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſpheres; it is noted by the Letters Æ A Q.

The *Ecliptic* is a great Circle interſecting the Equinoctial in two oppoſite Points, the beginning of *Aries*, and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈	called Northern Signs	*Libra*	♎	called Southern Signs
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptic* is noted by the Characters of the 12 Signs, as above.

The Poles of the *Ecliptic* are two Points 23d. 29m. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiac* is a Zone, having about 8 deg. in Breadth on either Side of the Ecliptic, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great Circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NP, R, SP.

The Tropics are two ſmall Circles 23d. 29m. diſtant from the Equinoctial, being parallel thereto, and limit the Sun's greateſt Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*, the South Tropic is called the Tropic of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two ſmall Circles 23d. 29m. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, *viz.* 90d. diſtant from the Horizon, as Z.

The *Nadir* is the Point diametrically oppoſite to the Zenith, as N.

The *Azimuths* are great Circles interſecting each other in the Zenith and Nadir, and cutting the Horizon at Right-angles, as Z S N.

The *Horizon* is a great Circle 90d. diſtant from the Zenith and Nadir, and divides the World into the viſible and inviſible Hemiſpheres, as H A O.

The *Meridian* of a Place, is that Meridian that paſſeth by the Zenith and the Nadir, of the ſaid Place, and is repreſented by the Circle Z N P O Q N S P H Æ Z.

Parallels of Altitude or *Almicanters*, are ſmall Circles parallel to the Horizon; imagined to paſs through any Degree of Altitude, between the Horizon, and the Zenith, as *a l t*.

Parallels of Declination or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ♋ *p* R C.

Circles

Circles of Longitude in the Heavens, are great Circles intersecting each other in the Poles of the Ecliptic, and cutting the Ecliptic at right Angles, as G, ☉, D.

Parallels of Latitude in the Heavens, are small Circles parallel to the Ecliptic.

The *Latitude* of a Star is an Arch of a Circle of Longitude contained between the Center of the Star and the Ecliptic, and is accounted either Northerly or Southerly.

The *Longitude* of a Star is an Arch of the Ecliptic, intercepted between a Circle of Longitude passing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star is an Arch of the Meridian contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Ascension* is that Degree and Minute of the Equinoctial that comes to the Meridian with the Center of the Sun or Star.

Oblique Ascension is the Degree and Minute of the Equinoctial that riseth with the Center of the Sun or Star, in an Oblique Sphere.

Oblique Descension is the Degree and Minnte of the Equinoctial that sets with the Center of the Sun or Star, in an Oblique Sphere.

Ascensional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Descension or Ascension, or it is the Difference of the Time between the Sun-rising or setting, and six o'Clock.

The *Amplitude* is an Arch of the Horizon, being the Distance of the Rising or Setting of the Sun or Star from the East or West, and is accounted either Northerly or Southerly.

The *Latitude* of a Place is the Height of the Pole above the Horizon, or the Distance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equator contained between the Meridian of the Place, where the Longitude is assigned to begin, and the Meridian of any other Place, and is accounted either Easterly or Westerly.

Astronomic Problems useful in NAVIGATION.

PROBLEM I.

THE Sun's Place and greatest Declination given, to find it's present Declination.

Example.

Suppose the Sun's Place to be 20d. 30m. in *Gemini*, the greatest Declination is 23d. 29m. it is required to find the present Declination.

The Operation by the Logarithms.

As Radius	10.000000
Is to S. Sun's greatest Declination 23d. 29m.	9.600409
So is S. Sun's Longitude 80d. 30m. from *Aries*	9.994003
To S. Sun's present Declination 23d. 09m. North	9.594412

By Gunter.

The Extent from Radius S. 90d. to S. 23d. 29m. will reach from S. 86d. 30m. to the S. 23d. 9m. the Sun's Declin. N. becauſe in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point. Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius* or *Piſces*, the Longitude is accounted from *Aries*; but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius* and *Piſces*, are called Southern Signs. Conſequently, if the Sun's Place be in any of the firſt ſix Signs, the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declin. and preſent Declin. given, to find his Place.

The Sun's greateſt Declination is 23d. 29m. and preſent Declination is 18d. 30m. North increaſing, the Sun's Place required?

By the Logarithms.

As the S. of the Sun's greateſt Declination 23d. 29m. —— 9.600409
To the Radius —— 10.000000
So is the Sine of the preſent Declination 18d. 30m. North —— 9.501476
To the Sine of the Sun's Longitude 52d. 46m. —— 9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries*, becauſe the Declination is North and increaſing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By Gunter.

The Extent of the Compaſſes from the Sine 23d. 29m. the greateſt Declination to Radius, S. 90d. will reach from S. 18d. 30m. the Sun's preſent Declination, to 52d. 46m. the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Example.

The Sun's Place 10d. 30m. in *Aquarius*, the Right Aſcenſion is required.

The Operation by the Logarithms.

As Radius —— 10.000000
To the Tangent of the Sun's Longitude from *Aries* 49d. 30m. — 10.068501
So is the S. c. of the greateſt Declination 23d. 29m. —— 9.962453
To the Tangent of the Sun's Right Aſcenſion 47d. 2m. —— 10.030954

By Gunter.

The Extent from Radius S. 90d. to S.c. of the greateſt Declination 66d. 41m. will reach from Tangent Sun's Longitude from *Aries* 49d. 30m. to the Tangent of the Right Aſcenſion 47d. 02m. required.

Note,

Note, This Proportion gives the Sun's Right Ascension from the next Equinoctial Point; but it ought to be accounted from *Aries* according to the Order and Succession of the Signs, and therefore in this Case 47d. 2m. subtracted from 360d. (because the Sun is in the 4th Quarter of the Ecliptic, or South decreasing) gives 312d. 58m. the Right Ascension from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As S. c. of the Latitude 51d. 32m.	9.793832
To Radius	10.000000
So is the S. of the Declination 15d. 20m. North	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	9.628486

By Gunter.

The Extent from the S. c. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, will reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is also South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Ascensional Difference.

Example.

Suppose in the Latitude 51d. 32m. North, the Sun's Declination is 10d. 45m. North, and the Ascensional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51d. 32m.	9.900086
To Radius	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	9.278424
To the Sine of the Ascensional Difference 13d. 49m.	9.378338

By Gunter.

The Extent from Tangent 38d. 28m. (the Complement of Latitude) to Tangent 10d. 45m. the Sun's Declination; will reach from Radius S. 90d. to S. 13d. 49m. the Sun's Ascensional Difference as above.

PROB.

PROB. VI.

To find the Oblique Ascension and Descension.

First, Find the Ascensional Difference by the Fifth Problem.

Secondly, The Right Ascension by the Third Problem.

When the Latitude and Sun's Declination are both North or both South, the Ascensional Difference subtracted from the Right Ascension, gives the Oblique Ascension, and added thereto, gives the Oblique Descension. But when one is North and the other South, the Ascensional Difference added to the Right Ascension, gives the Oblique Ascension, and subtracted gives the Oblique Descension.

Note, That if the Ascensional Difference exceed the Right Ascension, add to the Right Ascension 360 Degrees, then subtract the Ascensional Difference therefrom.

Or, if both being added together exceed 360 Degrees, the Excess is the Oblique Ascension or Descension.

PROB. VII.

To find the Time of the Sun's Rising and Setting, and Length of the Day or Night.

Find the Ascensional Difference by the fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 Degrees of the Equinoctial one Hour, and for every Degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Ascensional Difference added to six Hours, gives the Time of Sun-setting; and subtracted is the Time of Sun-rising.

2. But if one be North and the other South, then the Ascensional Difference added, gives the Time of Sun-rising; and subtracted is the Time of setting.

The Time of Sun-setting doubled, gives the Length of the Day; the Time of Sun's-rising doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, suppose the Sun's Declination 21d. 57m. North, the Ascensional Difference is 30d. 29m. which reduced in Time is

H. M. S.

2 01 56

6 00 00

Sun setteth — 8 01 56 } doubled is { 16 03 52 } length of the { Day

Sun riseth — 3 58 04 } { 07 56 08 } { Night.

PROB.

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth.

The RULE.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination, add them together, and take the half Sum; subtract the Compl. of the Declination from the half Sum, and take the Remainder; then set down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms is the S. c. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90d. you must add 90 Degrees thereto, and then proceed as before.

Example 1.

In the Latitude 51d. 32m. North, the Sun's Declination is 20d. 30m. North, his Altitude 47d. 30m. and his Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
42	30	Compl. Altitude A. M. —— —— S. Co. Ar. —	0.170317
38	28	Compl. Latitude North ——— — S. Co. Ar. —	0.206168
69	30	Compl. Declination N. or Sun's Distance from the Pole.	
150	28	Sum	
75	14	Half Sum ——— ——— S. ——	9.985414
5	44	Excess of the Half Sum above c. Decl. S. ——	8.999559
		Sum	19.361458
61d.	21m.	——— S. c. ——— Half Sum	9.680729
61d.	21m.		
doubled 122d.	42m.	the Sun's Azimuth from the North required.	

The Operation by Gunter's-*Scale*.

The Extent of the Compasses from Radius S. 90d. to S. 42d. 30m. the Complement of the Altitude, will reach from S. 38d. 28m. the Complement of the Latitude, to Sine 24d. 40m. then the Extent from Sine 24d. 40m. to Sine 75d. 14. the half Sum will reach from S. 5d. 44m. (the Excess of the half Sum, above the Complement Declination) to 122d. 42m. (upon the Line of versed Sines) which is the Azimuth required.

Example

Example 2. In the Latitude of 51d. 32m. North, the Sun's Declination is 18d. 15m. South, his Altitude 17d. 45m. and the Azimuth from the North required?

The Operation by the Logarithms.

d.	m.		
72	15	Compl. Altitude ——— ——— —	S. Co. Ar. 0.021183
38	28	Compl. Latitude — ——— ———	S. Co. Ar. 0.206168
108	15	Declination 90 Degrees being added, becauſe South.	
218	58	Sum	
109	29	Half Sum ſupp. to 180d. is 70d. 31m. S. ———	9.974391
1	14	Remainder ——— ——— ——— S. ———	8.332924
			Sum 18.534660
		d. m.	
		79 : 20 ——— S.c. ——— half Sum ———	9.267333
		79 : 20	

Which doubled is 158 : 40 the Azimuth from the North required.

By Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Comp. Altitude will reach from Sine 38d. 28m. the Complement Latitude, to S. 36d. 20m. then the Extent from Sine 36d. 20m. to 70d. 31m. the Supplement of 109d. 29m. (the half Sum) to 180d. will reach from the Remainder 1d. 14m. to 158d. 40m. (upon the Line of Verſed Sines) the Sun's Azimuth as above.

In South Latitude the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame Manner you may find the Azimuth of any Star.

PROB. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude of 51d. 32m. North, ſuppoſe the Sun's Declination 23d. 29m. North. the Altitude 36d. 30m. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude, add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Comple-

ment

ment Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms, is the S.c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by Logarithms.

d.	m.			
66	31	Compl. Declination	S. Co. Ar.	0.037547
38	28	Compl. Latitude	S. Co. Ar.	0.206168
53	30	Compl. Altitude		
158	29			
79	14	Half Sum — Sine		9.992287
25	44	Remainder — Sine		9.637673
			Sum	19.873675
30	09	S.c.	Half Sum	9.936837
30	09			
60	18			

which doubled is 60 18, and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$ the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ subtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been Southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem; do the same when the Declination is North in South Latitude.

By Gunter.

The Extent of the Compasses from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Versed Sines) the Hour of the Day as above.

PROBLEM X.

Having the Latitude of the Place, the Sun's Right Ascension with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example.

In the Latitude of 51 deg. 32 min. North, on the 18th of *January*, 1753, the Sun's Right Aſcenſion was 20 hours 2 min. the Right Aſcenſion of the *Lion's-Tail* was 11 hours 35 min. the Declination 16 deg. 6 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the Hour of the Night required.

The RULE.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Sun's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of theſe four Logarithms, is the S.c. of half the Diſtance from the Meridian.

The Operation by Logarithms.

d.	m.			
73	54	Compl. Star's Declination	—— S. Co. Ar.	0.017377
38	28	Compl. Latitude	—— S. Co. Ar.	0.206168
59	30	Compl. Star's Altitude		
171	52			
85	56	Half Sum	—— Sine ——	9.998905
26	20	Remainder	—— Sine ——	9.648512
			Sum	19.870962
30d.	28m.	—— S. c. ——	Half Sum	9.935481
30d.	28m.			

which doubled is 60d. 56m. and reduced into Time, gives four Hours three Minutes, forty-four Seconds, or 3 quarters of a Minute.

By the Directions given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the fixed Stars find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but

But if the Star be to the Westward of the Meridian, add the Star's Distance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the Hour of the Night. In this Example, the Sun's Right Ascension 20 Hours 02 Minutes subtracted from the Star's Right Ascension (with 24 Hours added thereto) 35 Hours 35 Minutes, leaves 15 Hours 33 Minutes, the Time of the Star's coming on the Meridian; from which subtracting 4 Hours, 3 Minutes, 44 Seconds, the Hour above found, leaves 11 Hours, 29 Minutes, 16 Seconds, the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement Declination to 90 deg. there must be 90 deg. added thereto, as has been shewn in the Eighth preceding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90d. to the S. of 73 Degrees 54 Minutes, the Complement of the Star's Declination, will reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 40 Minutes; then the Extent from the S. 36 Degrees 40 Minutes, to S. 85 Degrees 56 Minutes the half Sum, will reach from S. 26 Degrees 26 Minutes the Remainder, to 60 Degrees 56 Minutes (upon the Line of Versed Sines required;) With which proceed as has been directed to find the Hour of the Night.

Courses and Distances between some of the most eminent Places on the Coast of England, *&c. As also the thwart Courses between the East Coast of* England *and* Holland, *the South Coast of* England *and* France, *and the West Coast of* England *and* Ireland.

		Leag.
FROM *Whitby* to *Tinmouth*,	NW. by N.	14
From *Buchaness* to *Cathness*,	North West	27
From the *North Foreland* to *Flushing*,	East	24
From the *North Foreland* to the *Texel*,	NE. by N. half E.	50
From the *Spurn* to the *Texel*,	East by South	55
From *Tinmouth* to the *Naze* of *Norway*,	NE. by E.	118
From *Tinmouth* to *Holy Land*,	East by South	110
From *Tinmouth* to the *Scaw*,	East North East	110
From *Yarmouth* to the *Texel*,	East by North	34

	Leag.
From *Newcaſtle* to *Maes Deep*, ENE.	83
From *Aberdeen* to *Maes Deep*, South East	113
From the *North Foreland* to the *Maes*, ENE.	30
From *Newcaſtle* to the *Fly*, ESE.	90
From *Scarborough* to *Holy Land*, East Northerly	97
From the *Start* to the *Eddyſtone*, Weſt half South	7
From the *Land's-end* to *Scilly*, WSW. three quarters Weſt	9
From the *Caſkets* to *Blakeneſs*, East North East	55
From *Beachy* to *Blakeneſs*, East a quarter North	15
From *Dover* to *Diep*, South half Weſt	25
From the *Lizard* to *Guernſey*, Eaſt by South	35
From the *Start* to *Seven Iſles*, South half Eaſt	25
From *Scilly* to *Uſhant*, South East by South	35
From the *Lizard* to *Uſhant*, South	29
From *Hartland* Point to the Iſland of *Lundy*, North	3
From *Lundey* to the *Holms*, Eaſt by North, Northerly	18
From *Black Rock* to *Tuſcar*, Eaſt North Eaſt	3
From Cape *Clear* to *Old Head*, Eaſt by North	13
From *Greſholm* to *Waterford*, Weſt by North	21
From the *Land's-end* of *England* to *Tuſcar*, North by Weſt	40
From the *Land's-end* of *England* to *Waterford*, NNW.	40
From *Holy Head* in the Iſland *Angleſea*, to the Bar of *Dublin*, W. by N.	18
From *Rochel* to *Black Rock*, South by Eaſt	80
From the *Land's-end* of *England* to *Cape Clear*, NW. by W.	55
From the *Land's-end* of *England* to *Old Head*, North Weſt	45

A TABLE *of the Soundings coming into the* Channel, *reſpecting the Bearing and Diſtances of* Scilly, Uſhant, *the* Lizard, *&c. with the Depth in Fathoms, and the various Sorts of Ground.*

	Bearings.	Diſtance	Lat. D.	Lat. M.	Depth of W.	*The various Sorts of Ground.*
Scilly.	South	05	50	20	50	Branny ſand, like ground wheat
	S S E.	05	50	12	45	White ſand mixed with ſhells
	S S E.	06			50	Coarſe ouſe
	E S E.	06			53	Coarſe ſand and fine red ſhells
	E by S.	08	50	12	78	Ouſe ſand, Queens ſhells amongſt it
	E by N.	07	49	15	72	Ouſe like muſtard-ſeed with broken ſhells
	E by N.	15	48	50	72	Pepper ſand, black and yellow

	Bearings.	Dist.	Lat. D.	Lat. M.	Depth	*The various Sorts of Ground.*
Scilly.	E by N.	24	49	50	72	Black, white and red ſtones with ouſe
	E N E.	07	49	15	60	Some black ſand
	E N E.	20	49	15	80	Rocky ground
	E N E.	55			103	Fine white ſand
	NE by E.	22	49	10	85	Sand and ouſe together
	NE by E.	10	49	20	55	White and red ſand mix'd with ſhells
	NE by E.	50	49	50	100	White ſand with ouſe and nits
	NE by E.	25	49	50	64	Branny ſand with white and red ſhells
	NE by E.	06	49	10	48	Black ſand
	North East	13	49	43	65	Branny ſand with ſome pieces of ſhells
	NE by N.	10	49	40	65	Branny ſand, ſmall ſtones, herring bones
	N N E.	10	49	20	57	Small red ſand
	N by E.	18	49	47	100	White ſand then entring on the Bank
	North	12	49	15	68	Red ſand with black & white ſcollop ſhells
	North	10	49	47	65	Broken ſhells with white and red ſand
	N N W.	33	48	52	65	White ſand on the Eaſt part of the Bank
	NW by N.	07	49	40	77	Red ſand and ſhells amongſt it
	North Weſt	04	50	10	54	More ſhells, the *Lizard* NE. diſt. 18 leag.
	North Weſt	07	49	47	50	Branny ſand with black and broken ſhells
	NW by N.	04	50	25	60	Stony ground
	NW by W.	2½			61	Red and black ſand, with gliſtering ſhells
	W by N.	13	50	25	44	Shells and ſand like Points of Needles
	Weſt	21	50	08	63	Fine white ſand with little ouſe
	W by S.	32	49	50	66	Red and black ſand with gliſtering ſhells
	W by S.	3½			75	Fine white ſand and gliſtering ſhells
					40	Like broken Wheat or coarſe Bran
Uſhant.	North	06	48	36	63	Full of ſmall Maes ſand
	N by E.	18	48	15	80	Round ſtones mixed with ſcollop ſhells
	NE by N.	11			60	Small beaten ſhells and Hakes Teeth
	North Eaſt	29	48	50	85	Great and ſmall pieces of Cockle ſhells
	North Eaſt	25	48	10	55	Grey and brown ſand with white ſhells
	NE by N.	07	48	30	68	White and grey Maes ſand
	E N E.	14	48	36	68	Small ſhells and herring-bones
	E by N.	25	48	30	85	White and grey ſand with ſmall red ſtones
	Eaſt	18	49	00	70	Branny ſand with ſome ſhells
	Eaſt	06	49	00	65	Red ſand, ſhells, things like needles points
	Eaſt	15	49	15	70	Fine white ſand
	Eaſt	33	49	15	87	Dazling ſand like Barley-ſtraw
		04	49	10	60	Full of Maes ſand and broken ſhells

E by S.

	Bearings.	Dist.	Lat. D.	Lat. M.	Depth	*The various Sorts of Ground.*
Uſhant.	E by S.	14	48	56	63	Shells like Perriwinkles
	E S E.	15	48	15	70	Shells grey and red pieces of Cockle ſhells
	E S E.	12	49	20	68	Groſs white ſand with ſhells
	E S E.	8	49	5	64	White ſhells and fine ſmall ſtones
	E S E.	6			61	Hakes teeth and ſhells like oatmeal huſks
	SE by E.	20	49	15	72	Great ſtones like peaſe and beans
	SE by E.	9	49	15	65	Sand and ſome ſhells
	SE by E.	37	48	30	65	Jame's ſhells
	SE by E.	15	49	25	60	Small ſcollop ſhells, with ſome ſtones

	Bearings.	Dist.	Depth	*The various Sorts of Ground.*
Lizard.	North Eaſt	6½	43	Marſhy ſhells and ſome ſcollop ſhells
	NE by N.	10	52	Marſhy ſhells and Hakes teeth
	N N E.	9	50	Marſhy ſhells like Oatmeal huſks
	N by E.	15	58	Marſhy ſhells and Hakes teeth
	North	1	39	Stones as big as Beans four Leagues off
	North Weſt	5	45	Grey ſand like Oatmeal flour
	North Weſt	3	46	Marſhy ſhells like ſmall ſtones
	W N W.	3½	47	Small ſhingly ſtones, and marſhy ſhells
	W by N.	4	40	Fine marſhy ſhells like white ſtones
	W by S.	3	41	Black gravelly Ground with ſmall ſtones
	NE by E.	12	57	Scollop ſhells
	NE by E.	4	44	Great ſtones and rough Ground
	North Eaſt	6½	50	Like Huſks of Oatmeal and ſmall ſtones

Eddyſtone.	N. ½ a Mile		35	Dirty brown ſand and Hakes teeth
	W. 2 Miles		34	Dirty brown ſand
	S. 1 Mile		26	Fine ſand, and within this 28 and 30 fathom.

Start.	N by E. N.ly	8½	40	Like the Duſt of a Grindſtone with Hakes teeth
	NW by W.	4½	43	and ſhells
	NW by N.	3	38	Gravelly ſand, ſmall ſtones and ſhells
	NbyWW.ly	12	38	Reddiſh ſhells maſhed as if beat in a mortar,
	NW by W.	14	43	white ſand and ſcollop ſhells.

Foreland

	Bearings.	Dist.	Depth	The various Sorts of Ground.
Foreland.	NE by E.	08	35	Small ſhingly ſtones as big as Peaſe
	North	08	40	Streamy Ground with ſmall ſtones
	N by E.	5½	33	The ſame with ſome black ſand
	NE by N.	11	41	Fine ſand and ſcollop ſhells
	N N E.	08	40	Fine ſand, ſcollop ſhells and ſmall ſtones
	NE by E.	2½	27	Shingly Ground
	W N W.	2½	20	Small ſtones
Needles	NE by E.	02	17	Great ſhingly Ground
	NE half E.	2½	17	Small ſhingly Ground
	North East	02	13	Rocky Ground
I Wight	N by W.	3½	20	All the Ground from St. *Alban*'s to the Eaſt-end
	E by N.	04	21	of the *Wight* is chalky and brown Sand.
	N by E.	03	18	
Dunnoſe	W by S.	04	16	Rough Ground with ſome big ſtones
	Weſt	04	21	A kind of ſandy fiſhy Ground
	W N W.	08	33	Fiſhy Ground ſomewhat red, with ſtones as big
	N by W.	06	26	as Peaſe, and ſmall Beans.

Directions to ſail into ſome of the Principal Harbours on the Coaſt of England.

Directions to ſail into Scilly.

SCILLY is divided into divers Iſlands; along the Weſt-ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt called St. *Mary*'s Sound is the beſt, being a fair opening of the Channel, but near the Midſt lie two ſunken Rocks, which in foul Weather the Sea may be ſeen to break over: It is beſt to leave them on the Larboard-ſide going in, and on the Starboard-ſide coming out. Go ſo near the Starboard-ſhore, as that a Stone might almoſt be thrown on it. And when you are within the Point, luff up round, and come to an Anchor in Sight of the Houſes; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard-ſide.

To

Directions for ſailing into Mount's-Bay.

To anchor in Gover's Lake.

There are two ſunken Rocks, which lie right in the Way of going into the Lake, about a Mile without your Anchoring Place; theſe Rocks lie NNW. and SSE. about half a Mile in length, to ſhun which obſerve the following Directions.

If the Wind is in the Eaſtern Hank, give the Eaſtern Shore about a League Birth, and keep St. *Paul*'s Church wholly in Sight above the Hill, 'till you bring a Church on the Eaſtern Shore a Sail's Breadth to the Northward of St. *Michael*'s Mount, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul*'s Church down under the Hill, then let go your NE. Anchor, and carry the other to the SW. and you will be well moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll go clear of them to the Eaſtward, and when it ſhuts down you are to the Weſtward of them, and when upon them the Top of the Tower and a long Hedge is in one, about 6 or 7 Feet at low Water.

If the Wind is in the Southern or Weſtern Hank, keep the Land on board, which is bold; you may go within a Quarter of a Mile of the Point: run till you ſhut *Mouſehole* Iſland in, and St. *Paul*'s Church down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before mentioned: Be ſure to have the Church on the Eaſtern Shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never ſtart, the Wind at SSE. or SE. heaves in a great Sea, and raiſes a great Ground Sea when it blows hard; the harder it blows you have a ſtronger Outſet in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will ſooner ſtart with the Wind to the N. or NW. becauſe the Ground goes out with a little Deſcent.

To ſail into Foy.

Foy may be very eaſily known, lying in between two high Lands; on the Weſt-ſide going in, is an old Church and Caſtle, and on the Eaſt-ſide the Ruins of an old Church, as you may ſee by the making of it in Capt. *Collin*'s Draught of *Foy*. The going in is a Cable's Length over from Side to Side, and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch* War, in the Year 1666, there was above ſixty Sail of *Virginia* Ships put into this Harbour. This Place lieth NE. and SW. in and out, which makes it a better Out-let to the Weſtward than *Plymouth* or *Falmouth*. And whereas it

it hath been reported to be a Bar Harbour, and that you cannot enter till half Tide, I do aſſure you that there is no leſs than three Fathom at Low-water at a Spring-Tide; here you may lie aſhore to waſh, tallow, or ſtop Leaks; the Spring Tides riſe and fall 16 and 17 Feet, and it is Highwater here at Full and Change a Quarter paſt Five. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the ſaid Weſt-ſide, lieth a Rock above Water, you may ſail in on either Side of it, on the Inner-ſide of the Eaſt Point lie alſo ſome Rocks off the Shore; on the Eaſt-ſide is deepeſt Water, and moſt Room, therefore in going in, give the Eaſt-Point a large Birth; there will be 7 or 8 Fathom. Keep the ſaid Shore till you come within St. *Maud's* Caſtle; which when it bears Eaſt, there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth* Caſtle, and ſo it muſt be kept till you ſhut the Church over *Penny Compaick*, into the North Eaſt-end of the *Smithick*, and ſo bear over to St. *Maud's*, and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in four Fathom, as ſhall be moſt convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth* Sound lieth a high round Rock called *Mewſtone*; between it and *Rambead* lieth the ſaid Sound, North North Eaſt, being round and deep.

A little to the Northward of *Rambead*, is a fair ſandy Bay, where is good Anchoring cloſe under the Land, in 9 or 10 Fathom: South a little Eaſterly from *Rambead*, lies a Rock above Water called the *Eddyſtone*, (on which is erected a Light-houſe) the Point of *Plymouth* lies from it N. by E. diſtant about 4 Leagues.

In the Sound, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas* or *Drake* Iſland, which is joined to the Weſt-ſide with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide with the Land of *Plymouth*, till *Catwater* open on the Starboard-ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the

Point on the Starboard ſide, leaving moſt Part of the Channel on the Starboard-ſide, until you come within the Point, and anchor there right againſt the high ſteep Northern Land; there is at Low-water, with extraordinary high Tides 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about twelve Feet Water at half Flood, which Buoy muſt be left on the Starboard-ſide going in, and when *Catwater* is altogether open you may run into the Eaſtward, leaving in the Entry of the Harbour two-thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the South-ſhore is ſomewhat flat off, there lying a ſandy Bank, which reaches to the Second Point of the South-ſhore of *Catwater*.

A little to the Eaſtward of *Drake* Iſland lies a Rock under Water, upon which at Low-water it is not deeper than two Fathom. To ſail within the Land you may go to the Eaſtward or Weſtward of the Rock, as Occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entrance lying in between two high Lands: On each Side of the Haven ſtandeth a little Caſtle; on the Weſt-ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward run in along by the Weſt Land, ſo far to the Eaſtward until the Key of the Village (on the Eaſt-ſide of the Haven) be brought in the Midſt of the Entry of the Haven between the two Lands: It's convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to tow in. Being come in, edge over to the Weſt-ſide before the Brewhouſe, and anchor there in 10 or 11 Fathom, or before the Village to the Eaſt-ſide at Pleaſure. At the Eaſt-ſide lieth a ſunken Rock, to avoid which ſteer in with St. *Patrick*'s Church, and do not bring the Village which ſtandeth on the Weſt-ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt-ſide of the Chapel, always in Sight, without the Bulwarks on the North-ſide by St. *Patrick*'s Church, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt Point of the *Berry* S. by E. or SSE, from you; and anchor there in 7 or 8 Fathom, where you ſhall be Landlock'd for a S. and SW.

SW. Wind. At the North East-end of the Bay is alſo a Tide Haven called the *Yarmouth*; before it is very good Anchor Ground in 4 or 5 Fathom, according as you deſire to be nearer or further from the Shore.

Directions for ſailing in at the Eaſt-end of the Iſle of Wight to Portſmouth Harbour, *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight* or *Portſmouth*; after you come to the Weſtward of the Shoal called the *Owers*, hale in North Weſt with St. *Hellen*'s Point; but do not hale too much to the Northward, for there lies a Bank off of *Longſtone* Haven to the Eaſtward of the *Horſe*, that hath not above 13 Feet on it at Low-water; but keeping in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the SE. End of the Sand called the *Horſe*. St. *Hellen*'s Church being SW. by W. from you, you may run in 5 Fathom, and when you have brought the Weſtermoſt great white Patch, or Chalk upon *Poſt-Down* (which is the high Land to the Northward of *Portſmouth*) a Ship's Length to the Weſtward of *South-Sea* Caſtle that ſtands upon the Beach, then you may luff up without Fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the Shore, until you come by the Town-wall's End, and there you muſt bear off a little for a Flat, that lieth off from the Shore, this is for an Eaſterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown-Down*, (which is to the WNW. of *Haſlewood* Point) within a Ship's Length without the ſaid Point, then you may bear to the Weſtward along the Outſide of the *Spit*, which is the Shoal on the Weſt-ſide of the Entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward, and deſign for St. *Hellen*'s Road or *Stokes-Bay* (from *Dunnoſe* to St. *Hellen*'s Point, the Courſe is NE. by N. and NNE.) but borrow no nearer to St. *Hellen*'s than 6 or 7 Fathom, for the *Spit* lies off a great Way; but if it be clear Weather, that you may keep *Sand-Down* Caſtle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; ſteer along in this Mark, until you open St. *Hellen*'s Church about two Ship's Length open of the *Red-Cliff* within St. *Hellen*'s Point or *Port-Sea* Caſtle to the Eaſtward of *South-Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellen*'s Road NW. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water, on very good Ground.

Note; That you have no good clear Ground all along the Island until you have opened St. *Hellen*'s Church, as aforesaid, and have brought the Point to bear from you SSW.

From St. *Hellen*'s Point, to go between *No Man's-Land* and the *Horse*, the direct Course in, is NW. by N. and NW. but you have no Shoaling upon the SW. side of *No-Mand-Land*, for you have 16 Fathom, and the next Cast but 3; but at the *Horse* you may stand into 10, 9 or 8 Fathom: If the strong Tide be spent, and smooth Water, you shall have a great washing of them by the Overfall of the Water; but especially on *No-Man's-Land*, if it be clear Weather, there are two very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the Isle of *Wight*, that they may be seen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and so up all along the Island without some middle Ground that lieth WSW. off the Point *No-Man's-Land*.

Also from St. *Hellen*'s Point (if it be clear Weather that you can see it) there is a direct Mark, *viz.* a Part of an Old Castle formerly called *Hasle-wood* Castle, standing on *Gilkicker* Point (which is kept white,) keep *Gosport* Church and that Castle in one, or this Castle in the Middle of the Wood about the Church, which sheweth with a Valley like a Saddle, and so you may run directly in without Fear. Or if the Wind be so that you are forc'd to turn in, then you may run the said Mark within two Sail's Breadth of each End of the Wood. In the Middle of the Channel is about 11 Fathom Water; and if you bring the said Mark right under the North-End of the Wood you shall run in a middle Ground near the *Horse* that hath not above 10 Feet on it at Low-water, and hard Sand.

Being in *Yarmouth* Road, and you would sail out of the *Needles*, steer away from *Hurst* Castle, which Place is very steep; being past the Castle, steer away for the *Needles*, which are sharp white Rocks; giving a Birth to some Rocks that lie off from the Island-side in the Fairway, between the Castle and the *Needles*, you must keep close to the *Needles*. The Tide of Ebb setteth on the *Shingles*, which are hard Stones. The Flood setteth on the *Needles*.

To sail into the *Needles*, you will know the going in by the high white Land which is the West-end of the *Isle of Wight*; run boldly in with the Land, till you see the *Needles* Rocks, and then keep close to them, observing the Tides, as in the Directions coming out. *Note*, That there is a strong Indraught that sets in at the *Needles*, and into *Pool*; which Indraught hath haul'd many Ships into *Freshwater* Bay. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight*.

To sail within the Wight *in thick Weather.*

To sail between the Main and the *Wight* in thick Weather, borrow in 6 Fathom off St. *Hellen*'s, and steer NW. by N. and NNW. from St. *Hellen*'s Point,

Point, till you have 12 Fathom, and then ſteer more Weſterly, as you find the Depth; come no nearer *No-Man's-Land* than 9 or 10 Fathom; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly; but if it be large keep in 14 or 15 Fathom, which is a good Birth from both Sides, and ſo ſteer W. by S. and WSW. as you find the Depth until you come to *Cows*. *Note*, That being about *Stoke's-bay*, there will be leſs Water; if you go nearer to *Cows*, there you may anchor in 12 or 14 Fathom, in the Midſt of the Channel, where is ouſey Ground.

Directions for Dover-Road.

The beſt Ground in *Dover-Road* is with the *Whiteway*, to the NW. of *Dover-Caſtle*, or between that Hill that comes from St. *James*'s Church, which is a flat Steeple at the North-end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwara of *Foulkſtone* in 12 or 14 Fathom is very good Ground.

Directions to ſail into the North-Foreland *through the* Gulls *in the Night.*

If your Ground Tackle ſhould fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *Northſand-head*; if you can but ſee the *North-Foreland* Light, when that Light-houſe bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering SSW.) you may be ſure it will carry you directly through with the *Brake*, by keeping your Lead carefully, and borrowing no nearer the *Brake* than five Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North-end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and the Tides fall out too early or too late; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient Time, to be at the *North-ſand-head* at the turning of the Tide to the Southward. From the *Foreland* you may ſteer out with a Flood Tide, SE. by E. and SE. or keep the Light of the *North-Foreland* NW. by N. this Courſe will lead you out. But for the more Certainty, be ſure keep the Lead well, and then you may borrow off and on with the foreſaid Winds in 7 or 8 Fathom. and ſteering out with the foreſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 Fathom:

then

then you may hale up cloſe the the Southward, along the Back of the *Goodwin*, the Eaſtermoſt-ſide of which lies SSW. and NNE. 12 or 14 Fathom, and is not above a Saker-ſhot from the Sand. But if it be in the Day Time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is a flat Church upon the *Foreland*, called St. *Peter's*, a Ship's Length to the Northward of *Broad-ſtairs* Pier-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtward, till the *South-Foreland* bears W. by S. then caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Downs* Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin* or *King's-Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits*, the Buoy lieth in 5, 6, and 7 Feet Water at Low-water, and the Paſſage often alters, ſometimes more Water, ſometimes leſs. The Buoy lieth on the Weſt-end of the *Gunfleet-ſand*, and the Eaſt-end of the *Buxey*, being from a flat Steeple, called *Great Holland* Church, South by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, ſix, ſeven and eight Fathom Water; the Sands lying without, makes it a moſt excellent Road. There is a good and deep Channel to ſail in at the *Wallet* between the *Gunfleet* and the *Weſt* Rock, but 'tis ſeldom uſed. Being over the *Spits* in the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank, which hath but 5 Feet Water on it at Low-water; and lieth from the *Naze* Trees E. by N. About a Mile and an half from the *Naze* Point, there is about 8 or 9 Feet Water between it and the *Naze* at Low-water: Keep *Payn's* Trees that lie a little to the Southward of *Harwich*, open and ſhut with *Harwich-Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Cork-land*, juſt open of the *Naze-land*, will carry you on the Bank alſo. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will alſo carry you between the *Pyeſand* and the Ridge, into the *Rowling-Grounds*, where the Ships anchor in 3 or 4 Fathom at Low-water. The Mark to anchor in the beſt of the *Rowling-Ground*, is to bring *Harwich* Windmill two Sails Breadth open of *Harwich-Cliff*: And to ſail from the *Rowling-Ground* to the *Naze*, keep *Payn's* Trees open off *Harwich-Cliff*, till you bring the

Naze

Naze to bear SW. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to ſail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees SW. ſailing down NE. between the Cork and the Ridge, in 5, 6, and 7 Fath. Water. And when you have brought *Harwich* Steeple on the Brewhouſe that lieth to the Northward of *Languard* Fort, then are you clear of the Cork Ledge; this Channel is much uſed by the Light Colliers going to the Northward.

Being in the *Rowling-Grounds*, and that you would ſail into *Harwich* Harbour, keeping cloſe by the *Andrews*, which is a Sand that lieth off from *Languard* Fort, and is ſteep too on the Weſt-ſide: The Tide of Ebb runneth ſtrong over the *Andrews*, the firſt half Ebb, of which you muſt have a Care. This Sand is dry at Low-water; keep cloſe by the Beach of *Languard* Eort, to avoid the *Altar*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard* Fort, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 or 6 Feet at Low-water. You may ſail to the Weſtward of it, between it and *Harwich* Cliff, according as the Tide is up, and what Draught of Water your Ship draweth: But if you ſhould want to go into *Harwich* at Low-water, and your Ship draweth above 15 Feet, you may ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard* Fort. Being paſt the *Glutton*, you muſt keep cloſe to the Beach to avoid the *Griſtle*, that lieth in the Middle between *Harwich* and the Beach of *Languard* Fort, on which is but three Feet at Low-water, there is a ſmall Channel between the *Griſtle* and the Guard, of nine Feet at Low-water, but when you have opened *Dover* Court Church off *Harwich* Town, then you are clear of the *Griſtle* and the Guard, and may anchor before the Town of *Harwich*, in five Fathom Water, or run into *Ipſwich* Water and anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a-ſhore ſhe can take no Harm, the Shore being ſoft ouſey. The Spring Tides riſe 15 and 16 Feet, and the Niep-Tides 10 and 11 Feet.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to ſail over the *Spit*, then keep down by the *Gunfleet-ſand*, in 7 and 8 Fathom Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit* ESE. from the Sand about a Cable's Length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood ſetteth ſtrong into the *Wallet*; of which you muſt have a Care

Care when you come near it, eſpecially in little Winds or Calms, you may be hauled on the *Gunfleet-ſand*; this Sand lieth NE. and SW. and drieth in ſeveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* SE. by E. Eaſterly; you may ſtand into 7 or 8 Fathom along the Side of the W. Rock into the *Sledway*, keeping *Balſey* Church N. by W. and NNW. till you bring *Harwich* Steeple on the Brewhouſe (that lieth to the Northward of *Languard* Fort) which will carry you clear of the Cork Ledge, on which is two Fathom and an half at Low-water, and then ſtand to the Weſtward, and keep *Orford* Church and Caſtle open of *Balſey* Church a Sail's Breadth, 'till you have the Lights together, keep them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*; you may ſtand in upon the *Platters* into five Fathom, on which Sand is but two and three Feet at Low-water; the Ridge hath ſeven Feet at Low-water; a great Part of the Cork Sand drieth at Low-water; and lieth in Length NE. and SW. about two Miles and a half long, and a Mile broad: Weſt Rocks lie in Length NE. and SW. about three Miles, and two Miles broad, and drieth in ſeveral Places, full of Banks and Swatches, the Ground rocky and ſtony in many Places; there is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For the more particular Directions for ſailing into theſe and other Harbours in *England*, *Scrtland*, *Holland*, *Normandy*, *Bretagne*, &c. ſee the laſt Edition of the COASTING-PILOT, newly Corrected, and Re-printed for W. and J. MOUNT, T. PAGE and SON, on *Tower-Hill*, *London*, with many Additions.

FINIS.

A. for January & October
B. for May all y^e World over
C. for August As I well Remember
D. for Feb. March and November
E. for June be it Late or Soon
F. stands for y^e Month September
and like wise for the month December
G for July & April
the Month-s Do End and all is well

When first the marriage Knot was tied between my wife and me
my age to hers did so agree as 19 doth with [illegible] 8. 3 or 11
But when 10 & ½ : 10 years: we man and wife had been
Her age Came up as near to mine 2 times 3 to 9 which
I guis 4 times 11 which

19 | 11 | I guis or e = 11 | 22 | 44 | I add to 44 | 4 time 19
2 | 2 | | | | 15 | his age 76
38 | 22 | | | | 59 | 15
add 05 | add 15 years | | | | 29 ½ | 91
for 53 his age | 38 for her age | | | | 88 ½ | 98
| 68 ½ | | 2 ½ add 2 ½ | | divisor | 02
| 55 ½ for his age | | 22 | 11 | |
| 53 for his age | | 88 | 44 | |

too litle 0 2 ½ the Error   110 add 55   168 (33 the error to big
55   58 the answer
870   165 dividend

She was thre times 11 and he 5 times 19 when marry
and she was 48 at 15 years end and he 72 - her age end.