No. 1

Mathematics

1 If the line of Log. Sines is numbered backwards, that is making 80, 10 70 20 &c, it will become a line of Secants. — Why —

2. A Table of Natural sines to the Radius 1 is very useful in Geom?, navigation and other practical branches of the mathematics —

3. To find the Areas of the three Zones

1. Rad : S, 46°, 56' :: Area Glob : area of the Torrid Zone —

2. R : Diff Sines of 23°, 28' and 66°, 32 :: ½ the Globe : Area Temp: Zone

3. To the whole Temp: add half the Torrid and which subtract from half the Globe, the remainder is the area of a Frigid Zone

4. The oval and Ellipse are very different curves, the former has never been considered by Geometricians —

5. Verniers Scale is best explained by a sliding frame which may be of paste board, the no. of parts in the slide and fixed frame differing by one —

6. A mere mathematician is incable of examining the works of nature. define him of his lines and angles and he is perfectly at a stand —

— Euler imagined that if the attraction force was destroyed the planet must be annihilated —

7. The Specific gravity of quicksilver to air is 14019 to 1¼ from this to find the height of the Atmosphere

$1\frac{1}{4} : 14019 :: 30 : 336456 = 5\frac{1}{4}$ Miles

All bodies whose orthographic Section taken by rays in the direction of their motion are equal, meet with the same resistance when moving in a fluid e.g. A Globe Cylinder and cone moving in the direction of their axes, their Diam. equal, meet with the same resistance —

9. The resistance which a fluid makes to a cylinder moving in it, in the direction of its axis, is equal to the weight of a Coll. of the fluid of which the base is equal to that of the Cylinder and height equal to half the space thro' which a body ought to fall to acquire the given velocity of the Cylinder

— Hence the velocity, bulk and weight of the body together with the Density of the fluid being given

the resistance and retardation of
the body may be found —

Example

A Globe of lead is in D.^r 3 Inc
its weight 84 Oz. moves at the
rate of 2 feet ℘ second. required
the resistance and retardation
the water makes to its motion

As the square of 32 feet ℘ sec
is to the space by falling thro'
which that velocity was acquired
=16, so is the square of 2 the
given velo.^y to the space thro'
which a body must fall to acquire it

Thus

$1024 : 16 :: 4 : \frac{64}{1024} = \frac{1}{16}$

half of which is $\frac{1}{32}$ foot inch

or the space thro' which the body
must fall to acquire the velocity
2 feet ℘ second or the length of
the Colm. of water; and its D.^r being
3 In. it will weigh $2\frac{1}{2}$ Oz Troy
which therefore shows the quantity of resistance
We may therefore consider the effect
as if a body of 84 Oz had struck
with a velocity of 2 against a quiescent body of $2\frac{1}{2}$ ounces and each
discover the velocity of the body 84
to be after the stroke $84 \times 2 = 168$
and the whole sum of the motion is
not altered by the mutual actions
of the bodies. As therefore the motion
continues still 168 altho' the mass
be encreased by the addition of $2\frac{1}{2}$ Oz
and so becomes $86\frac{1}{2}$ instead of 84
To find the velocity, divide the quantity
of motion 168 by the mass $86\frac{1}{2}$ gives $1\frac{9}{10}$
the difference between which and the former
velocity $2 = \frac{1}{10}$ is the retardation

Hence it appears that in order to maintain the uniform motion of a body in a fluid, a constant accession of force is required to overcome the resistance; but as in general there is no such accession, the motion must decay by degrees and at last terminate —

10 Cubic Equations cannot be resolved Geometrically

11. The Trisection of an angle, the Duplication of the cube, and the squaring the Circle are three famous problems which have not yet been solved

12. The 16 prop: 1st Eucl: is less accurate than the others. There is no common measure of a mixtilineal and rectilineal angle

13. The Composition ~~and~~ resolution of forces as illustrated by a Parallelogram not accurate —

4 The objections to the Theorem of a Parallelogram as demonstrated by Newton from the Analyst

5 The fallacy of the common method of measuring unequal sided timber by taking $\frac{1}{4}$ of the circumference for the side of the square is demonstrated from the 5th prop: of the 2d book of Euclid

16. Some have thought to determine the problem to find the depth of a well from the time that the report of a stones striking the water takes to reach the ear, by what they call a new method, bodies moving uniform~~ing~~ly in a solid sphere Curve time described in the same time as the arch —

17. The objection to the tenth Def of the XIth book of Euclid well fou

18. An Algebraic expression is so times mistaken for a Demonstrati

19. Mr Gordon in his treatise on Ship building endeavours to prov that the Momentum of water acti obliquely on a Body moving th it is not as the squares of the sin of the angles of incidence as commonly received, but simply as the Sines of the angles of inciden

20. Mr De Lolme thinks that the doctrine of superimposition in Mathematics is not always jus — Difference between figures conside identically and with regard to ye senses — Divining rod!!! &c &

A General theorem for ascertaining the vibration of a pendulum, when the point of suspension is not at-tached at the end, but in the pendu-lum.

What effect in time will the Par:x of Mercury occasion between the Royal Observatory at Greenwich and fort William in Bengal?

Lat Fort Will.m 22° 32' 10" N
Long —— 88, 28. 30 E

Altitude of Mer.y at Gh. 35° 56
Fort W. 56 18

Transit happened on the 3 May

1786 —

— query the best general mode of determining this? —

23. The tenth propos^n of the 3 book of Euclid is defective — How is it known that the point K is within the circle DEF? —

24. When it is said that two quantities are incommensurable with respect to each other it is meant only with respect to the present calculus. A calculus may be discovered by which the ratio of the Diam.^{r} to the circumference of the circle may be expressed in finite quantities

25. An Essay on Fluxions lately gained the prize at Berlin. In this Essay the Expression of infinite is left out and new principles are assumed less liable to objecti

6. Its Circles were applied to the purposes of Geography and Astronomy in early times it is probable that 360° were taken as the nearest number to the Days in the year

Logarithms

1 2 4 8 16 numbers
1 10 100 1000. 10000 Numbers
0. 1 2 3 5 Logarithms —

It is no matter in what proportion the ~~the~~ natural numbers increase the Logarith^m may be fitted to any series — The second of the above is that now used

0. Use of Sines and Tangents explained by a quadrant and Diagon — By this Instrument it is manifest that

of the Rad: be 1000 &c the Natural
sines give the opposite angles, but
if the Radius be any other No
then it bears the same proportion
to 1000 &c that ~~the corresponding~~ any sine
does to the sine of the angle oppo

29. The Practical Triangle is wrote
of a Rhumb line, Meridian and Pa
called

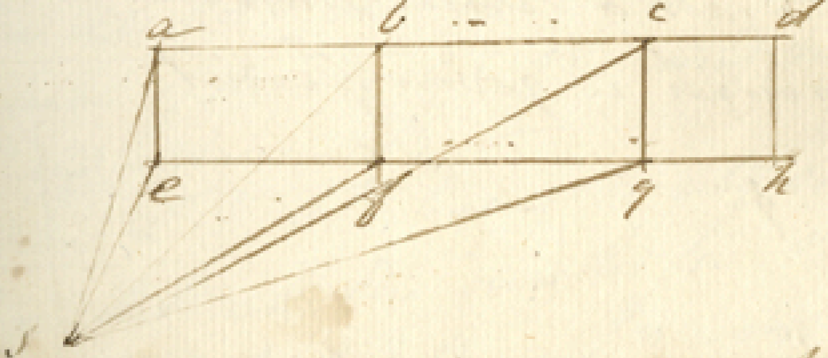
30 What height of a pile Engine
will produce a maximum?

31. In the 22. Prop:n of the 3d
book of Euclid a quadrilateral
figure inscribed in a circle is
mentioned whereas the definition
of inscribed figures does not occur
till the 4th book—

An Apparatus for proving practically the principal propositions in Geometry

In the first Prop:n of Euclid should it not be proved that the circles cut each other? and is it not here taken for granted that the chord falls within the circle, why then demonstrate this property in the 2d Prop. of the 3d book?

4.

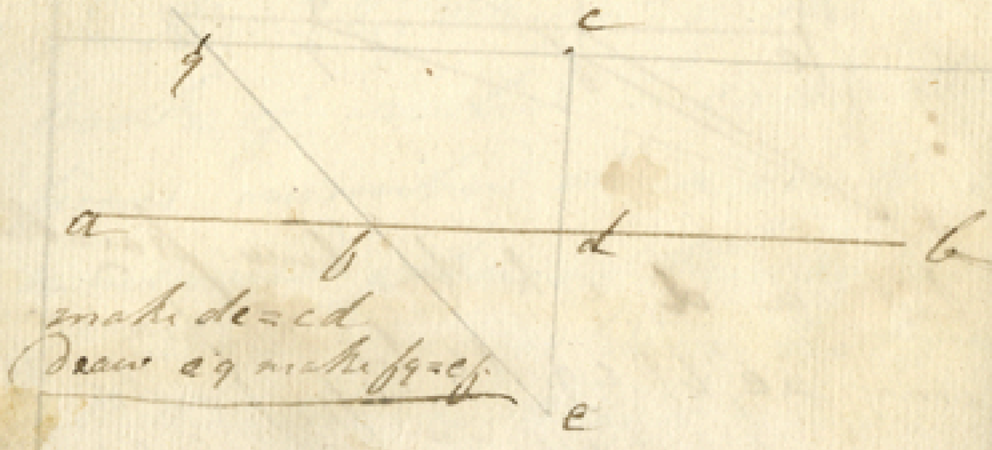


Let a d, e h be two parallel lines ae, bf, cg, dh be perpendicular s any point, required the position of the perpendicular to render ∠ s u maximum

35. What proportion does the diminution of a body in altitude bear to its distance, is the ratio the same as in a horizontal position? if not what is the cause of the difference

36. Have the diagrams of the ancient Mathematicians been transmitted to us? or have they been supplied by the moderns?

37. To draw a line parallel to another through a given point

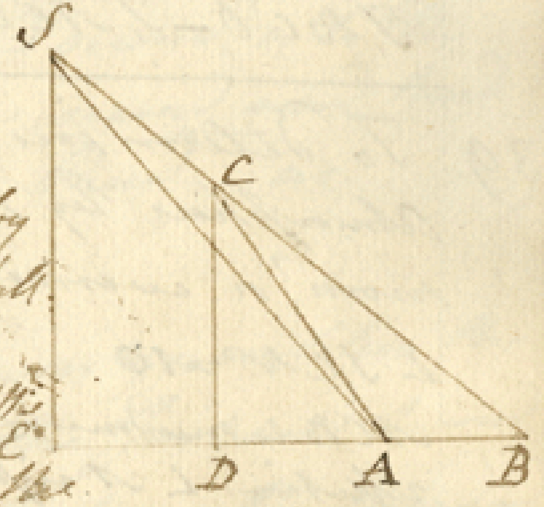


make de = cd
Draw eg make fg = ef

No 2.

Mathematics

8. To measure the height of a cloud at one station



Let S be the sun C a cloud, whose shadow is observed by a person at A to fall at B

Take the height of the sun = ∠ SAE, and the height of the cloud CAE and measure the distance AB

Then SA, SB being to all sense parallel all the angles in the triangles CDA, CDB, are given

Therefore S, ACD : AB :: S.B : AC
and R : AC :: S, CAD : CD = perpendicular height of the cloud

The following elegant solution is given by Kepler

T, BCD : R :: BD : DC
T, ACD : R :: AB : DC
Therefore taking the difference of the antecedents it will be

T, BCD − T, ACD : R :: AB : DC —

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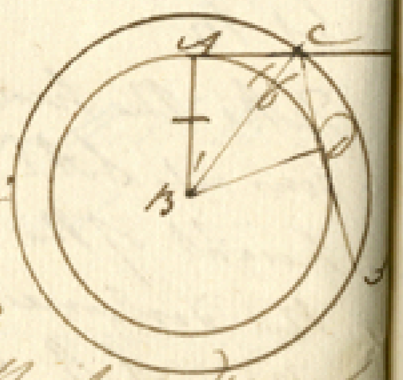
39. To determine the height of the Atmosphere by the duration of the morn.g or evening twilight —

∠ SCN = 18
ACB ∠ incidence = DCB ∠
reflection ∠ A right
subtract 18 from 180 remains
162 halfe is 81 = ∠ BCA
S, C : AB :: R : BC from
which deduct the AC the Semidiameter
of the earth remains f.e the height of
the Atmosphere —



Harmonical proportion

ab : ad :: cb : dc is in numbers when of three given quantities the difference between the first and second, is to the difference between the second and third as the first is to the third as

6 : 8 : 12

or when of four given quantities the difference between the first and second is to the difference between the third and fourth as the first to the fourth — thus

6 : 8 :: 12 : 18 i.e. 6 : 18 :: 2 : 6

Contra Harmonical proposition is when the Diff: between the 1st & 2d is to the diff: between the 2d & 3d as the 3d to the 1st as 6 : 10 : 12 & 4 : 2 :: 12 : 6.

41. Rule for oblique ang^d Spherical triangles —

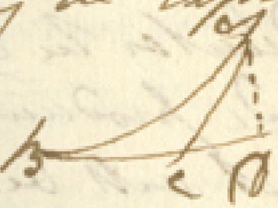
1 Sines of the Analogous Segm^ts :: to the Tangents of the adjacent parts —

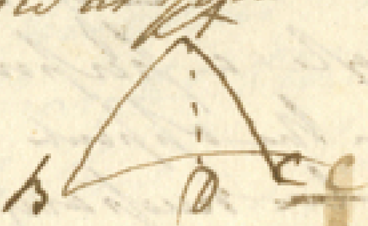
2. Cosines of the analogous Segm :: Sines of the opposite parts

Same complements as in Nap

If the three given parts be conti guous the perpendicular must be drawn to one of the extremes; witho dividing the part required; if not contiguous, the perpendicular mus always divide two unknown parts

The former Rule for the solut of ~~right~~ oblique ∠ Spherical triangles may be expressed as follows —





The angles B.A.D. C.A.D. are called segments of the vertical angle whether the perpendicular fall within or without the triangle. The parts B.D, DC are called segments of the base, whether the base be produced or not.

If the segments of the vertical angle be considered, AB and AC are called adjacent parts and the ∠s B.C opposite parts.

If the segments of the base be considered, the ∠s B.C are adjacent and the sides A B. A C. are opposite parts

— Theorem —

If from one ∠ of a spherical triangle a perpendicular be let fall on the opposite side produced if ~~need be~~ necessary it will be

1st Sines of the seg.t ∠s ÷ Co sines opp.te
— Co S. ——— ÷ Co T. adjac.t
2d Sines Seg.t Base ÷ Co T. adj.t
— Co. Sines ——— ÷ Co Sines Op.te

— That is —

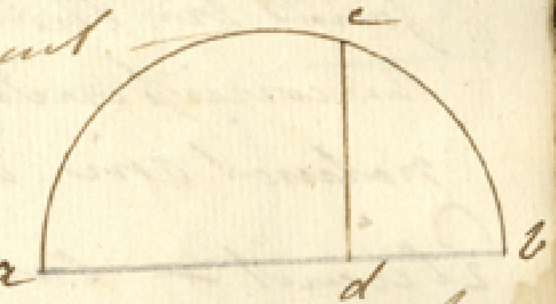
1. S, BAD : S, CAD :: Co S, B : Co S, C
2. Co S, BAD : Co S. CAD :: Co T, AB : Co T, AC
3. S. BD : S. CD :: Co T. B : Co T. C
4 Co S, BD : Co S, CD :: Co S, AB : Co S, AC.

Loci among the ancient Geometers was a term applicable to an indeterminate problem For Examp

Given a Straight line AB it is required to find a point from which a line drawn perpendicular to AB, will be a mean proportional to the segments

Describe the ac b from any point of which let fall ~~the~~ a perpendicular cd, this is a mean proportional to the segments ad, db —

The Locus of the point c is a Semicircle



43. By the Logarithmic Sines and Tangents to find the Natural sin Logs. Secants and Versed Sines —

1st Natural Sines and Tangents Find the Logarithmic Sine or Tang reject the index, and the remainder found in the common Logm of the corresponding Nat: No. is the natural sine or tangent ——

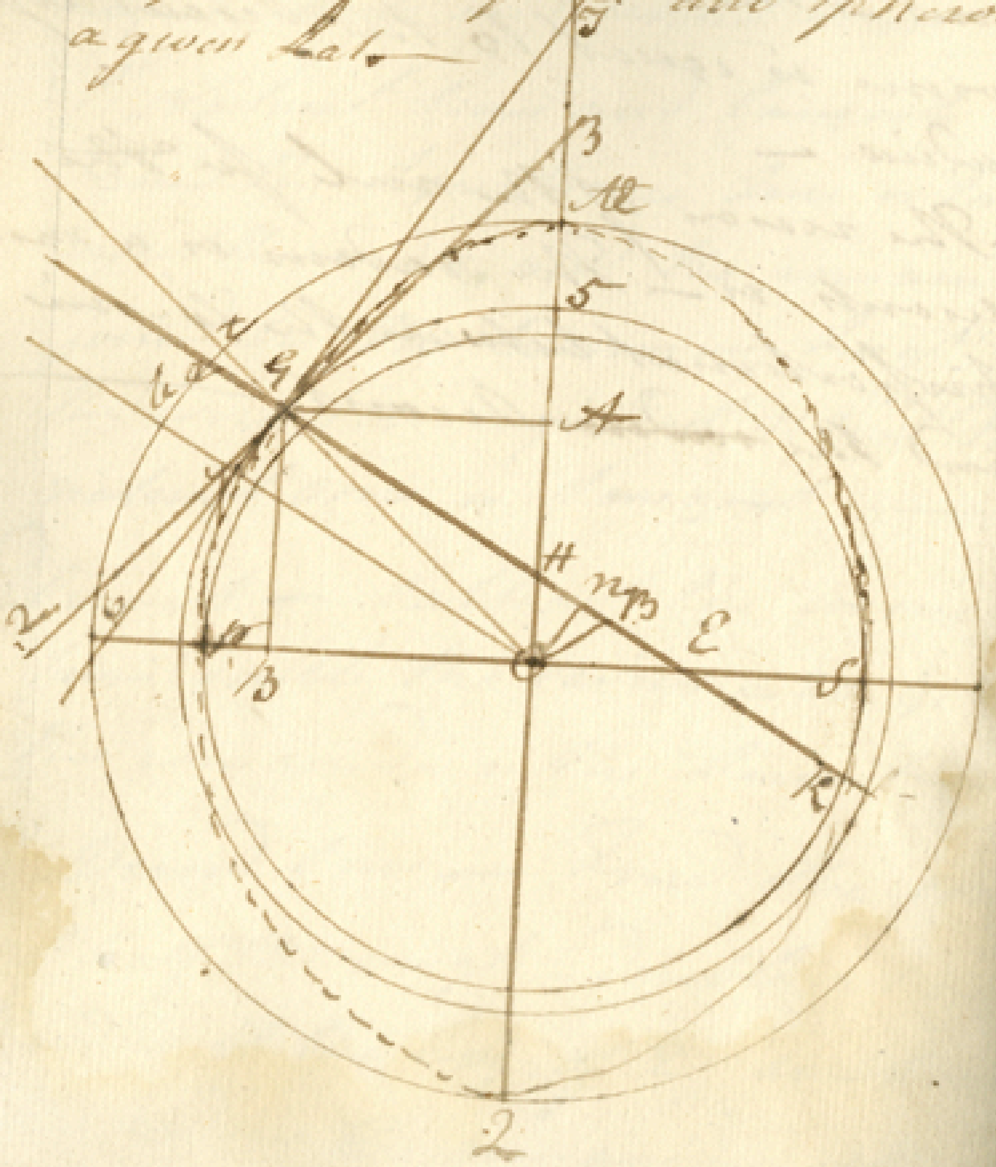
2 Secant — subtract the cosine from double the radius = 20. &c — the remainder is the Secant —

3 Versed Sine — Find the sine of half the angle double it and add to it the Log: of 2, subtract the radius, the remainder is the Versed Sine —

— Hence a table of Sines and Tangents is sufficient for all purposes — The arith: Comp: of the cosine is equal to the Secant less radius —

— The reason of the rule for the secants is — The radius is a mean proportional between the co-sine and the ~~radius~~ Secant ——

To find the angle of deviation in a Spheroid, or difference of position in the horizons of a sphere and spheroid in a given Lat.



Let T.G.t be a tangent to the earth's surface in the point G; GHEK a perpendicular to the tangent cutting the transverse axis in H, and the conjugate in E, O the center, let fall on PS the perp. GB — Then as the square of the conjugate &c to the square of transverse axis so is BO to BE, and as GB to BE so is R: Tang. ∠ BGE. but BO and BG are nearly the sine and co-sine of the Latitude, and BO nearly the Tangent of the Lat. to the Radius BG. Therefore BE is the Tangent of an angle to the Radius BG which ∠ exceeds the Lat by the angle OGE the angle of deviation required.

Hence
As the square of the polar axis
To the square of the Equat.
So the sine of the Lat
To a fourth no. and

As the Co. Sine Lat :
To this fourth no. ::
So is Radius :
To the Tangent of an angle which [exceeds]
the Lat by the ∠ of deviation —

— In this theorem assuming the Diameters of the earth as 6525 to 6562 the Square of the less is to the [square] of the greater nearly as 1 to 1.00[illegible] whose log. with the addition of the Rad. is a constant Log. Hence the Theorem comes out thus —

To the Log. Sine of the Lat. add the constant Log. 10.0048952 & from the sum subtract the Log. Co[sine] of the Lat. The remainder is the Tangent of an arch which exceeds the Lat by the ∠ of deviation —

Ex 1

What is the deviation for Lat 20°

Sine 20° — 9.5340517
Const. Log — 10.0048952
19.5389469
Co. Sine Lat. 20° 9.9729858
12′ Deviat Tangt. — 9.5559611

Ex

Lat 39°
Sine 39° — 9.798872
Const Log. 10.004895
19.803767
Co. Sine 39° 9.890503
18′ Tang′ 9.913264

The deviation of any Lat and its Compt. is the same. — Hence a table may be easily constructed for every degree to 45°, by which the Lat may be corrected for the spheroid and then the calculation for the hour ∠ &c will be the same as usual —

45 To correct the Latitude for the sph
Subtract the ∠ of Deviation from it, the
remainder is the true spheroidal
Lat — This affects every calculation
but most of all the time by an alti-
tude of the sun —

Example

Given Co.Lat. 38° 29'
Co.alt 30 25
Co.Decl 66 32 } Req^d hour angle

H	'	"	
1	1	6	Usual Calculat
1	4	30	True Calculati
	3	24	Diff = 51' Long.

Here 19' = ∠ Dev. is added to the Lat. or subtracted from the Co. Lat and calcu is made from Co. Lat 38° 48' for the spheroid but from 38° 29' as usual for the sphere — Similar errors take place in the Amplitude. Again these errors decrease towards the east and west points —

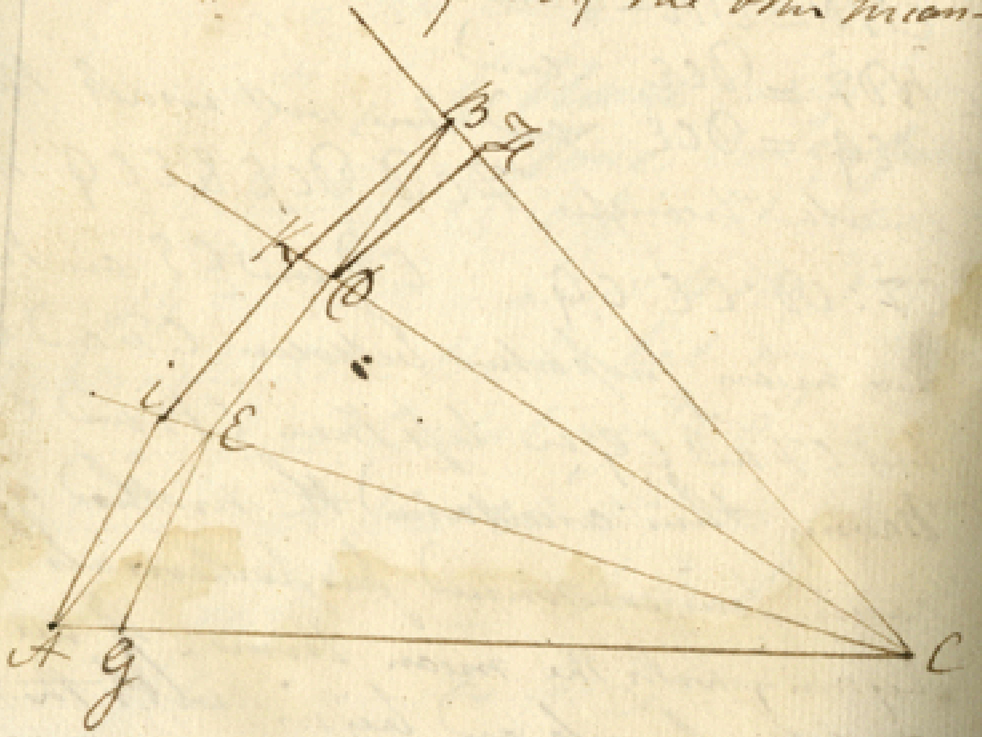
6. To find two mean proportionals
between two given lines —

Let ACE, ECD and DCB be equal ∠s of any assumed magnitude, and let AC and BC be the extremes given. Draw AB a right line crossing EC and DC in the points E and D. Then

$\angle AEC = EDC + DCE$ and
$CBD = CDE - DCE$ wherefore make ∠
$\angle BDF = DCE$ and
$\angle AEG = DCE$ and there will result three similar triangles FCD, DCE & ECG hence
$CF : CD : CE : CG$. CD and CE are therefore two mean proportionals between CF and CG but CF and CG are less than CB and CA.

Having thus ascertained the method of finding easily four continued proportionals by beginning with the mean terms. If we invert the process and begin with the extremes and make the angles EAC &

DBK each equal to DCE we shall have BK
par. to FD and Ai part. to EG. and
therefore Ki part. to DE. Therefore the
triangles CBK, CKi and Cia are
similar to CDE and by reason of posi-
tion CK. and Ci are the mean propo
required — In practice it is only necessary
after joining the points A. B. to make
~~the~~ EAi equal to DCE and we have
the term in the series next to one of the
extremes, and consequently the other mean —



No 3

Mathematics

$\overset{7}{16}$ The multiplication of surds is performed by multiplying the quantities first into each other, and then prefixing the radical sign — This is commendable for both in theory and practice — Example $\sqrt[2]{2} \times \sqrt[2]{6} = \sqrt[2]{12}$ — Sometimes it happens that both factors are irrational and yet the product turns out rational E.G. $\sqrt[2]{2} \times \sqrt[2]{8} = \sqrt[2]{16} = 4$ —

48 If one agent do a piece of work in a, and another agent in b days both together will do it in $\frac{ab}{a+b}$ days —

49 Any power or root of a product is equal to the same power or root the two factors × together — any power or $\overset{x}{}$root of a vulgar fraction is equal to the same power or root of the numerator divided by the denominator

E.g. $\overline{4 \times 6}^{3} = 13824 = 64 \times 216$

$\overline{\tfrac{2}{3}}^{3} = \frac{8}{27}$

50 ~~44~~ Since the square of every quantity whether that quant. be affirmative or negative is always affirmative, therefore the square root of a negative quantity is impossible.

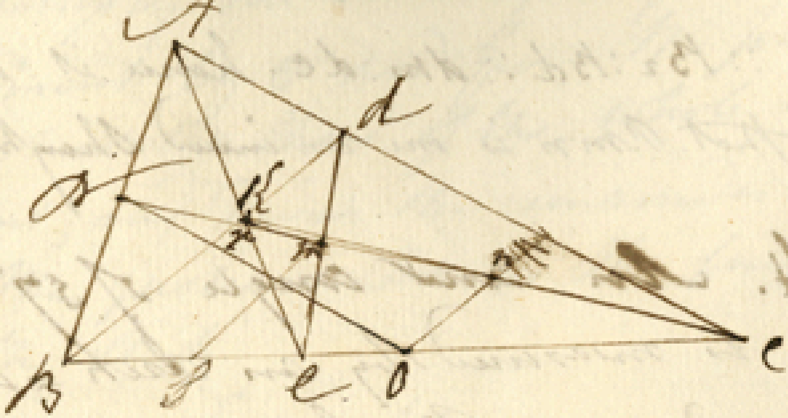
51. Rule for measuring heights by the Barom. Specific gravity of air is to that of mercury as 1¼ to 14019 — ~~then two coll: of every height balance each other, and~~ — When two coll: of the same diamr. consisting of fluids of different specific gravity bal: each other, their heights will be inversely as the specific gravities. Therefore

$1\frac{1}{4} : 14019 :: \overset{\text{Inch}}{30} : \overset{\text{In.}}{336456} = \overset{\text{Mile}}{5\frac{1}{4}} =$

the height of the Atmosphere were it of the same uniform density — But the density of the atmosphere decreases in geometrical proportion. Hence the real height is about 45 miles —

52. Suppose the height of the Atmosph. to be divided into a great number of equal parts, the density of each of which is as its quantity; and the weight of ~~each~~ ~~of which~~ the whole incumbent Atmosph: being also as its quantity; it is evident that the weight of the incumbent air is every where as the quantity contained in the subjacent part, which makes a difference between the weights of each two contiguous parts of air.. By a theorem in Geometry, since the differences of Magnitudes are geometrically proportional to the Magnitudes themselves, it appears that these magnitudes are in continual Arithmetical proportion, therefore if according to the supposition the Altitudes of the air, by the addition of new parts into which it is divided, do continually increase in Arithmetical proportion, its density will be diminished in Geometrical portion —

3.



Let ABC be a triangle. AC and
Bd lines drawn from the angular points
A and B meeting ~~the~~ opposite sides in
c and d — CeKd a trapezium whose
diagonals are bisected in the points m and
n. Draw no and ms parallel to Bd. Also
to O the middle of AB draw Oa. join
the points a.m, m.n and r m.
now because Cn = nK . CO = OB and
Ba = aA. Oa is par: to CA and Bd
is bisected in the point r, and ed in m
consequently r m is par^l to B.C. Then by
similar triangles

cn : ck :: co : cB :: no : KB :: BP : BA
:: Bz : Bd :: dm : dc. hence it appears
that Pmn is one continued Straight line

54. An arch angle of 57° 17' 42"
is measured by an Arch = to the
radius — The Radius of a Circle
being 1 the semicircumference is
3.14159 this divided by 100° gives
.01745329 for the length of one degree
the radius being unity — To find the
length of any Arch

Rule

Multiply continually the radius
the No. of degrees in the Arch and the
constant Number .01745329 the product will give the length of the arch
line. —

or

Rule 2d

Multiply the Chord of half the
Segment by 8 and from the product
subtract the Chord of the whole segment, and divide the remainder by
3. the quotient will be the length
of the Arch

Example

Let the Radius = 71. the Chord of
the whole segment = 67, of half the
Segment = 35 Then by the first
Rule

57°.295 angle given
71.
57295
401065
4067.945 × .01745329 =

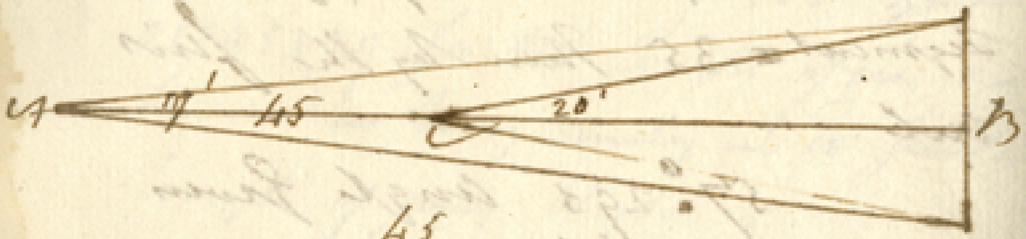
gives 71 as above

55. Having the angles subtended by the same object seen at two Stations in a line with the object, to find the Distance of the object.—

Rule.

Multiply the greatest angle by the distance between the Stations, and divide the product by the difference of the angles the quotient is the distance from the farthest Stat:n

Exempt



$$\begin{array}{r} 45 \\ 20 \\ \hline 20-17 = 3)\,900 \\ \hline 300 \end{array} = \text{Distance AB}$$

$$\begin{array}{r} 45 \\ \hline 255 \end{array} = \text{CB}$$

Demonstration of the foregoing rule—

If T denote the tang: of the greater ∠ and t that of the lesser, d the distance between the fo Stations A and C.— y the unknown distance from the farthest station, y−d Dist: of the nearest station, r the radius and x the unknown size of the object. Then in small angles the tangents being as the angles it will be by Trig:ry $r:t::y:x$ and $r:T::y-d:x$. hence $rx=ty$ and $rx=Ty-Td$ therefore $ty=Ty-Td$ and $Ty-ty=Td$ which divide by $T-t$ gives $y=\frac{Td}{T-t}$

56. Numbers, whether whole, fractional or mixed are commensurable — For unity measures ~~a~~ any whole number; and a fraction whose Numr. is 1 and Denominator, the common Denr. ~~of~~ any Numbr. of fractions, will measure them all; and mixed numbers, by ~~by~~ being reduced to improper fractions may be measured in like manner —

57. The Logarithmic Curve is said to have been invented by Edmund Gunter but it is not mentioned in his works Considering with what ease and how naturally it explains the construction of Logarithms ^it is a wonder it was not invented sooner^ It differs in its properties widely from the Hyperbola —

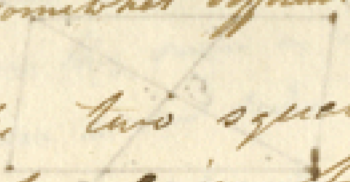
58. Parallelograms ~~inscribed~~ described between the Hyp:a and its Asymptotes are all equal, Hence it follows that the Asp: and Hyperbola are constantly approaching, without a possibility of meeting — Em—n —

59. From the 8th Prop.n of the 6th book it follows that the Rect.e under the Abscissae are equal to the square of the ordinate in the circle as in other curves

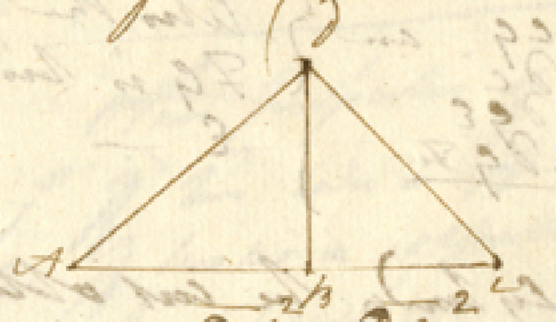
60. The 47th 1st Book Demonstrated differently from Euclid, by T Simpson, Emerson, Hirst, Norris, ~~Payne~~ and ~~Robertson~~ — Simpson two methods demon: from the preceding proposition. — Emerson takes the 8th of 6th book to his aid — Norris's method is ~~Simpson~~ 2d

Norris's ^first^ made is the same as Simpson's 2d and worth — His 2d method the same as Emerson — Payne's is the same as Euclid's, also Robertson's —

— 32d 1st book somewhat different by Robertson



61. To make two squares in the ratio of two given lines AB, BC



AB : BC :: $\overline{DA}^2$: $\overline{DC}^2$ — deduced from the 8th of the 6 Euclid ~~[illegible]~~

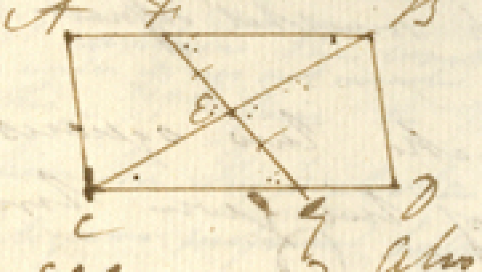
62nd In the right angled triangle ^ADC^ (61)

$AC \times AB = \overline{DA}^2$

$AC \times BC = \overline{DC}^2$

Th: $AC^2 = AD^2 + DC^2$ — 47th 1st Euclid. —

63. A line bisecting the Diameter and produced to the opposite sides bisects the parallelogram —



Δ BEF = ECG and
ABC = BDC
th. AFEC = BDGE
th. AFGC = BDGF

Also the line FG is bisected in E —

64 If a cylinder be cut obliquely the section is an Ellipsis — see Emerson con: sect. prop 80, 1st Cor

65. The solidity of a spheroid ~~or~~ ~~solid~~ generated by an Ellipsis revolving about either axis is = 2/3 the circumscribing cylinder

Em: & Cont. prop 74

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61 Triangles are equal

Eu.

8 — 1. When all the three sides in each are =
4 — 2. When two sides & the included ∠ are =
26 — 3. When two angles and a side are =
37, 38 — 4. When on the same or equal b. & ∥s =
B6, 15 5 When one ∠ and sides reciprocally :: =
B1. 1.15 Equiangular Δs with one side =

Other properties of Triangles

1 If two sides = opp: ∠s are =. 5
2. If two ∠s = opposite sides = 6
3 Greatest side sub: great: ∠ & v.v. 18, 19
4. Any two sides greater than one — 20
5 Outw^d ∠ = inner and opp: — ones = 2 R∠s 32
6. Square of Hyp^s = sq: of two sides — 47
7 Δ is 1/2 ▱ on same b. & ∥. ▱ double Δ = 41
8 Square of side opp: obt: ∠ greater & acute less 12, 13
9. In a right angled Δ perp: mean prop: between seg: of the base, and each side a mean prop: between the base and its adj. seg: 8. 6
10. Three lines drawn from the three angles of a triangle to the middle of the opposite sides, meet in one point

The distance of which from any angle is double the distance from the opposite side

11. Three perpendiculars in the middle of the three sides of a △ all meet in one point which is equally distant from the three angles

12. Three perpendiculars drawn from the three ∠s of a △ upon the opposite sides meet in one point

13. Three lines bisecting the three ∠s of a △ meet in one point which is equally distant from the sides – two lines the same. —

14 △s same Alt: :: bases — 1st 6B

15. Line par. to one side cuts the other ::ly 2 —

16 A line bisecting one ∠ of a △ cuts the base in the prop: of the sides — — 3

17. Equi: △s sides proportional — 4

18 Similar △s in the duplicate :: Hom: sides 19

19. 47 prop. extended to all similar figures 31

20. If a line bisecting an ∠ of a triangle cuts the base, the ▭ sides = ▭ seg: base + bisecting line² — B

21. If a line be drawn from an ∠ ⊥ base the ▭ sides = ▭ perp: and Diameter of the circumscribing circle C

67. Parallelograms —

1st B

1 Opp: sides and angles = & v.v. 34

2. A line bisecting the Diam. and produced to the opp: sides bisects the ▭ and is itself bisected by the Diamr. —

3. Par. on the same or equal bases are equal 35, 36

4. Parm. double of a triangle on the same or equal base and between the same par: 41 —

5. Complements are equal — 43

6. If one angle of a Par: be a right angle all the others are right

7. Par. of the same altitude are to each other as their bases — 1st, 6B

8. Equal Ps, one ∠ in each = have their sides about the equal ∠s reciprocally :: 14, 6B

9. Equiangular Par. have to one another the ratio which is compounded of their sides — 23. 6B —

10th The Pars. about the Diam. are similar to the whole and to one another 24.6

11. If two similar Pars. have a common angle, and be similarly situated they are about the same diameter 24,4

12. The sum of the squares of the Diameters is equal to the sum of the squares of all the sides

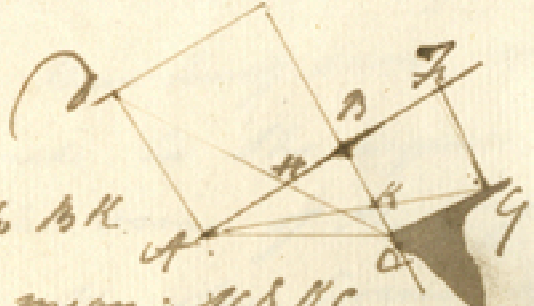
6th Rectangles —

Circle

70. In the 40 prop: of the 1st of Eucl
BC and DC is inferred to be equal
from their squares being equal. From
what axiom or principle is this derived?

71. The term __similarly situated__ is often
used but not defined by Euclid!
Similar figures are also similarly
situated when all their homologous
sides are parallel— 18th. 6th Book—

72.



BH is equal to BK
and either is a mean :: AC & KC

Dem:

In the △s A[illegible]G, ABK — AF : FG :: AB : BK
Therefore AB+BC : BC : AB : BK ;
and in the △s CED, CBH — CE : ED :: CB : BH
Therefore AB+BC : BC :: AB : BH
Cons: AB : BK :: AB : BH
Then : BH = BK —

also BH or BK is a mean prop.l
between ~~AB~~ AH and KC –

By similar triangles

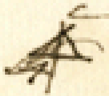
AB(=A) : AH :: BC : BH

and AB : BK :: BC(=CE) : ~~AB~~ CK

Therefore ex Eq: ~~AB : BK~~ or BK :: AH : BK ::
BH : CK –

Three sides of a plane triangle being given to find an angle

Rule – To the arith: compl. of the Log of the sides containing the required ∠ add the Log. of half the sum of the three sides, and of the (diff: between this half sum and the side opposite to the required angle then half the sum of these four Logs will be the Log. Cosine of half the required angle

Ex..


Req.d ∠A

Sid. oppo: ∠ ~~A~~ 365

Cont.d sides { AB – 426 — Ar.c Log – 7.37059

{ AC – 230 — Ar.c Log. 7.63827

sum 1021

½ – 510.5 — Log – 2.70800

Diff. 145.5 — Log 2.16286

Ans.r 58° 56' 29°.28' = 9.93986 ∴ 19.87972