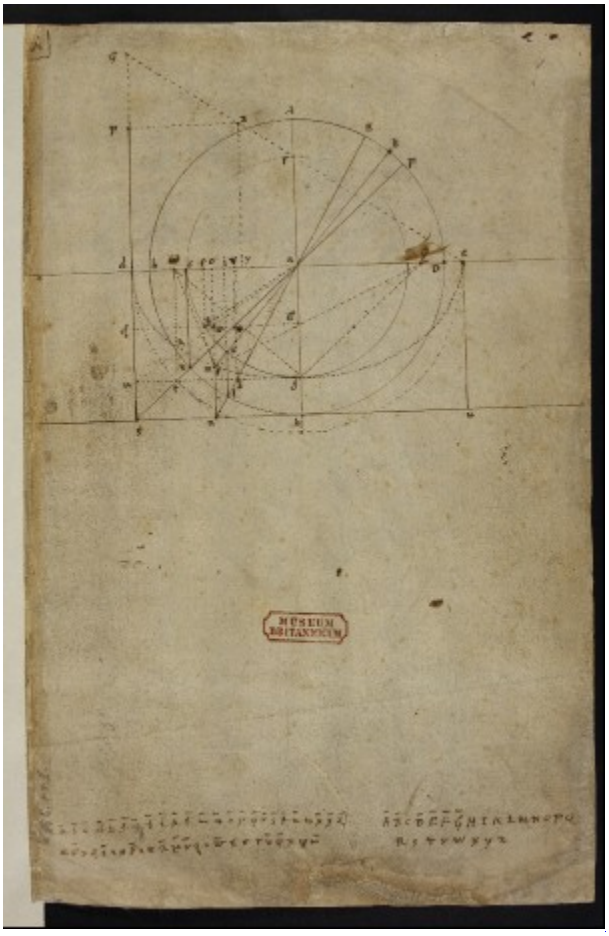
Harriot, Thomas, **Mss. 6785**



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Supplementi. [tr: Proposition 20 from the Supplementum] prop. 21. [tr: Proposition 21] Explicatio aeqationum quae habentur post 24 propositionem Supplementi. [tr: An explanation of the equation to be found after Proposition 19 in the Supplementum] prop. 19. Supplementi. [tr: Proposition 19 from the Supplementum] prop. 19. Supplementi. [tr: Proposition 19 from the Supplementum] De infinitis [tr: On infinity] Ex Linea Quadrataria producta. Consequentiones quædam miranda. [tr: From the production of a quadrate line, certain marvellous consequences.] De infinitis. [tr: On infinity] Quod quædam superficies infinitae longitudinis erit æqualis cuisdam finitæ. [tr: How a certain surface infinite in length may be equal in length to one finite.] De Continue proportionalibus. Et Infinitis. [tr: On continued propotions. An infinity.] Cardan. de Aliza. pa. 83 [tr: Cardano, De regula aliza liber, page 83] Cardan. Arith, lib. 10. cap. 39. pag. 143. [tr: Cardano, De arithmetica liber X, Chapter 39, page 143.] 6) 5) 4) 3.) Diophantus. lib. 2. 8. Zet. 4. 1. [tr: Diophantus, Book II, Proposition 8 Zetetica, Book IV, Zetetic 1] 2.) Zet. lib. 4. 1. [tr: Zetetica, Book IV, Zeteticum 1] 1.) Zet. lib. 3. 9. [tr: Zetetica, Book III, Zeteticum 9] Zet. lib. 3. 10. [tr: Zetetica, Book 3, Zeteticum 10.] Zet. lib. 4. 6. [tr: Zetetica, Book IV, Zeteticum 6.] Zet. lib. 4. 6. [tr: Zetetica, Book IV, Zeteticum 6.] Responsorum. pag. 30. in Corollarium. [tr: Responsorum, page 30, on the Corollary] Responsorum. pag. 30 prop. 2. [tr: Responsorum, page 30, Proposition 2.] Secundum Adrianum Romanum. pag. 110. et 111. [tr: According to Adrianus Romanus, pages 110 and 111.] Aliter: De quadrilatero sive ptolomaico [tr: Another way: on quadrilaterals, or by Ptolemy] Simon Stevin. Novemb. 25, 1612 w.1.) Invenire 4or numerus. b. c. d. f. ita ut tres sequentes comparationes sint veræ. [tr: To find four numbers b, c, d, f, such that the three following comparisons are true.] w.2.) w.4.) w.3. 1) De quadrilatero, et cæteris multilateris [tr: On quadrilaterals and other multilaterals] b.2.) 2o. De quadrilatero. pro diagonijs. per ptolomaicum [tr: On quadrilaterals; for finding the diagonals, as Ptolemy.] 3i Aliter. De quadrilatero. Sive Ptolomaico [tr: Another way. On quadrilaterals. Or by Ptolemy.] 7) Latera triangulorum rectangulorum rational [tr: Rational sides of right-angled triangles] Appoll. Gall. problema. 9. Casus. 1. [tr: Apollonius Gallus, Problem IX, case 1.] Ad Demonstrandi secundum praemissum cap. 2. in tractatum Alligationis Bernardi Salignaci. [tr: A demonstration of the second premise of Chapter 2 in Bernard Salignac's treatise on alligation] In Libro primo Elementorum Euclidis [tr: In Book I of Euclid's Elements] Lib. I. [tr: Book I] vide proclum. lib. 4o. pag. 222. [tr: See Proclus, Book 4, page 222.] 1) 1.Δ.) 2.) 2.Δ. 2.2o 2.3o Cla. pa. 176. Geom. pract. [tr: Clavius, page 176, Geometria practica] 2.4o 3.) 4.) 5.) 1.) De triangulis poristica 6.) 6.2o) 7.) Quinta et ultima propositio appendiculæ 2 Appollonij Galli [tr: Fifth and last proposition from Appendiula II of Apollonius Gallus] Comandinus Lemma ad 43 p. 10. lib. el. [tr: Commandino, Lemma to Proposition 43, Book X of the Elements] Appoll. lib. 1. [tr: Apollonius, Book I] Appoll. lib. 1. [tr: Apollonius, Book I] Appoll. lib. 2. [tr: Apollonius, Book II] Ad Quintem lib. Euclidis [tr: On the fifith book of Euclid] De infnitis 1. Achilles Euclid.lib.13.pr.18 De lateribus corporum regularium [tr: Euclid Book XIII, Proposition 18: On the sides of regular solids] De lateribus polygonum in circulo [tr: On the sides of polygons in circles]

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[*Note:*

This page referes to Proposition 21 from Book I of Apollonius, as edited by Commandino Conicorum libri quattuor
I.21 If in a hyperbola or ellipse or circumference of a circle straight lines are dropped as ordinates to the diameter, the square on them will be to the areas contained by the straight lines cut off by them beginning from the ends of the transverse side of the figure, as the upright side of the figure is to the transverse, and to each other as the areas contained by the straight lines cut off, as we have

A,6.

Ergo:
per: 21, p.
1. lib.
[*tr: Therefore, by Proposition 21 of Book I of Apollonius*]

om cum sit parallela lineæ
ag est ordinatim applicata
ad diametrum ed; et punctum
m est in elipsi.
Quod demonstrare
[*tr: om, since it is parallel to the line ag is an ordinate to the diameter ed; and the point m is on the ellipse.*
Which was to be]

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[Page 21]

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[*Note:*

This page referes to Propositions I.21 and III.52 of Apollonius, as edited by Commandino Conicorum libri quattuor
I.21 If in a hyperbola or ellipse or circumference of a circle straight lines are dropped as ordinates to the diameter, the square on them will be to the areas contained by the straight lines cut off by them beginning from the ends of the transverse side of the figure, as the upright side of the figure is to the transverse, and to each other as the areas contained by the straight lines cut off, as we have
III.52 If in an ellipse a rectangle equal to the fourth part of the figure is applied from both sides to the major axis and deficient by a square figure, and from the points resulting from the application straight lines are deflected to the line of the section, then they will be equal to the axis.

per 21, p.
1. lib.
[*tr: by Proposition 21 of Book I of Apollonius*]

[*tr: Whence*]

figura
vel 14
[*tr: figure*
or 14 of the]

fiat
[...]
vel 14figura
ut sequitur
ponatur: DW dari

[...]
centro igitur g, intervallo ad p
periferia agatur secabit ad in w
Ergo w est centroides per 52. p. 3.
[*tr: Let*
[...]
or 14ofthefigure,asfollows.
Put DW to be given

[...]
Therefore the centre is g, the interval taken to p the periphery will therefore cut ad in w.
Therefore w is the centroid by Proposition 52 of Book 3 of]

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ptol. lib.
[*tr: Ptolemy, book 2.*]

Three aequall

Anguli
[*tr: Angles given*]

Anguli
[*tr: Angles sought*]

linea
[*tr: line sought*]

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[*Note:*

The reference on this page is to Variorum responsorum liber VIII, Chapter 12, Proposition
Propositio VII.
Si ab unaquaque extremitatum diametri, sumantur in eadem partem circuli duæ circumferentiae æquales ab altera autem earundem extremitatum, inscribantur lineæ rectæ ad terminus sumptarum æqualium circumferentiarum; spatium circuli quod interjacet inter diametrum & proximam inscriptam, adjunctaum sectioni circuli, quam facit altera inscriptarum, æquale est duobus sectoribus qui sub æqualibus sumptis circumferentiis comprehenduntur.
If from both ends of a diameter there are taken, in the same part of the circle, two equal arcs, and moreover from one of those same extremities there are drawn straight lines to the ends of the equal arcs, then the space inside the circle which is bounded by the diameter and the closest inscribed line and the arc is equal to the two sectors made by the equal arcs.

Vieta resps. lib. 8.
pag. 21.
[*tr: Viète, Responsorum liber VII, page 21v*]

Data. BE=CD.
consequentia:
sector in circumferentia EBD
æqualis est:
sector in centro EAD.
Etiam:

[...]

Quoniam:
sector in circumferentia
BDC + segmento BE.
æqualis est:
Duobus sectoribus in centro
ABE et ADC
[*tr: Given BE=DC, then:*
The sector to the circumference, EBD, is equal to the sector to the centre, EAD.
Also:

[...]

Because:
The sector to the circumference, BDC plus the segment BE is equal to the two sectors to the centre, ABE and ADC]

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[*Note:*

This page contains varous scraps of writing in teh following order.
Hebrew letters for ...
Consonants only from the phrase: 'In the beginning God made heaven and earth'. 'Tomas Haryot' written in the letters of Harriot's ALgonquin alphabet (see Add MS 6782, f. 337).
'Ld sn sltrm' (unexplained).
Consonants only from the phrase: 'Now full well marvel how a thing in it self so

n th bgnnng gd md hvn nd

[tomas

Ld sn

Nw f w mrvl hw a thng n t slf s

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[*Note:*

Lists of books held by the Earl of Northumberland and Sir Walter Ralegh, respectively, probably from the time when both were imprisoned in the Tower of London.

In my Lords hands
Hollanders Viage
Carlile [???] into hell.
Æliaus de Acribus
Rarum diabolica
Taleri [???]
with lines
in the margent

In Sr Walters hands
vita Adriani

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[*Note:*

The reference on this page is to Petrus Ramus (Pierre de la Scholarum mathematicarum libri unus et triginta (1569). (The same diagram appears in the 1599 edition, but there on page 314.) On pages 319–320 (the last two pages of the 1569 edition) Ramus states and proves what is usually known as Heron's Rule, for the area of a triangle given all three of its sides. Harriot's diagram is the same as that given by Ramus, but he translates Ramus 19s verbal proof into symbols.
See also Add MS 6785, f.345, for the same problem and a similar diagram, there from Geometria practica

sc^{h}olæ mathematicæ Rami. pag.
[*tr: Scholarum mathematicorum of Ramus, page*]

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[*Note:*

The reference on this page is to Simplicius's commentary on Aristotle's Physics, Book I, Simplicii commentarii in octo Aristoteles Physicae ausculationis libros cum ipso Aristotelis contextu

Eudemi Quadraturas ex Simplicio in lib. prim. phys. Tex. 10. pag. 13.
[*tr: Quadrature of Eudemus, from Simplicius, on the first book of Physics, text 10, page 13v.*]

Data ex
[*tr: Given from the construction:*]

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[*Note:*

The referece at the top of the page is to Adrianus Romanus responsum, page

Ad praxin Adrian. pag. 32. de polygones
et
[*tr: On carrying out Adrianus , page 32, on polygons and more*.]

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To find the summe of all the sines of minutes in a quarter of a

Nostra methodus. Vietæ
[*tr: My method. Viète's method.*]

The half the summe of
the sines being. 4. the whole sine being

The secant and tangent of 89.59 is æquall to the secant of 89.59.30. see Lansberg's de triangulis pag. 11. and therefore both
the values by demonstration are all one. But the numbers disagreeing do argue that the secant & tangent
are not truly calculated in Rheticus his tables out of which those are

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[*Note:*

Diagrams pertaining to work on polygons in the surrounding

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Numerus laterum
latera polyg.
complementum
semissæ complementum
complem. semissium
semiss. comp. et illorum
[*tr: Number of sides*
Polygonal side
Complement
Halves of the complement
Complememnt of the halves
Half of the complement and their]

[*tr: Checked*]

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[*Note:*

The reference on this page is to Adrianus Romanus responsum

subtensæ omnes quæ commode
per æquatione haberi possunt.
Nam. 20.
Subtensa cd non est quærenda per methodum
Adriani Romani, per alias et cæteræ. Inde
investiganda per æquationum linea fi. unde
una subtensa se habetur per æquationem.
altera manifesta ex
[*tr: All the subtended angles that can conveniently be had from the equation, namely, 20.*
The angle cd is not sought by the method of Adrianus Romanus, or by others and the rest. In that place it is investigated by the equation of the line fi, whence one angle is had from the equation; the other is clear from the diagram.]

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[*Note:*

The reference on this page is to Adrianus Romanus responsum (1595), page

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[*Note:*

On this page, Harriot continues his work on Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

Apoll: Gallus. problema. 9. casus.
[*tr: Apollonius Gallus, Problem IX, case 2.*]

[*tr: restored*]

In isto casu
Si punctum datum I, sit intra tangentes
et intra circulos cuius diamet: AH
Duo circuli describi possunt.
Si extra tangentes; unus tantum.
punctum non dabitur in spatio yZAXt, mpHqm.
alias
[*tr: In this case, if the point I is inside the tangents and inside the circle with diameter AH, two circles can be described. If outside the tangents, one such.*
The point is not given in the space yZAXt or mpHqm, otherwise]

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[*Note:*

On this page, Harriot continues his work on Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

Apoll: Gallus. probl. 9. casus.
[*tr: Apollonius Gallus, Problem IX, case 3.*]

In isto casu
Si punctum datum I, sit extra
circuli circa AH, et intra
tangentes ad partes A:
intra tangentis ad partes H:
Duo circuli possunt tangere duos

[*tr: In this case, if the point I is outside the circle around AH and inside the tangents on the side of A, and inside the tangents on the side of H, two circles are possible touching those*]

punctum non dabitur.
In circulo AD et intra tangentes
ad partes DM.
Neque in circulo HE et intra tangentes
extra E.
Alias
[*tr: The point I is not given in the circle AD and inside the tangents on the side DM, nor in the circle HE and inside the tangents outside E.*
Otherwise]

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[*Note:*

An investigation of Lemma I, preceding Problem IX of Apollonius Gallus (1600). Harriot notes some cases missed by Viète.
Lemma I.
Propositis duobus circulis, invenire punctum in jungente ipsorum centra, a quo, cum ducetur quævis linea recta ipsos circulos secans , similis erunt segmenta.
Lemma I. Given two circles, find a point in the line joining their centre, from which, when any straight line is drawn cutting those circles, the segments wil be similar.

Apoll: Gallus. Lemma. 1. pag.
[*tr: Apollonius Gallus, Lemma I, page 6.*]

casus a Vieta

[*tr: cases missed by Viète*]

similes arcus
ad easdem
[*tr: similar arcs on the same side*]

similes arcus
ad contrarias
[*tr: similar arcs on opposite sides*]

sunt
preterea
4 casus
de circulis secantibus
et 4
de tangentibus
si placeat.
et 1.
de
[*tr: besides the 4 cases of cutting the circles, there are 4 of tangents, if one wishes; and 1 of parallels.*]

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[*Note:*

On this page, Harriot examines Problem VI from Apollonius Gallus (1600), noting cases that were missed by
Problema VI.
Datis puncto, linea recta, & circulo, per datum punctam describere circulum, quem data linea recta & datus circulus
VI. Given a point, a line, and a circle, through the given point describe a circle that touches the given line and the given circle.

(. – o) Apoll: Gallus. prob.
[*tr: Apollonius Gallus, Problem VI.*]

alius casus:
a Vieta

[*tr: another case, missed by Viète*]

Data.
punctum, a
linea bc
circulum def
Quæsitum. abc.
[*tr: Given:*
the point a,
the line bc,
the circle def.
Sought: the circle abc]

Casus
1. cfd. Vieta.
2. cdf.
3. dcf.
4. dcf.
[*tr: Cases:*
1. cfd, in Viète.
2. cdf.
3. dcf.
4. dcf, in]

alter casus:
a Vieta

[*tr: another case missed by Viète*]

In tribus prioribus
casibus
punctum (a) datum, est extra

datum circulum, et d punctum
est ad easdem partes lineæ datæ.
cum (a) puncto seu cum circulo
[*tr: In the three previous cases, the point a is outside the given circle, and the point d is on the same side of the given line as the point a or as the given*]

In 4° casu, punctum (a) datum
est intra datum circulum
et d, a, sunt ad partes

[*tr: In the 4th case, the given point a is inside the given circle, and d and a are on opposite*]

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[*Note:*

Some working for Lemma II, preceding Problem IX of Apollonius Gallus (1600). Harriot notes some cases missed by Viète.
Lemma II.
Sint duo circuli, unius ABCD, alter EFGH; jungens autem eorum centra KL secet circulum primum in A, D; secundum vero in E, H; & in ea sumatur M punctum, a quo acta MGFCB recta secet circulm primum in B, C, secundum in F, G, & sint similia segmenta, & puncta quidem sectionum A, B sint remotior a ipsis C, & puncta F, E ipsis C, H. Ajo id quod fit sub MG, MB aequari id quod fit sub MH,
Lemma II. Let there be two circles ABCD and EFGH; moreover the line KL joining their centres cuts the first circle in A and D, and the second in E and H; and in that line there is taken the point M, from which the straight line MGFCB cuts the first circle in B and C, and the second in F and G, and the segments are similar, and the points A, B are further away than C, D, and the points F, E than C, H. I say that the rectangle formed by MG, MB is equal to that formed by MH,

Apol: Gallus. Lemma 2. pag.
[*tr: Apollonius Gallus, Lemma II, page 6.*]

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[*Note:*

On this page, Harriot examines Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

.oo) Apoll: Gall. prob. 9. de casibus

[*tr: Apollonius Gallus, Problem IX, on impossible cases.*]

Duobus datis
circulis et

[*tr: From two given circles and a points*]

Si tertius tangetur
a datis, intra:
punctum non dabitur in abc
neque in spatio gklh.
extra:
punctum non dabitur
in spatio fghd, kcl
[*tr: If the third is touched by the given one, internally, then the point may not be in abc nor in gklh; if extrenally, the point may not be in the spaces fghd or kcl*]

Extra et intra:
punctum non dabitur
in spatio fghd, kcl
[*tr: Outside or inside, the point may not be in the spaces fghd or kcl*]

Si unus datorum includat
alterum circulum:
punctum non dabitur
extra maiorem circuli
vel intra
[*tr: If one of the given circles includes the other circle, the point may not be outside the larger circle nor inside the smaller*]

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[*Note:*

On this page, Harriot examines Problem VIII from Apollonius Gallus
Problema VIII.
Datis duobus punctis, & circulo, per data duo puncta circulum describere, qui datum
VIII. Given two points and a circle, through the two given points describe a circle that touches the given

Apoll: Gallus. prob.
[*tr: Apollonius Gallus, Problem VIII.*]

Desirit Duo casus (et alij)
in Vieta:
[*tr: There are missing two cases in Viète, namely:*]

Datis duobus puncti d, b.
Et circulo, gef:
per datum, circulum contingentem

[*tr: Given the two points d and b, and the circle gef, describe a circle through the given points, touching the circle.*]

Sit iam factum:
Et sit contactus in g
agantur rectæ db, bg, dg, ef
arcus gf, et gb sunt similes
ita ge, et gd. ob contingentium.

[...]

[*tr: And let it be done thus:*
And let it meet in g.
Connect the lines db, bg, dg, ef.
The arcs ge and gb are simlar, thus ge and gd, touching ob]

Datur latera triangulorum afh, abh
fb est distantia
[*tr: Given the sides of triangles afh and abh, The distance to the vertex is fb*]

In alia charta
modus
[*tr: The method of investigation is in another sheet.*]

Si linea a d, b $^{\text{per se vel producta}}$ non secat circulum
datum: fierunt duo circuli
[*tr: If the lines from d and b, either in themselves or produced, do not cut the given circle, then there will arise two touching circles.*
]

Si unum punctum sit intra alterum extra
circulum datum: casus
[*tr: If one point is inside, the other outside, the given circle, the case is impossible.*]

Si ab uno datorum punctum
sint duæ tangentes
circulum: et altera fit:
extra

[*tr: If from one of the given points there are two tangents to the circle, and the other is constructed outside*
]

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[*Note:*

The reference to Pappus is to Commandino's edition of Books III to Mathematicae collecitones (1558). The relevant proposition on page 44 is Proposition IV.11. Harriot's diagram is the same as the one given by Commandino except for his use of lower case
Theorema XI. Propositio XI.
Sit semicirculus ABC, & inflectatur CBA. ducaturque CD ita, vt CB fit æqualis utrisque simul AB & perpendiculares BE EF ducantur. Dico AF ipsius BE duplæ
Let there be a semicircle ABC, curved along CBA. The line CD is drawn so that CB is equal to AB and CD together, and there are drawn the perpendiculars BE and EF. I say that AF is twice BE.

Utile ad
[*tr: Useful for sines*]

et ad locum
de
[*tr: and for the place of touching*]

pappus pag.
[*tr: Pappus, page 44.*]

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[*Note:*

Some working for Lemma II, preceding Problem IX of Apollonius Gallus (1600). Harriot notes some cases missed by Viète.
Lemma II.
Sint duo circuli, unius ABCD, alter EFGH; jungens autem eorum centra KL secet circulum primum in A, D; secundum vero in E, H; & in ea sumatur M punctum, a quo acta MGFCB recta secet circulm primum in B, C, secundum in F, G, & sint similia segmenta, & puncta quidem sectionum A, B sint remotior a ipsis C, & puncta F, E ipsis C, H. Ajo id quod fit sub MG, MB aequari id quod fit sub MH,
Lemma II. Let there be two circles ABCD and EFGH; moreover the line KL joining their centres cuts the first circle in A and D, and the second in E and H; and in that line there is taken the point M, from which the straight line MGFCB cuts the first circle in B and C, and the second in F and G, and the segments are similar, and the points A, B are further away than C, D, and the points F, E than C, H. I say that the rectangle formed by MG, MB is equal to that formed by MH,

Apoll: Gallus. pag. 6. Lemma.
[*tr: Apollonius Gallus, page 6, Lemma II.*]

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[*Note:*

The reference to Pappus is to Commandino's edition of Books III to Mathematicae collecitones (1558). The proposition on page 41 is Proposition IV.7.
Theorema VII. Propositio VII.
Sit quadrilaterum ABCD, rectum angulus habens ABC, & datam unamquamque rectarum linearum AB BC CD DA. ostendum est rectam lineam, quæ BD puncta coniungit, datam esse.
Let there be a quadrilateral ABCD, having a right angle ABC. Given any one of the lines AB, BC, CD, DA, it is to be shown that the line which joins BD is given.

Lemmata, ad
locum de
[*tr: Lemmas, on the place of touching*]

Datis tribus lateribus
trianguli; invenire
diametrum circuli

[*tr: Given three sides of a triangle, find the diameter of the circumscribing circle.*]

[*tr: poristic*]

hinc i.p. Appendiculæ

[*tr: Here see the Appendix of Viète.*]

Datis lateribus duorum
triangulorum super eandem
basim: verticum distantiam
invenire.
videlicet: bd
[*tr: Given the sides of two triangles on the same base, to find the vertical distance, namely bd*]

Sunt etiam alia in pappo
pag: 41. &
[*tr: There are also more in Pappus, page 41 and what follows.*]

[*Note:*

On this page, Harriot continues his work on Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

Apoll: Gallus. prob. 9. casus.
[*tr: Apollonius Gallus, Problem IX, case 2.*]

Vietæ constructio inepta est.
In altera charta
[*tr: Viète's construction is inappropriate; it is restored in the other sheet.*]
[*Note: The other sheet is Add MS 6785, f. 50.*]

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[*Note:*

Note the diagrams representing combinations of points (.), lines (-), and circles

[*Note:*

A diagram for Lemma I, preceding Problem IX of Apollonius Gallus
Lemma I.
Propositis duobus circulis, invenire punctum in jungente ipsorum centra, a quo, cum ducetur quævis linea recta ipsos circulos secans , similis erunt segmenta.
Lemma I. Given two circles, find a point in the line joining their centre, from which, when any straight line is drawn cutting those circles, the segments wil be similar.

Apoll: Gall: pag; 5. b.
lem.
[*tr: Apollonius Gallus, page 5v, Lemma I.*]

[*Note:*

Note the diagrams representing combinations of points (.), lines (-), and circles

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[Page 126]

[*Note:*

On this page, Harriot examines problems from Appendix I from Apollonius Gallus Appendicula I.
De problematis, quorum geometricam constructionem se nescire ait
On problems whose geometric construction is necessary according to

In appendiculam ad Appollonium
[*tr: From the appendix to Apollonius Gallus.*]

[*Note:*

On this page, Harriot examines Problem I from Appendix I from Apollonius Gallus
Problema I.
Data base trianguli, altitudine, & rectangulo sub cruribus, invenire
I. Given the base of a triangle, its height, and the product of its legs, to find the

prob. 1. Apend: Apoll:
[*tr: Problem I from the appendix to Apollonius Gallus.*]

[*Note:*

An attempt to count the possible ways of arranging three circles.
The first row shows the possible ways of arranging two circles (separated, touching, intersecting, one inside the other touching, one inside the other but not touching).
Below that, a third circle is added, outside the other two but touching both, or between them touching both, or outside one but touching the other, and so on.
The attempt soon becomes erratic, but is an interesting example of Harriot's liking for systematic

The comment 'better' appears to refer to the re-ordering of the first row as 1, 3, 5, 4,
[*tr: better*]

Habitudines
trium
[*tr: Possibilities for three circles*]

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[*Note:*

On this page, Harriot examines Problem X from Apollonius Gallus
Problema IX.
Datis tribus circulis, desribere quartum circulum quem illi
X. Given three circles and a point, describe a fourth circle that touches

Apoll: Gall. prob. 10. casus
[*tr: Apollonius Gallus, Problem X, certain cases.*]

8.
in una

[*tr: 8 in one diagram*]

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[Page 134]

[*Note:*

On this page, Harriot examines Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

Appo: Gal. prob: 9.
[*tr: Apollonius Gallus, Problem IX, cases.*]

Etsi circuli dati
ponuntur inæquales
tamen similes casus
intelligantur de
æqualibus
[*tr: Although the given circles are supposed unequal, nevertheless similar cases can be understood of equal circles.*]

Hic casus
impossibiles
facile
[*tr: These case are easily understood to be impossible.*]

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[Page 136]

[*Note:*

On this page, Harriot examines Problem VIII from Apollonius Gallus
Problema VIII.
Datis duobus punctis, & circulo, per dato puncta circulum describere, qui datum
VIII. Given two points and a circle, through the given point describe a circle that touches the given

Apol: Gallus. prob. 8. Casus Â

[*tr: Apollonius Gallus, Problem VIII, cases.*]

[*tr: Impossible.*]

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[*Note:*

On this page, Harriot examines Problem VII from Apollonius Gallus
Problema VII.
Datis duobus circulis, & linea recta, describere tertium circulum, quem duo dati, & dati linea recta
VII. Given two circles and a straight line, describe a third circle that touches the two given and the given straight line.

Apol: Gal. 7. prob. Casus
7.
[*tr: Apollonius Gallus, Problem VII, cases.*]

ut. 2.
[*tr: as two parts*]

æquales
[*tr: equal circles*]

[*tr: Impossible.*]

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[*Note:*

Diagrams for Problem VIII from Apollonius Gallus
Problema VIII.
Datis duobus punctis, & circulo, per dato puncta circulum describere, qui datum
VIII. Given two points and a circle, through the given point describe a circle that touches the given

Apol: Galli. prob.
[*tr: Apollonius Gallus, Problem VIII.*]

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[*Note:*

On this page, Harriot outlines the first six problems in Apollonius Gallus (1600). Each problem requires the construction of a circle passing through given points and/or touching given lines or circles. The sketches next to the problem numbers, down the left-hand side of the page, offer a brief summary of each problem. Problem 2, for example, is to describe a circle through two given points touching a given line. On the right-hand side of the page, Harriot attempts to enumerate the different cases, according to the relative positions of points and lines and whether the lines are inclined to each other or
Problema I.
Datis tribus punctis per eadem circulum describere: oportet autem data puncta non existere tria in eadem linea recta.
Problema II.
Datis duobus punctis, & linea recta, per data puncta circulum describere, quem data linea recta contingat.
Problema III.
Datis tribus lineis rectis, describere circulum quem harum unaquæque contingat. Oportet autem datas lineas rectas non esse parallelas.
Problema IV.
Datis duabus lineis rectis, & puncto, per datum punctum circulum describere, quem datae duae lineae rectae contingat.
Problema V.
Dato circulo, & duabus lineis describere circulum quem datus & datae duae lineæ rectæ contingat.
Problema VI.
Datis puncto, linea recta, & circulo, per datum punctam describere circulum, quem data linea recta & datus circulus
I. Given three points, describe a circle thorugh them; moreover it must be the case that the three fiven points are not in a straight line.
II. Given two points and a line, through the given points describe a circle that touches the given line.
III. Given three lines, describe a circle that touches each of them. Moroever it must be the case that the three lines are not parallel.
IV. Given two lines and point, through the given point describe a circle that touches the two lines.
V. Given a curcle and two lines, describe a cricle that touches the given circle and the two lines.
VI. Given a point, a line, and a circle, through the given point describe a circle that touches the given line and the given circle.
It is very difficult to transcribe this page in a meaningful way, and the reader is strongly advised to examine the layout of the original.

Appollonij Galli
[*tr: Cases in Apollonius Gallus*]

prob. 1. casus. 2.
Data in recta. Imposs. vel infinit.
non in
[*tr: Problem I, 2 cases.*
Given [points] in a line. Impossible or infinitely many.
Not in a]

2. 3. casus
linea per
puncta.
est parallela. unus quæsitum

inclinans. 1.
perpendicularis. 1.
duo circuli

[*tr: Problem II.*
3 cases, line through the points;
parallel: one sought;
inclined: 1.
perpendicular: two circles]

duorum punctum in linea
2. ad easdem
[*tr: Two points in a line.*
2 cases: on the same]

3. imposs.
Ad contrarias partes. Imposs.
In directum tria. Duo, linea et
[*tr: 3 impossible cases.*
On opposite sides. Impossible
On the line of all three. Two lines and a]

casus. 3. 3.
1. Nullæ parallelæ
2. tertia perpendic.
3. secans oblique
4. non secans vel parallela.
Imposs.
5. Duae in directa.
6. tres in
[*tr: Problem III.*
3 + 3 cses
1. None parallel
2. third perpendicular
3. cutting obliquely
4. not cutting or parallel; impossible
5. Two in a line
6. three in a]

4. 4. lineæ parallelæ
(Duo circ: quæsiti:)
puncto in medio.
extra media sed intra.

[*tr: Problem IV.*
4 cases: parallel lines (two circles sought)
points in the middle
outside the middle but inside;]

punctum in linea. 2.
lineæ inclinantes
punctum in medio
extra
[*tr: 2 cases: points in the line.*
lines inclined
point in the middle
outside the]

1. punctum extra lineas.
[*tr: 1 case: point outside the lines; impossible*]

5. 8. linea parallelæ
circulus in medio
2. quæs extra
2. quæs. intra
1. circulus extra medium
sed intra
2. quæs extra
2. quæs. intra
lineæ inclinantes
similiter.

[*tr: Problem V.*
8 cases: parallel lines
circle in the middle
2 sought outside, 2 sought inside.
1 case, circle outside the middle but between
2 sought outside, 2 sought inside
4 cases: lines inclined,]

circulus extra lineas totaliter

[*tr: Circle completely outside the lines; impossible.*]

4. [???] circulus extra lineas parallel. sed pars periphæriæ
intra. similiter.
4.
[*tr: 4 cases: circle outside parallel lines but part of the circumference inside, similarly.*]

4. [???] circuli extra lineas inclinationes
sed pars periphæriæ intra. Similiter.

[*tr: 4 cases: circle outside inclined lines but part between the circumferences, similarly.*]

6. 6. ad easdem partes lineæ
punctum extra circulum et totus circulus extra

2. quæs extra. 1.
2. quæs. intra. 1.
pars minor major circuli
2. quæs extra. 1.
2. quæs. extra. 1.
punctum intra circuli dati
ad easdem partes lineæ
cum centro circuli.
2. quæs. intra. 1.
ad contrarias partes
2. quæs extra.
[*tr: Problem VI.*
6 cases: on the same side of the line, point outside circle and total circle outside
2 sought outside, 1 case
2 sought inside, 1 case
lesser or greater part of the circle
2 sought outside, 1 case
2 sought inside, 1 case
point between the given circles, on the same side of the line as the centre of the circle
2 sought inside, 1 case
on opposite sides
2 sought outside, 1]

punctum in linea.
[*tr: 3 cases: point in the circumference*]

punctum in periferia.
[*tr: 3 cases: point in the circumference*]

1. punctum et circulus
totus contrarias partes lineæ.
[*tr: 1 case: point and total circle on opposite sides of the line; impossible.*]

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1.) Anguli **[Page 145]**

[*tr: Trisection of angles*]

Deliniatio ^{completa} pro
3^{a} bc, est in 2^{a}
[*tr: A complete delineation for the third bc is in the 2nd*]
[*Note: The second sheet is Add MS 6785, f. 74.*]

Sint quatuor continue proportionales

[...]

erit a
[*tr: Let there be four continued proportionals.*

[...]

a will be]

Si cg fit latus trianguli
erit:
1, bc= lateri nonanguli
unius circuli.
2, bc= lateri nonanguli
duarum revoluti
onum.
3, bc= lateri nonanguli
4^{a}
[*tr: If cg is the side of the triangle, then:*
1. bc is the side of a ninth of an angle of one circle. 2. bc is the side of a ninth of an angle of two revolutions. 3. bc is the side of a ninth of an angle of four]

[*tr: My own trisection*]

2.) Anguli **[Page 147]**

[*tr: Trisection*]

Deliniatio pro

3ª bc quæ in 1ᵃᵉ

[*tr: A delineation for the 3rd bc as in the 1st*]

[*Note: The first sheet is Add MS 6765, f. 73.*]

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[*Note:*

Drawing a regular heptagon inside a circle is the subject of Chapter VII of Variorum responsorum liber VII (1593). Harriot knew this book well but there is no reference to Viete on this page.

a.) pro later Heptagoni
et
[*tr: For the sides of a heptagon, and the angles.*]

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[Page 164]

[*Note:*

A generalization of Pascal 19s triangle,showing the results of multiplication by a and by 3 (see also Add MS 6782, f. 165).
Note that in the third table, the entry 34,a12 on the diagonal, for example, is to be read as 3×4a1×2 and similarly for the other entries.
In the lower part of the page are general formulae for the rows, similar to those that Harriot derived elsewhere for the standard version of Pascal's triangle.
See also page 2 of the 'Magisteria' (Add MS 6782, f. 109).

Æquipollentia ex utraque
parte diagonalis perse

[*tr: Equality (or symmetry) on either side of the diagonal is shown by this*]

[*Note:*

See page 1 of the 'Magisteria' (Add MS 6782, f. 108).

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[*Note:*

A general form of Pascal 19s triangle, in which each entry is the sum of the entry above it and the entry to the left of it.

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[Page 172]

[*Note:*

On this page, Harriot works on Propositions 12 and 13 from Effectionum geometricarum canonica recensio (1593). Proposition 12 is mentioned explicitly at the top of the page. The work continues with Proposition 13 below the dividing
Propositio XII.
Data media trium proportionalium et differentia extremarum, invenire
Given three proportionals and the difference of the extremes, to find the
Propositio XII.
Data media trium proportionalium & adgregato extremarum, invenire
Given three proportionals and the sum of the extremes, to find the
In both of these propositions, Viète showed how the standard construction for three proportionals can lead to the given equation. Harriot works the other way round: beginning from an equation, he gives a construction that represents the same relationship geometrically. This is what he means by 'effectio æquationis' or 'the construction of an

In Effectiones Geometricas. prop. 12 ex 9 et
[*tr: From Effectiones Geometricas, Proposition XII, from pages 9 and 10.*]

Data media trium proportionalium et differentia extremarum: invenire

[*tr: Given the mean of three proportionals and thd difference of the extremes, find the extremes.*]

Data.
Media.
Differentia.

[*tr: Given.*
Mean.
Difference.
]

Data Media trium proportionalium et
aggregato extremarum: invenire
[*tr: Given the mean of three proportionals and the sum of the extremes, find the extremes.*]

Data.
Media.
Adgreg.

[*tr: Given.*
Mean.
Sum.
]

Methodus ad exhibenda quæsita
in numeris.

Dimidium
Subtrahe 36 id est DF
vel AI. pro GI. Adde pro IH
Multiplica IH
per GI. et erit
Hoc est.
Cuius radix.
Ergo AC 612 vel 132 52 ID est FC. 4. prima proportionalis.
132 plus 52 est BF. 9. tertia
[*tr: A method of showing the sought quantities in numbers.*
Halve.
Subtract 36, that is DF, or AI for GI.
Add for IH
Multiply IH by GI and it will be
That is
Whose root is
Therefore AC (612 or 132) minus ID (52ID) is FC, or 4, the first proportional.
132 plus 52 is BF, or 9, the third]

Brevius.
Et est accurate
modus
[*tr: More briefly.*
And it is precisely the ancient]

Poste.
Etsi modus operandi videtur specie quadam differe antiquo
consideranti tamen, et operanti per commpendium; est omnino
[*tr: Postscript.*
Although the mode of operation seems in certain respects to differ from the ancient way, nevertheless examined, and carried out more briefly, it is exactly the same.]

[*Note:*

The note from the bottom of Add MS 6785, f. 174 is written again more legibly here on the reverse of the

* Etsi modus operandi videtur funde quadam differe antiquo
Consideranti tamen, et operanti per commpendium, est omnino
[*tr: Although the mode of operation seems in certain respects to differ from the ancient way, nevertheless examined, and carried out more briefly, it is exactly the*]

[*Note:*

This page gives the three standard cases of quadratic (aa+2ca=dd, aa-2ca=dd, and 2ca-aa=dd), and shows how they relate to divisions of a line into given ratios. The first case is the subject of Propositions IX and XII from Effectionum geometricarum canonica recensio (1593).
The second case is the subject of Propositions X and XIII.
The third case is the subject of Proposition XI.
Note on this page two different words used for demonstrating the nature of an equation: 'exegesis' when the equation is written in general notation, but 'effectio' when it is represented by a geometric

De
[*tr: On constructions*]

extrema et
media
[*tr: extreme and mean ratio*]

De exegesi per species
et per effectiones arith.
[*tr: On showing [the solution] in general form and by arithmetic or geometric*]

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[*Note:*

This page contains some rough work on Proposition 16 from Effectionum geometricarum canonica recensio
Data prima trium proportionalium, & ea cujus quadratum æquale est adgregato quadratorum secundæ & tertiæ, dantur secunda &
Given the first of three proportionals and that quantity whose square is equal to the sum of the squares of the second and third, the second and third are given.
Harriot's diagram is a partial copy of

In 16. p.
[*tr: From page 16 of the Effectionum*]

Proportionales. Etiam
[*tr: Proportionals. Also proportionals.*]

AB est differentia inter AE & EB.
et GE est media proportinonalis data.
Hoc est:
AB est prima proportionalis, et GE ea cuius quadratum est
æquale adgregatum quadratorum BG et BE.
Ita ut ista proportio per interpretationem est vale cum 12[a]
[*tr: Proportionals. Also proportionals.*]

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[*Note:*

The problem on this page is from Propositions 12 and 14 from Effectionum geometricarum canonica recensio (1593). Harriot does not mention the Effectionum explicitly here but the notation is essentially Viète's, except reduced to lower case letters.
Note Harriot's use of the = symbol for what we now write as ±.
Note also that once he has arrived at an equation, he regards the problem as solved. The rest is merely 'mechanicen', or practical calculation.
Harriot's source for the method of Diophantus must have been the edition of Wilhelm Diophanti Alexandrini rerum arithmeticarum libri sex (1575). Mahomet was by now all that was remembered of the name of Muhammad ibn Musa al-Khwarizmi. His name appears in this form in Bombelli's Algebra (1572), for

Data media trium proportionalium et differentia extremarum:
invenire
[*tr: Given the mean of three proportionals and thd difference of the extremes, find the extremes.*]

Sit media data d. et differentia b.
Et ponatur unus terminus ignotus a.
Ergo alter erit a=b. hoc est
vel a-b vel a+b.
Ergo: Resolutio.
Ergo per Mechanicen.
Hoc est Minor.

[*tr: Let the given mean be d and the difference b, and denote one of the unkonwn extrmes by a.*
Therefore the other will be a±b, that is, either a-b4or a + b .
Hence the solution.
Therefore by calculation
That is, the lesser extreme
the]

Et emitandas applicationes in fine mechanicas, melius est
ponere vel notare in principio, dimidium differentiæ c. tum differentia
tota erit 2,c.
Ergo per resolutionem
solutio fit
Ergo per
[*tr: To force out the divisions in the final calculation, it is better to put or denote from the beginning half the difference c, then the total difference will be 2c. Hence from the solution, the equation will be.*
Therefore by]

Mechanicum secundum Diophantum
et Mahometen.
Adde utrique parte æquationis cc.

[...]

Et per

[*tr: Calculation according to Diohantus and Mahomet.*

Add cc to each side of the equation.

[...]

And by]

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[*Note:*

This page contains further work on Propostion 12 from Effectionum geometricarum canonica recensio (1593). At the end, Harriot makes the same observation as on Add MS 6785, f. 94, that the method of solving the equation is essentially the same as the ' ancient' method, that is, the traditional numerical method taught in every algebra text.

Alia operatio per ~~[???]~~ solam proportionem [???] ad illam [???] quod
prop. 12. effectionum geometricarum
[*tr: Another method using a single proportion [???] to that [???] done in Proposition 12 of the Effectionum geomtericarum*]

Dico quod:
Nam:
per const:
et per invers:

[...]

[*tr: I say that:*
For:
By constrcution
And by]

A lemma.
Ergo. h, vel maior, a
mminor, a
æqualis, a
sit h maior a: hh maior aa; et
2ch maior 2ca et
hh+2ch maior, aa+2ca.
quod contra hypothesin
Ergo h non maior a.
sit h minor a: hh minor aa; et
2ch minor 2ca, et
hh+2ch, minor, aa+2ca.
quod contra hypothesin
Ergo h non minor a.
Ergo: h=a
[*tr: A. Lemma.*
Therefore, h is either greater than, less than, or equal to a.
Suppose h is greater than a; then hh is greater than aa, and 2ch is greater than 2ca, and hh+2ch is greater than aa+ 2ca ,whichisag ainstthehypothesis.
Therefore h is not greater than a.
Suppose h is less than a; then hh is less than aa, and 2ch is less than 2ca, and hh+2ch is less than aa+ 2ca ,whichisagainstthehypothesi s.

Therefore h is not less than a.
Therefore h=a]

praxis ista per compendium
eadem omnino est cum
[*tr: The practice of this more briefly is exactly the same as the ancient method.*]

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To devide a square
into two other squares
which shall have a ratio

To devide a square into 2 other squares
whose sides shall have a ratio

To devide a cube into other cubes
which shall have a ratio

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f.) Effectiones geometricæ

Quadrata in

[*tr: Geometrical constructions*

Squares in general]

Multiplicatio in

[*tr: Multiplication in radicals*]

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[Page 214]

[*Note:*

On this page, Harriot works on the first part of Proposition 14 from Effectionum geometricarum canonica recensio
Propositio XIV.
Quadratum Ã media proportionali inter hypotenusam trianguli rectanguli & perpendiculum ejusdem, proportionale est inter quadratum perpendiculi & quadratum idem perpendiculi continuatum basis
The square of the mean proportional between the hypotenuse of a right-angled triangle and its perpendicular, is the proportional between the square of the perpendicular and the square of the same perpendicular together with the square of the
Viète demonstrated this proposition geometrically and showed that it can be represented by the quartic A4+B2A2=D4 (in modern notation), where A is the perpendicular, B the base, and D the mean. As in the earlier pages in this set, Harriot works the other way round, beginning from the equation aaaa+bbaa=dddd and then deriving the corresponding

g.) Effectiones
[*tr: Geometrical constructions*]

1) aaaa+2cbaa=dddd
Et intelligatur. 2c=b
[*tr: 1) aaaa+2cbaa=dddd; and it may be understood that 2c=b*]

Notatio pro effectione
[*tr: Notation for the geometric construction*]

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[*Note:*

On this page, Harriot works on the second part of Proposition 14 from Effectionum geometricarum canonica recensio
Propositio XIV.
Idem quadratum Ã media proportionali inter hypotenusam trianguli rectanguli & perpendiculum ejusdem, proportionale est inter quadratum hpotenusæ & quadratum idem hypotenusæ multatum basis
The square of the mean proportional between the hypotenuse of a right-angled triangle and its perpendicular, is the proportional between the square of the hypotenuse and the square of the same hypotenuse minus the square of the
Viète demonstrated this proposition geometrically and showed that it can be represented by the quartic A4-B2A2=D4 (in modern notation), where A is the hypotenuse, B the base, and D the mean. As in the earlier pages in this set, Harriot works the other way round, beginning from the equation aaaa-bbaa=dddd and then deriving the corresponding

h.) Effectiones
[*tr: Geometrical constructions*]

2.) aaaa-2cbaa=dddd
Et intelligatur. 2c=b
[*tr: 2.) aaaa-2cbaa=dddd; and it may be understood that 2c=b*]

Notatio pro effectione
[*tr: Notation for the geometric construction*]

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[*Note:*

On this page, Harriot works on Proposition 15 from Effectionum geometricarum canonica recensio
Propositio XV.
Quadratum Ã media proportionali inter basin trianguli rectanguli & perpendiculum ejusdem, proportionale est inter quadratum basi, & quadratum hypotenusae multatum ipso basis quadrato. Vel etiam inter quadratum perpendiculi, & quadratum hypotenusae multatum ipso perpendiculi
The square of the mean proportional between the base of a right-angled triangle and its perpendicular, is the proportional between the square of the base and the square of the hypotenuse, reduced by the square of the base. Or also between the square of the perpendicular and the square of the hypotenuse, reduced by the square of the perpendicular.
Viète demonstrated this proposition geometrically and showed that it can be represented by the quartic B2A2-A4=D4 (in modern notation), where A is the base or perpendicular, B the hypotenuse, and D the mean. As in the earlier pages in this set, Harriot works the other way round, beginning from the equation bbaa-aaaa=dddd and then deriving the corresponding

i.) Effectiones
[*tr: Geometrical constructions*]

3.) 2,cbaa-aaaa=dddd
Et intelligatur. 2c=b
[*tr: 3.) 2cba-aaaa=dddd; and it may be understood that 2c=b*]

Notatio pro effectione
[*tr: Notation for the geometric construction*]

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[*Note:*

Further work on the two equations aaaa+bbaa=dddd and aaaa-bbaa=dddd, which appear in Add MS 6785, f. 108 and f. 109, in connection with Proposition XIV from Viète'sEffectionum geometricarum canonica recensio

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[*tr: Suppositions*]

1.) Gradus ~~circuli est~~ periphæriæ est, 1360 totus
[*tr: A degree of a circumference is 1360 of the total*]

2.) Gradus anguli sphærici est 1360 quatuor rectorum
[*tr: A degree of a spherical angle is 1360 of four spherical right*]

3.) Gradus superficiei sphæricæ est 1360 totius superficiei sphæricæ,
et est figura biangularis, comprehensa semi- periphæris ex ~~circuli~~ maximis
cuius uterque angulus est gradus
[*tr: A degree of a spherical surface is 1360 of the total spherical surface, and is a biangular figure, contained by two maximum semi-circumferences, in which either angle is the degree of the*]

4.) Biangulum [???] est figura biangularis comprehensa duabus
semi periphæris ex maximis. Et dicitur dari quando unus angulorum
datur. Quoniam ut talis angulus ad 360 ita superficies bianguli
ad totam superficiei
[*tr: A biangle [???] is a biangular figure contained by two maximum semi-circumferences. And it is said to be given when one of its angles is given. Because as such an angle is to 360 degrees, so is the surface of the biangulum to the total surface of the*]

5.) Ex demonstratis Archimedæis, superficies sphæræ est æqualis illa
circulo plano cuius semidiameter est sphæræ diameter &
[*tr: From the demonstration of Archimedes, that the surface of a sphere is equal to that of a plane circle whose semidiameter is the diameter of the*]

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Chymica

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Memoranda ut quaeratur

An Bombellicæ æquationes possunt solvi per numeros

[*tr: Note and query: whether Bombelli's equations can be solved by triangulated numbers*]

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Facere quadrato-quadratum, æquale duobus **[Page 265]**

[*tr: To make a square-square, equal to two given ones.*]

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[*Note:*

On this page Harriot examines Proposition V from Supplementum geometriæ (1593). See also Add MS 6785, f. 143.
Propositio V.
Datis duabus lineis rectis, invenire inter easdem duas medias continue,
Given two straight lines, to find two mean proportionals between

5ia. pr.
De Inveniendis Duabus Medijs continuÃ² proportionalibus inter
**[*tr: 5th proposition*
On finding two mean continued proportionals between given **]**

Data
constructa
parallela

[*tr: Given*
Constructed
Parallels
]

Species continue
[*tr: The continued proportionals in general form.*]

Resolutiones
[*tr: Solutions 1.*]

Resolutiones
[*tr: Solutions 2.*]

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[*Note:*

On this page Harriot examines Proposition VI from Supplementum geometriæ (1593). See also Add MS 6785, f. 143.
Propositio VI.
Dato triangulo rectangulo, invenire aliud triangulum rectangulum majus, & aeque altum; ut quod fit sub differentia basium ipsorum & differentia hypotenusarum, aequale fit dato cuicumque recti-lineo.
Given a right-angled triangle, to find another larger right-angled triangle, with equal height, so that the product of the difference of the bases and the difference of the hypotenuses is equal to a given

In prop: 6.
[*tr: From proposition 6 of the Supplement.*]

Data
prima
quarta
quatuor
parallela
Quæsita
continue
[*tr: Given*
first
fourth
four
parallel
Sought
continued]

Conclusio ex inferiore
[*tr: Conclusion from the demonstration below.*]

Demonstratio per compositionem.
Sint primo constructio quatuor proportionales
per 5^{tam} prop.
[...]
Unde Bβ
est æqualis AB. et βλ et AZ parallelæ. Iam fiat βD æqualis Aβ.
et ducatur recta Dμ $^{\text{parallela } \beta\alpha}$ et βμ sit parallela Aα vel AC. Ergo angulus Dβμ æqualis βAα. et αβA, angulo μDβ, et tertius angulo tertio.
Ergo triangula Aαβ et Dμβ simila et æqualia. Et producta Dμ transibit per C, alias Aα et αC non sunt æquales. Sit producta Aγ versus E.
Et ducatur CE $^{\text{parallela } \alpha\gamma}$. Sit inde γδ parallela AZ. Ergo anguli γδE, AHE, æqualis, et Aεγ. et γε æqualis δH. et δE.
et æqualis Eγ et γA. et Hλ æqualis αε vel γθ. Et quia Aβ et βD æqualis inter parallelas, æqualis etiam Hλ et λC.
Conclusio igitur
facile colligitur et manifesta. vel triplex ut
[*tr: Demonstration by construction.*

Let there be first constructed four proportionals by the 5th proposition.
Whence Bβ is equal to AB, and βλ and AZ are parallel.
Now construct βD equal to Aβ, and the line Dμ parallel to βα, and βμ is parallel to Aα or AC. Therefore the angule Dβμ is equal to βAα, and αβA to angle μDβ, and the third angle to the third. Therefore the triangles Aαβ and Dμβ are similar and qual.
And Dμ produced will pass through C, otherwis Aα and αC are not equal. Let Aγ be produced towars E.
And CE is constrcuted parallel to αγ. Let γδ be parallel to AZ. Therefore angles γδE and AHE are equal, and Aεγ; and γε is equal to δH and δE; and Eγ to γA; and Hλ is equal to αε or γθ. And because Aβ and βD are equal between parallels, Hλ and λ C are also equal.
Therefore the conclusion is easily gathered and shown, or three times, as]

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[*Note:*

On this page Harriot continues to work on Proposition VI from Supplementum geometriæ (1593). See also Add MS 6785, f. 135

Prop. 6. Supplementi, in partem
[*tr: Proposition 6 of the Supplement, on the last part.*]

Hoc est:
Quatuor continue proportionalium, quorum
prima minima:
Quadratum quartæ, minus quadrao primæ
Æquatur:
Quadrato, compositæ ex quarta
et duplæ secundæ, minus quadrato
compositæ ex prima et duplo tertiæ.
Hæc demonstrantur per
compositione altera
[*tr: That is: for four continued proportionals, of which the first is the least, the square of the fourth minus the square of the first is equal to the square composed of the fourth and twice the second, minus the square composed of the first and twice the third.*
This is demonstrated by construction on the previous]
[*Note: The previous sheet is Add MS 6785, f. 135.*]

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Mesographa
Heronis.
Philonis Bizantij.

Cum Annotatione nostra de
faciliori
[*tr: With my annotations for easier practice.*]

where ab is
double to bc
as

Note:
whether these
lines be

then dh would be parallel to ac
& the problem performed nearly
and also other wayes &

Although Eutocius prefereth philo Bizantius his pratice of finding two
mean proportionalls Before that of Because the number being devided
into small æquall parts, it may now easily be seene when hg & fc be æquall,
then by often applying of the compasses to find ef & eg Yet in
my improvement the pratice would be better & more easy Let the figures
nombring the æquall parts beginne at k. & let their numeration runne towards f;
& the like from k towards g Then will the shape of a rectangle or gnomon
keepe ke always at rectangles with the ruler fg. ~~and then~~ and moving
the ruler with the gnomon keeping the poynt c also in the line till you find
kf and kg æquall; then is that performed ~~whi~~ also which they now have
& ~~[???]~~ thus easier in practice because that æquallity is sooner found
~~because~~ the figures go in both wayes a like, which in philoes practice cannot
be observed but with ~~with~~ as much difficulty almost, if not so much as
that of ~~her~~

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[*Note:*

The text referred to here is Bernard Mesolabii expositio (1574). The diagram relates to Proposition 4, on pages 20–22. Harriot 19s lettering matches Salignac 19s diagrams on pages 21 and 22, but is more complete and shows construction lines.

De Mesolabio B.
[*tr: On the mesolabium of B. Salignac*]

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[*Note:*

On this page Harriot examines Proposition V from Supplementum geometriæ (1593). See also Add MS 6785, 134.
Propositio V.
Datis duabus lineis rectis, invenire inter easdem duas medias continue,
Given two straight lines, to find two mean proportionals between

In 5^{am} Supplementi. De medias proportionales inter
[*tr: From the 5th proposition of the Supplement. On two mean proportionals between given quantities.*]

per constructione

[...]

lineæ extreiores
lineæ interiores
Ergo per 4^{am} prop IK. HB. HI. BC. continuæ
[*tr: by construction*

[...]

external lines
internal lines
Therefore by the 4th proposition, IK, HB, HI, BC are continued]

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[*Note:*

This is the first of a set of twenty-one pages exploring propositions from Supplementum geometriæ (1593). In the Effectionum geometricarum (1593), whic preceded it, Viète gave Euclidean constructions to demonstrate relationships between proportional lines , and showed that they corresponded to quadratic, or sometimes quartic, equations. This, however, gave him only a limited range of constructions, or equations, insufficient for the requirements of the analytic art by which he meant to leave no problem (nulla non problema solvereIn artem analyticen isagoge, (1591), final sentence). The Supplementum geometricarum was intended to remedy this (defecta Geometriæ) by offering constructions that went beyone the limitations of ruler and compass. Thus the first statement of the book
A quovis puncto ad duas quavis lineas rectam ducere, interceptam ab iis præfinito possibili quocumque intersegmento.
To draw a straight from any point to any two straight lines, the intercept between them being any possible predefined distance.
Such constructions are sometimes knownn as neusis constructions.
On this page, Harriot examines Propositions 3 and
Propositio III.
Si duae lineae rectae Ã puncto extra circulum eductae ipsum secent, pars autem exterior primae fit proportionalis inter partem exteriorem secundae & partem interiorem ejusdem: erit quoque pars exterior secundae proportionalis inter partem exteriorem primae & partem interiorem
If two straight lines drawn from a point outside a circle cut it in such a way that the external part of the first is a proportional between the external and internal parts of the second, the external part of the second will be a proportional between the external and internal parts of the
Propositio IV.
Si duae lineae rectae Ã puncto extra circulum eductae ipsum secent quod autem fit sub partibus exterioribus eductarum, aequale fit ei quod fit sub intertioribus: exteriores partes permutatim sumptae, erunt continue proportionales inter partes
If two straight lines drawn from a point outside a circle cut it, and moreover the product of the external parts is equal to that of the internal parts, the external parts taken in turn will be continued proportionals between the internal

In prop: 3am
[*tr: From the 3rd proposition of the Supplement*]

sunt partes ablatæ a BD et BF et in eadem ratione
partes reliquæ sunt BC EF quæ per 19,5 sunt ^{etiam} in eadem ratione.
Ergo ut supra.
Ergo si BE sit media proportionalis inter CD et BC
BC erit inter FE et BE
[*tr: the parts are taken from BD and BF in the same ratio.*
the remaining parts are BC, EF, which by [Euclid's Elements] V.19 are also in the same ratio.
Therefore as above.
Therefore if BE is the mean proportional between CD and BC, then BC will be between FE and BE]

From the
[*tr: Proposition 3 of the Supplement*]

continue proportionales ut supra

[...]

Et per synæresin
Ex ratione constructionis

[...]

Ergo CD. BE. BD. BF. continuæ
[*tr: continued proportionals as above*

[...]

And by synæresis
By reason of the construction

[...]

Therefore CD, BE, BD, BF are continued]

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[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 12 to 14. These propositions in full are as follows:
II.12.In obtuse-angle triangles the square on the side opposite the obtuse angle is greater than the sum of the squares on the sides containing the obtuse angle by twice the rectangle contained by one of the sides about the obtuse angle, namely that on which the perpendicular falls, and the straight line cut off outside by the perpendicular towards the obtuse angle.
II.13. In acute-angled triangles the square on the side opposite the acute angle is less than the sum of the squares on the sides containing the acute angle by twice the rectangle contained by one of the sides about the acute angle, namely that on which the perpendicular falls, and the straight line cut off within by the perpendicular towards the acute angle.
II.14. To construct a square equal to a given rectilinear

d) propositiones 2[i]
[*tr: Propositions from the second book of Euclid*]

Invenire
[*tr: To show that:*]

[*tr: Proposition 12*]

Invenire
[*tr: To show that:*]

[*tr: Proposition 13*]

p.14. et
[*tr: Proposition 14, the last*]

Facere quadratum, æquale
[*tr: Make a square equal to the rectangle.*]

(cuiuslibet parallelogrammi rectanguli
unæqualium laterum:
si maius latus ponatur b+c
minus latus erit, b-c
[*tr: For any rectangular parallelogram of unequal sides, if the longer side is supposed b+c, the shorter will be b-c*]

Finis 2[i]
[*tr: The end of the second book.*]

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[*Note:*

This page contains a symbolic version of Euclid Book II, Proposition 11. Harriot observes that this is the same as Book VI, Proposition 30. These propositions in full are as follows:
II.11. To cut a given straight line so that the rectangle contained by the whole and one of the segments equals the square on the remaining segment.
VI.30. To cut a given finite straight line in extreme and mean

c) propositiones 2[i]
[*tr: Propositions from the second book of Euclid*]

11.p) est etiam : e.6 p.
[*tr: Proposition 11 is also Proposition VI.30*]

Data AB
Facere AH.AH=AB.HB (hoc est AB,AH:AH,HB ut e,6. p.
[*tr: Given AB, make AH.AH=AB.HB. (that is, AB:AH=AH:HB as in Proposition*]

[*tr: zetetic*]

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[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 9 and 10. These propositions in full are as follows:
II.9. If a straight line is cut into equal and unequal segments, then the sum of the squares on the unequal segments of the whole is double the sum of the square on the half and the square on the straight line between the points of section.
II.10. If a straight line is bisected, and a straight line is added to it in a straight line, then the square on the hole with the added straight line and the square on the added straight line both together are double the sum of the square on the half and the square described on the straight line made up of the half and the added straight line as on one straight line.

b) propositiones 2[i]
[*tr: Propositions from the second book of Euclid*]

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[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 1 to 8. These propositions in full are as follows:
II.1. If there are two straight lines, and one of them is cut into any number of segments whatever, then the rectangle contained by the two straight lines equals the sum of the rectangles contained by the uncut straight line and each of the segments.
II.2. If a straight line is cut at random, then the sum of the rectangles contained by the whole and each of the segments equals the square on the whole.
II.3. If a straight line is cut a random, then the rectangle contained by the whole and one of the segments equals the sum of the rectangle contained by the segments and the square on the aforesaid segment.
II.4. If a straight line is cut at random, the square on the whole equals the square on the segments plus twice the rectangle contained by the segments.
II.5. If a straight line is cut into equal and unequal segments, then the rectangle contained by the unequal segments of the whole together with the square on the straight line between the points of section equals the square on the half.
II.6. If a straight line is bisected and a straight line is added to it in a straight line, then the rectangle contained by the whole width with the added straight line and the added straight line together with the square on the half equals the square on the straight line made up of the half and the added straight line.
II.7. If a straight line is cut at random, then the sum of the square on the whole and that on one of the segments equals twice the rectangle contained by the hole and the said segment plus the square on the remaining segment.
II.8. If a straight line is cut at random, then four times the rectangle contained by the whole and one of the segments plus the square on the remaining segment equals the square described on the whole and the aforesaid segment as on one straight

a) propositiones 2[i]
[*tr: Propositions from the second book of Euclid*]

[*Note: For the full version of Harriot's verse beginning 'If more by more' verse, see Add MS 6784, f. 321v.*]
If more
by more
&

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[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 1 to 4. For full versions of these propositions see the commentary to Add MS 6785, f. 156.

Euclid. lib.
[*tr: Euclid Book II*]

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[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 5 to 7. For full versions of these propositions see the commentary to Add MS 6785, f. 156.

Euclid. lib.
[*tr: Euclid Book II*]

[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 8 to 10. For full versions of these propositions see the commentary to Add MS 6785, f. 156 and f. 155.

lib. 2.
[*tr: Euclid Book II*]

[*Note:*

This page contains symbolic versions of Euclid Book II, Propositions 12 and 13. For full versions of these propositions see the commentary to Add MS 6785, f. 153.

Euclid. lib.
[*tr: Euclid Book II*]

prop. 11. problema
[*tr: Proposition 11 is an analytic problem*]

prop. 12.
[*tr: proposition 12 analytically*]

13.
[*tr: proposition 13 analytically*]

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[*Note:*

Pascal's triangle, dot patterns for linear and triangular numbers, and a sketchy attempt to write the numbers of the triangle in general form.

[???]
unum
totum

[*tr: [???]*
one
all
the]

a half
a third
a quarter
1 fifth

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[*Note:*

Sums of some infinite progressions.
The first example 11+22+34+48+516+…=4. From the similar examples shown on Add MS 6789, f. 44, we may assume that Harriot summed this as follows:
11+12+14+18+…=2,
12+14+18+…=1,
14+18+…=12,
…. The sums of these series form a geometric progression2+1+12+14+…=4.
The second example is similar to the first.
The third example 11+33+69+1127+2081+…=334. This can be rewritten as the sum of two separate series:
Thus the total sum is 334.
The fourth example 21+56+1336+35216+…. This can be rewritten as the sum of two separate series:
Thus the total sum is 5.

[*Note:*

The text referred to here is Thomas Geometriae rotundi libri XIIII (1583), pages 1 to 4. There Finck discusses two propositions of Ptolemy. The second is:
15. Si quatuor rectarum duae faciant angulum, reliquae ab harum terminis in se reflexae priores secent: ratio unius ad segmentum suum, vel segmentorum inter se fit e ratione ita conterminarum, ut prima facientium conterminetur antecedentis factae principio, secunda huius consequentis fini contermina terminetur in finem consequentis factae. Sint enim quatuor rectae ae. ai. eu. io. quarum duae priores faciant angulum ad a. reliquae ab harum terminis reflexae secent se in y. atque duae priores in u & o.
Dico primo rationem ia ad au esse factam e ratione io ad oy. & ye ad eu. Qui primus Ptolemaei casus est.
Secundo rationem iu ad ua esse factam e ratione iy ad yo. & oe ad ea. Qui secundus est Ptolemaei casus.
Finck proves these and notes four further variations given by Theon; these are listed by Harriot as fraceuuy, fracaiiu, fracueey, frace yyu

In propositionem ptolomaicum initio
[*tr: On a proposition of Ptolemy, from the beginning of Finck.*]

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[*Note:*

The reference on this sheet is to page 35 of Liber de centro gravitatis solidorum

De frustra pyramedis
Vel Coni. Ut Comandinus
pag:
[***tr: On the frustrum of a pyramid or cone, as Commandinus, page 35.***]

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[*Note:*

On this page Harriot investigates Propositions 20 and 21 from Supplementum geometriæ
Proposition XX.
Constituere triangulum aæquicrurum, ut differntia inter basin & alterum e cruribus fit ad basin, sicut quadratum cruris ad quadratum compositae ex crure &
To construct an isosceles triangle so that the difference between the base and either of the legs is to the base as the square of a leg is to the square of the sum of a leg and the base.
Proposition XXI.
Si fuerit triangulum aequicrurum, fit autem differentia inter basin & alterum e cruribus ad basin, sicut quadratum cruris ad quadratum compositæ ex crure & base: quae a termino basis ducetur ad crus linea recta ipsi cruri æquale, secabit bisariam angulum ad basin.
If there is an isosceles triangle, and moreover the [ratio of the] difference between the base and either of the legs, to the base, is equal to the square of the leg to the square of the sum of a leg and the base, then a line drawn from the [end of the] base to the leg, equal [in length] to that leg, will bisect the angle at the
There is a reference to Propostion 19 of the Supplementum (see Add MS 6785, f. 186). There are also several references to propostions from Euclid's Elements
III.20 The angle at the centre of a circle is double the angle at the circumference, when they have the same part of the circumference for a base.
III.36 If from a point without a circle two straight lines be drawn to it, one of which is a tangent to the circle, and the other cuts it; the rectangle under the whole cutting line and the external segment is equal to the square of the
VI.12 To find a fourth proportional to three given
VI.14 Equal parallograms which have one angle each eaual have the sides about the equal angles reciprocally

prop. 20.
[*tr: Proposition 20 from the Supplementum*]

Constituere triangulum aæquicrurum; ut differntia inter basin et alterum
e cruribus fit ad basin, sicut quadratum cruris ad quadratum compositæ
ex crure et
[*tr: To construct an isosceles triangle so that the difference between the base and either of the legs is to the base, as the square of a leg is to the square of the sum of a leg and the*]

per 19,p fiat
Et ponatur in circumferentia, DE=AB vel AC.
Et ducantur recta AE
Triangulum AED est quod
[*tr: By Proposition 19,*
And in the circumference, put DE=AB or AC. and constructing the line AE, the triangle AED is as]

prop.
[*tr: Proposition 21*]

Si fuerit triangulum aequicrurum: fit autem differentia inter basin et alterum
e cruribus ad basin; sicut quadratum cruris ad quadratum compositæ ex crure et base.

Quae a termino basis ducetur ad crus linea recta ipsi cruri æquale: secabit
bisariam angulum ad
[*tr: If there is an isosceles triangle, and moreover the [ratio of the] difference between the base and either of the legs, to the base, is equal to the square of the leg to the square of the sum of a leg and the base, then a line drawn from the [end of the] base to the leg, equal [in length] to that leg, will bisect the angle at the base.*]

AF secat bisariam angulum EAD.
Nam ex hypothesi.

[...]

Et per 36,3 el
Ergo. per 14, 6 el

[...]

Consequenter:
Et subducendo
Ergo: per 2,6: el: EC et FA sunt parallelæ
Et: Angulus ECD æqualis angulo FAD.
Sed. per 20,3: Angulus EAD est duplus anguli ECD Hoc est: FAD
Ergo angulus EAD sectis est bisariam a recta AF.
Quod erat
[*tr: AF bisects the angle EAD.*
For from the hypothesis

[...]

And by Elements III.36
Therefore by Elements VI.14

[...]

Consequently:
And subtracting
Therefore, by Elements VI.2, EC and FA are parallel.
And angle ECD is equal to angle FAD.
But by Elements III.20, angle EAD is twice angle ECD, that is FAD.
Therefore angle EAD is cut in two by the line AF.
Which was to be]

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[*Note:*

On this page Harriot gives a statement and diagram for Proposition 24 from Supplementum geometriæ
Proposition XXIV.
In dato circulo heptagonum æquilaterum & æquiangulum
To describe a regular heptagon in a given
There are two references to equations found in connection with Proposition 19 of the Supplementum; these are to be found on Add MS 6785, f. 187.

Explicatio aeqationum quae habentur post 24 propositionem
[*tr: An explanation of the equation to be found after Proposition 19 in the Supplementum*]

Sit triangulum æquicrurum ANI
cuius angulus ad verticem N
sesquialter est utriusque angulorum
ad basim. oportet invenire
basis quantitatem IA in
[*tr: Let ANI be an isosceles triangle with vertical angle N, which is one and a half times either angle at the base.*
There must be found IA, the length of the base, in]

In 19[a] propositione, secundum illatum ita est:
sit ergo pro basi IA, nota A. et pro cruro AN cui æquatur AB.
nota Z. et forma æquationis ita erit.
Aliter per reductionem.
In eadem 19*a* propositione demonstratur ista Analogia:
Notatur igitur loco 3ID vel AB+3IA, litera E. Et pro AB, Z et contra.
et analogia ita erit:
Ergo resoluta analogia æquatio ita
[*tr: In Proposition 19, the second result is:*
therfore let IA be the base, denoted by A, and AN the side, which is equal to AB, denoted by Z.
And the form of the equation will be:
Otherwise, by reduction:
In the same Propostion 19, there is demonstrated this ratio:
Therefore there may be put the letter E in place of 3ID or AB+3IA. And Z for AB, and conversely.
And the ratio will be:
Therfore, having resolved the ratio, the equation will]

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[*Note:*

On this page Harriot gives a statement and diagram for Proposition 19 from Supplementum geometriæ (1593). See also Add MS 6785, f.
Proposition XIX.
Diametrum circuli ita continuare, ut fit continuatio ad semidiametrum adjunctum continuationi, sicut quadratum semidiametri ad quadratum continuatae diametri.
To extend the diameter of a circle so that the extension is to the semidiameter together with the extension as the square of the semidiameter to the square of the extended diameter.

prop. 19.
[*tr: Proposition 19 from the Supplementum*]

Diametrum circuli ita continuare, ut fit continuatio ad semidiametrum adjunctum continuationi, sicut quadratum semidiametri ad quadratum continuatae diametri.
[*tr: To extend the diameter of a circle so that the extension is to the semidiameter together with the extension as the square of the semidiameter to the square of the extended*]

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[*Note:*

On this page Harriot investigates Proposition 19 from Supplementum geometriæ
Proposition XIX.
Diametrum circuli ita continuare, ut fit continuatio ad semidiametrum adjunctum continuationi, sicut quadratum semidiametri ad quadratum continuatae diametri.
To extend the diameter of a circle so that the extension is to the semidiameter together with the extension as the square of the semidiameter to the square of the extended diameter.
There is a reference to Proposition 10 from the Supplementum (see Add MS 6784, f. 354), and there are also two references to propositions from Euclid's Elements
II.4 If a straight line be divided into any two parts, the square of the whole line is equal to the squares of the parts, together with twice the rectangle contained by the parts.

prop. 19.
[*tr: Proposition 19 from the Supplementum*]

per 16,p

[...]

Ducantur per
Dividantur per 3:
[*tr: If two triangles are each isosceles, equal to one another in their legs, By Proposition 16.*

[...]

Multiplying by
Dividing by 3,]

per
12,13

[*tr: by Proposition XIII.12 of the Elements*]

Ista æquatio [???] fit ex æquatione supra
Scilicet
Ducantibus per DL
Itaque per istam, et primam
et 10^{am} æquationem supra:
Primum
[*tr: This equation arises from the equation above, namely:*
Having multiplied by DL
Therfore by this, and the first, and the equation of the 10th above:
The first]

Ducantur per 27. Ergo:
Fiat reductio ad
analogiam et erunt:
per 4,2, el

[...]

Ducantur per 9. et erunt:
per superiorem analogiam et
æquationis erunt:
resolutio Anaolgia: erunt:
Secundum
[*tr: Multiplying by 27, therefore:*
Carry out the reduction to the ratio, and then:
by Proposition II.4 of the Elements

[...]

Multiplying by 9, and then:
by the ratio above and the equation:
The second]

Fiat reductio ad analogiam: et erunt:
per 4,2, el
Ergo tandem
[*tr: Carry out the reduction of the ratio and then:*
by Proposition II.4
Therefore finally the]

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De
[*tr: On infinity*]
Ex Linea Quadrataria producta.
Consequentiones quædam
**[*tr: From the production of a quadrate line,*
certain marvellous]**

* Eadem evenient si motus
BD sit in maior vel
minori
[*tr: The same hapapens if the motion of BD is in a greater or smaller ratio.*]

* Si ponatur BD movendi
ad situm CE in spacio unius
horæ: ac etiam eodem tempore
AB producta movendi ad
situm AK per
[*tr: If it is supposed that BD moves towards the position of CE in the space of one hour, and also in the same time that AB produced moves towards the position of AK by*]

Haec
[*tr: These things follow:*]

1. Ex communi sectione duarum
linearum dictarum sit curva
linea infinita BFGH &c.
acta designata in termino
illius
[*tr: 1. From the point of intersection of the two said lines comes the infnite curved line BFGH etc. and the path is traced out in one*]

2. Illa curva cum linea CE
non concurrebat ante terminum
horæ: et in ipse termino
concurrit: et si dicti motus
continuentur, ultra terminum
horæ non fit ulterior productio
nec
[*tr: 2. The curve and the line CE do not meet before the end of one hour; and at the end they do meet; and if the said motions are continued, beyond the end of the hour there will be no further lengthening or cutting.*]

3. Eodem instanti scilicet
termino horæ, AB mota et
in termino motus: tum secat
lineam CE: cum habet situ
AK scilicet parallelum ad

[*tr: 3. In that same instant at the end of the hour, AB is moving and at the end of its motion; then it cuts the line CE; while of course the position of AK is parallel to*]

Ita ut re hac racionatione sequitur duas
lineas parallelas in infinite distantia
[*tr: Thus by this reasoning it follows that two parallel lines cut at an infinite distance.*]

Et hoc mirandum quod ~~[???]~~dum generatur illa curva terminus in acta
productionis magis ac magis distantia linea AK, et in termino horæ
habet suam maximam distantia ac etiam concursum cum AK et
[*tr: And this is marvellous, that while the end of the curve is generated, in the act of production it becomes more and more distant from the line AK, and at the end of the hour has its maximum distance and yet meets with AK and CE.*]

De

[*tr: On infinity*]

Quod quædam superficies infinitae longitudinis erit æqualis

cuisdam

[*tr: How a certain surface infinite in length may be equal in length to one finite.*]

in

[*tr: on infinity*]

[*Note:*

The demonstration on this page relies on Elements, Book V, Proposition 12:
If any number of magnitudes be proportional, as one of the antecedents is to one of the consequents, so will all the antecedents be to all the

De Continue proportionalibus. Et
[*tr: On continued propotions. An infinity.*]

Si fuerint quantitates continue proportionales; Erit ut terminus
rationis maior, ad terminum rationis minorem: ita differentia
compositæ ex omnibus et minimæ, ad differentiae compositæ ex
omnibus et
[*tr: If there are quantities in continued proportion: as the greater term of the ratio is to the lesser term of the ratio, so will be the difference between the sum and the least to the difference between the sum and the*]

Sint continue proportionales. b. c. d. f. g. h. k
[*tr: Let there be continued proportionals b, c, d, f, g, h, k*]

Differentiæ compositæ ex omnibus
et
[*tr: The difference between the sum and the least.*]

Hoc est, omnes
[*tr: That is, all before it.*]

Differentæ compositæ ex omnibus
et
[*tr: The difference between the sum and the greatest.*]
Hoc est, omnis
consequentes, quæ ita sub ante-
cedentibus
[*tr: That is, all the consequents, which are thus placed under the antecedents.*]

Inde manifesta Theorematis demonstratio; quia ut b et c ita (per
synthetica) omnes antecedentes ad omnes consequentes. (per 12. pr. li.
[*tr: Thus the demonstration of the theorem is clear; because as b is to c so, by construction, are all the antecedents to all the consequents (by Book 5, Proposition 12).*]

Datis b. c. k, dabitur compositæ ex omnibus
quæ significetur per a
[*tr: Given b, c, ..., k, there is given the sum of all of them, denoted by a*]

Sit tota composita ducenda per primam
quantitatem affirmatam et secundum negatum:
facta erit bb-ck. cæteræ partes

intermediæ factæ eliduntur quoniam æquales
affirmatæ et negatæ scilicet -cb et +bc
[*tr: Let the total be multiplied by the first quantity taken positively and the second taken negatively: it will make bb-ck. The other intermediate terms will be destroyed because of equal positive and negative quantities like -cb and +bc*]

Ergo bb-ckb-c=a. compositæ ex omnibus. patet igitur
[*tr: Therefore bb-ckb-c=a is the sum of all of them. The demonstration is therefore*]

alia Notatio
[*tr: another notation for quantities.*]

Hinc in infinitis progressionibus cum u hoc est ultima quantitatis in infinitum
abeat, tres isti termini sint proport[ionales] videlicet:
b-c, c, a co[mpositæ om]nibus.
[*tr: Hence, in an infinite porgression, since u, that is, the last quantity, disappears to infinity, these three terms are clearly proportional:b-c, c, a the sum of*]

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[*Note:*

On this page, Harriot works a problem from De regula aliza liber, Chapter, pages 82–83. Cardano states the problem as follows:
De difficillimo problemate quod facillimum uidetur. CAP. XLI.
Nihil est admirabilius quam cum sub facili quaestione latet difficillimus scrupulus, huiusmodi est hic: quadratum ab cum latere bc est 10, & quadratum bc cum latere bd est 8, quaeritur quantum fit unum horum seu latus seu quadratum: Quia ergo abc est & a b 1 quad. erit bc 10 m: 1 quad. igitur bc 100 m: 20 quad. p: 1 pos. p: 1 quad. & hoc est aequale 8, quare 1 quad. quad. p: 92, aequatur 20 quad. m: 1 pos. adde 19 quad. utrinque fient 1 quad. quad. p: 19, quadrat. p: 92, aequalia 39. quad, m: 1 pos. detrahe 114, erunt 1 quad. quad. p: 19 quad. p: 9014 aequalia 39 quad. m: 1 pos. m: 114, inde adde 2 pos. p: 1 quad. utrinque ut in Arte magna, & videbis difficillimam
Chapter 41. On a very difficult question that seems easy.
Nothing is more remarkable than when under an easy question there lies a very hard stone, of which kind is this: the square of ab with the side bc is 10, and the square of bc with the side bd is 8; it is required to find one of those sides or squares. Therefore because abc is 10, and ab is one square, bc will be 10 minus a square. Therefore the square of bc is 100 minus 20 squares plus 1 square-square. Therefore bcd will be 100 minus 20 squares plus 1 unknown plus 1 square-square, and this is equal to 8, whence 1 square-square plus 92 equals 20 squares minus 1 unknown. Add 19 squares to each side, making 1 square-square plus 19 squares plus 92 equal to 39 squares minus 1 unknown. Subtract 114, to give 1 square-square plus 19 squares plus 9014 equal to 39 squares minus 1 unknown minus 114, whence add 2 unknowns plus one square to each side as in the Ars magna, and you will see this very difficult question.
Harriot lets the side of bc be a and then works through these instructions

Cardan. de Aliza. pa.
[*tr: Cardano, De regula aliza liber, page*]

[*tr: Given*]

Quæritur df vel fg
[*tr: Sought, df and fg*]

[*tr: Another way*]

Et per

[*tr: And by Antithesis*]

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[*Note:*

This question is a slight variation on a question from Girolamo De arithmetica liber X (= Artis magnaeArtis magnae) (1570), Chapter 39, page 143, Question I:
Quaestio I.
Exemplum. Inuenias tres numeros in continua proportione, quorum quadratum primi fit aequale secundo & & quadratum tertij fit aequale quadratis primi &
Question 1.
Example. Find three numbers in continual proportion, such that the square of the first is equal to the second and third, and the square of the third is equal to the square of the first and

Cardan. Arith, lib. 10. cap. 39. pag.
[*tr: Cardano, De arithmetica liber X, Chapter 39, page*]

Invenire tres numeros
continue proportionales
quorum tertius sit aequalis
primo et secundo, et
quadratum primi sit aequale
aggregato secundi et
[*tr: Find three numbers in continual proportion of which the third is equal to the first and second, and the square of the first is equal to the sum of the second and*]

Argumentatio
[*tr: First argument*]

[...]

Ergo ~~prima~~ dispositio terminorum proportionalium ex prima conditione illata
ita se
[*tr: Therefore the arrangement of proportional terms according to the first condition is had thus.*]

Argumentatio secunda, seu de secunda
[*tr: Second argument, or from the second condition*]

[...]

Unde tres proportionales
[*tr: Whence the three proportionals sought*]

Examen fit in altera
[*tr: To be tested in another sheet*]

Aggregatum I + II + III 125+11 vel duplum

[*tr: The sum of the first, second, and third is 125+11, or twice the*]

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[*Note:*

Further calculations of Pythagorean triples from the parameters r and s, continued from Add MS 6785, f. 405 and f. 403.

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[*Note:*

Further calculations of Pythagorean triples from the parameters r and s, continued from Add MS 6785, f. 405.

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[*Note:*

This folio shows the calculation of Pythagorean triples from the parameters r and s.
Those marked with asterisks do not appear in the lists given by Stifel, which were reproduced by Harriot on Add MS 6782, f. 84.

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[*Note:*

The reference at the top of the page is to Zetetic IV.1 from Zeteticorum libri quinque. This is also Proposition II.8 from the Arithmetica of Diophantus. In Zeteticum IV.1, Viète wrote as follows:
Zeteticum I
Invenire numero duo quadrata, aequalia dato quadrato.

[...]

Eoque recidit Analysis Diophantæa, secundum quam oporteat B quadratum, in duo quadrata dispescere. Latus primi quadrati esto A, secundi B − S in A/R. Primi lateris in quadratum, est A quadratum. Secundi, B quad. − S in A in B2/R + S quad. in A quad./R quad. Quae duo quadrata ideo aequalia sunt B quadrato.
Aequalitas igitur ordinetur. S in R in B2/S quad. + R quadr. aequabitur A lateri primi singularis quadrati. Et latus secundi fit R quad. in B, − S quad. in B/S quad. + R quad. Nempe triangulum rectangulum numero effingitur a lateribus duobus S & & fit hypotenusa similis S quad + R quad. basis similis S quadrato − R quadrato. Perendiculum simile S in R2. Itaque ad dispectionem B quadrati fit, ut S quadr. + R quadr. ad B hypotenusam similis trianguli, ita R quadr. − S quadr. ad basim, latus unus singularis & ita S in R2 ad perpendiculum, latus
To find in numbers, two squares equal to a given square.

[...]

The same is taught in the analysis of Diophantus, according to which it is required to divide the square of b into two other squares. Let the side of the first be a, of the second b-sar. The square of the first side is a2, of the second b2-2sabr+s2a2. Which two squares are therefore equal to b2.
The equalisation is carried out. [We obtain] a=2srbs2+r2. And the second side is r2b-s2bs2+r2. That is, a right-angled triangle in numbers may be constructed from the two terms s and r, and the hypotenuse will be proportional to s2+r2, the base to s2-r2 [actually r2-s2], the perpendicular to 2rs. Thus, the division of b2 [into two other squares] gives a triangle with hypotenuse proportional to s2+r2, base proportional to s2-r2, [axtually r2-s2], the side of one square, and perpendicular proportional to 2sr, the side of the
For the first time in this run of pages, Harriot refers directly to Diophantus, not only in the heading but also in the course of his working. It seems likely that he had now turned directly to Problem II.8 of the Arithemtica in the edition by Wilhelm Diophanti Alexandrini rerum arithmeticarum libri sex (1575). There he would have found that Diophantus gave only a single numerical example, with none of the generality that Viète had
Supposing the initial square was 16, Diophantus took the side of the first square to be some number which, following Xylander, we may call N, with side Q, and the side of the second square to be 2N-4. In Viète's more general notation, 16 was replaced by B and N by A. The side of the second square, in Diophantus's method, was thus 2A-B. Harriot was therefore correct in his assertion that Viète, who wrote the second side as B-SAR, had actually proceeded differently from Diophantus.
Diophantus was working purely in numbers, but for Viète, who was relating the problem to lengths of sides of a triangle, it was clearly more natural to take the side of the second square to be B-SAR. Viete did not specify the relative sizes of R and S, but it must be the case that SAR<B if the triangle is to be constructed. In the case where S>R, Harriot argues that one should instead use the method of Diophantus (who gave the example where S:R=2:1), in which case one requires SAR>B

3.) Diophantus. lib. 2. 8. Zet. 4.
[*tr: Diophantus, Book II, Proposition 8 Zetetica, Book IV, Zetetic*]

Dividere bb in duo quadrata numeri.

[*tr: Divide bb into two square*]
Sit 1. quad. aa

[*tr: Let the first square be aa*]
Erit: 2. quad. bb-aa

[*tr: The second square will be bb-aa.*
]
Qæritur latus
huius 2^{i} et fit: b-sar vel secundi Diophant: sar-b
[*tr: The side of this second square is sought; and it will be b-sar, or according to Diophantus sar-b*]

latus secundi fuerit. b-sar

[*tr: the side of the second will be b-sar*]
(sive ex hypothesi quod
est r>s) b-sar formeretur pro lateri 2^{i}

[*tr: (or from the hypothesis that r>s), the side of the second square will be b-sar*]
Et in illa
forma bss+brrss+rr=b. latus
[*tr: And in that form bss+brrss+rr=b is the side of the given*]

Sed si ponatur quod s sit >r; ~~[???]~~ ut posuit Vieta
latus 2^{i} [???] est sar-b. ut
[*tr: But if we put s>r, as Viète supposed, the side of the second square is sar-b, as in*]
Vieta igitur
[*tr: Viete is therefore to be corrected.*]

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[*Note:*

The reference at the top of this page is to Zeteticorum libri quinque, Book IV, Zetetic
Zeteticum I
Invenire numero duo quadrata, aequalia dato
To find in numbers, two squares equal to a given
Harriot's pagination indicates that this page follows Add MS 6785, f. 207, but now c and d have been replaced by s and r.
In the second half of the page, Harriot addresses the problem posed in Zeteticum IV.1: to divide a square into two other squares. This is also Problem II.8 in the Arithmetica of Diophantus. Viète referred to the working by Diophantus, but Harriot refers only to Viète.
Following Viète, Harriot denoted the side of the given square by b, the side of the first unknown square by a, and the side of the other by b-sar. The side of the second square is thus found to be brr-bssrr+ss. In the 1591 edition of Viète's Zetetica, there is a switch between R and S at this point, so that the second side is given S2B-R2BS2+R2. This is the error Harriot refers to. It was corrected in the 1646 edition of Viète's collected works, the Opera mathematica

2.) Zet. lib. 4.
[*tr: Zetetica, Book IV, Zeteticum 1*]

Dividere bb in
[*tr: To divide bb into two [squares].*]

latus 2^{i}
[*tr: the side of the second square*]

Contra Vieta, igitur emendandus
vide chartam
[*tr: Contrary to Viete, therefore to be amended*
see sheet]
[*Note: Sheet 3 is Add MS 6782, f. 204.*]

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[*Note:*

The reference at the top of this page is to Zeteticorum libri quinque, Book III, Zetetic
Zeteticum IX
Invenitur triangulum rectangulum numero.
Enim vero,
Adsumptis duobus lateribus rationalibus, hypotenusa fit similis adgregata quadratorum, basis differentia corumdem, perpendiculum duplo sub lateribus rectangulo.
Sint duo latero B & D. Sunt igitur proportionalia tria latera B, D, D quadratum/B. Omnia in B. Sunt tria proprtionalia Bq. Bin D. Dq. A quibus proportionalibus fit per antecdicta, hypotenusa trianguli similis Bq + Dq. basis Bq=Dq. perpendiculum B in D2. Et alioqui jam ordinatum est. Quadratum ab adgregato quadratorum, aequare quadratum a differentia quadratorum, adjunctum quadrato dupli rectanguli sub lateribus.
Sit B2. D3. Hypotenusa fiet similis 13, basis 5, perpendiculum
To find a right-angled triangle in numbers.
Taking two rational sides, the hypotenuse is similar to the sum of the squares, the base to their difference, the perpendicular to twice the product.
Let the two sides be B and D. There are therefore three proportionals B, D, D2B[Multiply] all by b. There are three proportionals b2, bd, d2. From which proportionals it comes about, from what has been said before [see Zeteticum III.8], that the hypotenuse of the triangle is similar to B2+D2, the base to B2-D2, the perpendicular to 2BD. And now the rest is in order. The square of the sum of squares is equal to the square of the difference of squares added to the square of twice the product.
Suppose B=2, D=3. The hypotenuse is similar to 13, the base to 5, the perpendicular to
Harriot followed the same instructions, replacing Viète's B, D, by c, d, reserving the letter b for the base of the triangle. He denotes the quantities cc+dd, 2cd, cc-dd h (hypotenuse), p (perpendicular), and b (base), respectively, and demonstrates that h2=p2+b2, as required.
Note his use of what looks like an = sign in the first appearance of cc-dd. This indicates that the positive difference is to be taken if d >c. In modern notation, Harriot's cc=dd would be written |c2-d2|

1.) Zet. lib. 3.
[*tr: Zetetica, Book III, Zeteticum 9*]

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[*Note:*

The reference at the top of this page is to Zeteticorum libri quinque, Book III, Zetetic
Zeteticum X
Dato adgregato quadratorum Ã singulis tribus proportionalibus, atque ea in serie extremarum una, invenitur altera extrema.
Given the sum the sum of squares of each of three proportionals, and one of the extremes of the sequence, the other extreme may be found.

Zet. lib. 3.
[*tr: Zetetica, Book 3, Zeteticum 10.*]

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[*Note:*

The reference at the top of this page is to Zeteticorum libri quinque, Book IV, Zetetic 6. This is also Proposition II.10 from the Arithmetica of Diophantus, but Harriot refers only to Viète's version of it.
Zeteticum VI
Invenire numero duo quadrata, distantia dato
To find in numbers two squares having a given difference between
Viète used the letter B for the given difference. Harriot followed Viète's working but in his own lower-case notation. The 1591 edition of the Zetetica at one point mistakenly gives 'maior' instead of 'minor'. This is the error that Harriot points out. It was corrected in the 1646 edition of Viète's Opera mathematica

Zet. lib. 4.
[*tr: Zetetica, Book IV, Zeteticum 6.*]

Invenire duo quadrata
distantia data
[*tr: To find two squares a given distance apart.*]

et ut differentia vel
summa laterum sit æqualis, d
dato
[*tr: and so that the difference or sum of the sides is equal to d, a given*]

Sit datum intervallum rs
et intelligatur pro quadrato basis
Et sit differentia inter hypotenusum
et perpendiculum quælibet quantitas d
[*tr: Let the given interval be rs, and it is understood to be the square of the base; And let the difference between the hypotenuse and the perpendicular be any quantity.*]

Menda in
[*tr: Wrong in Viète.*]

Ergo latera
[*tr: Therefore the sides of the triangle:*]

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[*Note:*

The reference at the top of this page is to Zeteticorum libri quinque, Book IV, Zetetic 6. This is also Proposition II.10 from the Arithmetica of Diophantus. The page appears to be a continuation of Add MS 6785, f. 208.
Zeteticum VI
Invenire numero duo quadrata, distantia dato
To find in numbers two squares having a given difference between

Zet. lib. 4.
[*tr: Zetetica, Book IV, Zeteticum 6.*]

ut in altera
charta
[*tr: as in the other sheet above*]
[*Note: The other sheet is Add MS 6785, f. 208.*]

Menda in
[*tr: Wrong in Viète.*]

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To devide a number into 2 such partes
that the difference of there squares be
æquall to an other nomber

The nomber to be devided let be. b.
The second nober geven. cc.
The first part. a.
The second. b-a

[*tr: It must be that*]

the
the
the roote of the 2
nomber

Aliter the greater parte. a
The greater
The lesser
The roote of the
nomber

Examinatur.

[*Note:*

The first row contains numbers of the form 2n. The second row contains numbers of the form 2n-1. Those that are prime, for example, 3, 7, and 31, give rise to perfect numbers of the form 2n-1(2n-1), as stated in Euclid IX.36. See also Add MS 6786, f. 230v.

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[*Note:*

Calculation of (b+c+d+f)(b+c+d-f)(b+c-d+f)….
See

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[*Note:*

The reference on this page is to Variorum responsorum liber VIII, Chapter XVIII, Proposition 2, Corollarium.
Itaque quadratum circulo inscriptum erit ad circulum, sicut latus illius quadrati ad potestatem diametri altissimam adplicatam ad id quod fit continue sub apotomis laterum octogoni, hexdecagoni, polygoni triginta duorum laterum, sexagintao quatuor, centum viginti octo, ducentorum quinquaginta sex,& reliquorum omnium in ea ratione angulorum laterumve
Thus a square inscribed in a circle will be to the circle as the side of the square to the greatest power of the diameter applied to that which is successively under the apotome of the sides of octagons, hexdecagons, polygons with thirty-two sides, sixty-four, one hundred and twenty eight, two hundred and fifty six, and so on, all in the ratio of halved angles and

Responsorum. pag. 30.
in
[*tr: Responsorum, page 30, on the Corollary*]

per propositione
[*tr: by the preceding proposition*]

As B to
[...]
so let $\alpha\beta$ be to $\beta\gamma$.
So will the square α\varepsioln be to the oblong $\beta\theta$.
And as ... to ... O.
Therefore if $\alpha\beta$ be æquall to B
these æquations will also follow:
And therfore the oblong made of B and
[...]

is æquall to the

The oblong or square therefore æquall to the circle is
Devide it by the semidiameter
And the Quotient wilbe the semiperimeter

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[*Note:*

The reference on this page is to Variorum responsorum liber VIII, Chapter XVIII, Proposition
Propositio II.
Si eidem circulo inscribantur polygona ordinata in & numerus laterum primi fit ad numerum laterum secundi subduplus, ad numerum vero laterum tertii subquadruplus, quarti suboctuplus, quinti subdexdecuplus,& ea deinceps continua ratione subdupla.
If in the same circle there are inscribed polygons ordered indefinitely, and the number of sides of the first is half the number of sides of the second, and a quarter the number of sides of the third, and an eighth of the fourth, and a sixteenth of the fifth, and so on continually halving. ...
There are also references to Propositions VI.14 and XI.34 from Euclid's Elements.
VI.14 Equal parallograms which have an angle in each equal, have the sides about the equal angles reciprocally

Responsorum. pag. 30 prop. 2.
[*tr: Responsorum, page 30, Proposition 2.*]

Apotome lateris
Diameter circuli
polygon
[*tr: Apotome of the side*
Diameter of the circle
the polygon]

Est igitur per 14.p.6.l. vel
[*tr: Therefore by Elements VI.14 or XI.34*]

Est igitur per
[*tr: Therefore by Elements VI.14*]

Est sic de
[*tr: And so on for the rest.*]

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[*Note:*

The reference on this page is to Adrianus Romanus resposum (1595), pages 110,

Secundum Adrianum Romanum. pag. 110. et
[*tr: According to Adrianus Romanus, pages 110 and 111.*]

Latus trigintanguli
Latus sexagintanguli
Ex. pag. 28. Adriani
Latus trigintanguli
subtensa 132
subtensa 24
seu latus
[*tr: Side of a thirtieth of an angle*
Side of a sixtieth of an angle
From page 28 of Adrianus
Side of a thirtieth of an angle
Subtended side of 132 degrees
Subtended side of 24 degrees, a]

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[*Note:*

This sheet refers to Stevin's L 19arithmétique ... aussi l 19algebre (1585), page 214. On that page, Stevin wrote: 'Et multipliant √bino. 1 + √2, par √bino. 3 + √5, le produict sera √quadrino. √3 + √6 + √5 + √10.' Harriot has re-written the same calculation in his own notation: [2]1+2, and so

Stevin.
pa.

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[Page 470]

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Aliter: De quadrilatero **[Page 473]**

sive

[*tr: Another way: on quadrilaterals, or by Ptolemy*]

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[*Note:*

See Add MS 6786, f. 240 for the

Simon Stevin. Novemb. 25,

Datur quadrilaterum circulo inscribendum cuius area est 1344
ambitus 162, & productum ex duabus diagonalibus seu
dimetientibus Exprimantur latera & dimetientes
situsque ipsius quadrilateri, ac circuli etiam

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Diameter circuli.

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Joannes Thinnagel [???]
Cæsariæ Mtrs [???]
Supplirium
Johannis (Erici)

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w.1.) Invenire 4or numerus. b. c. d. f.
ita ut tres sequentes comparationes sint
[*tr: To find four numbers b, c, d, f, such that the three following comparisons are*]

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[Page 503]

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1) De quadrilatero,
et cæteris
[*tr: On quadrilaterals and other multilaterals*]

[*tr: triangular numbers*]

or 2 in 3; 2 in 4; 2 in 5; 2 in 6 ; 2 in 7
or the diagonalls

solidus angulus ex
quotlibet datis non
potest constitui sine
hoc
[*tr: It is not possible to construct a solid angle from any given number [of plane angles] without this*]

[*Note: The relevant passage in Commandino's Euclidis elementorum XV (1572) is to be found on page 201v (not 102), as part of a Scholium following Book XI, Proposition 23. Commandino's statement is:*
Ex planis quotlibet datis angulis, quorum uno reliqui sint maiores quomodocumque sumpti, solidum angulum constituere, oportet autem datos angulos quatuor rectis esse minores. From any number of given plane angles, given one of which, the rest are greater, however taken, to make a solid angle it is necessary that the given angles are less than four right angles.]
vide. Euclid. lib. 11
pag. 102.
[*tr: See Euclid Book XI, page 202 of Commandino.*]

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b.2.) 2°. De quadrilatero. pro diagonijs.

per

[*tr: On quadrilaterals; for finding the diagonals, as Ptolemy.*]

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[Page 578]

3[i] Aliter. De quadrilatero. Sive

[*tr: Another way. On quadrilaterals. Or by Ptolemy.*]

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[*Note:*

Lists of Pythagorean triples, including some where one side length is a mixed

7) Latera triangulorum rectangulorum

[*tr: Rational sides of right-angled triangles*]

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[*Note:*

On this page, Harriot examines Problem IX from Apollonius Gallus
Problema IX.
Datis duobus circulis, & puncto, per datum punctum circulum describere quem duo dati circuli contingat.
IX. Given two circles and a point, through the given point describe a circle that touches the two given

Appoll. Gall. problema. 9.
Casus.
[*tr: Apollonius Gallus, Problem IX, case 1.*]

In isto casu:
Si punctum datum I sit extra
circulum circa AH, et intra
tangentes ad partes A:
vel extra eundem circulum et
intra tangentes ad partes H. M.
Duo circuli possunt
tangere duos
[*tr: In this case, if the point I is outside the circle around AH, and inside the tangents on the side of A, or outside the same circle and inside the tangents on the sides of H and M, then two circles can touch the two given.*]

Punctum non dabiter in circulis
AD et EH, neque in spatio intra
illos circulos vidilicet DE
et intra tangentes.
Alias utercunque: et unus tantum
circulus tangens describitur nisi in
locis supra
[*tr: The point will not be given in the circles AD and EH, nor in the space inside those circles, namely DE, and inside the tangents. Any other way, and one such tangent circle will be descibed unless in the places delineated*]

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[Page 597]

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[*Note:*

The text reffered to here is Bernard Tractatus arithmetici partium et alligationis

Ad Demonstrandi secundum praemissum cap. 2. in tractatum Alligationis Bernardi
[*tr: A demonstration of the second premise of Chapter 2 in Bernard Salignac's treatise on alligation*]

præmissum 2^{m}
[*tr: second premise*]

exemplum
[*tr: the example following*]

Exempli, proprietates
2^{a}, illustratio
[*tr: Examples, illustrating the properties of the second.*]

[*tr: second premise*]

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[*Note:*

This page and the next (Add MD 6785, f. 334)contain a summary of earlier propositions used in each proposition in Book I of Euclid's Elements

[*Note:*

The continuation of Add MS 6785, f.

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[*Note:*

This page contains an analysis of earlier propositions used in each proposition in Book IV of Euclid's Elements. (For similar analyses of Books I and III, see Add MS 6785, f. 337, f. 338, f. 336.)
The first wide column shows all the propositions, postulates, definitions, and axioms used in each proposition in Book IV, in the order in which they occur, including repetitions.
The second wide column shows the earlier propositions used in each proposition in Book IV, in numerical order without repetitions.
Proposition 1, for example, relies on Proposition 3 from Book I, and Proposition 15 from Book

In lib. 4°
[*tr: In the fourth book*]

Definitiones
[*tr: Definitions 7*]

propositiones
[*tr: propositions 16*]

[*tr: problems*]

[*tr: theorems*]

pro-

[*tr: propositions*]

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[*Note:*

This page contains an analysis of earlier propositions used in each proposition in Book III of Euclid's Elements. (For a similar analysis of Book I see Add MS 6785, f. 337, f, 338.)
The first wide column shows all the propositions, postulates, definitions, and axioms used in each proposition in Book III, in the order in which they occur, including repetitions.
The second wide column shows the earlier propositions used in each proposition in Book III, in numerical order without repetitions.

Proposition 2, for example, relies on Propositions 5, 16, 19 from Book I, and Proposition 1 from Book

In lib. 3°
[*tr: In the third book*]

Definitiones
[*tr: Definitions 10*]

propositiones
[*tr: propositions 37*]

[*tr: problems*]

[*tr: theorems*]

pro-

[*tr: propositions*]

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[*Note:*

This page contains an analysis of the contents and structure of Book I of Euclid's Elements. The list at the top of the page gives the number of definitions, postulates, axioms, and propositions given by various authors. The table in the lower half of the page lists the individual propositions, each classified as a Problem or a Theorem, with notes of the postulates, definitions, and axioms used in each
.
The first wide column lists all the postulates, definitions, and axioms used in each proposition, in the order in which they occur, including repetitions.
The second wide column lists the postulates, definitions, and axioms in numerical order without repetitions.
The third wide column lists previous propositions used.
The final narrow column shows the total number of previous propositions used.
Proposition 2, for example uses Definition 15; Postulates 1, 2, 3; Axioms 1, 3; and Proposition 1.

The editions of Euclid referred to on this page are:
Federico Commandino, Euclidis Elementorum libri XV (1572)
Christophor Clavius, Euclidis Elementorum libri XV (1574, 1589, 1591, 1603, 1607), to which was added a supposed sixteenth book, De solidorum regularium comparatione by Francis Flussas Candalla (François de Foix comte de

In Libro primo Elementorum
[*tr: In Book I of Euclid's Elements*]

[*tr: Definitions*]

Graeco codice et apud Comandinum. 35
Secundum Flussatum et Clavium.
[*tr: In a Greek codex and in Commandino 35; and in Flussas and Clavius 36.*]

[*tr: Postulates*]

In graecis quibusdum codicibus et
et [???] Gemini. 3
[*tr: In certain Greek codices and in [???] Gemini.*]

In alijs graecis codicibus et apud
Comandinum.
[*tr: In other Greek codices and in Commandino. 5*]

Apud Clavium.
[*tr: In Clavius. 4*]

[*tr: Axioms*]

In Graecis quibusdum.
[*tr: In certain Greek authors 12*]

Apud Comandinum.
[*tr: In Commandino 10*]

Apud Clavium.
[*tr: In Clavius 20*]

Problemata.
[*tr: Problems 14*]

Theoremata.
[*tr: Theorems 34*]

propositiones.
[*tr: Propositions 48*]

[*tr: problems*]

[*tr: theorems*]

[*tr: propositions*]

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[*Note:*

This page continues the table begun on Add MS 6785, f. 337, to the end of Book I of Elements

Lib.
[*tr: Book I*]

pro-

[*tr: problems*]

[*tr: theorems*]

[*tr: propositions*]

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vide proclum. lib. 4*o*. **[Page 679]**

pag.

[*tr: See Proclus, Book 4, page 222.*]

[*tr: Toy wheel*]

Et sic

[*tr: And thus infinitely*]

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1) **[Page 683]**

hoc est quadrato superficiei
trianguli
[*tr: that is, the square of the surface of triangle ABC*]

[Empty page]

2.) **[Page 685]**

[*Note: Sheet (1Δ) is the previous one, Add MS 6785, f. 342.*]
eadem species ut in
[*tr: the same form as in 1*Δ]

ergo. perpendiculum AD. et superficies Δ^{i}, ABC habet eadem species ut (1Δ)
[*tr: therefore the perpendicular AD and the surface of the triangle ABC have the same form as in 1*Δ]

Quæritur perpendiculum AD.
[*tr: The perpendicular AD is sought another way*]

idem ut supra.
[*tr: the same as above (1Δ)*]

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[*Note:*

The diagram on this page is copied from Clavius, Geometria practica (1604), page 176. On pages 175 to 178 Clavius states and proves what is usually known as Heron's Rule, for the area of a triangle given its sides. Harriot translates Clavius 19s verbal proof into symbols, and adds variants of his own.
In the second edition of the Geometria practica, of 1606, the same text appears on pages 158 to 161, with the diagram on page 159
.
See Also Add MS 6785, f. 33, for the same problem and a similar diagram, there from Scholarum mathematicarum libri unus et triginta

2.3° Cla. pa. 176. Geom.
[*tr: Clavius, page 176, Geometria practica*]

Ego aliter, et
[*tr: Another way of my own, much shorter*]

Ego
[*tr: Another way of mine*]

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superficies Δ^{i}
[*tr: surface of the triangle*]

dimidium
[*tr: half of the side*]

recte
[*tr: correctly thus*]

[Empty page]

[*tr: not*]

AD
[*tr: AD perpendicula*]

corallarium ad sinus vel
[*tr: pertaining to the sine or chord.*]

Dato diameter et duabus subtensis
datur
[*tr: Given the diamter and two chords, one is given the third.*]

dupla superficies
[*tr: twice the area of the triangle*]

[Empty page]

[*tr: Given*]

[*tr: Triangle*]

[*tr: Sought*]

[*tr: Given*]

ergo et, CG
[*tr: therfore also CG, the difference*]

[*tr: Given*]

[*tr: Therefore*]

Notum
[*tr: Note therefore*]

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[*Note:*

Franciscus Flussas Candalla (François de Foix, comte de Candale) added a sixteenth book to Clavius's Euclidis Elementorum (1574, 1589, 1591, 1603, 1607). In it he claimed to compare the propositions of Book XV in the same way that Book XIV compared the propositions of Book XIII. The reference to Proposition 37 is puzzling, however, since Book XVI contains only 31 propositions.
See also Add MS 6783, f.

1.) De triangulis

Vide Flussata
lib.16.p.37.

[*tr: See Flussas, Book 16, Proposition 37, Corollary 2.*]

poristicum 1ª arithmetica
[*tr: first proof; arithmetic proportion*]

poristicum
[*tr: another proof*]

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The 6 sides of a
pyramis being geven
to find the

The sides
b, c, d, f, g,

I would have the
solidity geven without
the table of sines.
or
in specie of
the sides only
if it may
as the superficies
of a

As the superficies of a trinagle is ~~had~~ argued by a circle inscribed, two sides
produced, & like triangles: In like manner remember to try to argue
the solidity of a pyramis, by a sphære inscribed, three planes produced &
like Now followeth the way by the perpendicular

If the vertex of a triangular pyramis to the base be understood
a perpendicular falling, & from the end or poynt in the base
be drawne perpendiculars to the sides of the triangles of
the

pappus
lib.6.
pr.

Then if from the vertex be drawne lines to the sayd poyntes
in the triangular base; ~~where~~ those lines shalbe also

Let two perpendiculars be drawne aθ and αx
& suppose the perpendicular from the vertex to the playne of
the base be

Then Drawe the lines $\theta\varepsilon$, εx,

$\theta\delta$ & $\delta\theta$ with the anlge $\theta\delta$x are knowne,
therefore θx with his angle adjacent are also
Therefore in the triangle θxε, besides the side θx the two angles
adiacent are also knowne. therefore also the sides $\theta\varepsilon$ and

Then in the triangle αxε having $\alpha\varepsilon$x a right angle; & the
two sides εx & xα being knowne, $\alpha\varepsilon$ cannot be
And therefore the solidity of the pyramis wilbe also

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[*Note:*

On this page, Harriot examines Problem V from Appendix II from Apollonius Gallus
Appendicula II.
De problemata quorum factionem geometricam non tradunt astronomi, itaque infeliciter resolvunt.
Problema V.
Dato triangulo, invenire punctum, a quo ad apices dati trianguli actæ tres lineæ rectæ imperatam teneant rationem.

Appendix II.
On problems whose geometric construction the astronomers do not teach, thereby resolving them imperfectly.
Problem V.
Given a triangle, to find a point from which there may be drawn three straight lines to the vertices of the given triangle, keeping a fixed ratio.

Quinta et ultima propositio appendiculæ 2 Appollonij
[*tr: Fifth and last proposition from Appendiula II of Apollonius Gallus*]

Dato triangulo: invenire punctum, a quo ad apices dati
triangli actæ tres lineæ rectæ imperatam teneant
rationem. Si sit
[*tr: Given a triangle, to find a point from which to the given vertices of the triangle there are constructed three straight lines in a determined ratio. If it is*]

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[*Note:*

The reference at the top of the page is to a lemma given by Federico Commandino to Proposition 43 of Book X of Euclid's Elements, in Euclidis Elementorum XV (1572). The original proposition is:
X.43 A first bimedial straightline is divided at one point only.
There are also references to Book II, Propositions 5 and 9 (marked as 5,2. and 9,2.):
II.5. If a straight line is cut into equal and unequal segments, then the rectangle contained by the unequal segments of the whole together with the square on the straight line between the points of section equals the square on the half.
II.9. If a straight line is cut into equal and unequal segments, then the sum of the squares on the unequal segments of the whole is double the sum of the square on the half and the square on the straight line between the points of

Comandinus
Lemma ad 43 p. 10. lib.
[*tr: Commandino, Lemma to Proposition 43, Book X of the Elements*]

est
[*tr: is less than*]

[*tr: greater*]

[*tr: conclusion*]

[*tr: Another way*]

[*tr: greater*]

prima
[*tr: first conclusion*]

sed
maius est
[...]
per prima
[*tr: but*
[...]
is greater than
[...]
by the first]

ergo
minus est

[...]
secunda
[*tr: therefore*
[...]
is less than
[...]
second]

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[*Note:*

The table analyses the first 56 propositions of Book I of Apollonius, as edited by Commandino Conicorum libri quattuor (1566), showing the 'parents' of each proposition. (For a similar analysis of Book I of Euclid's Elements see Add MS 6785, f.

Appoll. lib.
[*tr: Apollonius, Book I*]

prop.
[*tr: Proposition. Parents.*]

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[*Note:*

The table analyses the first 56 propositions of Book I of Apollonius, as edited by Commandino Conicorum libri quattuor (1566), showing the 'offspring' of each proposition.

Appoll. lib.
[*tr: Apollonius, Book I*]

prop.
[*tr: Proposition. Offspring.*]

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[*Note:*

The table analyses the first 11 (of 53) propositions of Book II of Apollonius, as edited by Commandino Conicorum libri quattuor (1566), showing their 'parent' propositions in Book I and Book II.

Appoll. lib.
[*tr: Apollonius, Book II*]

parentes.
lib.
[*tr: parents, Book I*]

[*tr: proposition*]

parentes
lib.
[*tr: parents, Book II*]

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[*Note:*

On the left of the page, Harriot tests several quadratic equations for two roots, one positive and one negative in each case.
It is not clear what is going on at A and B since -6 and -4 are not correct solutions to the given equations.
'W.W.' is presumably Walter

Ad Impossibilia [W.W.]
[*tr: On impossibility, response to W.W.*]

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4. If more be more & lesse be lesse
3. Lesse by lesse brings lesse of lesse
2. Lesse by more brings lesse of more
1. More by more must needes bring more.
Novemb. 23.

Double

[*Note:*

This page shows a table of vales for 2r-1z (in modern notation 2x-x2), for r= 1, 2, 3, 4, 5, 6, 7. The required value, 5, does not appear in the column of possible

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Ad Quintem lib. **[Page 777]**

[*tr: On the fifith book of Euclid*]

Quicquid intelligatur; et dicitur, vel dici potest, esse: appellatur [???]
modus vel forma essendi qui vel qua
Malus quo, vel forma qua utiquid dicitur esse; appellatur entitas
vel

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[*Note:*

The text at the top of the page uses Stevin's notation, 5(2), for example, for what we would now write as 5x2.
At the bottom of the page are two references to Stevin's L 19arithmétique … aussi l 19algebre, pages 289 and 293. On page 289 Stevin deals with equations of the form: square = number – roots. On page 293 he deals with the form: square = roots – number. Stevin's example is 1(2) = 6(1) – 5 (in modern notation x2=6x-5), which has two real roots, 1 and 5. Harriot's example 1z=2r-5 (in modern notation x2=2x-5) has no real roots. The annotation 'W.W.' is presumably a reference to Harriot's friend Walter Warner.

to find a number which being multiplied by 3. & the product mulltiplied into it self
may be equal to the first number multiplied by it self, ~~after~~ and the product by
Suppose the number 1(1) to be multiplied by 3 to be 3(1) which multiplied into it self makes
after, multiplie the first supposed number being 1(1) into it self which is 1(2) and the same
1(2) multiplie by 5 the product shalbe 5(2) which must be equal to 9(2) which
equation is

1z=7-8r. 289.
1z=2r-5 imposib. W.W.

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[*Note: 'W.W.' is presumably a reference to Walter Warner. The same equation appears again on the other side of this page, Add MS 6785, f. 397v.*]

816 or 864 = 80r-1zz imposs.

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An sit maximum ~~finitis~~ et minimum finitum.
An sit minimum et maximum infinitum.
An ex finito generetur infinitum.
An ex finitis componatur infinitum.
An resolvatur finitum in indidivisibilia.
~~vel~~ An componatur finitum ex indivisibilibus.
An a finito ad infinitum sint transitis per maximum finitum.
An æquale et inæquale possit [???] omniciarii de infinitis.
An æquale et inæquale attribuatur

Much ado about nothing.
Great warres & no blows.
Who is the foole

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1.

[Page 873]

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[*Note:*

This page is based on Euclid, Proposition XIII.18:
XIII.18 To set out the sides of the five figures and compare them with one

Euclid.lib.13.pr.18 De lateribus corporum
[*tr: Euclid Book XIII, Proposition 18: On the sides of regular solids*]

secetur bf extrema et
media
[*tr: let bf be cut in extreme and mean*]

[*tr: Collection*]

Dimetiens
[*tr: Meaure of a sphere*]

Latus
[*tr: Side of a pyramid*]

Latus
[*tr: Side of an octahedron*]

Latus
[*tr: Side of a cube*]

Latus
[*tr: Side of an icosahedron*]

Latus
[*tr: Side of a dodecahedron*]

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[*Note:*

This page and the next explore sides of polygons inscribed in circles. Harriot refers to two propoistions from Euclid Book XIII:
XIII.12 If an equilateral triangle is inscribed in a circle, then the square on the side of the triangle is triple the square on the radius of the circle.
XIII.9 If the side of the hexagon and that of the decagon inscribed in the same circle be added together, the whole straight line has been cut in extreme and mean ratio, and its greater segment is the side of the hexagon.
There is also a reference to Euclid X. 13:
X.13 If two magnitudes be commensurable, and one of them be incommensurable with some magnitude, the remaning one will also be incommensuarble with the same.

De lateribus polygonum in
[*tr: On the sides of polygons in circles*]

Euclid.lib.13.pr.12 Euclid Book XIII, Propostion 12.

[...]

latus
[*tr: The side of a triangle*]

[*tr: Book XIII, Proposition 9*]

Apot. 5^{a}.
[*tr: A fifth apotome, for decagons*]

cuius quadratum
[...]
Apot 1^{a}
[*tr: whose square is a first apotome*]

ergo etiam
[...]
decagoni
[*tr: therefore also*
[...]
the side of a]

lateri
[*tr: sides of squares*]

sint bc, et cd, lateri pentagoni
ergo: bd latus
[*tr: let bc and cd be sides of a pentagon, therefore bd is the side of a*]

ut supra latus
[*tr: as above for the side of a decagon*]

[...]

Minor. Latus
[*tr: Lesser. Side of a pentagon.*]

per
[*tr: by Proposition X.13 of Euclid*]

lateris
[*tr: side of a pentagon*]

Lateri pentagoni.

[*tr: Side of a pentagon; lesser.*]

verte paginam pro
ambitiosa
[*tr: turn the page for the complicated root*]

pro ambitiosa latere
[*tr: for the complicated pentagonal root*]

lateris
[*tr: side of a pentagon*]

cuius
[*tr: whose root*]

Latus pentagoni.

[*tr: Side of a pentagon; lesser.*]

[*tr: Another way.*]

cuius
[*tr: whose root is*]

eadem quæ
[*tr: the same as above*]

Radix igitur vera,
sed ambitiosa
[*tr: Therefore the true root, but exceedingly complicated.*]