# *TRIGONOMETRIAE BRITANNICAE*

# *BOOK TWO PART ONE*

## *CONCERNING PLANE TRIANGLES.*

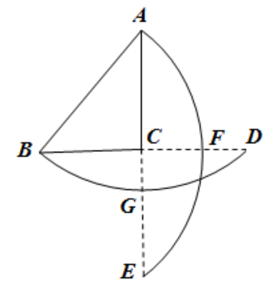
### *CHAPTER ONE.*

With the construction of the Tables resolved, we may proceed towards illustrating the use of these, which is concerned especially with the measurement of triangles. A triangle is a figure understood to have three sides. Moreover a triangle is either *plane* or *spherical.* A plane triangle is one described in a plane ; the three sides of which are right lines. And it is either *right* angled or *oblique* angled. A plane triangle is right because it has a single right angle, and an oblique angled triangle has none. *Eucl.27 D*.1.
If a right angled triangle shall have equal legs [the name sometimes given to the sides of lengths smaller than the hypotenuse in a rt. angled triangle], each angle at the base is half a right angle ; And conversely. *Ram*.3.*el*.8, Thus, if the remaining angles of the triangle may be equal, then it is right ; And conversely. And if the right line from the vertex of the triangle shall bisect the base into two equal segments, the vertex angle is right.
An oblique angled triangle is *obtuse* angled or *acute* angled.
It is obtuse angled because it has one obtuse angle. *Eucl.*28*D*.1.
It is acute angled because all the angle are acute. Eucl. 29*D*.1. And thus if an angle of a plane triangle shall be greater than the remaining angles, it is obtuse ; if less than the remaining angles, it is acute. And if the right line from the vertex of the triangle bisecting the base is less than the bisected length, the angle from the vertex is obtuse ; if greater, the angle from the vertex is acute.
The three angles of a triangle are equal to two right angles. *Eucl.* 32 *p*.1. And thus any two angles of a triangle are less than two right angles. And with a side continued, the exterior angle is equal to the two interior opposite angles.
If a triangle shall be of equal legs, it has an equiangular base : And if it shall be of equal sides, it is also equiangular. *Eucl.* 5 *&* 6 *p*.6.
Any two sides of a triangle shall be greater than the remaining side. *Eucl.*29 *p*.1.
The greater side of a triangle subtends the greater angle; and the greater angle is subtended by the greater side. *Eucl.* 19 *&* 18 *p*.1.
The complements of angles or arcs are said to be for quadrants or semicircles.

## *CHAPTER II.*

### *PROP. I.*

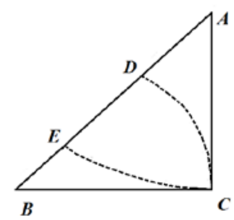
In a right angled triangle ; *If the side subtending the right angle becomes the radius of a circle, the legs will be as the sines of the opposite angles.*




In the right angled triangle ABC, with the interval AB, and from the centres A & B the arcs BGD & AFE are described ; the legs AC & BC will be as the sines of the angles A & B: for they are as half of the subtended [chords] ACE & BCD.

### *PROP. II.*

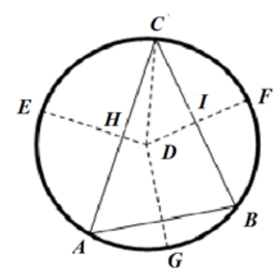
In a right angle triangle ; *if, from either point with an acute angle , and with the interval of the other leg, a periphery may be described; either leg will be the radius, tangent to the remaining leg, but cutting the hypotenuse (or the sided subtending the right angle).*




In the right angled triangle ACB, from the point of the angle B, and with the interval of the leg BC, the periphery DC may be described; BC will be the radius, AC will be as the tangent & AB as the secant [of the angle ABC]. Likewise if the periphery AC may be described with the interval AC, AC will be the radius, BC will be as the tangent, and AB the secant of the angle BAC, by Chap.1,Book 1, [of this book].

### *PROP. III.*

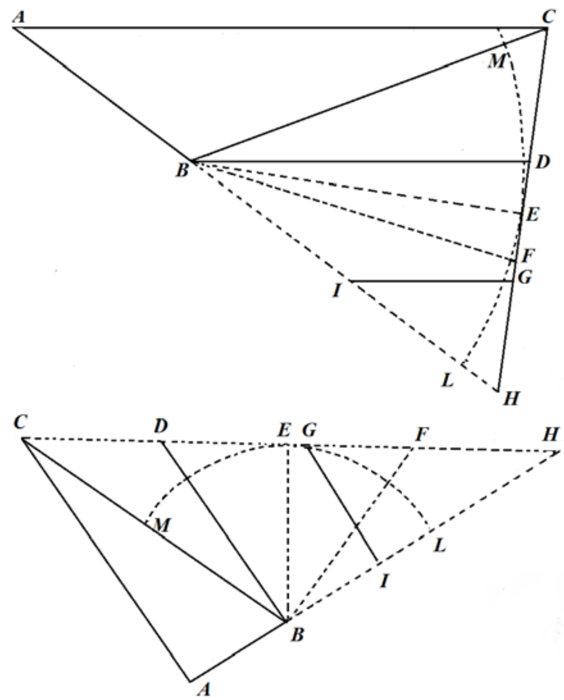
In any plane triangle whatever ; *The sides are proportional to the sines of the opposite angles* ; *and conversely.*




ABC shall be a triangle inscribed in the circle, and from the centre D the perpendicular radii may be drawn DF, DE, DG, bisecting both the peripheries as well as the subtended chords of the peripheries ; also the radius DC may be drawn. And thus because the angle at the centre EDC is equal to the angle at the periphery ABC; and CDF is equal to CAB, *by prop.* 20.*Book* 3.*Eucl.* On that account half the sides will be as the sines. Therefore the side CA has the same ratio to the side CB, as the sine CH has to the sine CI. For what the ratio of whole to whole shall be, so the same shall be of half to half.

*PROP. IIII.*

In any plane triangle. *As the sum of two sides to the difference of the same, thus the tangent of half the sum of the angles to the tangent of half the difference of these.*




In an oblique angled triangle ABC, the sides AB, CB shall be known, together with the angle ABC understood from the same, as in the obtuse angled triangle above, and in the acute angled triangle below. And with the side AB continued into H, as far as BH shall be equal to BC, and C & H will be joined. And BI shall be equal to the side AB. Also from the indicated points B & I the right lines BD & IG may be drawn parallel to the side AC. Therefore the exterior angle CBH is equal to the sum of the interior opposite angles *by Prop*.32. *Book*1. *Eucl*. For the angle CBD is equal to the angle BCA; & the angle DBH to the angle CAB. In addition from the point B the perpendicular BE may be drawn, which will bisect CH.
Also the radius BE may be drawn to the periphery MEL. And the tangent CE will be half the sum of the opposite angles, & DE (which also is equal to FE) the tangent of half the difference [*i.e*. in proportion]. And thus because AC, BD, & IG are parallel, CD, DG, & FH shall be equal ; & and thus DF & GH will be equal. And thus I say

$$\textit{The proportions are}:\left\{\begin{array}{l}\text{AH (or related by an}\\ \text{IH equation of}\\ \text{CH the proportions)}:\\ \text{CH=DF}\end{array}\right.\left\{\begin{array}{l}\text{AH Sum of the two sides.}\\ \text{IH Difference of the two sides.}\\ \text{CE Tangent } \tfrac{1}{2} \text{ of half the sum of the opposite angles.}\\ \text{DE Tangent } \tfrac{1}{2} \text{ of half the difference of the angles.}\end{array}\right.$$

[In modern notation, we have : $\dfrac{a+c}{a-c}=\dfrac{\tan\dfrac{A+C}{2}}{\tan\dfrac{A-C}{2}}$ .]

Otherwise.

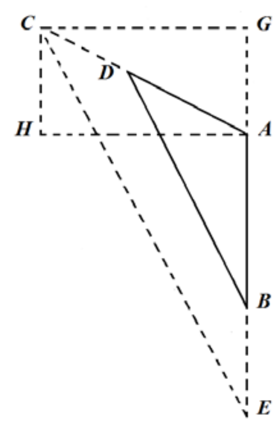
*So that the sum of the sides, shall be to the greater side doubled: thus as the tangent of half the sum of the opposite angles, to the sum of the tangents of half the sum and of half the difference of the angles.*

$$[\text{i.e. : } \frac{a+c}{2a}=\frac{\tan\frac{A+C}{2}}{\tan\frac{A-C}{2}+\tan\frac{A+C}{2}}.]$$

And again :

*So that the sum of the sides, shall be to the lesser side doubled: thus as the tangent of half the sum of the opposite angles to the difference of the tangents of half the sum and half the difference of the angles.*

$$[\text{i.e. : } \frac{a+c}{2c}=\frac{\tan\frac{A+C}{2}}{\tan\frac{A+C}{2}-\tan\frac{A-C}{2}}.]$$

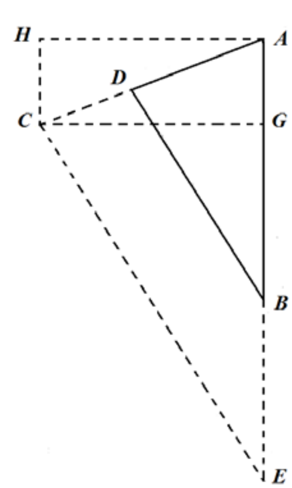



It is possible to put these in place from the preceding proposition with the adjoining diagrams [, or simply from the properties of simple proportions].

This fourth proposition even now can be expressed otherwise.

*As the lesser side to the greater side : thus the secant of the complement or excess of the angle taken to the fourth proportion.*

Thus the fourth prop. itself may be put [into a ratio] together with the tangent of the complement or the excess. Then if the given angle shall be obtuse, the sum is the tangent of the complement of the angle of the smaller side opposite: if acute, the difference is the tangent of the complement of the angle of the smaller side opposite.




In the oblique angled triangle ABD, the sides AB, AD, shall be known, together with the angle BAD contained by these, in the upper obtuse angled triangle, and also in the lower acute angled triangle. And with the sides AB, AD continued as far as to E & C; from the point C the right line CE may be drawn parallel to the side DB, together with CG perpendicular to the right line AE where there is a need for it to be continued. From the same point A, the right line AH may be drawn equal and parallel to the right line CG, which may be joined to the perpendiculars CH & AG: and thus the oblique angled triangles DAB and CAE may be equated by *prop*. 4 & 5. *Book* 6. *Eucl*: Likewise the right angled triangles CAH, AC*G*, by *prop.8. Book*1. *Eucl.* And there will be $\mathrm{CG}=\mathrm{AH}$, the radius ;

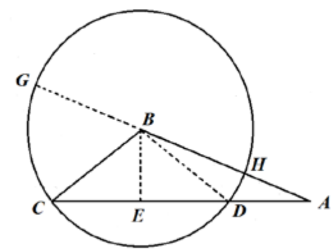
$GA = HC$, the tangent ; & CA the secant, by *prop*.2. of this Chapter. I say :

$$Proportions.\begin{cases} \text{DA} & \text{Lesser side.} \\ \text{AB} & \text{Greater side.} \\ \text{CA} & \text{Secant of the Complement or the excess of the given angle.} \\ \text{AE} & \text{Fourth Prop.} \end{cases}$$

The fourth prop. may be associated with GA itself, with the tangent of the angle GCA. Then if the angle taken may be oblique, Then if the angle taken shall be oblique, the sum will be BE, but if the angle shall be acute, the difference will be BE, the tangent of the angle GCE ; the complement of which shall be CEG, equal to the angle DBA; And thence the angle ADB left by the complement.

PROP. V.

In some plane triangle : *As the base is to the sum of the sides, thus the difference of the sides to the difference of the segments of the base.*

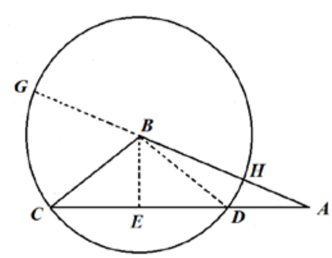



In the oblique angled triangle ABC, the base shall be CA, The sum of the sides GA, the difference of the sides HA, the difference of the segments of the base AD. The perpendicular BE may be drawn bisecting CD in E. And thus because the rectangle AC, AD is equal to the rectangle AG, AH by *prop.* 36. *Book* 1 *Eucl.* therefore the sides of these are inversely proportional. I say, therefore :

$$Proportions\begin{cases} \text{AC} & \textit{Base.} \\ \text{AG} & \textit{Sum of sides.} \\ \text{AH} & \textit{Difference of sides.} \\ \text{AD} & \textit{Difference of base segments.Thence the segment } \text{AE } \textit{or } \text{CE.} \end{cases}$$

Otherwise.

*The difference of the squares may be taken from the sides* BC, BA, *and divided by the base* CA, *the quotient will be the difference of the segments of the base DA.*




Or again.

*The sides* AB, BC *and* CA *may be squared, & the square* BA *taken from the rest, half of the remainder may be divided by the base, and the quotient will be* CE *less the segment of the base.*
*And by taking the square* CB *from the squares* BA, AC, *half of the remainder divided by the base will give the quotient* AE, *the greater segment of the base*.

[Essentially the cosine rule.]

## *CHAPTER III.*

*The manner of changing sexagesimal parts into decimals, and vice versa.*

The given parts [*i.e.* fractions] may be reduced to the other name, if the number of given parts may be multiplied by the new name, and the product divided by the name of the given parts ; the quotient will be the number of parts sought.

Let the given parts be $\frac{12}{60}$, and the new given name shall be $\frac{\quad}{100}$; the number is sought for this name thus agreeing so that the parts found shall be equal to the given parts.

$$Proportions.\begin{cases} Given\ name & 60 \\ Number\ given & 12 \\ Number\ assumed & 100 \\ Number\ found & 20 \end{cases} \qquad \frac{12}{60} \text{ equals } \frac{20}{100}.$$

And thus if the name accepted may multiply the given number, and the product may be divided by the given name, the quotient will be the number sought. And from the given minutes or sixtieth parts (since nothing will change on multiplying by 100) division by 6 is made, and the quotient will be the numerator sought.

So that 29 Degrees, 27' may be put in place thus $29^{\,27}$, and 27 is divided by 6, and the quotient put in place thus below $29^{\,27}\tfrac{45}{100}$, the quotient is $\tfrac{45}{100}$, and this will be the number sought, & 29 Deg. 27' shall be equal to $29\tfrac{45}{100}$.

[Recall that Briggs in Part One had used decimal fractions of degrees as an easier alternative in calculations rather than minutes and seconds of arc, a suggestion not adopted at the time by others.]

Thus the diurnal motion of the moon in the works of *Copernicus* 12 Deg. $11':26'':41''':\ 31'''':$ is reduced to 12.$\underline{19074776}$. Thus the motion of the sun in 44 days, 43 Deg. $22':0'';19''':$ is reduced to 43$\underline{3667546}$.

| | |
|---|---|
| 31 | 19 |
| 41$\underline{51667}$ | 00$\underline{31667}$ |
| 26$\underline{691944}$ | 22$\underline{0052777}$ |
| 11$\underline{4448657}$ | 43$\underline{36675463}$ |
| 12$\underline{19074776}$ | 100000000 |
| 100000000 | |

It is made easier with the aid of the adjoining table, with the decimal parts added corresponding to the first, second, the third and the fourth minutes in a single sum, thus

| | | | |
|---|---|---|---|
| 11 *first minutes correspond to* | 1833,333,333 | 22 *Min. correspond to* | 3666,666,667 |
| 26 *from the second*………….. | 72,222,222 | 0 *Seconds*……………………. | 0 |
| 41 *from the third* ……………….. | 1,898,148 | 19 *from the third.*………… | 879,630 |
| 31 *from the fourth* …………….. | 23,920 | *Providing* ……….. | 3667,546,297 |
| *Providing the decimal* | 1907,4771623 | | |

If on the other hand given hundredth parts shall be reduced to sexagesimals, the multiplication of the given parts by 60, the product divided by 100 (that is, with two placed removed by us) will give the number of minutes. For example.

There shall be given $24\underline{45}$ degr., the number of minutes is sought equal to the parts $\frac{45}{100}$. Perform the multiplication of the number 45 by 60, the product will be 2700; I say, that with two zeros removed, 27 minutes is equal to 45 hundredths. Thus,
let the diurnal motion of the moon be $12\underline{19074776}$ degr., the multiplication of the part $\underline{19074776}$ by 60 is performed, the first factor arises $11\underline{44486560}$; and the diurnal motion of the moon shall be 12 degr.$11\frac{44486560}{100000000}$ minutes.

*Table for the reduction of sexagesimal to decimals parts, & vice-versa.*

| *Sexag.* | *First corr. minutes* | *Second* | *Third* | *Fourth* | *Fifth.* |
|---|---|---|---|---|---|
| 1 | 0166,666,667 | 0002,777,778 | 0000,046,296 | 0000,000,772 | 0000,000,013 |
| 2 | 0333,333,333 | 5,555,555 | , 92,593 | , 1,573 | , ,026 |
| 3 | 0500,000,000 | 8,333,333 | ,138,889 | , 2,315 | , ,039 |
| 4 | 0666,666,666 | 11,111,111 | ,185,185 | , 2,315 | , ,051 |
| 5 | 0833,333,333 | 13,888,889 | ,231,481 | , 3,046 | , ,064 |
| 6 | 1000,000,000 | 16,666,667 | ,277,778 | , 4,630 | , ,077 |
| 7 | 1166,666,667 | 19,444,444 | ,324,074 | , 5,401 | , ,090 |
| 8 | 1333,333,333 | 22,222,222 | ,370,370 | , 6,173 | , ,103 |
| 9 | 1500,000,000 | 25,000,000 | ,416,667 | , 6,944 | , ,116 |
| 10 | 1666,666,667 | 27,777,778 | ,462,963 | , 7,716 | , ,129 |
| 11 | 1833,333,333 | 30,555,556 | ,509,259 | , 8,488 | , ,141 |
| 12 | 2000,000,000 | 33,333,333 | ,555,556 | , 9,259 | , ,154 |
| 13 | 2166,666,667 | 36,111,111 | ,601,852 | , 10,031 | , ,167 |
| 14 | 2333,333,333 | 38,888,889 | ,548,148 | , 10,802 | , ,180 |
| 15 | 2500,000,000 | 41,666,667 | ,694,444 | , 11,574 | , ,193 |
| 16 | 2666,666,667 | 44,444,444 | ,740,741 | , 12,345 | , ,206 |
| 17 | 2833,333,333 | 47,222,222 | ,787,037 | , 13,117 | , ,219 |
| 18 | 3000,000,000 | 50,000,000 | ,833,333 | , 13,889 | , ,232 |
| 19 | 3166,666,667 | 52,777,778 | ,879,630 | , 14,660 | , ,245 |
| 20 | 3333,333,333 | 55,555,555 | ,925,926 | , 15,432 | , ,258 |
| 21 | 35,00,000,000 | 58,333,333 | ,972,222 | , 16,204 | , ,270 |
| 22 | 3666,666,667 | 61,111,111 | 1,018,578 | , 16,975 | , ,283 |
| 23 | 3833,333,333 | 63,888,889 | 1,064,814 | , 17,747 | , ,296 |
| 24 | 4000,000,000 | 66,666,667 | 1,111,111 | , 18,518 | , ,309 |
| 25 | 4166,666,667 | 69,444,444 | 1,157,407 | , 19,290 | , ,322 |
| 26 | 4333,333,333 | 72,222,222 | 1,203,703 | , 20,062 | , ,335 |
| 27 | 4500,000,000 | 75,000,000 | 1,250,000 | , 20,833 | , ,348 |
| 28 | 4666,666,667 | 77,777,778 | 1,296,296 | , 21,605 | , ,360 |
| 29 | 4833,333,333 | 80,555,555 | 1,342,592 | , 22,376 | , ,373 |
| 30 | 5000,000,000 | 83,333,333 | 1,388,888 | , 23,148 | , ,386 |
| 31 | 5166,666,667 | 86,111,111 | 1,435,184 | , 23,920 | , ,399 |
| 32 | 5333,333,333 | 88,888,889 | 1,481,481 | , 24,691 | , ,412 |
| 33 | 5500,000,000 | 91,666,667 | 527,777 | , 25,463 | , ,425 |
| 34 | 5666,666,667 | 94,444,444 | 1,574,073 | , 26,234 | , ,438 |
| 35 | 5833,333,333 | 97,222,222 | 1,620,370 | , 27,006 | , ,450 |
| 36 | 6000,000,000 | 100,000,000 | 1,666,666 | ,27,778 | , ,463 |
| 37 | 6166,666,667 | 102,777,778 | 1,712,963 | ,28,549 | , ,476 |
| 38 | 6333,333,333 | 105,555,555 | 1,759,259 | , 29,321 | , ,489 |
| 39 | 6500,000,000 | 108,333,333 | 1,805,556 | , 30,092 | , ,502 |
| 40 | 6666,666,667 | 111,111,111 | 1,851,852 | , 30,864 | , ,515 |
| 41 | 6833,333,333 | 113,888,889 | 1,898,148 | , 31,636 | , ,527 |
| 42 | 7000,000,000 | 116,666,667 | 1,944,444 | , 32,407 | , ,540 |
| 43 | 7166,666,667 | 1l9,444,444 | 1,990,740 | , 33,179 | , ,553 |
| 44 | 7333,333,333 | 122,222,222 | 2,037,037 | , 33,950 | , ,566 |
| 45 | 7500,000,000 | 125,000,000 | 2,083,333 | , 34,722 | , ,579 |
| 46 | 7666,666,666 | 127,777,778 | 2,129,629 | , 35,494 | , ,592 |
| 47 | 7833,333,333 | 130,555,555 | 2,175,925 | , 36,265 | , ,605 |
| 48 | 8000,000,000 | 133,333,333 | 2,222,222 | , 37,037 | , ,618 |
| 49 | 8166,666,667 | 136,111,111 | 2,268,518 | , 37,808 | , ,630 |
| 50 | 8333,333,333 | 138,888,889 | 2,314,815 | , 38,580 | , ,643 |
| 51 | 8500,000,000 | 141,666,667 | 2,361,111 | , 39,352 | , ,656 |
| 52 | 8666,666,667 | 144,444,444 | 2,407,407 | , 40,123 | , ,669 |
| 53 | 8333,333,333 | 147,222,222 | 2,453,703 | , 40,895 | , ,682 |
| 54 | 9000,000,000 | 150,000,000 | 2,500,000 | , 41,666 | , ,694 |
| 55 | 9166,666,667 | 152,777,778 | 2,546,296 | , 42,438 | , ,707 |
| 56 | 9333,333,333 | 155,555,555 | 2,592,592 | , 43,210 | , ,720 |
| 57 | 9500,000,000 | 158,333,333 | 2,638,889 | , 43,981 | , ,733 |
| 58 | 9666,666,667 | 161,111,111 | 2,685,185 | , 44,753 | , ,746 |
| 59 | 9833,333,333 | 163,888,889 | 2,731,481 | , 56,524 | , ,759 |

These decimal parts 44486560 are reduced in the same manner to minutes of the second order on multiplying by 60, thus :

11 44486560
26 69193600
41 51616000
30 96960000
58 17600000

And in the same manner decimals of the second order can be reduced to minutes of the third order, &c.

Thus the motion of the sun in 44 days is :

Degr. 43 36675463
22 00527780
00 31666800
19 0008000

Likewise the motion of the sun in 44 days is 43 degr. 22': 00":19'''.

Note: *with eight places removed everywhere from the product, evidently just as many places are in the numerator as in the given parts ; the parts remaining are the first, second, third minutes etc.*

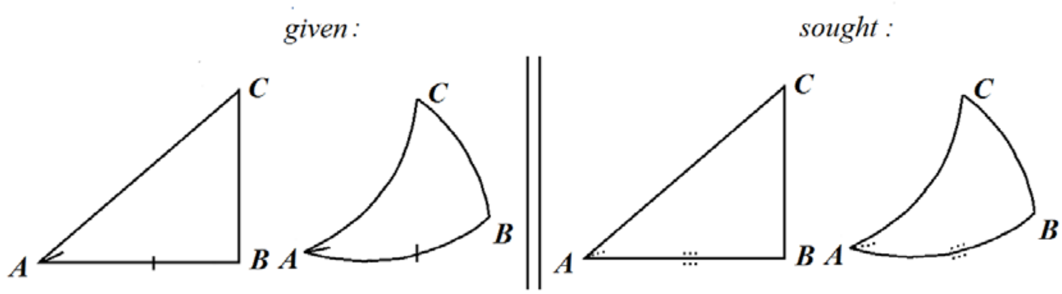
With the aid of the preceding table, it is permitted by continued subtraction to acquire the sexigesimals corresponding to these also, the nearest of the smaller parts of the decimals found in that fraction from the given decimal. Thus

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Parts given* | 1907,477,6 | | | *Parts given* | *3667,546,3* | | |
| *Found* ……... | 1833,333,3 … | 11 | *First Min.* | *Found* … | *3666,666,6.* | 22 | *First Min.* |
| | 74,144,3 | | | | *879,7* | 0 | *Second* |
| *Found* … | 72,122,2…. | 26 | *Second.* | *Found* … | *879,6,* | 19 | *Third.* |
| | 1,922,1 | | | | | | |
| *Found* … | 1,898,1…. | 41 | *Third.* | | | | |
| | 24,0 | | | | | | |
| *Found* … | 23,9….. | 31 | *Fourth.* | | | | |

## *CHAPTER IIII.*

### *The measurement of plane right angled triangles.*

In the solutions of all triangles, the diagrams are expressed thus :



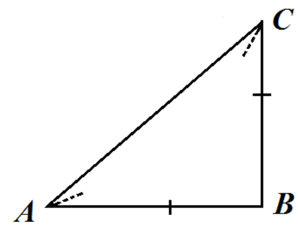

Besides both in plane as well as in spherical right angled triangles, the side subtending the right angle is called the *hypotenuse*, so that the side AC subtends the angle ABC. And moreover so that the sides AB, CB containing the right angle are called the *legs*. In addition it may be known trigonometrically, in the measurement of triangles by the rule of proportion in which there are four terms, that three are given, and the fourth is sought ; If the terms of the ratio shall be sines, tangents, secants or sides, with the product of the second and third divided by the first, the quotient will show the fourth.

But if the terms of the ratio shall be the logarithms of sines tangents, secants or sides ; If from the sum of the logarithms of the second and the third and the logarithm of the first may be subtracted, the difference will be the logarithm of the fourth.

PROB. 1.

*With the legs given, either angle is sought.*

In the right angled triangle ABC, either acute angle is sought.



from the given legs $\begin{cases} \text{AB} & 1123\underline{7943} \\ \text{BC} & 605\underline{8601} \end{cases}$

*Terms of the ratio:*

*Proportions.* $\begin{cases} \textit{Either leg.} \\ \textit{The remaining leg.} \\ \textit{Radius.} \\ \textit{Tangent of the angle of the remaining opposite leg, by } \text{Prop.2.Chap.2.} \end{cases}$

Shown by arithmetic :

| | *Legs & Tang.* | *Logarith. legs & Tang.* |
|---|---|---|
| *Leg* AB . . . . | $1123\underline{7943}$ . . | 3,05068,6815 |
| *Leg remaining* BC . . | $605\underline{8601}$ . . | 2,78237,2352 |
| *Radius* AB . . . . | 100000,00000 . . | 10,00000,0000 |
| *Tangent* BAC gr. $28\underline{33}$ | 53912,01159 . . | 9,73168,5537 |

Hence for the complement BCA gr.$61\underline{67}$.

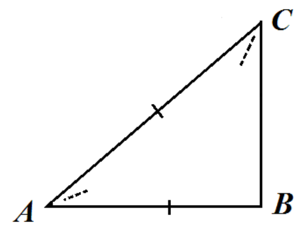
*Note.* The logarithms of the sides are desired from the *Chiliad of Logarithms* or from the *Arithmetica Logarithmica* of the most learned *Mr. Briggs*. Which truly itself is negative, and this table will be satisfied by a positive logarithm, but we may reject the characteristic, and substitute another (so that the negative numbers are removed). Because if they may not occur accurately in that, yet they are able to be obtained by a proportional part closely ; Thus for example : The leg BC $605\underline{8601}$ being sought in the tables, we come upon that among the tangents near to Gr. $31\underline{21}$, of which the logarithm is 9,78237,23521. Thus with the number nine or the characteristic excluded, we have substituted the number two, always by increasing or decreasing the characteristic by a number of places beyond the place of unity. So that if the whole number shall be placed together, such decimal parts shall be distinguished from these whole parts by a line drawn below; [using logs,] a whole number is permitted to be written in several notations, yet the characteristic of that considers only these noted in which whole units are written, so that no account will be had of the numbers noted following subsequently, by which the parts adjoined may be expressed. So that :

| | | *Logarithms* |
|---|---|---|
| | $11\underline{237943}$ | 1,05068,6815 |
| | $112\underline{37943}$ | 2,05068,6815 |
| *Leg* AB | $1123\underline{7943}$ | 3,05068,6815 |
| | $11237\underline{943}$ | 4,05068,6815 |

## PROB. 2.

*With a leg and hypotenuse given, either angle is sought.*

In the right angled triangle ABC either acute angle is sought.




From the given:
- leg AB . . . . $1123\underline{7943}$
- hypotenuse AC . . $1276\underline{7067}$.

*Terms of the ratio*

*Proportions.*
- *Hypotenuse given.*
- *Leg given.*
- *Whole sine.*
- *Sine of the angle of the leg given opposite.* per Prop.1.Cap.2.

Shown by arithmetic.

| *Proportions.* | | *Sides & Sines.* | *Log.Legs.& Sines.* |
|---|---|---|---|
| *Hypotenuse* AC | | $1276\underline{7067}$ | 3,10609,1142 |
| *Leg* BC | | $1123\underline{7943}$ | 3,05008,6815 |
| *Whole sine* ABC | gr.$90\underline{00}$ | 100000,00000 | 10,00000,0000 |
| *Sine* ACB | gr.$61\underline{67}$ | 88022,90008 | 9,94459,5673 |

The complement of which gr.$28\underline{33}$ is the remaining angle BAC.

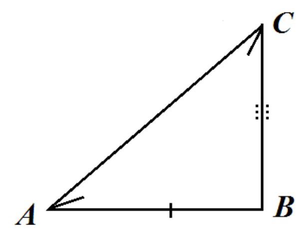
Otherwise.

$$\textit{Proportions.}\begin{cases}\textit{Leg given.}\\ \textit{Hypotenuse given.}\\ \textit{Radius.}\\ \textit{Secant of the angle enclosed by the sides given.}\end{cases}$$

But there is no need for this variation, on account of the easy use of logarithms.

PROB. 3.

*With the angles and a leg given, the remaining leg is sought.*




In the right angled triangle ABC the leg BC is sought.

$$\text{From the given}\begin{cases}\text{leg AB . . . . } 1123\underline{7943}\\ \text{with the angles}\begin{cases}\text{ACB gr.}61\underline{67}\\ \text{BAC gr.}28\underline{33}\end{cases}\end{cases}$$

*Terms of the ratio*

$$\textit{Proportions.}\begin{cases}\textit{Radius.}\\ \textit{Tangent of the adjacent angle for the given leg.}\\ \textit{Leg given.}\\ \textit{Leg sought.}\text{ per Prop.2.Cap.2.}\end{cases}$$

Shown by numbers.

| Proportions. | *Tang. & legs.* | *Log.Tan.& legs.* |
|---|---|---|
| Radius AB | 100000,00000 | 100000,00000 |
| Tangent BAC gr.28$\underline{33}$ | 53912,01159 | 9,73168,5536 |
| Leg AB | 1123$\underline{7943}$ | $\underline{3,05068,6815}$ |
| Leg BC | 605$\underline{8601}$ | $\cancel{1}$2,78237,2351 |

Otherwise.

$$\textit{Proportions}\left\{\begin{array}{l}\textit{Sine of the opposite angle for a given leg.}\\ \textit{Sine of the angle for the leg sought.}\\ \textit{Leg given.}\\ \textit{Leg sought.}\end{array}\right.$$

Otherwise.

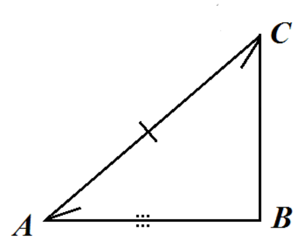
$$\textit{Proportions.}\left\{\begin{array}{l}\textit{Tangent of the opposite angle for the given leg.}\\ \textit{Radius.}\\ \textit{Leg given.}\\ \textit{Leg sought.}\end{array}\right.$$

PROB. 4**.**

*With the hypotenuse & angles given,*
*either leg is sought.*

In the right angled triangle ABC the leg AB is sought.

$$\text{From the given}\left\{\begin{array}{l}\text{hypotenuse AC}\;\ldots\ldots\;1276\underline{7067}\\ \text{with the angles}\left\{\begin{array}{l}\text{ACB gr.}61\underline{67}\\ \text{BAC gr.}28\underline{33}.\end{array}\right.\end{array}\right.$$




*Terms of the ratio.*

$$\textit{Proportions.}\left\{\begin{array}{l}\textit{Whole sine.}\\ \textit{Sine of the angle adjacent to the legs sought.}\\ \textit{Hypotenuse given.}\\ \textit{Leg sought.}\text{ per Prop.1.Cap.2.}\end{array}\right.$$

Shown by arithmetic.

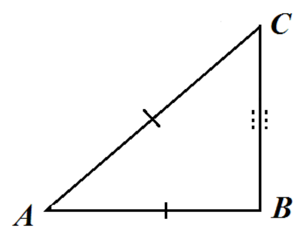
| | | *Sine.* & *Sides* | *Log.Sin.* & *Sides.* |
|---|---|---|---|
| *Proportions.* | Whole sine . . . . | 100000,00000 | . . 10,00000,0000 |
| | Sine ACB gr.61<u>67</u> . | 88022,90008 | . . 9,94459,5673 |
| | Hypotenuse AC . . | 1276<u>7067</u> | . . 3,10609,1142 |
| | Leg AB . . | 1123<u>7943</u> | . . 3,05068,6815 |

The problem itself can be solved by secants and tangents, but we omit the use of these purposely as redundant.

## PROB. 5
*With the hypotenuse and a leg given, the remaining leg is sought.*

In the right angled triangle ABC the leg BC is sought,

with the given $\begin{cases} \text{hypotenuse AC . . . . } 1276\underline{7067} \\ \text{leg AB . . . . } 1123\underline{7943}. \end{cases}$




47 *Prop.* 1.*Eucl.* supplies the Solution of this problem.
For because in the right angled triangle the hypotenuse can be equated to the legs ; on that account the difference of the squares of the hypotenuse and of a leg will be the leg sought [by setting up a proportionality]. Anyone who wishes to acquaint themselves with arts of this kind, should consult the most learned Briggs, *Arith. Logarith.*, Ch.18. & 19. Because truly it is our present intent, to illustrate the use of the tables, thus we will approach this problem itself with others following with the help of this work, by agreeing on a twofold exercise for the solution of this ; of which first the angle, then the leg is shown.

*Terms of the ratio.*

I. by Prob.2.

*Proportions.*
- *Hypotenuse given.*
- *Leg given.*
- *Whole sine.*
- *Sine of the adjacent angle for the leg sought*. per Prop.1.Cap.2.

| | II. | II. by Prob.3. |
|---|---|---|
| *Proportions.* | *Whole sine.* | *Radius.* |
| | *Sine adjacent angle for leg sought.* | *Tangent adjacent angle for leg given.* |
| | *Hypotenuse given.* | *Leg given.* |
| | *Leg sought*. | *Leg sought*. |

Shown by arithmetic.

| | | I. *Sides* & *Sines*. | *Log.Sides.* & *Sines*. |
|---|---|---|---|
| *Proportions.* | Hypotenuse AC . . | 1276<u>7067</u> | . . 3,10609,1142 |
| | Leg AB . . | 1123<u>7943</u> | . . 3,05068,6815 |
| | Whole Sine . . . | 100000,00000 | . . 10,00000,0000 |
| | Sine ACB gr.61<u>67</u> . | 88022,90008 | . . 9,94459,5673 |

II.

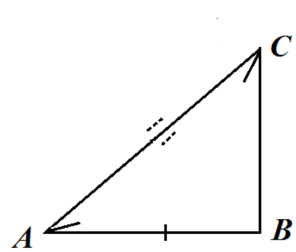
| | | | |
|---|---|---|---|
| *Proportions.* | Whole sine . . . . . . | 100000,00000 | . . 10,00000,0000 |
| | Sine angle CAB gr.28<u>33</u> . | 47454,91609 | . . 9,67628,1209 |
| | Hypotenuse AC . . . . . . | 1276<u>7067</u> | . . 3,10609,1142 |
| | Leg BC . . . . . . | 605<u>8601</u> | . . 2,72837,2351 |

## PROB. 6.

*With the angles and a leg given, the hypotenuse is sought.*

In the right angled triangle ABC the hypotenuse AC is sought.

From the given
- leg AB . . . . 1123<u>7943</u>
- with the angles ACB gr.61<u>67</u>, BAC gr.28<u>33</u>.



$$\textit{Terms of the ratio.}$$

$$\textit{Proportion.}\left\{\begin{array}{l}\textit{Sine of the angle for the opposite leg}\\ \textit{Whole sine.}\\ \textit{Leg given.}\\ \textit{Hypotenuse sought}.\ \text{per Prop.1.Cap.2.}\end{array}\right.$$

Shown by Arithmetic.

*Proportions.*

| | Sines & Sides | Log.Sin.& Sides. |
|---|---|---|
| Sine ACB gr.61$\underline{67}$ . | 88022,90008 . . | 9,94459,5673 |
| Whole Sine . . . . | 100000,00000 . . | 10,00000,0000 |
| Leg AB . . | 1123$\underline{7943}$ . . | 3,05068,6815 |
| Hypotenuse AC . . | 1276$\underline{7067}$ . . | 3,10609,1142 |

Otherwise

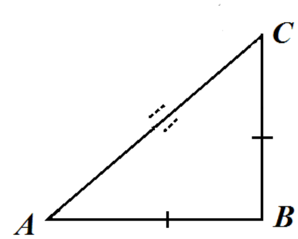
$$\textit{Terms of the ratio.}$$

$$\textit{Proportions.}\left\{\begin{array}{l}\textit{Radius.}\\ \textit{Secant of the adjacent angle for the given leg}.\\ \textit{Leg given.}\\ \textit{Hypotenuse sought}.\ \text{per Prop.2.Cap.2.}\end{array}\right.$$

PROB. 7.

*With the legs given the hypotenuse is sought.*

In the right angled triangle ABC the hypotenuse AC is sought.




$$\text{From the given}\left\{\text{legs}\left\{\begin{array}{ll}\text{AB} & 1123\underline{7943}\\ \text{BC} & 605\underline{8601}.\end{array}\right.\right.$$

*Terms of the ratio.*

1. For either acute angle

*Proportions.*
- *Either leg.*
- *Remaining leg.*
- *Radius.*
- *Tangent of the angle for the remaining opposite leg*, by Prop.2.Cap.2.

II. For the hypotenuse

*Proportions.*
- *Sine of the angle for the leg opposite.*
- *Leg opposite to that angle.*
- *Whole sine.*
- *Hypotenuse sought.*

or
- *Radius*
- *Secant of the angle for the adjacent leg*
- *Leg for the adjacent angle*
- *Hypotenuse sought*.per Prop.2Cap.2.

Shown by numbers.

| *Proportions.* | *Legs* & *Tans.* I | *Logs.Legs.* & *Tans.* |
|---|---|---|
| *Leg* AB . . . . | 1123$\underline{7943}$ . . | 3,05068,6815 |
| *Leg* BC . . . . | 605$\underline{8601}$ . . | 2,78237,2352 |
| *Radius* AB . . . . | 100000,00000 . . | 10,00000,0000 |
| *Tangent* BAC gr. 28$\underline{33}$ | 53912,01159 . . | 9,73168,5537 |

| *Proportions.* | *Sines* & *Sides.* II | *Logs.Sin.* & *Sides.* |
|---|---|---|
| Sine CAB gr.28$\underline{33}$ . | 47454,91609 . . | 9,67628,1209 |
| Whole Sine . . . . | 100000,00000 . . | 10,00000,0000 |
| Leg BC . . . . . | 605$\underline{8601}$ . . | 2,78237,2352 |
| Hypotenuse AC . | 1276$\underline{7067}$ . . | 3,10609,1142 |

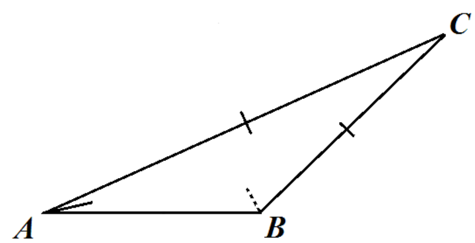
## *CHAPTER V.*

*The measurement of plane oblique angled triangles.*

PROB. 1.

*With two given sides and with either of the opposite angles given, the angle opposite to the remaining side is sought.*

In the oblique angled triangle ABC the obtuse angle ABC is sought.




From the given sides AC $1276\underline{7067}$, BC $865\underline{1765}$, with the angle CAB gr. $37\underline{4454}$.

*Terms of the ratio.*

*Proportions.*
- *the one side.*
- *the other side.*
- *Sine of the angle opposite the one side.*
- *Sine of the angle opposite the other side.* per Prop.3.Cap.2.

Shown by arithmetic.

| | | *Sides & Sines.* | *Logs.Sides.& Sines.* |
|---|---|---|---|
| *Proportions.* | Side BC . . | $865\underline{1765}$ | . . 2,93710,4743 |
| | Side AC . . | $1276\underline{7067}$ | . . 3,10609,1142 |
| | Sine BAC gr. $37\underline{4454}$ | 60800,51245 | . . $\underline{9,78390,7237}$ |
| | | | . . 12,88999,8379 *Sum* |
| | Sine ABC gr.$116\underline{2064}$ | 89720,90422 | . . 9,95289,3642 *Differ*. |

Hence by the complement the remaining angle is gr. $26\underline{3482}$.

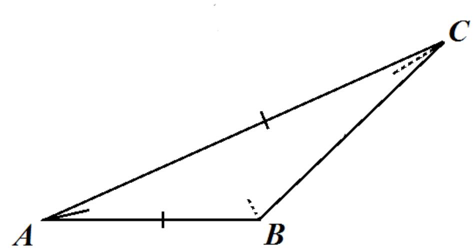
*Note.* If the given angle shall be obtuse, the side opposite to that will be greater than any of the rest, and the remaining two angles will be acute. But if the remaining angle shall be acute and the sides may be given, it will be uncertain whether the angle of the greater side opposite shall be obtuse, right, or acute ; yet the fourth proportion shall be the same, surely the sine of an acute angle or its complement to two right angles.

Therefore in order that we know what kind of angle the largest side is placed opposite, the largest sum and difference is taken of the sides, and the mean (or the smallest) logarithm of these it taken : and if the half of these logarithms is equal to the logarithm of the third side, the maximum angle of the opposite side is right. But if the logarithm of the third side is more than half, the angle will be acute: and if less, obtuse. [A result that we could relate to the cosine rule also]. Just as the most learned *Mr. Briggs* has indicated in Ch.18. of the *Arith. Logarithmica, London Edition.*

## PROB. 2.

*With two sides given with the angle between them taken, either other angle is sought.*

In the oblique angled triangle ABC either the angle B or C is sought.




$$\text{From the given}\begin{cases}\text{sides}\begin{cases}\text{AC} & 1276\underline{7067}\\ \text{AB} & 631\underline{5525}\end{cases}\\ \text{with the angle BAC gr. } 37\underline{4454}\end{cases}$$

*Terms of the ratio.*

$$\textit{Proportions.}\begin{cases}\textit{Sum of the sides.}\\ \textit{Difference of the sides.}\\ \textit{Tangent of half the sum of the opposite angles;}\\ \textit{or of half the complement of the angles taken.}\\ \textit{Tangent of half the difference of the opposite angles.}\end{cases}$$

Shown by numbers.

| | | |
|---|---|---|
| Side AC . . . . . | 12767067 | |
| Side AB . . . . . | 6315525 | |
| Sum of the sides . . . . | 19082592 | D |
| Difference of the sides . . | 6451542 | E |
| Twice the greater side . . | 25534134 | G |
| Twice the smaller side . . | 12631050 | H |
| Given included angle | gr. 374454 | |
| The whole circle . . . . | gr.1800000 | |
| Sum of the remaining . . . | gr.1425546 | |
| Half the sum . . . . | gr. 712773 | F |

| | | | Sides & Tans. | Logs.Sides.& Tans. |
|---|---|---|---|---|
| *Proports.* | Sum of the sides . . . | D . . . . | 19082592 . . . . . | 3,28063,7363 |
| | Difference of the sides | E . . . . | 6451542 . . . . . | 2,80966,3527 |
| | Tan. $\frac{1}{2}$ sum of the angles | F 712773 | 295052,31525. . | 10,46989,9013 |
| | | | | 13,87702,0138 *sum.* |
| | Tangent $\frac{1}{2}$ difference | gr. 449291 | 99752,82205 | 9,99892,5177 *diff*. |

To this half sum of the angles gr. 712773 . . . . . 712773

If the half difference is added gr. 449291. But if the $\frac{1}{2}$ differ. is subtr. 449291

The obtuse angle ABC is gr. 1162064. The acute angle ACB remains 263482

Otherwise.

| | | Sides & Tans. | Log.Sides & Tans. |
|---|---|---|---|
| *Proportions.* | Sum of the sides . . . . . . . . . . | 19082592 D . . . . . | 3,28063,7363 |
| | Greater side doubled . . . . . . . . | 25534134 G . . . . . | 3,40712,1125 |
| | Tan. $\frac{1}{2}$ sum of the angles 712773 F. | 295052,31525. . . . . | 10,46989,9013 |
| | Sum tangents of $\frac{1}{2}$ sum & | | 13,87702,0138 |
| | $\frac{1}{2}$ difference of angles | 394805,13730 | 10,59638,2775 |

| | |
|---|---|
| Difference of tangents is. . . . . | 99752,82205 |
| Arc agreeing to this difference is | 449291 |
| Half the sum of opp. angles | 772773 |
| Sum is the angle ABC | 1162064 |
| Difference is the angle ACB | 263482. |

Otherwise

| | | *Sides & Tans.* | *Logs.Sides & Tans.* |
|---|---|---|---|
| *Proportions.* | Sum of sides . . . . . . . . . . | 19082592 D . . . . . | 3,28063,7363 |
| | Lesser side doubled . . . . . . . . | 12631050 H . . . . . | 3,10143,9454 |
| | Tan. $\frac{1}{2}$ sum of angles 712773 F. | 295052,31525. . . . | .10,46989,9013 |
| | Difference of tangents $\frac{1}{2}$ sum & | | 13,87702,0138 |
| | $\frac{1}{2}$ difference of angles opp. | 195299,49319 | 10,29070,1104 |

Difference of tangents is . . . . . . 99752,82206

for this difference of the tangents the arc agrees 449291

Half the sum of the angles opp. 712773

Sum of these is the angle ABC 1162064

Difference is the angle ACB 263482 as above.

Otherwise.

Clearly with the same given sides retained AC 12767067 & AB 6315525 maintaining the same acute angle, Gr. 374454. Of which complement Gr. 525546, the secant is 164472,30008 and the tangent 130580,00340.

| | *Sides.* | *Log.sides.* |
|---|---|---|
| Lesser side AB . . . . . . | 6315535 . . | 2,80040,9454 |
| Greater side AC . . . . . . | 12767067 . . | 3,10609,1142 |
| Secant compl. of included angle | 164472,3001 . . | 0,21609,2763 |
| | . . | 3,32218,3905 |
| Fourth prop. . . . . . . . | 332486,6875 | 0,52177,4451 |

From the fourth compl. of the tan. 130580,0034 is taken

Difference will be the tangent gr. 636518 201906,6941

Of which the complement is gr. 263482 , the angle ACB opp. the smaller side ;
and thence the obtuse angle by the complement 1162064.

*But if the included angle shall be obtuse, clearly* Grad.1162064 the excess of which is

262064 { The secant is 111456,74557 / The tangent is 48219,97608 } And the sides { AB 6315525 / BC 8651765 } There will be

| | *Sides.* | *Logs.sides.* |
|---|---|---|
| Lesser side AB . . . . . . | 6315535 | . . 2,80040,9454 |
| Greater side BC . . . . . . | 8651765 | . . 2,93710,4737 |
| Secant compl. of included angle | 11145,74557 | . . 0,04710,6357 |
| | | . . 2,98421,1094 |
| Fourth prop. . . . . . . . . | 152686,84239 | . . 0,18380,1640 |

To this forth prop. add the tangent

of the excess angle 49219,97608

Sum is the tangent 636518 201906,81847

Of which the compl. is 263482 the angle ACB of the opposite lesser side ;

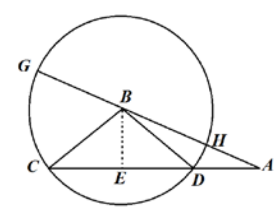
and thence the acute angle BAC 37445 as above.

## PROB. 3.

*With the individual sides given, any angle is sought.*

In the oblique angled triangle ABC any angle is sought, for example BAC

From the given individual sides { AC 12767067 / AB 8651765 / BC 6315525 }




For the solution of this problem two operations are required ; The first for the segment of the base DA. The second for the angle sought.

I. For the segment DA.

*Terms of the ratio.*

*Proportions.* { *Greatest side, or base.* / *Sum of the other sides.* / *Difference the other sides.* / *Difference of the Base segments.* }

Shown by numbers.

| | | *Sides & Tans.* | *Log.Sides.& Tans.* |
|---|---|---|---|
| *Proportions.* | Greatest side AC . . . . . . . . . . . | 12767067 . . . . . . | 3,10609,1142 |
| | Sum of the others AB, BC . . . . . . | 14965525 . . . . . . | 3,17514,3173 |
| | Difference of the others HA . . . . . . | 2336240 . . . . . . | 2,36851,7458 |
| | | | 5,54366,0621 |
| | Difference of base segments 2738858 | | 2,43756,9479 |

Difference of this & base CD 10028209

Half of which is CE or DE 5014145

Thence AE . . . . . . . . . 7752962

From these segments constructed, we can arrive at any angle of the triangle by *Prob*.2.*Cap*.3. We have selected the angle ECB.

*Terms of the ratio.*

| | |
|---|---|
| *Proportions.* | *Leg given.* |
| | *Hypotenuse given.* |
| | *Radius.* |
| | *Secant of the angle taken from the given.* |

Shown by Arithmetic.

| | | *Sides & Secant.* | *Logs.Sides & Secant.* |
|---|---|---|---|
| *Proportions.* | Leg given CE. . . . . . . . . . . | 5014145 . . . . . . | 2,70019,3336 |
| | Hypotenuse CB . . . . . . | 6315525 . . . . . | 2,80040,9454 |
| | Radius . . . . . . | 100000,00000 . . | 10,00000,0000 |
| | Secant of angle ECB gr.374454 | 125955,19299 . . | 10,10021,6118 |

Truly because here the table does not show the logarithm of the secant, yet if twice the radius is subtracted from this fourth proportion, what is returned is the logarithm of the secant ; The logarithm of sine of the complement of the angle ECB will remain. For example :

| | | |
|---|---|---|
| Twice the log. of the radius . . . | | 20,00000,0000 |
| Logarithm of the secant . . . . | | 10,10021,6118 |
| Log.Sine CBE | gr. 52$\underline{5546}$ . . | 9,89978,3882 |

Therefore angle ECB is gr.37$\underline{4454}$.

Or

| | | *Sides & Sines.* | *Logs.Sides. & Sines.* |
|---|---|---|---|
| *Proportions.* | Hypotenuse CB . . | 631$\underline{5525}$ | . . 2,80040,9454 |
| | Leg CE . . . . . | 501$\underline{41045}$ | . . 2,70019,3336 |
| | Whole sine . . . . | 100000,00000 | . . 10,00000,0000 |
| | Sine of the angle CBE gr. 52$\underline{5546}$ | 79393,31251 | . . 9,89978,3882 |

Of which the complement ECB is gr. 37$\underline{4454}$.

The same labour is required to be expended in the remainder of triangle AEB, so that the remaining angles may become known.
This problem also can be solved more expediently, and that by a single operation following the precepts, the fundamentals of which is to be sought in Ch. 18 of the Arithm. Logarithum. by the most learned Mr. Briggs.

*From half of the combined sides, the sides of the triangle can be taken away one by one ; And the sum of the logarithms, of half the sum of the sides and of the difference of the side subtending the angle sought, may be taken from the sum of the remaining logarithms of the differences and of twice the radius ; half the remainder will be the logarithm of the tangent of half the angle sought.*

[This if an expression of the tangent of the half-angle formula of a planar triangle, given by $\tan\frac{A}{2}=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$, where $s$ is the semi perimeter, given by $2s=a+b+c$. Note that the expression is scaled up by a factor of 100000,00000 by including the radius of the whole sine, removing the need for fractions.]

The angle may be sought subtended by the greatest side, evidently ABC.

Showing the precepts by arithmetic.

| | | | |
|---|---|---|---|
| | *Latera.* | | |
| Side AC . . . . | 12767067 | | |
| Side AB . . . . | 8651765 | | |
| Side BC . . . . | 6315525 | | |
| Sum if the sides . . | 27734357 | | *Logarithms.* |
| Half the sum | 138671785 | . . . . | 3,14198,81057 |
| Difference of the side AC | 11001115 | . . . . | 2,04143,67044 |
| | | Sum | 5,18342,48101 L |
| Difference of the side AB | 52154135 | . . . . | 2,71728,87468 |
| Difference of the side BC | 7551653 | . . . . | 2,87804,20547 |
| Radius . . . | 100000,00000 | ; twice log. Radius | 20,00000,00000 |
| | | Sum | 25,59533,08015 M |
| | | Sum | 5,18342,48101 L |
| | | Difference | 20,41190,59914 |
| | | Half Differ. | 10,20595,29957 is |

Logarithm of tangent gr. 581032,
of which the double is gr.1162064, the angle ABC sought.

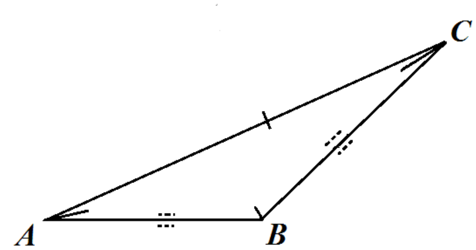
## PROB. 4.

*With the angles and a side given, either remaining side is sought.*

In the oblique angled triangle ABC either side is sought, for example BC

From the given:
- angles
  - BAC gr. 374454
  - ACB gr. 263482
  - ABC gr. 1162064
- with side AC 12767067

*Proportions.*
- *Sine of the angle opposite side.*
- *Sine of angle opposite side sought*.
- *Side given.*
- *Side sought*.per Prop.3.Cap.2.



Shown by arithmetic, for BC.

| | | | *Sines & Sides.* | *Log.Sines & Sides.* |
|---|---|---|---|---|
| *Proportions.* | Sine of angle ABC gr. 637936. | | 89720,90442 | 9,95289,36427 |
| | Sine of angle BAC gr. 374454. | | 60800,51245 | 9,78390,72369 |
| | Side | AC | 12767067 | 3,10609,11422 |
| | | | | 12,88999,83791 |
| | Side | BC | 8651765 | 2,93710,47364 |

For AB

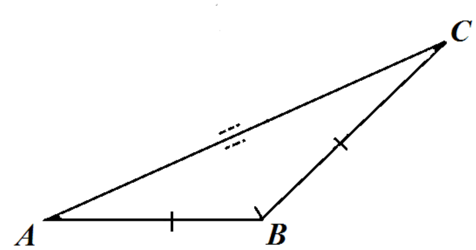
| | | | *Sines & Sides.* | *Log.Sines & Sides.* |
|---|---|---|---|---|
| *Proportions.* | Sine of angle ABC gr. 637936. | | 89720,90442 | 9,95289,36427 |
| | Sine of angle ACB gr. 263482. | | 44382,52009 | 9,64721,19544 |
| | Side | AC | 12767067 | 3,10609,11422 |
| | | | | 12,75330,30966 |
| | Side | AB | 6315525 | 2,80040,94539 |

PROB. 5.

*With two sides given with the angle taken between the same, the remaining side is sought.*

In the oblique angled triangle ABC the side AC is sought.

From the given sides CB 8651765, AB 6315525, with the angle ABC gr. 1162064




In the first place the remaining angles are sought by Prob.3. of this chapter.

Then with the angles acquired we may seek the remaining side by the problem preceding immediately. There is no need for examples.

Otherwise.

If the given angle may become the centre of a circle, of which the radius is equal to either leg, and from the end of the radius a perpendicular may be drawn to the remaining leg (continued if there shall be a need) then the rectangle from the remaining leg, and with twice the segment between the perpendicular and the periphery subtended by the given angle, with the square of the difference of the two given sides , will be equal to the square of the side sought.

# *TRIGONOMETRIAE BRITANNICAE*

# *LIBRI SECUNDI PARS PRIMA*

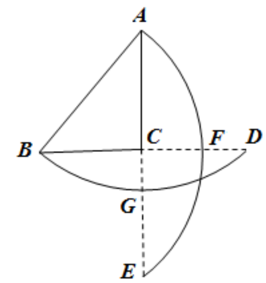
## *De Triangulis Planis.*

### *CAPUT PRIMUM.*

Canonis constructio absoluta, ad usum ipsius illustrandum procedimus, qui praecipue in Triangulorum dimensionibus cernitur. Triangulum est figura tribus lateribus comprehensa. Est autem Triangulum *Planum* vel *Sphaericum.* Planum est superficie plana descriptum; cuius tria latera sunt lineae. Estque *rectangulum* vel *Obliquangulum.*
Triangulum Planum Rectangulum est quod habet unicum angulum rectum.
Obliquangulum quod nullum. *Eucl.27 D*.1.
Si Triangulum Rectangulum sit aequicrurum, uterque angulus ad basintest dimidius recti; Et contra. *Ram*.3.*el*.8, Itaque
Si Trianguli angulus aequetur reliquis,est rectus; Et contra. Et
Si recta a vertice Trianguli bisecans basintfit aequalis bisegmento, angulus verticus rectus est.
Triangulum Planum Obliquangulum est *Obtusangulum vel Acutangulum.*
Obtusangulum est quod unum habet angulum obtusum. *Eucl.28D.1.*
Acutangulum quod omnes acutos. Eucl. 29*D*.1. Itaque
Si Trianguli Plani angulus sit major reliquis, est obtusus ; si minor reliquis, est acutus. Et
Si recta a vertice Trianguli bisecans basintest minor bisegmento, angulus vertice, obtusus est, si major, angulus verticis acutus est.
Trianguli tres anguli aequantur duobus rectis. *Eucl.* 32 *p*.1. Itaque
Trianguli duo quilibet anguli sunt minores duobus rectis. Et
Continuato latere, angulus exterior aequatur duobus interioribus oppositis.
Si Triangulum sit aequicrurum, est in basi aequiangulum: Etsi sit aequilaterum, est quoque aequiangulum. *Eucl. 5 & 6 p.6*
Trianguli duo quaelibet latera sunt majora reliquo. *Eucl. 29 p.1.*
Trianguli majus latus subtendit majorem angulum; & angulus major a majore latere subtenditur. *Eucl. 19 & 18 p.1.*
Angulorum sivc arcuum Complementa dicuntur vel ad Quadrantem vel ad Semicirculum.

## *CAPUT II.*

### PROP. I.

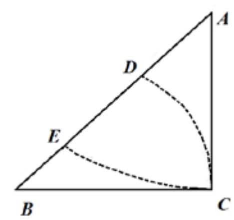



In Triangulo Rectangulo; Si *latus angulum rectum subtendus fiat Radius Circuli, erunt crura Sinus angulorum oppositorum.*

In Triangulo Rectangulo ABC, intervallo AB, & e centris A & B describantur arcus BGD, & AFE ; erunt crura AC & BC Sinus angulorum ad A & B: Sunt enim semisses subtensarum ACE, & BCD.

### PROP. II.

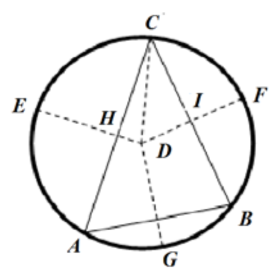
In Triangulo Rectangulo; *Si ex utriusvis acuti puncto angulari, & intervallo cruris alterius, peripheria describatur; Crus alterutrum erit Radius, reliquum Crus erit Radius, reliquum Crus Tangens, Hypotenusa autem (sive latus angulum rectum subtendens) Secans.*



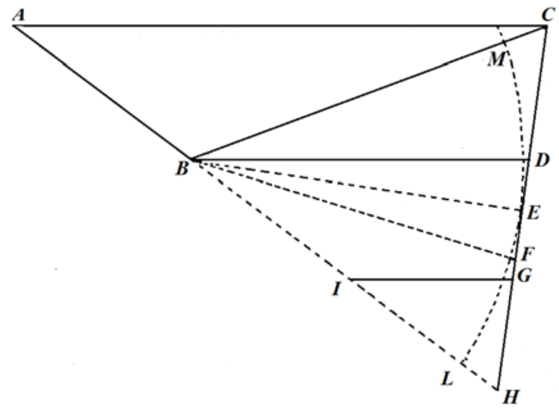

In Triangulo Rectangulo ACB, e puncto angulari B, & intervallo cruris BC, peripheria describatur DC; erit BC Radius, AC Tangent, & BA Secans. Itidem si intervallo AC, peripheria describatur EC, erit AC Radius, BC Tangens, & AB Secans anguli BAC. *per cap.1.lib.1*.

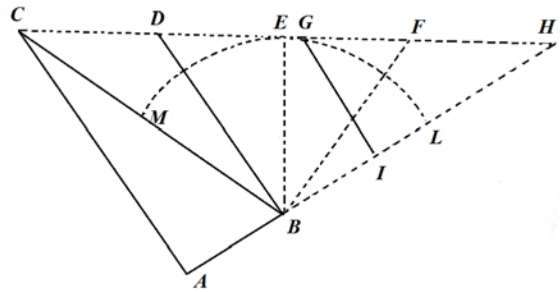
### PROP. III.

In quolibet Triangulo *plano; Latera Sinubus oppositorum angulorum sunt proportionalia* ; *Et contra.*




Sit Triangulum ABC, Circulo inscriptum, & e centro D ducantur Radii perpendiculares DF, DE, DG, tam peripheries quam peripheriarum subtensas bisecantes ; Radius etiam ducatur DC. Quoniam itaque angulus in centro EDC aequalis est angulo in periphcria ABC; Et CDF aequalis CAB *per 20 prop.*3 *.Eucl.* Erunt proinde laterum semisses tanquam Sinus. Quam ergo rationem habet latus CA ad latus CB, eandem habet *Sinus* CH ad Sinum CI. Nam quae est ratio totius ad totum, eadem est semissis ad semissem.




PROP. IIII.

In Quolibet Triangulo plano. *Ut summa duorum laterum,ad differentiam eorundem ; sic Tangens semissis summae angulorum oppositorum, ad Tangentem semissis differentiae eorum.*

In Triangulo obliquangulo ABC, sint nota latera AB, CB, una cum angulo ABC, ab iisdem comprehenso, in superior obtusangulo, acutangulo autem in inferiore. Et continuato latere AB in H, usque sit BH aequalis, BC, & connectentur C *&* H. Sitque BI aequalis lateri AB. E signis quoque B & I ducantur rectae BD & IG parallelae lateri AC. Erit ergo angulus exterior CBH aequalis duobus interioribus oppositis *per* 32.1.*Eucl*. Est enim angulus CBD aequalis angulo BCA ; & DBH angulus, angulo CAB. A puncto praeterea B perpendicularis ducatur BE, quae CH bisecabit. Radio quoque BE peripheria ducatur MEL. Eritque CE Tangens semisiis summae angulorum oppositorum, & DE (qui & aequalis FE) Tangens semissis differentia:. Quoniam itaque AC, BD, IG, sunt parallelae, erunt CD, DG, FH aequales; & idcirco DF & GH aequabuntur. Aio itaque

*Proport.* { AH, IH, CH, CH=DF } *vel per aequationem proportionis.* *Proport.* { AH *Summa duarum laterum.* IH *Differentia duarum laterum.* CE *Tangens* $\frac{1}{2}$ *angulorum oppositorum.* DE *Tangens* $\frac{1}{2}$ *differentiae angulorum.* }

Aliter.

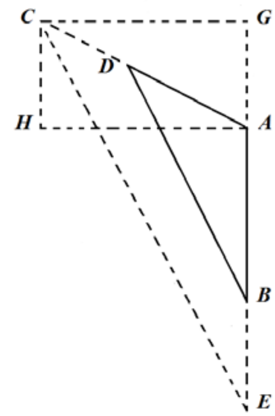
*Ut summa laterum, ad minus duplicatum: sic Tangens semissis summae angulorum oppositorum, ad summam Tangentium semissis summae & semissis differentiae angulorum.*

Aliter.

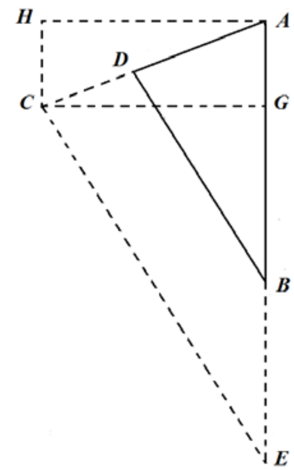
*Ut summa laterum, ad minus duplicatum: sic Tangens semissis summae angulorum oppositorum, ad differentiam Tangentium semissis summae & semissis differentiae angulorum.*

Propositionis praecedentis demonstration cum adjunctis Diagraphis, his inservire potest. Poterit etiamnum haec quarta Propositio aliter exprimi.

*Ut latus minus, ad majus: sic Secans Complementi vel excessus anguli comprehensi, ad quartum*.
Quartus iste conferatur cum Tangente Complementi vel excessus. Tum si angulus comprehensus sit obtusus, summa : Sin acutus, differentia est Tangens Complementi anguli lateri minori oppositi.



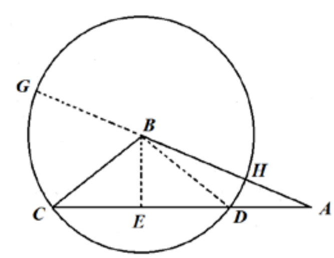
In Triangulo obliquanguloABD, nota sint latera AB, AD, una cum angulo ab iisdem comprehenso BAD, in Triangulo superiore obtusangulo, acutangulo autem inferiorc. Et continuatus lateribus AB, AD ad usque E & C; a puncta C ducatur recta CE lateri DB parallela, una cum CG perpendiculari rectae AE ubi opus est continuatae. A puncto idem A, ducatur recta AH aequalis & parallela rectae CG, quae connectantur perpendicularibus CH, & AG: AE aequantur itaque Triangula obliquangula DAB, CAE *per* 4 & *p.6 Eucl*: ltemque Rectangula Trangula CAH, AC*G, per 8 p*.1 *Eucl.* Eritque CG = AH Radius : GA = HC Tangens, & CA Secans *per 2 prop. huius Capitis*. Aio



*Proport.*
DA *Latus minus.*
AB *Latus majus.*
CA *Secans Complementi vel excessus anguli comprehensi.*
AE *Quartus.*

Quartus iste conferatur cum GA, Tangente anguli GCA, Tum si angulus comprehensus sit obliquus, summa: sin acutus, differentia erit BE. Tangens anguli GCE ; cujus Complementum est angulus CEG, aequalis angulo DBA; Atque inde per Complementum reliquus angulus ADB.

PROP. V.

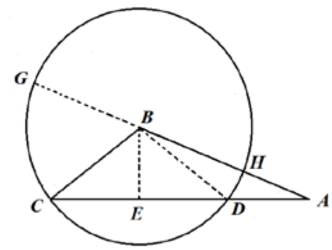


In quolibet Triangulo Plano. *Ut Basis,ad Summam laterum; ita Differentia laterum, ad Differentiam segmentorum Basis.*
In Triangulo obliquangulo ABC, sit Basis CA, Summa laterum GA, Differentia laterum HA, Differentia segmentorum Basis AD. Ducatur perpendicularis BE bisecans CD in E. Quoniam itaque oblongum AC, AD aequatur oblongo AG, AH *per* 36*pro*.1 *Eucl.* erunt propterea latera eorum reciproceproportionala. Aio, itaque

*Proport.*
AC *Basis.*
AG *Summa Laterum.*
AH *Differentia Laterum.*
AD *Differentia segmentorum Basis.Inde segmentum* AE *vel* CE.

Aliter.

*Sumatur differentia quadratorum e lateribus* BC, BA, & *dividatur per Basint*CA, *quotus erit differentia segmentorum Basis DA.*




Aliter.

*Quadrentur latera* AB, BC, CA, & au*feratur quadratum* BA *e reliquis, semissis reliqui dividatur per Basim, quotus erit* CE *minus segmentum Basis.*
*Et ablato quadrato* CB *e quadratis* BA, A*C, semissis reliqui divisis per Basintdabit quotum* AE *majus segmentus Basis.*

## *CAPUT III.*

*De Modo mutandi Sexagesimas partes in Decimales ; & contra.*

Datae partes reducuntur ad aliud Nomen, si numerus datarum partium multiplicet Nomen novum, & factus dividatur per Nomen datarum partium; quotus erit numerus partium quaesitarum. ——————

Sunto datae partes $\frac{12}{60}$, & sit datum Nomen novum $\frac{\quad}{100}$; quaeritur numerus huic Nomini ita conveniens ut partes inventae sintdatis partibus aequales.

$$\textit{Proport.}\begin{cases}\textit{Nomen datum} & 60\\ \textit{Numerus datus} & 12\\ \textit{Numerus sumptum} & 100\\ \textit{Numerus inventus} & 20\end{cases} \qquad \frac{12}{60} \text{ aequales } \frac{20}{100}.$$

Itaque si Nomen sumptum multiplicet numerum datum, & factus dividatur per datum Nomen; quotus erit numerus quaesitus.Et datis minutis vel partibus Sexagesimis (cum Multiplicatio per 100 nihil mutet) fiat divisio per 6, quotus erit numerator quaesitus.
Ut 29 Grad.27' statuentur sic $29^{\,27}$, & dividantur *27* per 6, statuaturque quotus in lineae inferiori sic $29^{\,27}\frac{45}{100}$, quotus est $\frac{45}{100}$, atquc is erit numerus quaesitus, & *29* Grad. 27' aequantur $29\frac{45}{100}$.

Sic motus Lunae diurnus apud *Copernicum* 12 Grad. $11':26'':41''':\ 31''''$:reducitur ad 12.$\underline{19074776}$. Sic motus Solis 44 dierum, 43 Gr. $22':0'';19'''$: reducitur ad 43$\underline{3667546}$.

| | |
|---|---|
| 31 | 19 |
| $41\underline{51667}$ | $00\underline{31667}$ |
| $26\underline{691944}$ | $22\underline{0052777}$ |
| $11\underline{4448657}$ | $43\underline{36675463}$ |
| $12\underline{19074776}$ | 100000000 |
| 100000000 | |

Facilius id fiet ope hujus adjunctae Tabulae, addendo partes Decimales respondentes Minutes Primis,Secundis, Tertiis, & Quartis in unam summam, sic

| | |
|---|---|
| *Minutis Primis* 11 *respondent* 1833,333,333 | 22 *Min. respondent 3666,666,667* |
| *Secundis 26* …………...72,222,222 | 0 *Secundis*…………………….0 |
| *Tertiis* 41………………..1,898,148 | 19 *Tertiis.………………… 879,630* |
| *Quartis* 31…………..……  23,920 | *Proveniunt.………..* *3667,546,297* |
| *Proveniunt Decimales* 1,907,4771623 | |

Contra si datae partes Centesimae reducendae sint ad Sexagesimas, fiat datarum partium multiplicatio per 6o, factus divisus per 100 (id est, a facto amputatis duabus nobis) dabit numerum Minutorum. Exempli causa.

Sint dati Grad.$24\underline{45}$, quaeritur quot Minuta aequentur partibus $\frac{45}{100}$. Fiat multiplicatio 45 numeratoris per 60, factus erit 2700; aio, amputatis duabus cyphris, 27 Minuta aequari 45 Centisimis. Sic

Sit motus Lunae diurnus Gra. $12\underline{19074776}$ , fiat multiplicatio partium $\underline{19074776}$ per 60, proveniunt $11\underline{44486560}$ factus primus; eritque motus Lunae diurnus

12 Gr.$11\frac{44486560}{100000000}$ Minutorum.

*Hae Tabula Reductionis Sexagesimarum Partium ad Decimales ; & Contra.*

| *Sexag.* | *Minut.Primis Respondens* | *Secundis* | *Tertiis* | *Quartis* | *Quintis.* |
|---|---|---|---|---|---|
| 1 | 0166,666,667 | 0002,777,778 | 0000,046,296 | 0000,000,772 | 0000,000,013 |
| 2 | 0333,333,333 | 5,555,555 | , 92,593 | , 1,573 | , ,026 |
| 3 | 0500,000,000 | 8,333,333 | ,138,889 | , 2,315 | , ,039 |
| 4 | 0666,666,666 | 11,111,111 | ,185,185 | , 2,315 | , ,051 |
| 5 | 0833,333,333 | 13,888,889 | ,231,481 | , 3,046 | , ,064 |
| 6 | 1000,000,000 | 16,666,667 | ,277,778 | , 4,630 | , ,077 |
| 7 | 1166,666,667 | 19,444,444 | ,324,074 | , 5,401 | , ,090 |
| 8 | 1333,333,333 | 22,222,222 | ,370,370 | , 6,173 | , ,103 |
| 9 | 1500,000,000 | 25,000,000 | ,416,667 | , 6,944 | , ,116 |
| 10 | 1666,666,667 | 27,777,778 | ,462,963 | , 7,716 | , ,129 |
| 11 | 1833,333,333 | 30,555,556 | ,509,259 | , 8,488 | , ,141 |
| 12 | 2000,000,000 | 33,333,333 | ,555,556 | , 9,259 | , ,154 |
| 13 | 2166,666,667 | 36,111,111 | ,601,852 | , 10,031 | , ,167 |
| 14 | 2333,333,333 | 38,888,889 | ,548,148 | , 10,802 | , ,180 |
| 15 | 2500,000,000 | 41,666,667 | ,694,444 | , 11,574 | , ,193 |
| 16 | 2666,666,667 | 44,444,444 | ,740,741 | , 12,345 | , ,206 |
| 17 | 2833,333,333 | 47,222,222 | ,787,037 | , 13,117 | , ,219 |
| 18 | 3000,000,000 | 50,000,000 | ,833,333 | , 13,889 | , ,232 |
| 19 | 3166,666,667 | 52,777,778 | ,879,630 | , 14,660 | , ,245 |
| 20 | 3333,333,333 | 55,555,555 | ,925,926 | , 15,432 | , ,258 |
| 21 | 35,00,000,000 | 58,333,333 | ,972,222 | , 16,204 | , ,270 |
| 22 | 3666,666,667 | 61,111,111 | 1,018,578 | , 16,975 | , ,283 |
| 23 | 3833,333,333 | 63,888,889 | 1,064,814 | , 17,747 | , ,296 |
| 24 | 4000,000,000 | 66,666,667 | 1,111,111 | , 18,518 | , ,309 |
| 25 | 4166,666,667 | 69,444,444 | 1,157,407 | , 19,290 | , ,322 |
| 26 | 4333,333,333 | 72,222,222 | 1,203,703 | , 20,062 | , ,335 |
| 27 | 4500,000,000 | 75,000,000 | 1,250,000 | , 20,833 | , ,348 |
| 28 | 4666,666,667 | 77,777,778 | 1,296,296 | , 21,605 | , ,360 |
| 29 | 4833,333,333 | 80,555,555 | 1,342,592 | , 22,376 | , ,373 |
| 30 | 5000,000,000 | 83,333,333 | 1,388,888 | , 23,148 | , ,386 |
| 31 | 5166,666,667 | 86,111,111 | 1,435,184 | , 23,920 | , ,399 |
| 32 | 5333,333,333 | 88,888,889 | 1,481,481 | , 24,691 | , ,412 |
| 33 | 5500,000,000 | 91,666,667 | 527,777 | , 25,463 | , ,425 |
| 34 | 5666,666,667 | 94,444,444 | 1,574,073 | , 26,234 | , ,438 |
| 35 | 5833,333,333 | 97,222,222 | 1,620,370 | , 27,006 | , ,450 |
| 36 | 6000,000,000 | 100,000,000 | 1,666,666 | ,27,778 | , ,463 |
| 37 | 6166,666,667 | 102,777,778 | 1,712,963 | ,28,549 | , ,476 |
| 38 | 6333,333,333 | 105,555,555 | 1,759,259 | , 29,321 | , ,489 |
| 39 | 6500,000,000 | 108,333,333 | 1,805,556 | , 30,092 | , ,502 |
| 40 | 6666,666,667 | 111,111,111 | 1,851,852 | , 30,864 | , ,515 |
| 41 | 6833,333,333 | 113,888,889 | 1,898,148 | , 31,636 | , ,527 |
| 42 | 7000,000,000 | 116,666,667 | 1,944,444 | , 32,407 | , ,540 |
| 43 | 7166,666,667 | 1l9,444,444 | 1,990,740 | , 33,179 | , ,553 |
| 44 | 7333,333,333 | 122,222,222 | 2,037,037 | , 33,950 | , ,566 |
| 45 | 7500,000,000 | 125,000,000 | 2,083,333 | , 34,722 | , ,579 |
| 46 | 7666,666,666 | 127,777,778 | 2,129,629 | , 35,494 | , ,592 |
| 47 | 7833,333,333 | 130,555,555 | 2,175,925 | , 36,265 | , ,605 |
| 48 | 8000,000,000 | 133,333,333 | 2,222,222 | , 37,037 | , ,618 |
| 49 | 8166,666,667 | 136,111,111 | 2,268,518 | , 37,808 | , ,630 |
| 50 | 8333,333,333 | 138,888,889 | 2,314,815 | , 38,580 | , ,643 |
| 51 | 8500,000,000 | 141,666,667 | 2,361,111 | , 39,352 | , ,656 |
| 52 | 8666,666,667 | 144,444,444 | 2,407,407 | , 40,123 | , ,669 |
| 53 | 8333,333,333 | 147,222,222 | 2,453,703 | , 40,895 | , ,682 |
| 54 | 9000,000,000 | 150,000,000 | 2,500,000 | , 41,666 | , ,694 |
| 55 | 9166,666,667 | 152,777,778 | 2,546,296 | , 42,438 | , ,707 |
| 56 | 9333,333,333 | 155,555,555 | 2,592,592 | , 43,210 | , ,720 |
| 57 | 9500,000,000 | 158,333,333 | 2,638,889 | , 43,981 | , ,733 |
| 58 | 9666,666,667 | 161,111,111 | 2,685,185 | , 44,753 | , ,746 |
| 59 | 9833,333,333 | 163,888,889 | 2,731,481 | , 56,524 | , ,759 |

Hae partes decimales $\underline{44486560}$ eodem modo reducuntur ad Minuta secunda multiplicatione per 60, sic

$$11\underline{44486560}$$
$$26\underline{69193600}$$
$$41\underline{51616000}$$
$$30\underline{96960000}$$
$$58\underline{17600000}$$

Et eodem modo Decimales secundorum ad tertia Minuta, &c.

Sic Solis motus in diebus 44 est

$$\text{Gr. } 43\underline{36675463}$$
$$22\underline{00527780}$$
$$00\underline{31666800}$$
$$19\underline{00008000}$$

Idem Solis motus in diebus 44 est 43 Grad. 22': 00": 19'"
Nota *a factis ubique amputari octo, tot scilicet quot sunt in Numeratore datarum partius ; reliqui sunt Minuta Prima, Secunda, Tertia, &c.*

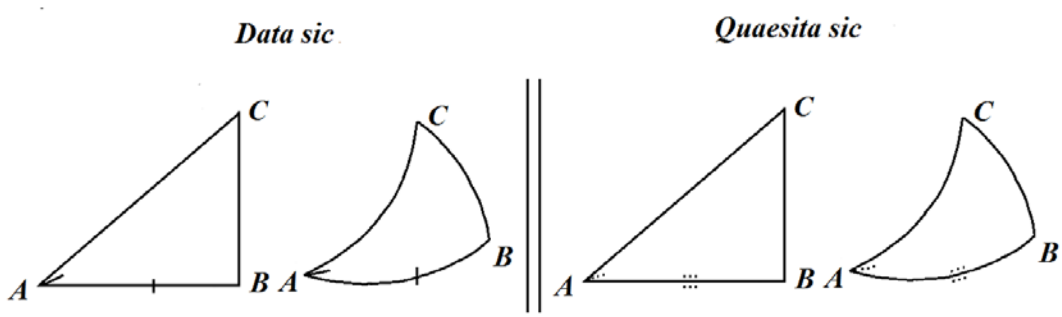
Ope praecedentis Tabulae licet quoque continua subtractione proxime minorum in ea repertarum partium Decimalium a datis, Sexagesimas iis respondentes acquirere. Sic

| | | | |
|---|---|---|---|
| *Partes datae* | 1907,477,6 | *Partes datae* | *3667,546,3* |
| *Inventae……..* | $\underline{1833,333,3}$ … 11 *Min. Prima.* | *Inventae* | $\underline{3666,666,6.19}$ *Min.Prima.* |
| | 74,144,3 | | *879,7* |
| *Inventae …* | $\underline{72,122,2}$…. 26 *Secunda.* | *Inventae* | *879,6, 19 Tertia.* |
| | 1,922,1 | | |
| *Inventae…* | $\underline{1,898,1}$…. 41 *Tertia.* | | |
| | 24,0 | | |
| *Inventae…* | 23,9.…. 31 *Quarta.* | | |

## *CAPUT IIII.*

### *De Dimensione Triangulorum Planorum Rectangulorum.*

In Triangulorum omnium solutionibus exprimuntur.




Praeterea in Triangulis Rectangulis tam Planis quam Spaericis, *Hypotenusa* dicatur latus subtendens angulu rectum, ut Latus AC subtendens angulum ABC.
*Crura* autem dicanturque angulum comprehendunt rectum, ut latera AB CB.
Sciat insuper Trigonometer, in dimensione Triangulorum per Regulam proportionum in qua sunt quatuor termini, tres dati, quartus quaesitus; Si termini rationum sint Sinus, Tangentes, Secantes,aut latera, facto a secundo & tertio per primum diviso,quotum exhibere quartum.

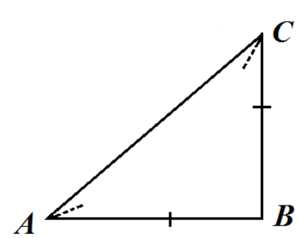
Sin termini rationum sint Logarithmi Sinuum, Tangentium,Secantium, aut laterum ; Si e summa Logarithmorum secundi & tertii subducatur Logarithmus primi, differentia erit Logarihmus quarti.

PROBL. 1.

*Datis Curibus,*
Quaeritur ANGULUS *alteruter.*

In Triangulo Rectangulo ABC quaeritur acutus alteruter

$$\text{E datis cruribus}\begin{cases}\text{AB} & 1123\underline{7943}\\ \text{BC} & 605\underline{8601}\end{cases}$$



*Termini Rationis*

*Proport.*
- *Crus alternum.*
- *Crus reliquum.*
- *Radius.*
- *Tangens anguli cruri reliquo oppositi, per* Prop.2.Cap.2.

Illustratio Arithmetica.

| | *Crura & Tang.* | *Logarith.Crura & Tang.* |
|---|---|---|
| *Crus* AB . . . . | $1123\underline{7943}$ . . | 3,05068,6815 |
| *Crus reliquum* BC . . | $605\underline{8601}$ . . | 2,78237,2352 |
| *Radius* AB . . . . | 100000,00000 . . | 10,00000,0000 |
| *Tangens* BAC gr. $28\underline{33}$ | 53912,01159 . . | 9,73168,5537 |

Hinc pro Complem. BCA gr.$61\underline{67}$.

*Nota.* Petendi sunt Logarithmi laterum e Logarithmorum Chiliadibus sive Arithmctica Logarithmica doctissimi *D.Briggii.* Qui vero ipsa destituuntur, abunde iis satisfaciet Canon hic,modo reiiciamus Characteristicam, & aliam (prout exigunt numeri) substituamus. Quod si accurate in eo non occurrunt, possunt tamen per partem proportionalem quam proxime obtineri; Exempi gratia sic : Crus BC $605\underline{8601}$ in Canone quaerentes, invenimus illud inter Tangentes juxta Gr.$31\underline{21}$ cuius Logarith. est 9,78237,23521. Excluso itaque numero novenario sive Characteristica, substituimus numerum binarium, crescente vel decrescente semper Characteristica pro numero locorum ultra unitatis locum. Quod si numero integro partes adhaeserint, quales sunt illae partes decimales linea subscripta ab integris distinctae, licet totus numerus pluribus notis scribatur, eius tamen Characteristica respicit tantum illas notas quibus integrae unitates scribuntur, reliquarum subsequentium notarum, quibus partes adjuncte exprimuntur, nulla habita ratione ut

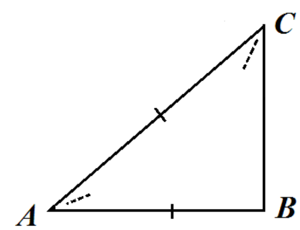
| | | *Logarithmi* |
|---|---|---|
| | $11\underline{237943}$ . . . | 1,05068,6815 |
| | $112\underline{37943}$ . . . | 2,05068,6815 |
| *Cras* AB . . . | $1123\underline{7943}$ . . . | 3,05068,6815 |
| | $11237\underline{943}$ . . . | 4,05068,6815 |

## PROBL. 2.

*Dati Crure & Hypotensa,*
*Quaeritur* ANGULUS *alteruter.*

ln triangulo Rectangulo ABC quaeritur angulus acutus alteruter

| | | |
|---|---|---|
| E datis | Crure AB . . . . | 11237943 |
| | Hypotenusa AC . . | 12767067 |




*Termini Rationis*

*Proport.*
- *Hypotenusa data.*
- *Crus datum.*
- *Sinus Totus.*
- *Sinus anguli cruri dato oppositi.* per Prop.1.Cap.2.

Illustratio Arithmetica.

| | | | *Latera & Sinus.* | | *Logar.Lat.& Sinuum.* |
|---|---|---|---|---|---|
| *Proport.* | *Hypotenusa* AC | . . | 12767067 | . . | 3,10609,1142 |
| | *Crus* BC | . . | 11237943 | . . | 3,05008,6815 |
| | *Sine Totus* ABC | gr.9000 | 100000,00000 | . . | 10,00000,0000 |
| | *Sinus* ACB | gr.6167 | 88022,90008 | . . | 9,94459,5673 |

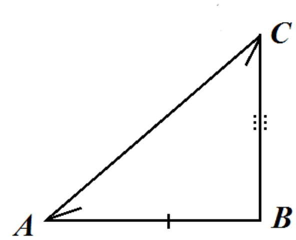
Cuius Complementum gr.2833 est angulus reliquus BAC.

Aliter.

*Proport.*
- *Crus datum.*
- *Hypotenusa data.*
- *Radius.*
- *Secans anguli a datis comprehensi.*

At hac varietate non est opus, propter facilem Logarithmorum usum.

PROBL. 3.
*Datis Angulis* & *Crure,*
*Quaeritur* CRUS *reliquum.*




In Triangulo Rectangulo ABC quaeritur Crus BC

$$\text{E datis}\begin{cases}\text{Crure AB}\ \ldots\ 1123\underline{7943}\\ \text{Angulis}\begin{cases}\text{ACB gr.}61\underline{67}\\ \text{BAC gr.}28\underline{33}\end{cases}\end{cases}$$

*Termini Rationis*

$$\textit{Proport.}\begin{cases}\textit{Radius.}\\ \textit{Tangens anguli cruri dato contermini.}\\ \textit{Crus datum.}\\ \textit{Crus quasitumi.}\ \text{per Prop.2.Cap.2.}\end{cases}$$

Illustratio per numeros.

| | *Tang. & Crura.* | *Logar.Tang. & Crura.* |
|---|---|---|
| Radius AB . . . . . . | .100000,00000 . . | 100000,00000 |
| Tangens. BAC gr.28$\underline{33}$ | . 53912,01159 . . | 9,73168,5536 |
| Crus AB . . . . . . . | 1123$\underline{7943}$ . . | $\underline{3,05068,6815}$ |
| Crus BC . . . . . . . | 605$\underline{8601}$ . . | ~~1~~2,78237,2351 |

Aliter.

$$\textit{Proport.}\begin{cases}\textit{Sinus anguli cruri dato oppositi.}\\ \textit{Sinus anguli cruri quaesito oppositi.}\\ \textit{Crus datum.}\\ \textit{Crus quasitum}\end{cases}$$

Aliter.

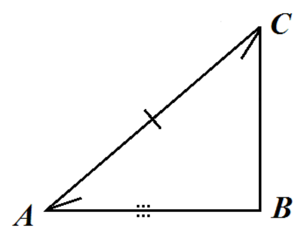
*Proport.* { *Tangens anguli cruri dato oppositi.* / *Radius.* / *Crus datum.* / *Crus quasitum*

PROBL. 4.

*Datis Hypotenusa* & *Angulis,*
Quaeritur CRUS *utrumlibet.*

In Triangulo Rectangulo ABC quaeritur Crus AB

E datis { Hypotenusa AC . . . . 1276<u>7067</u> / Angulis { ACB gr.61<u>67</u> / BAC gr.28<u>33</u>




*Termini Rationis*

*Proport.* { *Sinus Totus.* / *Sinus anguli Cruri quaesito contermini.* / *Hypotenusa data.* / *Crus quasitum.* per Prop.1.Cap.2.

Illustratio Arithmetica.

| | *Sinus.* & *Latera* | *Logar.Sin.* & *Lat.* |
| --- | --- | --- |
| Sinus totus . . . . | 100000,00000 | 10,00000,0000 |
| Sinus ACB gr.61<u>67</u> | 88022,90008 | 9,94459,5673 |
| Hypotenusa AC . . | 1276<u>7067</u> | 3,10609,1142 |
| Crus AB . . | 1123<u>7943</u> | 3,05068,6815 |

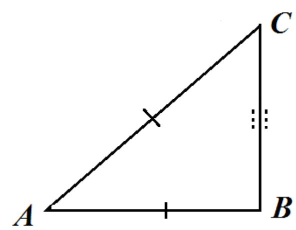
Poterit etiam Problema istud per Secantes & Tangentes expediri, at propter supervacaneum eorum usum consulto omisimus

PROBL. 5
*Datis Hypotenusa* & *Crure,*
*Quaeritur* CRUS reliquum.

In Triangulo Rectangulo ABC quaeritur Crus BC

$$\text{E datis} \begin{cases} \text{Hypotenusa AC} \ldots\ldots 1276\underline{7067} \\ \text{Crure} \qquad\quad \text{AB} \ldots\ldots 1123\underline{7943} \end{cases}$$

Solutionem hujus Problematis subministrat 47 *Prop. 1.Eucl.*
Quoniam enim in Triangulo Rectangulo Hypotenesa aeque potest Cruribus; Latus idcirco differentiae quadratorum Hypotenusae & Cruris erit Crus quaesitum. Qui hujusmodi artificiis capiuntur,consulant doctissimi *D.Briggii Arith.Logarit.cap.18.&19*. Quoniam vero praesentis est instituti nostri, usum Canonis illustrare, ideo Problema istud cum aliquibus sequentibus illius ope aggredimur, duplice ad hujus solutionem praxi concurrente; quarum prior angulum, posterior crus exhibet.




*Termini Rationum*

I. per Probl.2.

*Proport.*
- *Hypotenusa data.*
- *Crus datum.*
- *Sinus Totus.*
- *Sinus anguli Cruri quaesito contermini*. per Prop.1.Cap.2.

| | II. | II. per Probl.3. |
|---|---|---|
| *Proport.* | *Sinus Totus.* | *Radius.* |
| | *Sinus anguli Cruri quaesito contermini.* | *Tangens anguli Cruri dato contermini.* |
| | *Hypotenusa data.* | *Crus datum.* |
| | *Crus quaestum.* | *Crus quaestum.* |

Illustratio Arithmetica.

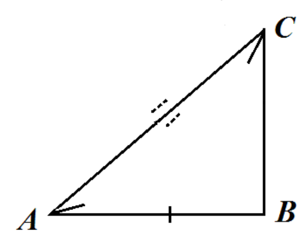
| | | I. *Latera & Sinus.* | *Logar.Lat. & Sin.* |
|---|---|---|---|
| Hypotenusa | AC . . | 12767067 | . . 3,10609,1142 |
| Crus | AB . . | 11237943 | . . 3,05068,6815 |
| Sinus totus | . . . | 100000,00000 | . . 10,00000,0000 |
| Sinus ACB | gr.6167 . | 88022,90008 | . . 9,94459,5673 |

II.

| | | | |
|---|---|---|---|
| Sinus totus | . . . . . | 100000,00000 | . . 10,00000,0000 |
| Sinus anguli CAB | gr.2833 . | 47454,91609 | . . 9,67628,1209 |
| Hypotenusa | AC . . . . . | 12767067 | . . 3,10609,1142 |
| Crus | BC . . . . . | 6058601 | . . 2,72837,2351 |

PROBL. 6.
*Datis Angulis & Crure,*
*Quaeritur Hypotenusa.*

In Triangulo Rectangulo ABC quaeritur Hypotenusa AC




E datis:
- Crure AB . . . . 11237943
- Angulis:
  - ACB gr.6167
  - BAC gr.2833

*Termini Rationis*

*Proport.*
- *Sinus anguli Cruri dato oppositi.*
- *Sinus Totus.*
- *Crus datum.*
- *Hypotenusa quasita.* per Prop.1.Cap.2.

Illustratio Arithmetica.

| | | *Sinus. & Latera* | *Logar.Sin. & Lat.* |
|---|---|---|---|
| Sinus ACB | gr.6167 . | 88022,90008 | . . 9,94459,5673 |
| Sinus totus | . . . . . | 100000,00000 | . . 10,00000,0000 |
| Crus | AB . . | 11237943 | . . 3,05068,6815 |
| Hypotenusa | AC . . | 12767067 | . . 3,10609,1142 |

Aliter

*Termini Rationis*

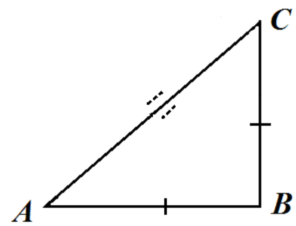
*Proport.* $\begin{cases} \textit{Radius.} \\ \textit{Secans anguli cruri dato contermini.} \\ \textit{Crus datum.} \\ \textit{Hypotenusa quasita.}\ \text{per Prop.2.Cap.2.} \end{cases}$

PROBL. 7.

*Datis Cruribus,*

*Quaeritur Hypotenesa.*

In Triangulo Rectangalo ABC quaeritur Hypotenesa AC




E datis $\left\{ \text{Cruribus} \begin{cases} \text{AB} & 1123\underline{7943} \\ \text{BC} & 605\underline{8601} \end{cases} \right.$

*Termini Rationum.*

1.Pro Angulo acuto alteruto

*Proport.*
- *Crus alternum.*
- *Crus reliquum.*
- *Radius.*
- *Tangens anguli cruri reliquo oppositi.* per Prop.2.Cap.2.

II. Pro Hypotenusa

*Proport.*
- *Sinus anguli cruri oppositi.*
- *Crus illi angulo oppositum.*
- *Sinus Totus.*
- *Crus Hypotenusa quaesta.*

vel *Proport.*
- *Radius*
- *Secans anguli cruri contermini*
- *Crus angulo conterminum*
- *Hypotenusa quaesta.*per Prop.2Cap.2.

Illustratio per numeros.

| | *Crura & Tang.* | *Logarith.Crur.& Tang.* |
|---|---|---|
| *Crus* AB . . . . | 1123$\underline{7943}$ . . | 3,05068,6815 |
| *Crus* BC . . . . | 605$\underline{8601}$ . . | 2,78237,2352 |
| *Radius* AB . . . . | 100000,00000 . . | 10,00000,0000 |
| *Tangens* BAC gr. 28$\underline{33}$ | 53912,01159 . . | 9,73168,5537 |

| | *Sinus.* & *Latera.* II | *Logar.Sin.& Lat.* |
|---|---|---|
| Sinus CAB gr.28$\underline{33}$ . | 47454,91609 . . | 9,67628,1209 |
| Sinus Totus . . . . . | 100000, 00000 . . | 10, 00000, 0000 |
| Crus BC . . . . . . | 605$\underline{8601}$ . . | 2,78237,2352 |
| Hypotenusa AC . . | 1276$\underline{7067}$ . . | 3,10609,1142 |

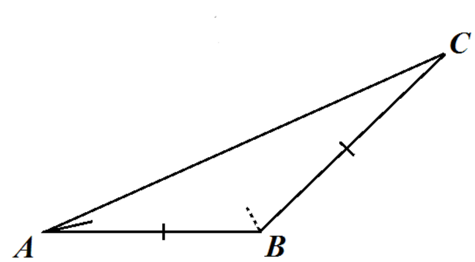
## *CAPUT V.*

*De Dimensione Triangulorum Planorum Obliquangulorum.*

### PROBL.1.

*Datis Duobus Lateribus & Angulo alteri datorum opposito,*
Quaeritur ANGULUS *lateri reliqo oppositus.*

In Triangulo Obliquangulo ABC quaeritur angulus obtusus ABC



E datis: Lateribus: AC 12767067; BC 8651765. Angulo CAB gr. 374454

*Termini Rationis*

*Proport.*
*Latus alteruum.*
*Latus reliquum.*
*Sinus anguli lateri alteri oppositi.*
*Sinus anguli lateri reliquo oppositi.* per Prop.3.Cap.2.

Illustratio Arithmetica.

| | *Latera & Sin.* | | *Logar.Lat. & Sin.* |
|---|---|---|---|
| Latus BC . . | 8651765 | | . . 2,93710,4743 |
| Latus AC . . | 12767067 | | . . 3,10609,1142 |
| Sinus BAC gr. 374454 | 60800,51245 | | . . 9,78390,7237 |
| | | | . . 12,88999,8379 *Summa* |
| Sinus ABC gr.1162064 | 89720,90422 | | . . 9,95289,3642 *Differ.* |

Hinc per Complementum reliquus angulus gr.263482.

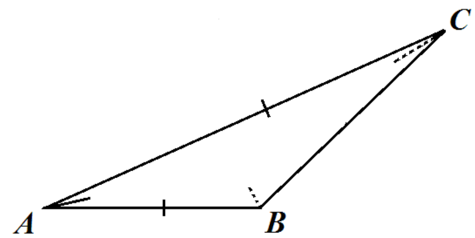
*Nota.* Si datus angulus sit obtusus, latus ei oppositum erit maius utrolibet reliquorum, et reliqui duo anguli erunt acuti.
Sin datus angulus sit acutus & denter latera, incertum erit an angulus lateri majori oppositus sit obtusus, rectus, an acutus ; Idem tamen erit quartus proportional Sinus nempe anguli acuti vel Complementi eius ad duos rectos.

Ut igitur scire possimus qualis sit angulus qui maximo lateri opponitur, sumantur summa & differentia maximi lateris & medii (vel minimi) earumque Logarithmi ; Et si horum semissis aequetur Logarthmo tertii lateris, angulus maximo lateri oppositus est rectus. Sin Logarithmus tertii lateris fuerit maior semisse, angulus acutus; sin minor, obtusus. Quemadmodum doctissimus *D.Briggius ad Cap.* 18. *Arith.Logarithmicae, Editionis Londiniensis.*

## PROBL. 2.

*Datis duobus Lateribus cum Angulo ab iisdem comprehenso,*
Quaeritur ANGULUS *alteruter reliquorum.*

In Triangulo Obliquangolo ABC quaeritur Angulus alteruter ad B vel C




E datis { Lateribus { AC $1276\underline{7067}$
AB $631\underline{5525}$
Angulo BAC gr. $37\underline{4454}$

*Termini Rationis*

*Proport.* {
*Differentia laterum.*
*Tangens semissis summae angulorum oppositorum*;
*vel semissis Complementi anguli comprehensi.*
*Tangens semissis differentiae angulorum oppositorum*

Illustratio per numeros.

| | | |
|---|---|---|
| Latus AC . . . . . | 12767067 | |
| Latus AB . . . . . | 6315525 | |
| Summa laterum . . . . | 19082592 | D |
| Differentia laterum . . | 6451542 | E |
| Maius latus duplicatum . . | 25534134 | G |
| Minus latus duplicatum . . | 12631050 | H |
| Angulus datus comprehensus | gr. 374454 | |
| Integer Circulus . . . . | gr. 1800000 | |
| Summa reliqorum . . . . | gr.1425546 | |
| Semissis summae . . . . | gr. 712773 | F |

*Proport.*

| | | *Latera & Tang.* | *Logar.Lat. & Tang.* |
|---|---|---|---|
| Summa Laterum | D . . . . | 19082592 . . . . . . | 3,28063,7363 |
| Differentia laterum | E . . . | 6451542 . . . . . . | 2,80966,3527 |
| Tang. $\frac{1}{2}$ summae angulorum | F 712773 | 295052,31525. . . | 10,46989,9013 |
| | | | 13,27956,2540 *sum.* |
| Tangens $\frac{1}{2}$ differentiae | gr. 449291 | 99752,82205 | 9,99892,5177 *diff.* |

Huic semisummae angulorum gr. 712773 . . . . . 712773

Si addatur semidifferentia gr. 449291. Sin subtrahatur $\frac{1}{2}$ differ. 449291

Conflatur angulus obtusus ABC gr. 1162064. Restabit acutus ACB 263482

Aliter

*Proportions.*

| | *Latera & Tang.* | *Logar.Lat. & Tang.* |
|---|---|---|
| Summa Laterum . . . . . . . . . . | 19082592 D . . . . . | 3,28063,7363 |
| Maius latus duplicatum . . . . . . . . | 25534134 G . . . . . | 3,40712,1125 |
| Tang. $\frac{1}{2}$ summae angulorum 712773 F. | 295052,31525. . . . . | 10,46989,9013 |
| Summa Tangentium $\frac{1}{2}$ summae & | | 13,87702,0138 |
| $\frac{1}{2}$ differentiae angulorum | 394805,13730 | 10,59638,2775 |

| | |
|---|---|
| Differentia Tangentium est . . . . . | 99752,82205 |
| Arcus conveniens huic differentiae est | 449291 |
| Semissis summae angulorum oppositorum | 772773 |
| Summa est Angulus ABC | 1162064 |
| Differentia est Angulus ACB | 263482 |

Aliter.

| | | Latera & Tang. | Logar. Lat. & Tang. |
|---|---|---|---|
| *Proport.* | Summa Laterum . . . . . . . . . . | 19082592 D . . . . . | 3,28063,7363 |
| | Minus latus duplicatum . . . . . . . . | 12631050 H . . . . . | 3,10143,9454 |
| | Tang. $\frac{1}{2}$ summae angulorum 712773 F. | 295052,31525. . . . . | 10,46989,9013 |
| | Differentia Tangentium $\frac{1}{2}$ summae & | | 13,87702,0138 |
| | $\frac{1}{2}$ differentiae angulorum oppos. | 195299,49319 | 10,29070,1104 |

Differentia Tangentium est . . . . . 99752,82205
huic differentiae Tangentium convenit arcus 449291
Semissis summae angulorum oppositorum 772773
Summa horum est Angulus ABC 1162064
Difference est Angulus ACB 263482 ut supra.

Aliter.

Retentis iisdem datis videlicet lateribus AC 12767067 & AB 6315525 eundem acutum comprehendentibus, Gr. 374454. Cuius Complementi Gr. 525546 Secans est 164472,30008 & Tangens est 130580,00340.

| | Latera. | Logar. lat. |
|---|---|---|
| Latus minus AB . . . . . | 6315535 | . . 2,80040,9454 |
| Latus maius AC . . . . . | 12767067 | . . 3,10609,1142 |
| Sicans Compl. anguli comprehensi | 164472,3001 | . . 0,21609,2763 |
| | | . . 3,32218,3905 |
| Quartus . . . . . . . . . . | 332486,6875 | . . 0,52177,4451 |

E quarto isto auferatur Tang.Compl. 130580,0034
Differentia erit tangens gr. 636518 201906,6941
Cuius Complementum gr. 263482 angulus ACB lateri minori oppositus ;
atque inde obtusus per Complementum 1162064.

*Sin angulus comprehensus sit obtusus,* videlicet Grad.1162064 cujus excessus

262064 { Secans est 111456,74557 / Tang. est 48219,97608 } Et Latera { AB 6315525 / BC 8651765 } Erunt

| | *Latera.* | *Logar.laterum.* |
|---|---|---|
| Latus minus AB . . . . . | 6315535 | . . 2,80040,9454 |
| Latus maius BC . . . . . | 8651765 | . . 2,93710,4737 |
| Sicans Compl. anguli comprehensi | 11145,74557 | . . 0,04710,6357 |
| | | . . 2,98421,1094 |
| Quartus . . . . . . . . . . | 152686,84239 | . . 0,18380,1640 |

Huic quarto adde Tang.excessus Anguli 49219,97608

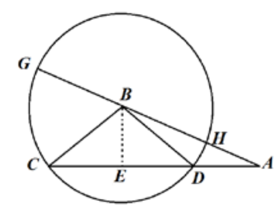
Summa est Tangens 636518 201906,81847

Cuius Complementum est 263482 Angulus ACB lateri minori oppositus ;
atque inde acutus BAC 37445 ut supra.

PROBL. 3.
*Datis* singulis *Lateribus,*
Quaeritur ANGULU*S quilibet.*

In Triangulo Obliquangulo ABC quaeritur angulus quilibet, puta BAC

E datis singulis lateribus { AC 12767067 / AB 8651765 / BC 6315525 }




Ad hujus Problematis solutinem duae requiruntur operationes ; Prior pro segmento Basis DA. Posterior pro angulo quaesito.

I. Pro Segmento DA.

*Termini Rationis.*

*Proport.* { *Latus maximum, sive Basis.* / *Summa reliquorum.* / *Differentia reliquorum.* / *Differentia segmentorum Basis.* }

Illustratio per numeros.

| | | *Latera & Tang.* | *Logar.Lat. & Tang.* |
|---|---|---|---|
| *Proport.* | Latus maximum AC . . . . . . . . . . . . | 12767067 . . . . . . | 3,10609,1142 |
| | Summa reliquorum AB, BC . . . . . | 14965525 . . . . . . | 3,17514,3173 |
| | Differentia reliquorum HA . . . . . | 3446240 . . . . . . | 2,36851,7458 |
| | | | 5,54366,0621 |
| | Differentia segmentor.Basis AD 2738858 | | 2,43756,9479 |
| | Differentia huius & Basis CD 10028209 | | |
| | Cuius semissis CE vel DE 5014145 | | |
| | Inde AE . . . . . . . . . . 7752962 | | |

His segmentis instructi, alterutri Trianguli Rectanguli angulos venare poterimus *per Prob.*2.*Cap.*3. Nos vero angulum ECB seligimus.

*Termini Rationis.*

*Proport.*
- *Crus datum.*
- *Hypotenusa data.*
- *Radius.*
- *Secans anguli a datis comprehensi.*

Illustratio Arithmetica.

| | | *Latera & Secant.* | *Logar.Lat. & Secant.* |
|---|---|---|---|
| *Proport.* | Crus datum CE. . . . . . . . . . . . | 50141045 . . . . . . | 2,70019,3336 |
| | Hypotenusa CB . . . . . | 6315525 . . . . . . | 2,80040,9454 |
| | Radius . . . . . | 100000,00000 . . | 10,00000,0000 |
| | Secans anguli ECB gr.374454 | 125955,19299 . . | 10,10021,6118 |

Quoniam vero Secantium Logarithmos non exhibit Canon hic, sit tamen e duplo Radii subtrahatur quartus iste, qui revera est Logarithmus Secantis; restabit Logarithmus Sinus Complementi anguli ECB. Exempli gratia.

| | |
|---|---|
| Duplus Radii . . . . . . . . . | 20,00000,0000 |
| Logarithmus Secantis . . . . | 10,10021,6118 |
| Logar.Sinus CBE gr. 525546 . . | 9,89978,3882 |

Ergo angulus ECB gr.374454.

Vel

| | | *Latera & Sin.* | *Logar.Lat.& Sin.* |
|---|---|---|---|
| *Proport.* | Hypotenusa CB . . | 6315525 | . . 2,80040,9454 |
| | Crus CE . . . . . | 50141045 | . . 2,70019,3336 |
| | Sinus Totus . . . . | 100000,00000 | . . 10,00000,0000 |
| | Sinus anguli CBE gr. 525546 | 79393,31251 | . . 9,89978,3882 |

Cuius Complementi ECB gr. 374454.

Idem labor repetendus est in reliquo Triangulo AEB, ut anguli innotescant reliqui.

Poterit etiam hoc Problema expedite magis solvi, idque unica operatione per praeceptum sequens, cuius fundamentum petendum est e Doctissimi D.Briggii Arithm.Logarithmm. Cap.18.

*De dimidio collectorum laterum, Latera Trianguli sigillatim subducantur ; Et summa Logarithmorum, semissis summae laterum, & differentiae lateris angulum quaesitum subtendentis, auferatur e summa Logarithmorum reliquarum differentiarum & duplicati Radii; semissis reliqui erit Logarithmus Tangentis semissis anguli quaesiti.*

Quaeratur Angulus a latere maximo subtendus, videlicet ABC.

Praecepti illustratioArithmetica.

| | *Latera.* | | *Logarithmi.* |
|---|---|---|---|
| Latus AC . . . . | 12767067 | | |
| Latus AB . . . . | 8651765 | | |
| Latus BC . . . . | 6315525 | | |
| Summa Laterum . . | 27734357 | | |
| Semissis Summae | 138671785 | . . . . | 3,14198,81057 |
| Differentia lateris AC | 11001115 | . . . . | 2,04143,67044 |
| | | Summa | 5,18342,48101 L |
| Differentia lateris AB | 52154135 | . . . . | 2,71728,87468 |
| Differentia lateris BC | 7551653 | . . . . | 2,87804,20547 |
| Radius . . . . | 100000,00000 | duplus Radii | 20,00000,00000 |
| | | Summa | 25,59533,08015 M |
| | | Summa | 5,18342,48101 L |
| | | Differentia | 20,41190,59914 |
| | | Semissis Differ. | 10,20595,29957 est |

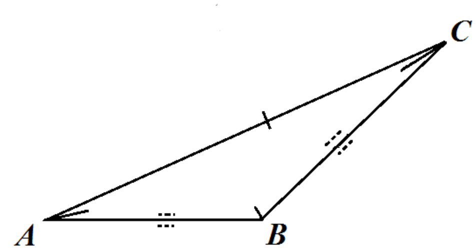
Logarithmus Tangentis gr. 581032
Cuius duplum est gr.1162064 Angulus ABC quaesitus.

## PROBL. 4.
*Datis Angulis* & *Latere,*
*Quaeritur* LATUS *alterutrum reliquorum.*

In Triangulo Obliquangulo ABC quaeritur latus alterutrum, puta BC

E datis
- Angulis
  - BAC gr. 374454
  - ACB gr. 263482
  - ABC gr. 1162064
- Latera AC 12767067

*Proport*.
- *Sinus anguli lateri dato oppositi.*
- *Sinus anguli lateri quaesito oppositi.*
- *Latus datum.*
- *Latus quaesitum.*per Prop.3.Cap.2.



Illustratio Arithmetica, Pro BC.

| | | | *Sin.* & *Lat.* | *Logar.Sin.* & *Lat.* |
|---|---|---|---|---|
| *Proport.* | Sinus anguli | ABC gr. 637936. . . . | 89720,90442 . . . . . | 9,95289,36427 |
| | Sinus anguli | BAC gr. 374454. . . . | 60800,51245 . . . . . | 9,78390,72369 |
| | Latus | AC . . . . . | 12767067 . . . . | 3,10609,11422 |
| | | | | 12,88999,83791 |
| | Latus | BC . . . . . | 8651765 . . . . | 2,93710,47364 |

Pro AB

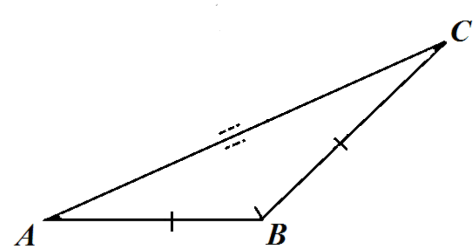
| | | | | |
|---|---|---|---|---|
| *Proport.* | Sinus anguli | ABC gr. 637936. . . . | 89720,90442 . . . . . | 9,95289,36427 |
| | Sinus anguli | ACB gr. 263482. . . . | 44382,52009 . . . . . | 9,64721,19544 |
| | Latus | AC . . . . . | 12767067 . . . . | 3,10609,11422 |
| | | | | 12,75330,30966 |
| | Latus | AB . . . . . | 6315525 . . . . | 2,80040,94539 |

## PROBL. 5.

*Datus Lateribus duobus cum Angulo ab iisdem comprehenso,*
*Quaeritur* LATUS *reliquum.*

In Triangulo Obliquangulo ABC quaeritur Latus AC

| | | | |
|---|---|---|---|
| E datis | Lateribus | CB | 8651765 |
| | | AB | 6315525 |
| | Angulo ABC gr. 1162064 | | |




Primo quaerantur anguli reliqui *per Probl.3:huius*.
Deinde acquisitis angulis indagamus latus reliquum *per Problema immediate praecedens.* Exemplis non opus est.

Aliter.

Si datus Angulus fiat Centrum Circuli cujus Radius altera Cruri aequatur, & a termino Radii ducatur Perpendicularis in Crus reliquum (si opus sit continuatum) Oblongum e reliquo Crure, & duplicato segmento inter perpendiculum & peripheriam dato angulo subtensam, cum quadrato differentiae datorum Laterum, aequabitur Quadrato Lateris quaesiti.