Institutiones mathematicae - Cod. St. Blasien 67

Kircher, Athanasius

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Geometrie

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Tractatus 3. De Geometria .

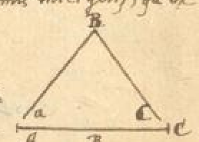
eiusq[ue] partibus subiectivis, seu potentialibus.

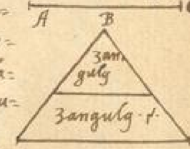
Isagoge.

Licet Geometria proprie sit mensuratio terrae, tamen ut est iam ex disciplinis mathematicis, capitur generaliter pro mensurae rei cuiuscunque, terrae, agrorum, distantiae locorum, altitudinis turrium, latitudinis fluviorum, capacitatis arearum, montium, sylvarum, oppidorum, magnitudinis totius globi terrestris, corporisque caelestium, elevationis poli, aequatoris, solis supra horizontem etc. atque ut sic sumitur, definitur, est scientia, quae considerat et percipit magnitudines et figuras, et terminos, qui his insunt, praeterea inquirit rationes et affectiones his accidentes, denique varias positiones et motus; quam doctrinam antiquiores geometrae in duas distinxerunt partes; in eam quae proprie geometria dicitur, quae in planarum figurarum dimensione consistit, et in alteram quam stereometriam vocant, quae est corporum solidorum scientia: Nos eam in 4 partiemur species, in cyclotrigonometriam, ichnographiam, stereometriam, staticam, de quibus omnibus theorice et practice in serie tractatu agetur.

Definitiones .

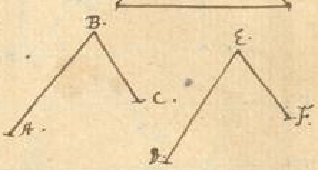
1° Magnitudo est, ratione quam aliquid dicitur quantum. bicubitum etc. 2 terminus est extremum magnitudinis 3 punctum est cuius nulla pars divisibilis. 4 linea est magnitudo longa tantum, lineae termini sunt puncta. 5 linea recta est, quae ex aequo suis terminis interiicitur, puta linea recta est A ——— B si omnes eius partes aequaliter iaceant intra terminos A et B ita ut nulla pars protuberet ullam in partem. Alii. linea recta est, cuius extrema obumbrat omnia media. 6. superficies est magnitudo longa et lata tantum. 7° superficiei termini sunt lineae. 8. plana superficies est, quae ex aequo suis terminis interiicitur, quod ex definitione lineae rectae colliges. 9. Planus angulus est duarum linearum in eodem plano non in directum iacentium, alterius ad alteram inclinatio; ut duae lineae AB, CB constituunt angulum planum ABC si iacentes in eadem plana superficie, inclinentur, et se tangant in puncto B. nec iaceant in directum; quia si iacerent in directum, sicut linea A B C, non angulum sed unam lineam AC constituerent. cum quo angulus sit duarum linearum inclinatio, non ideo maior erit angulus, si maiora sint latera, vel si maior sit laterum divaricatio, neque propterea angulus augebitur aut diminuetur, si eius latera augeantur, vel diminuantur.



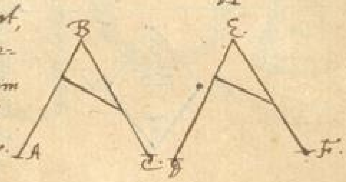


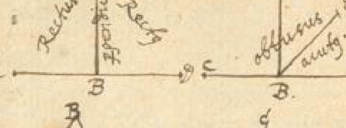
10 Angulus rectilineus est, qui rectis lineis constituitur, curvilineus, qui curvis.

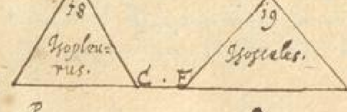
11 Angulus angulo aequilaterus est, si eorum latera alterum alteri aequalia sint, ut anguli A B C D E F sunt inter se aequilateri, si latus AB lateri DE, et latus BC lateri EF aequale sit, quod et alio nomine dicitur, utrumque utrique aequale, vel unum uni, alterum alteri.

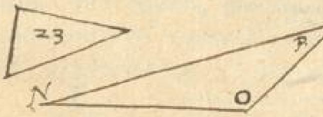


12. Anguli rectilinei aequales sunt, si cum aequilateri sumpti fuerint, ab aequalibus rectis subtendantur; ut anguli A B C D E F erunt aequales, si cum unius anguli latera, alterius anguli lateribus, alterum alteri aequalia sumpta fuerint; puta si latus BA, ipsi ED, et latus BC ipsi EF sumatur aequale, ab aequalibus A C D F subtendantur.









13 Inæquales v. anguli sunt, si, cū æqlateri sumpti fuerint, ab inæqualibus rectis subtendantur; et maior quidem ē, q a maiori, minor, q a minore subtenditur. +

14. Quando recta sup rectā consistens, æquales vtrinque fecerit angulos, erit linea perpendicularis, seu normalis, et vterque angulus erit rectus, vt si recta AB insistens rectæ CD, angulos ABC. et ABD æquales fecerit, vterque angulus ē rectus, et recta AB ipsi CD. dr̃ perpendicularis, siue ad rectos angulos, sicut et vicissim recta CD, ipsi AB ē ad rectos et perpendicularis. +

15. obtusus angulus ē, q maior ē recto, vt EBC.

16. Acutus vero, q minor ē recto, vt angulus EBD, q recto minor ē ABD

17. figura ē magnitudo, q sub vno, vel pluribus terminis continetur. Rectilinea vero figura sunt, q rectis lineis continentur; atque ea iterū multipliciter diuiduntur, in 3laterās, seu trigonas, eo qd̃ constent 3 lineis, quadrilateras, seu tetragonas, q 4 lineis, poligonas, seu multilateras, q pluribus constant lineis.

18. Inter figuras 3lateras æqlaterū 3angulū, siue Isopleurus ē, qd̃ 3a latera sunt æqualia, vt ABC.

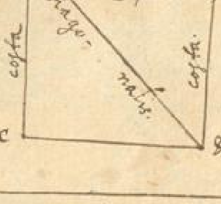
19. Isosceles v. seu æqcrurū 3angulū ē, qd̃ duo tm̃ latera sunt æqualia, vt F. G. H.

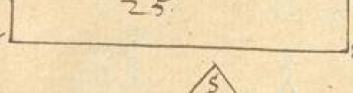
20. scalenū, seu gradatū 3angulū dr̃, qd̃ oīa latera sunt inæqualia vt SPO.

21 3angulū rectangulū ē qd̃ sunt aliqm ex angulis suis rectum, vt 3angulū KLM, in quo angulus L sit rectus.

22. Triangulū ampligoniū, seu obtusangulū ē, qd̃ aliqm e suis angulis ht obtusū, vt NOR. vbi angulus O ē obtusus.

23. 3angulū oxigoniū, seu acutangulū ē, qd̃ oēs 3, angulos ht acutos, vt KRS. +





De quadrilateris figuris. +

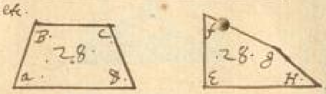
24. quadratū siue tetragonū ē figura constans 4 lateribus æqualibus, et totidem angulis æqualibus, vt figura ABCD. cuius AB dr̃ vertex quadrati. DC. basis. AC et BD costæ, seu catheti aut perpendiculares, AD linea diagonea, vel diagonalis a diameter quadrati. +

25. Parallelogramon, siue altera parte longius ē figura quadrilatera, cuius opposita latera inter se sunt parallela, æquangula quidem figura ē, at n̄ æqlatera, vt CDFE, cuius oēs anguli sunt æquales, n̄ v. oīa latera. +

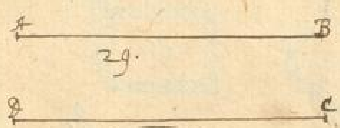
26. Rhombus e conuerso ē figura æqlatera, n̄ tm̄. æquangula, vt SPVT. in qua oīa latera æqualia, n̄ tm̄ oēs anguli. +

27. Rhomboides figura ē nec aequangula, nec aequilatera, opposita tn. latera et angulos oppositos st aequales, vt N O P M.

28. Quaeque v. alia figura quadrilatera, trapetia vocant, q irregulares st et infinitae, vt in figuris adiectis patet, a b c d. e f g h. etc.



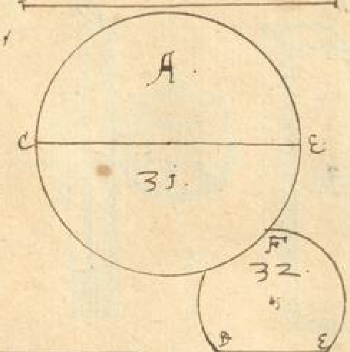
29. lineae parallelae seu aequidistantes dnr, quando semper (licet in infinitu producantur) aequaliter distant, siue quando a quouis puncto ad alterum perpendiculares sunt aequales, vt lineae AB. DC.



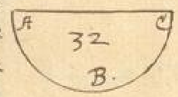
30. figurae aequales, seu isoperimetrae st, q superficies, seu areas aequales continent, pnt n. figurae aequales areas continere, etsi latera et angulos habeant inaequales, vt clarum ē, pt n. trianguli area, quadrati aequalis ee, neq tn. illarum figurarum anguli aut latera erunt aequalia, et figurae specie diversae aequales inter se ee pnt, circulus quadrato, parallelogramon triangulo cuicunque, de qbus deinceps.

De circularibus.

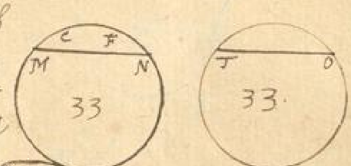
31. Circulus ē figura vnico termino seu linea contenta, lineam ambitum seu circumferiam dicunt, intra quam punctum quoddam est, ex quo oēs lineae ad ambitum ductae inter se st aequales, vt circulus A. Diameter v. circuli ē recta per centrum acta, et ad ambitum vtrinque terminata, qualis ē recta CE. ex qbus patet illos circulos inter se ee aequales, quorum diametri fuerint aequales, et e uerso.



32. Segmentum circuli ē figura, q ab arcu seu parte circumferiae, et a recta linea continetur, semicirculus v. ē segmentum circuli, qd a diametro subtenditur, vt ABC. q continetur arcu ABC et recta AC. segmentum vero DEF, qd continetur arcu DEF, cui subtenditur diameter DE.

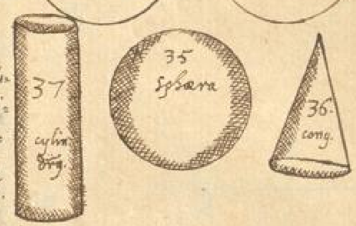


33. in aequalibus circulis, arcus et segmenta st aequalia, q ab aequalibus rectis subtenduntur, vt arcus superioris figurae MCFN, in eodem aut aequalibus circulis erunt aequalia, si recta subtensa MN. TO. fuerint aequales. item sicut arcus ita et segmenta erunt aequalia.



De corporibus solidis.

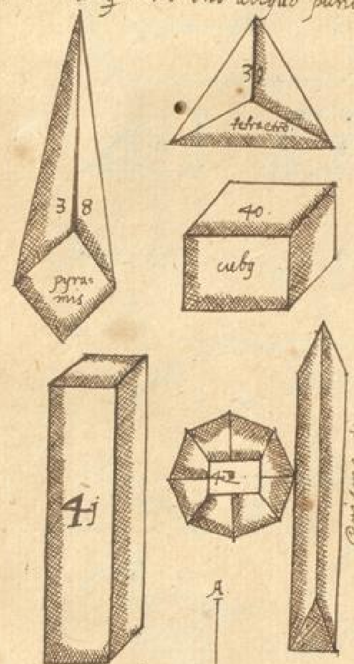
34. corpus solidum abstracte consideratum ē, qd longitudinis, latitudinis et profunditatis dimensionem habet, cuius quidem extremitates st superficies, et qa n nisi in sensibilibus rebus hae corpora considerantur, n tn. quaque materia sola figura constat, q sensibilibus inē; ideo nominantur figurae solidorum corporum, quorum hae st species.



35. Sphaera ē figura solida capacissima, vnica superficie contenta,

ad quam

 ad qm ab vno aliquo puncto in medio posito, oes lineæ rectæ ptractæ int se st æquales, fitq ex circuductu semicirculi maalis, in punctu, a quo moueri cœpit, partes eius st axis et diameter.



35 Conus e figura solida, q circulu ht p basi, et ad vnicu punctu colligit; nam si a puncto sublimi ad circuli circuferentia fuerit ducta linea recta, q circuducat, donec ad eunde locum redierit, figura solida, q gurat est conus.

37. Cylindrus e figura solida, q circulis ptinuatus æq distantibus, et intercepta superficie cylindrica, fitq ex circumductione parallelogrammi in locu, vnde moueri inceperat.

38. Pyramis e figura solida, q a basi 3latera, aut 4drilatera, aut m. multangula colligitur ad vnum punctum.

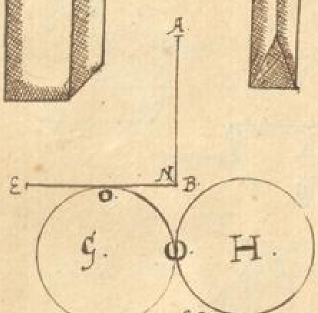
39. Tetraëtron, siue m. pyramis 4drilatera e, q ptinet 4 trigonis, q æqlatera, et æqangula sunt.

40. Cubus e figura solida, sex æqualibus et æqangulis quadratis ptenta, ptinens in se oes musicas proportiones.

41. Parallelipipedon e figura solida 6 pstans parallelogrammis, et subinde 4 et duobus quadratis.

42. Octaëtron e figura solida 8 trigonis æqualibus et æqlateris ptenta.

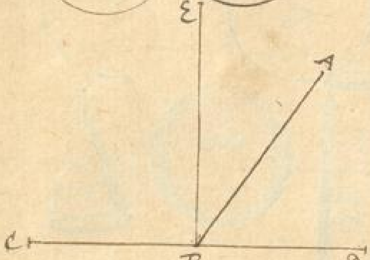
43. Icosaëtron e fig. solida 20 trigonis æqualibus et æqlateris ptenta.



Geometriæ speculatiuæ Theoremata.

Theorema de puncto. ptactus lineæ sup lineā aut planū erecta, iton lineæ et sphæra sibi et sphærarū ptactus fit in puncto. ratio q linea latitudinem nulla ht, et circulus seu sphæra nulla partem recti, exemplu ji e A E B tangentis in puncto N. lineam E B; iton sphæra G H tangentes se in puncto O.

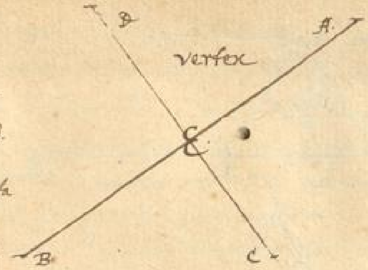
Propositio ja Theorema pu.



Recta in recta cadens aut duos rectos, aut duobus rectis æquales angulos facit; na si recta A B cadat ppendiculariter in C D, [redacted] faciet vtrimq angulos rectos, qd si aliter cadat, excitata ad ppendiculū B E linea, tunc v. ga angulus A B C valet rectum E B C, et supē pars E B A, q cu angulo A B D valet alteru recti E B D. patet gō duos angulos A B C et A B D duobus rectis eē æquales.

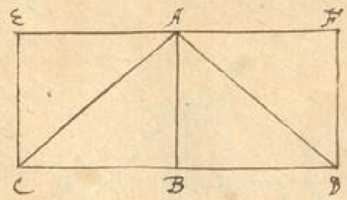
Prop. 2.

Prop. 2. Theorema. 2.



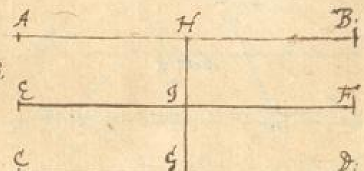
Si duae rectae se invicem secuerint, angulos ad verticem oppositos aequales facient: si duae rectae AB. DC. se mutuo secuerint in puncto E; anguli ad verticem oppositi AEC et DEB. erunt aequales, nam quia recta CE cadit in AB, anguli AEC et CEB. valent duos rectos iuxta propositionem jam; sed et recta BE cadens in rectam CD, similiter causabit angulos aequales duobus rectis BED, et BEC, ablato ergo communi CEB, anguli AEC et DEB manent aequales: non aliter probabitur, angulos AED, et CEB. quae oppununtur ad verticem, aequales esse; ergo si duae rectae etc.

Prop. 3. Theorema 3.



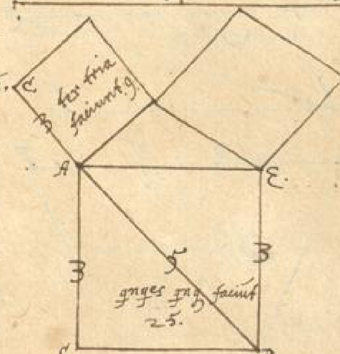
Quae alterutri parallelarum est perpendicularis, utrique est perpendicularis. Recta AB cadat in parallelas CD. EF, et alterutri illarum, puta CD sit perpendicularis; dico eandem BA ipsi quoque EF esse perpendicularem; sumantur n. utrinque aequales BC. BD, et ad puncta C et D excitentur ipsi perpendiculares CE. DF, ducanturque CA. DA, quia ergo in triangulis ABC, et ABD latera BC et BD aequalia sunt, et BA commune, angulique contenti ad B recti, et proinde aequales, erit basis CA basi DA aequalis, angulique correspondentes ACD ipsi ADB et CAB: BAD aequales. similiter ostendentur triangula ECA. ADF m. esse aequalia; ergo quae alterutri etc.

Prop. 4. Theorema 4.



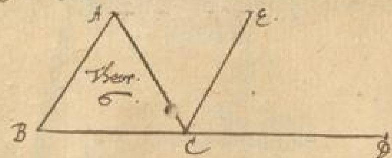
Quae eidem sunt parallelae, inter se quoque sunt parallelae, ut si recta AB. uni eidem EF sit parallela, erunt m. inter se parallelae. ducatur n. recta GH secans ad rectos ipsam EF in puncto I. quia ergo recta IH uni parallelarum EF est ad rectos, alteri quoque AB erit ad rectos, et similiter GI. utrique parallelae EF. CD erit perpendicularis; recta ergo AB. CD uni et eidem GH sunt perpendiculares, ideoque inter se parallelae. ergo quae eidem sunt etc. quod erat demonstrandum.

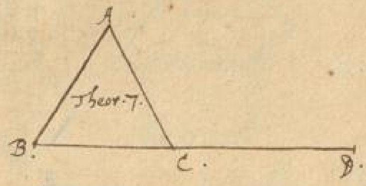
Prop. 5. Theorema 5.

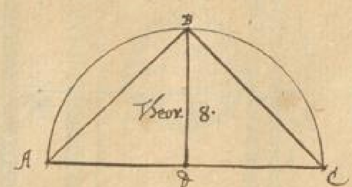


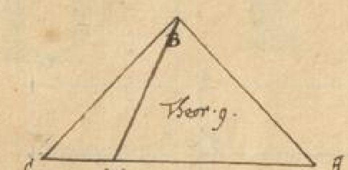
Diameter quadrati est incommensurabilis costae, quod probatur, quia si commensurabilis esset, numerus par esset aequalis numero impari, quod est impossibile. demonstratur. sit quadratum, cuius diameter sit AB, costa una AC; si igitur diameter haberet se ad costam AC, ut quadratum AB ad quadratum AC ex 7 propos. l. 10 Eucl. sed quadratum AB est 25, et quadratum AC 9, et rursum quadratum diametri AB duplum est ad quadratum AC costae. igitur numerus 25 quadratus diametri 5, duplus erit ad 9 qui est

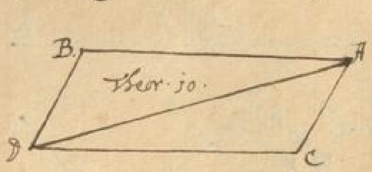
quadratus

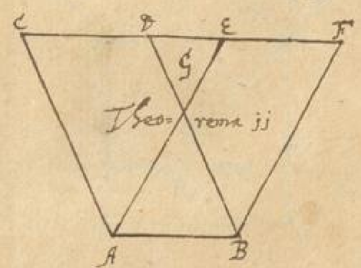












qdratꝰ nūerꝰ costę trium, et rursu 18 nūerꝰ 2plꝰ est ad 9. qdratū costę AC igit̃ nūerꝰ 18, ē equalis nūero 25 p 1m axiom. Eucl. q̃ vni et eidem st̃ equalia, etc. p hec oīa st̃, qd.

Prop. 6. Theorema 6.

oīs 3anguli quocūq latere pductꝰ, externꝰ angulꝰ duobꝰ simul internis et oppositis est equalis. in 3angulo ABC producto quocunq latere, puta BC vsq in D. externꝰ angulꝰ AED duobꝰ simul internis et oppositis A et B ē equalis; ducta n. ex C recta CE ipsi aB parallela, qa recta AC tangit parallelas aB et EC. anguli alterni BAC et, et ACE st̃ equales, et qa in easdem parallelas AB. EC cadit in recta DB angulꝰ externꝰ ECD equalis ē interno et opposito ABC, go totꝰ angulꝰ ACD duobꝰ simul a et b, ē equalis, oīs go 3ang. etc.

Prop: 7. Theorema 7.

In oī 3angulo tres anguli duobꝰ rectis st̃ equales, nā in 3angulo ABC producto latere BC internꝰ ACB cū externo ACD valet duos rectos, atq angulo externo duo interni et oppositi st̃ equales; angulꝰ go ACD cū duobꝰ AB. valebit in duos rectos; atq hinc patet, duos quoscūq 3anguli angulos, duobꝰ rectis ēē minores, nā si tres simul equales st̃ duobꝰ rectis, duo qcunq ex illis, minores erunt duobꝰ rectis. etc.

Prop. 8. Theorema 8.

oīs angulꝰ in semicirculo rectꝰ ē. In semicirculo ABC, si cstitutꝰ sit angulꝰ qcūq, puta CBA, dico eū ēē rectū, si n. ex centro D ducat̃ recta DB. cstituent̃ 3angula duo Isosceria DAB. DBC, st̃ n. latera DA, BD. item DC et DB equalia, quare angulꝰ DAB angulo DBA supra basin AB, item angulꝰ DBC angulo DCB supra basin BC equalis erit, iā v. qa 3anguli ABC tres anguli valent duos rectos, horū a. triū angulorū dimidiū, vt iā dmstratū ē, cstinet̃ in angulo ABC, quādoqdem hic angulꝰ duobꝰ alijs equaleat, nēē ē, hunc ipsum angulū ēē dimidiū duorū rectorū, ac pinde ēē rectū. qd erat dmstrandū. hinc patet, quo linea ppendicularis erigenda, quarē gnomones exarandi. etc.

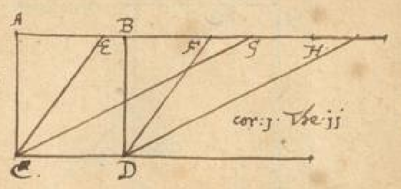
Prop. 9. Theorema. 9.

omnis trianguli maiꝰ latꝰ maiorem angulū subtendit, etsi

etsi angulus maior sit, a maiore latere subtenditur; vt si trianguli ABC latus AC maius sit quam AB. dico ipsum angulum ABC, ipso ACB esse maiorem, sumatur n. recta AD, ipsi AB aequalis, ducaturque recta BD; quia igitur triangulum ABD est Isosceles, anguli ABD, et ADB inter se sunt aequales, sed angulus ADB, est externus BDC et ipso triangulo BDC maior, inde interno et opposito C, quare angulus m. ABD maior est angulo C; multo igitur maior totus angulus ABC angulo C. quod erat demonstrandum. e converso si angulus ABC maior sit angulo C, maius m. erit latus CA subtendens maiorem angulum B, quam latus AB subtensum angulo minori C. non n. erit aequale, nec minus, alias angulus ABC aequalis esset, aut minor C, igitur erit AC maius, quam AB. hinc efficitur, omnium linearum quae ab aliquo puncto ad rectam quampiam ducuntur, brevissimam esse perpendicularem in triangulo. hinc aliud excerpitur, quod scilicet duo omnis trianguli latera simul sumpta maiora sint reliquo. +

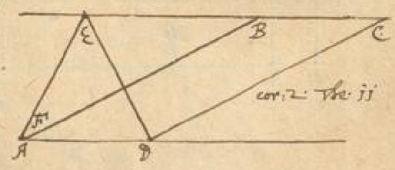
Prop: 10 Theorema 10.

In omni parallelogrammo oppositi anguli et latera aequalia sunt, ipsum vero parallelogramon diameter bifariam diuidit; nam in parallelogramo AB CD ducta diameter AD, anguli alterni BAD, ADC sunt aequales, sicut m. anguli alterni CAB et ADB. cum igitur triangula ABD et ADC duos angulos aequales habeant, et latus correspondens AD commune, triangula sunt vndique aequalia. quare opposita latera AB. CD sunt m. aequalia, oppositi item anguli C et B, itemque A et D, et quia triangula ABD, ADC sunt aequalia, diameter AD bifariam diuidit parallelogrammon. in omni igitur parallelogramo etc.



Prop: 11 Theor: 11

Parallelograma super eadem basi, et in eisdem parallelis constituta inter se sunt aequalia; super eadem basi AB constituta sint duo parallelograma AD; AF, sintque AB. CF lineae parallelae, consideranturque deinde duo triangula CAE, DBF, in quibus latus AC, aequale est ipsi DB, et CE alteri DF, nam CD. EF aequalia sunt vni et eidem AB, et addito communi DE lineae CE. DF. sunt pares, sed et angulus BDF, aequalis est ipsi C, cum in rectas CA, DB cadat CF, sunt igitur triangula CAE, BDF iuxta praedicta vndique aequalia; quare ablato communi triangulo DGE trapetia relicta CDGA. FEGB sunt aequalia, et addito communi triangulo ABG tota parallelograma sunt paria. +



Corollaria.

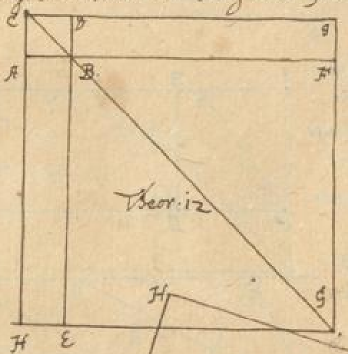
1. Parallelogrammon, super basibus aequalibus et in iisdem parallelis constituta inter se esse aequalia, quotumuis producantur, vt parallelogrami: ECDF et GHCD sunt omnia aequalia parallelogrammo ABCD.

2°.

2°. Si triangulum et parallelogrammon eandem habuerint basin, sintque in eisdem parallelis, erit parallelogrammon duplum trianguli, ut parallelogrammum ABCD est duplum trianguli DEF, e converso vero, si basis alicuius trianguli fuerit dupla basi parallelogrammi inter easdem parallelas constituti, erit triangulus aequalis parallelogrammo, ut triangulus OMC, cuius basis est dupla ad basin parallelogrammi ABCD, est eidem aequalis, item quotquot scribentur trianguli super basin OC ad alteram usque parallelam, et quocunque describatur, ut POC, omnes inter se sunt aequales, et parallelogrammo, cuius basis 2 continet.

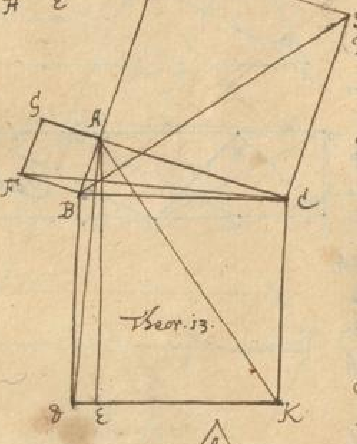
3° Quod possint construi triangula cuicunque quadrato, aut parallelogrammo aequalia, item triangulum dato parallelogrammo, aut e contra triangulo aequale triangulum, aut parallelogrammon.

4°. Eiusdem altitudinis triangula et parallelogramma sunt sicut bases, ut si triangula ABC, DEF habeant aequales altitudines AG, DH sicut et parallelogramma ABCI et EFDK, est enim altitudo figurae linea perpendicularis a vertice ad basin ducta; unde figurae in eisdem parallelis AD BH constitutae, eandem habent altitudinem, et e converso; dico tam triangula, quam parallelogramma in eadem ratione esse, in qua sunt bases, nam si basis BC, duplo aut triplo maior sit basi, ita enim triangulum ABC maius erit triangulo DEF, triangula enim eam rationem inter se habent, quam bases, et quia triangula sunt parallelogrammorum dimidia, quam proportionem habent triangula inter se, eandem quoque habebunt parallelogramma.



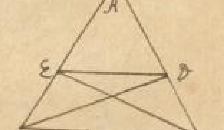
Prop: 12. Theor. 12.

Parallelogrammi omnis, eorum quae circa diametrum sunt, parallelogrammorum complementa sunt aequalia; Parallelogramma ABDC. BEGF constituta circa diametrum CG. complementa vero sunt parallelogramma ABEH et DBIF, quae dico inter se esse aequalia, nam quia diameter CG bifariam dividit parallelogramma circa diametrum constituta, aequalia enim erunt triangula EBG. BFG itemque triangula ABC et BCD, si ergo ab aequalibus triangulis HGC, et GCI auferantur aequalia EGB. et BGF, item ABC, et BCD, complementa ABEH et DBIF remanebunt aequalia.



Prop: 13. Theor: 13.

In triangulo rectangulo quadratum, lateris angulum rectum subtendentis aequale est duobus simul quadratis laterum aliorum angulum rectum continentium, et si quadratum unius lateris, duobus simul quadratis reliquorum aequale sit, angulus, quem reliqua latera continent, est rectus. in triangulo ABC, angulus A rectus sit, fiantque super lateribus AB et AC quadrata BG. CH, item fiat super latere BC angulum rectum



Theor. 14.

sub-

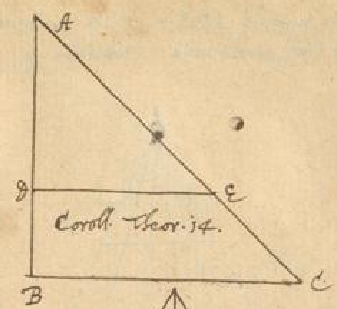
subtendente q̄drato BK, qd dico eē aequale duobq aliorum laterū q̄dratis simul sumptis, ducatur AE parallela, ipsi BD aut CK, iungantur rectae AD. FC, quia q̄ angulq DBC angulo FBA rectq recto, ē aequalis, addito cōi ABC, pares erunt anguli DBA, FBC; sunt igitur triangulorū ABD. FBC latera DB. BA ipsi BC. BF singula singulis aequalia. Triangula igitur ABD, et FBC sunt aequalia, sed triangulū ABD ē dimidiū parallelogrammi BE, cū sit sup eadem basi BD, inter parallelas BD vel AE, et eandem ob causas triangulū FBC ē dimidiū q̄drati BG. quadratū q̄ BG aequale ē parallelogramo BE cū eorū dimidia sint paria, q̄d si puncta BG. AK iungantur duabq lineis rectis; eadem plane methodo probabitur, parallelogramon EC, quadrato CH eē aequale; totū q̄ q̄dratū BK reliqs duobq aequale ē. In oī q̄ triangulo etc. f.

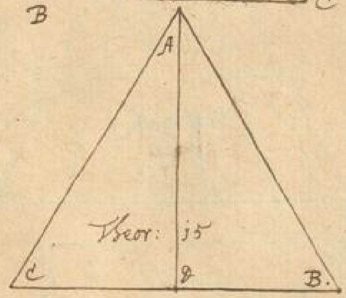
Prop: 14 Theor. 14.

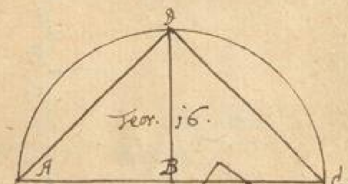
Si ad vnū trianguli latq parallela ducta fuerit, recta quidem linea haec proportionaliter secabit ipsiq trianguli latera. In triangulo ABC, ducatur ïo recta DE parallela lateri BC, dico latera AB et AC secta eē proportionaliter in D et E. i. eē vt AD ad DB. ita AE ad EC, vel vt ab ad dc. ita AD ad DE, vel vt AB ad AC. ita AD, ad AE, ductis n. rectis CD, et BE. erunt triangula DEB et DEC sup eandem basin DE, et inter easdem parallelas DE. BC constituta inter se aequalia. quare vt triangulq ADE ad triangulū DEB. ita ē triangulū idem ADE. ad triangulū DEC, atq vt triangulq ADE ad triang. DEB, ita ē basis AD ad BD, cū hae triangula sint eiusdem altitudinis, vt constat, si per E agatur parallela recta ipsi AB; et eadem rōe vt triang: ADE ad triang. DEC. i. basis AE ad basin EC, vt igitur AD ad DB, ita ē AE ad EC, cū hae duae proportiones eaedem sint proportiones trianguli ADE ad triangulū DEB et DEC, q̄d ē propositum.

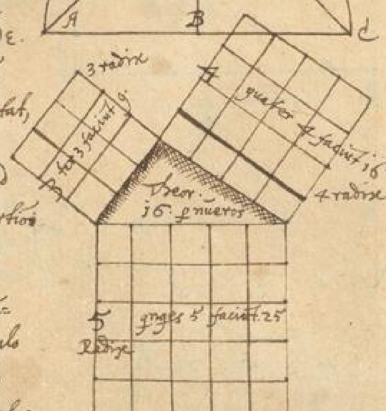
Corollarium.

Hinc fit, vt linea recta, q parallela ducitur, vni lateri in triangulo, auferat triangulū toti triangulo silem, ducatur n. in triangulo ABC lateri BC parallela DE, dico triangulū ADE triangulo ABC eē silem, aequanguli n. sunt, cū anguli ADE et AED aequales sint

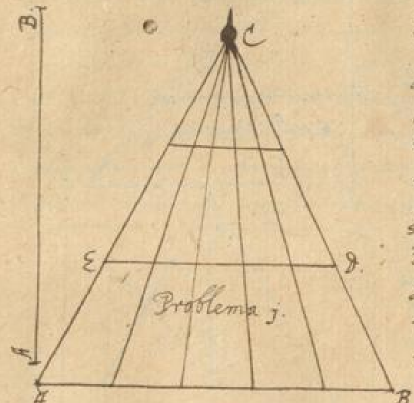


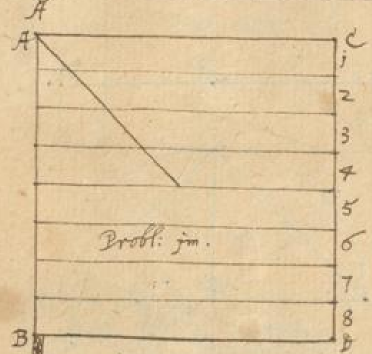


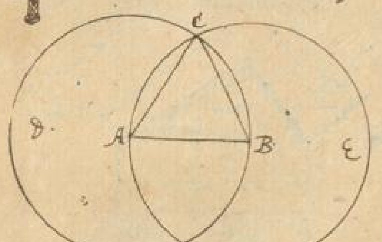




sint angulis ABC et ACB externis, et angulꝫ A cōis. quare vt dmstrāc sit, circa angulos aquales latera sint pportionalia, et homologa.







Problematis 2di.

Prop: 15 Theorema 15.

Si in triangulo rectangulo pperpendicularis ab angulo recto ad basin ducat, q ad pperpendicularem sit triangula, et toti triangulo et int se sint silia, et illa pperpendicularis erit media pportionalis; in triangulo ABC sit angulꝫ BAC rectꝫ, et ex basi CB ad basin A ducatꝫ pperpendicularis AD, qa go in triangulis ADB. ADC anguli DAC, et ADC recti sint, et angulꝫ C cōis, tertiꝫ ABC, DAC erit aqualis, ac pinde triangula ADC ADB sint aequangula et silia. n alibi ostendeꝫ triangulū ADB ēē sile toti triangulo ABC ac pinde sint m. silia int se triangula ABC, ADC. ex quo patet, pperpendicularem ab angulo recto ad basin ductā ēē mediam pportionalē int duo basis segmenta, nā vt ē CD ad DB, ita DB ad DA.

Prop: 16 Theorema 16.

Datis duabꝫ rectis mediā pportionalem invenire. data recta ABC in directū collocetꝫ, ac sup AC fiat semicirculꝫ ADC, nā si ad punctū B excitetur pperpendicularis DB secans semicirculū in D, recta DB erit media pportionalis, ductis n. rectis AD. DC angulꝫ ADC ē rectꝫ. quare recta DB ē media pportionalis int basis segmenta, hoc ē int datas rectas AB, et BC. datis go duabꝫ etc.

Inventio media pportionalis p numeros.

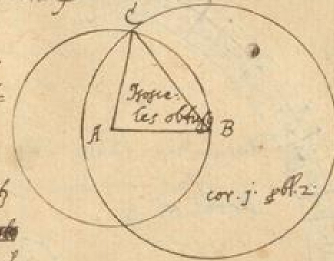
Mediū pportionale dr qntitas media int duas, q ita se ht ad minorē, qmadm maior ad mediā, sic invenitꝫ. duc pm in vltimū seu terciū, pductiꝫ radix quadrata dabit mediū pportionale, vt placet investigare mediū hoc int tria et 12, ducantꝫ 3 in 12, fiunt 36, quorū radix qdrata 6 scil ē mediū pportionale, item int 4 et 9, qbꝫ in se ductis fiunt 36, cuiꝫ radix qdrata ē 6 mediū pportioale; duo a. media pportionalia inter quosuiꝫ nūeros invenies hac roē; minorem duc in se, pductū in maiorem, quotientis radix cubica ostendit minorem nūerum tangm mediū pportionale mediantem, et in pportioe 2dū; vt int 3 et 24 sic invenies duo media; duc 3 in se fiunt 9, hac in 24 fiunt 216, cuiꝫ radix cubica ē 6, deinde vt 3ū habeas, ex priori regula duc 6 in se fiunt 36, q diuisa p 3 manet 12, ē go 3tigua pportio 3. 6. 12. 24, cuiꝫ pportioales duo medij sunt 6 et 12 qsiti.

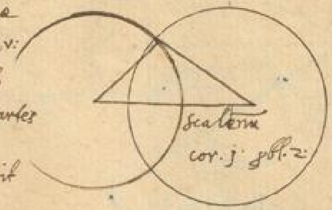
Probl:

Problemata Geometrica varia ad praxin in oi Scia mathematica aegredam idonea ; De sectione linearu rectaru.

Prop. j. Problema pr. j.

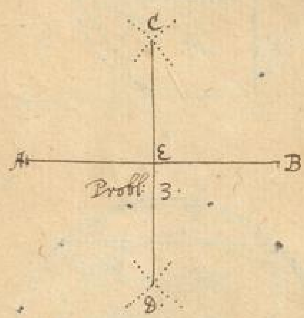
Datá rectá lineá finitá in quolibet partes aequales dividere
Sit data recta AB, secanda in 5 partes aequales, constituatur 3angulus ABC cuius basis sit divisa in 5 aequales partes, et ex punctis divisionum ducantur rectae coincidentes in angulo C. His factis intercipe datá rectá in 5 aequales partes secandá intra structurá 3anguli ACB ductaque parallela ED · [redacted] AB lineae ab uno crure ad alterum 3anguli, secta erit data recta in 5 aequales partes. Aliter per instrumentum. fiant duae lineae aeque distantes, cuiuscunque volueris magnitudinis, uno, duobus v. 3 ab invicem distantes palmis, et sint signatae AB. CD. quo facto trahe lineas aeque distantes parallelas a latere AB in aequales partes diviso, ad latus CD similiter in aequales partes diviso, a punctis ad puncta, cu ascriptis numeris parallelorum, ut hic vides, et paratum erit instrumentum. Usus erit iste: si offeratur linea secanda in 4 partes, ex centro A duc lineá rectá ad lineam parallelam 4am, et erit divisa aequaliter in 4 partes. et sic de aliis.



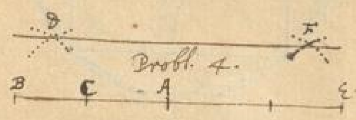


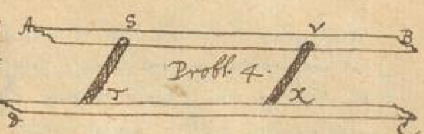
Prop. 2 Problema 2.

Sup datá rectá finitá 3angulu construere, sit data recta AB. ex centro A spatio AB describatur circulus BCD, et ex centro B spatio eodem ducatur alter ACE circulus, priorem secans in puncto C · iunganturque rectae lineae CA · CB, et erit factum. Rao e, qa oes 3 lineae sunt diameter circuli; cu go ex dfinióe circuli eiusmodi lineae a centro ad circumferentiam ductae sint aequales, et 3 latera 3anguli facti sint tales lineae, patet m. ee aequales.

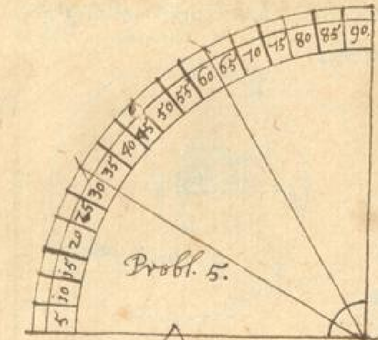


jo Coll. Sup datá rectá Isoscelem 3angulu sic construes. Sup datá rectá AB constitue circinu, ita ut unu crus consistat in B, alteru vero intra A vel ultra A extensu describat arcu, hoc facto invariato circino similiter ex A similem fac arcu; et ex A et B, ad puncta intersectionis arcuu C duc lineas, et erit factum. Isoscelem quidem acutu si ultra A extenso circino descripseris arcu, obtusu v; si intra A · quis scalenus sit sup datá, si duos circulos describas, et ad puncta intersectionum lineas rectas ducas.





2°.



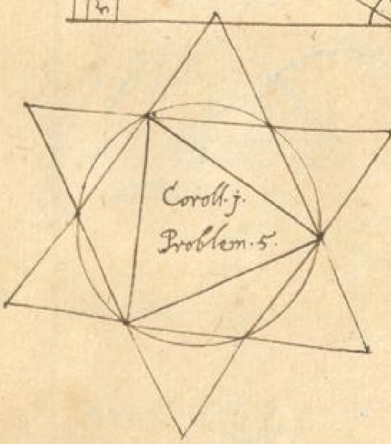
2°. ex hoc patet quo quis angulus bifariā diuidi poßit, item quis lineā data recta, aut perpendicularis erigi. +.

Problema 3.

Sup. datā rectā perpendicularem erigere. Centro facto C. et intervallo quovis eodem describantur duo arcus secantes rectā datā in A et B, deinde ex A et B eodemq intervallo, v: alio, si placet, describantur alij duo arcus secantes se in D, nā ducta recta CD secans AB in E erit perpendicularis ad AB. Aliter. ex quovis puncto A in linea data, et intervallo quolibet usq in C assumpto, arcus circuli describantur; deinde ex puncto B, quolibet alio intervallo usq ad idem C, arcus describatur, priorem secans in C et D, eritq ducta recta CD ad AB perpendicularis. +

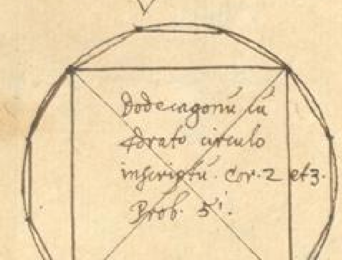
Probl. 4. ad datā rectā parallelā ducere.

Ex centro A ad quovis spatiū describatur arcus secans BC in puncto D. et eodem intervallo ex D. sumatur punctū E in recta eadem BC. deinde eodem intervallo ex A et E describantur duo arcus secātes se in F, nā ducta recta AF erit parallela BC. + Aliter. Fiant duo linealia ex ligno solido AB CD, quorū extrema exactè parallela duobq brachiolis ST. VX in vertebris suis iungantur, ut constringi et dilatari queant pro libitu, et parati sunt instrumentum pro parallelis, quocunq n. pones lineale ABCD, semper eidem erit parallela utraq linea quolibet modo constricta et dilatata. +



Problema 5. Circulū exacte in suas partes diuidere.

Circulus quicunq sit, diuidatur in 360 partes seu gradus hac methodo: 1o secetur in 4 aquales partes, seu quadrantes, per diametros se ad angulos rectos intersecantes. 2o diuide quemq quadrantem in 90 partes aquales, quo facto hoc totū circulū diuisū. Vg. sit circulus ABCD diuidendus in 360 gradus; diuiso eo prius in 4 partes, ut dictū, per diametros ad πρὸς ὀρθὰς ductas ABCD, diuides unū ex quadrantibus Vg AC in 90 partes aquales eo modo. Accipe quantitatem semidiametri circuli diuidendi circino, et ex C versus A interceptam quantitatem transfer sup arcū CA, et iterū invariato circino ex A versus C eandem quantitatem transfer sup arcū AC, et hoc quadrante diuisum in 3 aquales partes, quos si circino per totū circulū transferas, erit diuisus in 12 partes seu horas, si hec spatia iterū bifariā, habis 24. pro diuidendi magnam maximam habet utilitatem in sciotericis horologijs. diuisa itaq quadrante in 3 partes, quarū quaq habet 30 gradus, ter n. 3 faciunt 9 pro quadratem, diuidatur quaq harū tertiarū in duas, deinde quis ex duabus in 5 gradus, et habis quadrantem diuisum. +

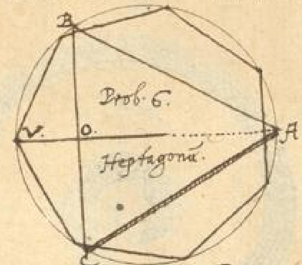


Wallenstein habet 30000 equitū et magnā copiā peditū paratā aduersus Suecū An. 1632. 10 maij, sed nondū ob defectum pabuli equorū prodijt in campos. o Jesu!

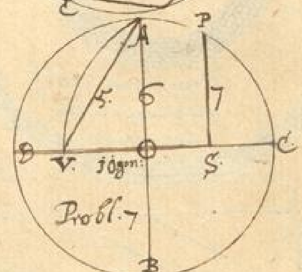
Coroll. ju.

Corollariū 1. Hexagonū describere, duc semidiametrū in ipheriam circuli, et necte pūcta lineis, et h̄bis hexagonū, q̄d si 3angulū æqlaterū circulo inscribere velis, iunge puncta quis 3º loco posita, medio omisso, et h̄bis q̄sitū. f. Coroll: 2. dodecagonū describere seu figurā laterū 12, divide circulū in 12 partes æquales iuxta dicta pbl: 5 et iunge puncta lineis, et h̄bis q̄situ. f. f.
Cor: 3. quadratū describere: iunge 4 extrema diametrorū circuli lineis rectis, et h̄bis q̄situ, si vero extra circulū q̄res, fiant particulares ad extrēa diametrorū iuxta pbl. 3. et q̄ducta ad occursū q̄stituunt q̄drati, cui circulq inscriptq. f.

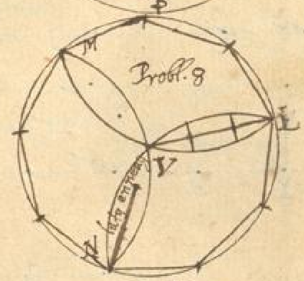
Probl: 6. Heptagonū describere, iuxta pbl. 5 coroll. 1. fiat 3angulū æqlaterū in circulo, et sit ABC, quo facto duc lineam ex centro A ad punctū vnū ex ante relictis, Vq ad V. secabit 3anguli latq in O bifariā, dico OB et latq heptagoni; q̄d si applices ipheriæ, habebis q̄fectū heptagonū, cuiq lateris arcū bifariā si dividas, et puncta punctis nectas, hs tesseradecagonū. f. 14 angulorq. Octogonū sic facies, describe q̄dratū in circulo iuxta pbl: 5 coroll: 3, arcūq, q̄m latq q̄drati subtendit, divide bifariā, et has partes duc q̄ reliqm ipheriā, lineis n. rectis a punctis ad puncta ductis hs octogonū, cuiq latera si iterū bifariā dividas, hs 16 laterū figuram. f.



Probl: 7. pentagonū, hexagonū, et heptagonū, decagonū in vna figura describere. Fiat circulq ABCD sectq suis diametris ad rectos ABDC, diametrūq OC divide bifariam, et ex puncto S ad intervallū SA fac arcū ex A vsq in V, fietq 3angulū AVO, cuiq latq AV erit latq pentagoni, AO latq hexagoni, OV latq decagoni, linea a. q̄pendicularis SP, latq heptagoni.

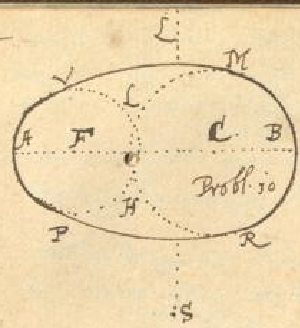


Probl: 8. Enneagonū, sive nonāgulū describere.
Facto circulo LMN, describatq invariato circino tres radij, seu piscium vesicæ LV, NV, MV, diviso vno radio ex illis iuxta semidiametrū circuli in 3 æquas partes, ductaq linea q̄pendiculari transversa, ex 3 puncto sectionis vel 2 ad vtriusq radij LV extrema, hæc n. linea erit latq enneagoni, media lateris octodecagoni. f.



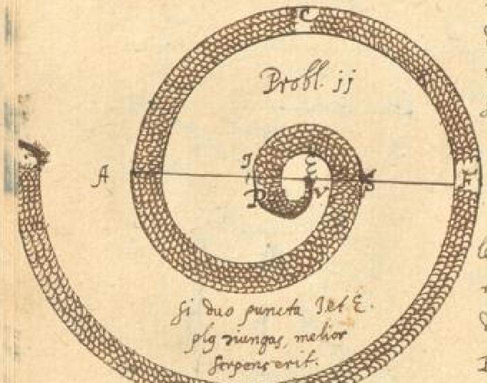
Problema 9. Hendecagonū seu 11 laterum figurā describere. Sume 4 partem diametri, et adhuc insuq 8uā partem eiusdem 4tæ, hæc dabit latq hendecagoni. f.

Probl: 10 ovalem figurā describere.
Fiant duo circuli CB. AF. occulti sup data rectam AB intersecantes se in punctis H et L. his factis impone pedem circini, sup punctū L et describe arcū PR radens sufficiem circulorq CB.



CB et F A. deinde inuariato circino describe stem arcu V M ex S. Puncto, et habis figurá oualem, quam si velis acutá poteris, si facias circulos distare vltra coem diametrum, aut obtusá iuxta coarctoem. f.

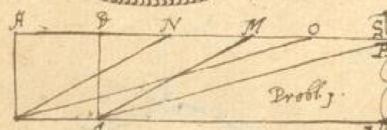
Problema ij figurá serpentiná seu spira sup datá rectá occultam A F describatur semicirculus A C F, inde ponatur quantalibet distia aliud centrú I iuxta centrú E, et ex hoc centro ex E contracto circino aliquantulú describes ex A semicirculú A S quod coincidet cu precedente A C F, sed terminabitur in S. hoc facto, pone pedem circini in centrú E et ab S semicirculi ante facti, describe aliú semicirculú S P quod terminabitur in P, deinde pone iterú pedem circini in centro I, et ex P in V denuo describe semicirculú, et hoc toties facies, donec figura coeat in centro. i

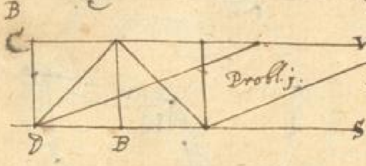


Problemata Geometria Isopimetra. f.

De similitudine figurarum, vel de augendis minuendisque figuris.

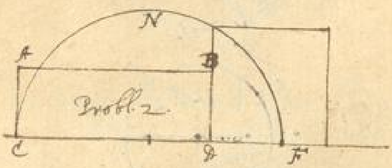
Problema j. Dato quadrato parallelogramo ei aequale describere, et dato quouis angulo, ei aequale parallelogrammú, aut quadratú. f. Sit datú quadratú A B C D, cui aequale debeat describi parallelogramum, extendatur latus quadrati A D et basis B C vsque in S V. et sup basin quadrati B C parallelogramum construatur inter parallelas C D et V S. dico illud esse aequale quadrato iuxta theorema 12. exemplú hic est, N M O P parallelogramú aequale quadrato; si vero duples basin quadrati D B et sup duplicatá basin construatur inter parallelas C D et V S angulus quantuscunque, dico eu esse aequalem quadrato. f.





Corollar: ex hoc problemate, oes figurae trigona tetragona in infinitum augeri, et minui possunt, si n. basin D B duples, habis parallelogramum duplo maius quadrato dato, similiter si cupis describere parallelogramum, quod 4 partem quadrati contineat, diuide basin quadrati in 4 aequales partes, et ad basin 4ae partis inter parallelas construe parallelogramum, et habis petitum. f. f.

Probl. 2. Dato parallelogramo aequale quadratú ei describere sit datú parallelogramum A B C D. cui oportet aequale quadratú describere, latus quadrati D B iungatur basi C D, in directum, siue protrahatur C D in F, ita vt D F aequale sit D B, postea sup lineá C F describatur semicirculus C N F. et linea B D ad peripheriá circuli ducta dabit

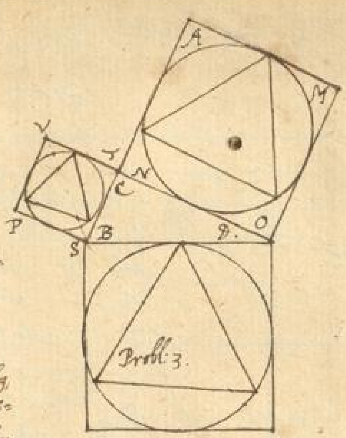


dabit latus quadrati, quod aequale sit parallelogramo. +

Probl. 3. Datis duobus quadratis, triangulis aut circulis, aequale eis quadratum, triangulum aut circulum describere. +

Sint data duo quadrata VTSP et AMNO, quibus inscribantur circuli et circulis triangula, quaeritur, quod debeat dari quadratum quadratis, circulus circulis, triangulus triangulis aequalis; constituatur ex lateribus duorum quadratorum, triangulus rectangulus BCD, et super basin subtendentem angulum rectum construatur quadratum, huic inscribatur circulus, circulo triangulus; dico quadratum hoc esse aequale duobus quadratis alijs, circulum circulis etc. iuxta Theor. 13.

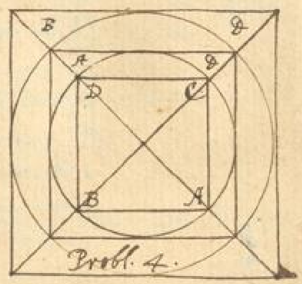
Coroll. Cum hoc divinum inventum non habeat finem inventionum, poteris quamcunque figuram datam aequalem facere duabus alijs datis inaequalibus, et e contra; nam si dato quadrato rectangulo quovis, a latere quasvis figuras descripseris, sibi tamen similes, semper eadem figura ex subtendente descripta, erit dupla ad duas a lateribus descripta. +



Probl. 3.

Probl. 4. quadratum multiplicare. +

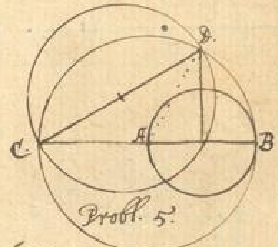
Nota. sicut se habet quadratum ad quadratum, sic circulus ad circulum ijsdem quadratis inscriptum, ita ut, si quadratum ad alterum sit duplum, eadem analogia quoque se habeant circuli ijsdem inscripti. Multiplicatur itaque circulus a quadrato, describatur quadratum iuxta coroll. probl. 5, quod sit ACBD, ducto diagoneo DC iuxta datum diagoneum describatur alius circulus, et circulus circundetur alio quadrato; dico quadratum hoc esse duplum ad quadratum BCDA, sicut et circuli ijsdem quadratis inscripti; quia DAC angulus rectus est, unde cum quadrata CA et AD simul iuncta sint aequalia CD quadrato, quod quadratum BD duplum est quadratorum CA, AD. +



Probl. 4.

Probl. 5. Datum circulum 3plum, 5tuplum, 7tuplum facere.

Sit dati circuli diameter AB, quem volumus 3plare, elongetur AB in C, et sit AB aequalis AC et sit AB aequalis AD, dico circulum ex DC descriptum esse 3plum priori datum. +



Probl. 5.

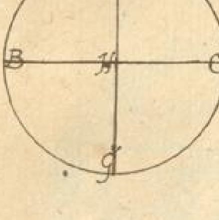
Finis Tractatus tertij.

Tract. 4

Tractatus 4 de Geometria Practica.

Pars 1a de doctrina sinuum.

Sinuum doctrina nihil est aliud quam scientia quantitatis rectarum linearum in circulo subtensarum, ad semidiametrum eiusdem circuli in certas partes divisam habentium certam proportionem, quae cum infinitum usum habeat, in omni negotio mathematico, ideo de hac dicendum restat.

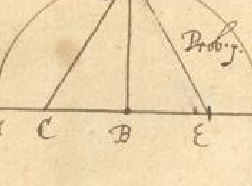


Definitiones. 1o. subtensa linea quae et chorda dicitur, est recta in circulum inscripta, totum circulum in duo segmenta dividens, et utrumque segmentum pariter subtendens, talis est in adiuncta figura, recta BC quae dicitur subtensa arcus BCD et BCG.

2o. sinus rectus, sive rectus primus, est dimidium subtensae seu chordae subtendentis duplum eius arcus, cuius dicitur sinus rectus; ut recta BH est sinus rectus arcus BDG et arcus BDG. quae est dimidium subtensae BC, subtendentis duplum arcus BD et duplum arcus BIG. sic CH est rectus sinus CD et arcus CIG.

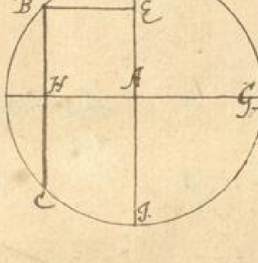
3o. sinus versus, quae et sagitta dicitur, est pars diametri inter arcum et sinum rectum intercepti, ut sinus versus arcus DB vel DC est BH recta, et sinus versus arcus BIG vel CIG est recta HG. et sinus versus arcus BF est EF.

4o. sinus complementi, quae et sinus rectus secundus dicitur, est sinus rectus illius arcus, quo datus arcus a quadrante differt, ut recta BE est sinus complementi arcus DB et arcus BFG. est enim sinus rectus arcus BF, quo prior datus arcus a quadrante superatur, et quo posterior datus quadrantem superat, sic recta BH est sinus complementi arcus DF et arcus BCI, cum sit sinus rectus arcus BD.



5o. sinus totus est semidiameter circuli, hoc est, sinus rectus, et sinus versus quadrantis, ut FA et DA dicitur sinus totus, quia omnium sinuum maximus est, cum gradibus 90. circuli quadranti respondeat, atque hic est basis omnium sinuum aliorum, quem dividunt Astronomorum alii in 100000 alii in 10000000. alii in plures particulas, ut harum partium ratione alios sinus metiantur, et proportiones omnium sinuum ad sinum totum exprimant; nobis satis erit in 1000 partes divisisse, pro dimensionibus tam geometricis, quam astronomicis.

Problema primum.

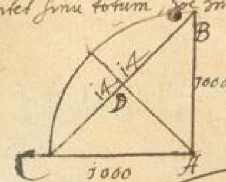


Data semidiametro, seu sinu toto 1000 partium quantitatem linearum subtendentium arcus 60. 36. 72. 18 reperire. Sit data circuli semidiameter AB, eidem aequale erit latus hexagoni eidem circulo inscripti per propositionem 5 probl. 5. atque hoc est subtensa sextae circuli partis, hoc est 60 graduum. porro dividatur semidiameter bifariam in E et ducta recta ED abscindatur iuxta problema 7. ei aequalis CE, ex qua subtracta CA relinquitur BC latus decagoni eiusdem circuli, hoc est arcus 36. hac praxi additis quadratis DB et CB notis, si a producto extrahas radicem quadratam, nota erit CD linea, iuxta 15 theor. Pythagorae. a qua si subtrahas lineam CB, nota habebis BE lineam, seu

seu decagoni latus subtensum gradibus 36, iterum quadratum DE inventum addatur quadrato sinus totius BD et extracta radice quadrata dabit lineam DE, latus pentagoni seu subtensam 72 gradibus.

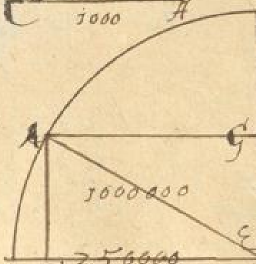
Probl. 2. Dato sinu toto 1000 partium, sinum rectum arcus 45 graduum invenire.

Cum sinus rectus sit cum sinu verso quadrantis subtendens, et utrumque representet sinum totum, hoc inito cognoscens illi hac praxi: quadratum sinus recti quadrato sinus versi iunge, latus summae* dabit subtensam arcus 90, cuius dimidium est sinus quaesitus. ut quadratum sinus recti CA est 1000 partium, quadratum sinus versi BA similiter est 1000 partium, quorum quadrata addita faciunt 2000000, cuius radix quadrata dabit subtensam arcus 90 graduum, cuius dimidium quaesitum dabit sinum 45 graduum. demonstratio pendet ex prop. 15 Theor. Pythag:



* sive radix quadrata.

Probl. 3. Dato sinu recto arcus quadrante minoris, sinum complementi eiusdem arcus reperire. Quadratum sinus recti aufer ex quadrato sinus totius, latus residui est sinus complementi. EG. quadratum sinus totius AE est 1000000. quadratum sinus recti EF arcus 30 graduum est 250000, hoc deducto de sinu toto manent 750000, cuius residui latus dat sinum complementi FA, vel EG. Sic ages de reliquis sinibus investigandis, quod facile fieri poterit, si primarijs sinibus erutis, reliquos subsidio regulae trium invenias.



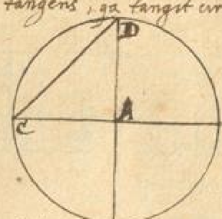
Sequitur Tabula sinuum rectorum, seu semichordarum posito sinu toto 1000 partium.

Min.	0	1	2	3	4	5	6	7	8	9	10	11	
0	000	17	34	52	69	87	104.	121	139.	156	173.	190	45
15	4	21	39	56	74	91	108	126.	143	160	177.	195	30
30	8	26	43	61	78	95	113	130	147	165.	182	199	15
45	13	30	47	65	82	100	117.	134	152	169	186	203	0
Min.	12	13	14	15	16	17	18	19	20	21	22	23	
0	207	224	241	258	275	292	309.	325	342.	358.	374	390	45
15	212	229	246	263	279.	296	313.	329.	346.	362.	378	394.	30
30	216	233	250	267	283	300	317.	333	350	366.	382	398.	15
45	220.	237.	254	271	288	304	321	337.	354	370	386	402.	0
Min.	24	25	26	27	28	29	30	31	32	33	34.	35.	
0	406.	422	438.	453.	469.	484.	500	515.	529.	544	559.	573.	45
15	410.	426.	442.	457.	473.	488.	503.	518.	533	548.	562	577.	30
30	414.	430.	446	461	477.	492	507.	522	537.	551.	566.	580	15
45	418.	434.	450.	465.	480	496.	511	526	540	555	569.	584.	0
Min.	36	37	38	39	40	41	42	43	44	45	46	47.	
0	587.	601	615	629.	642	656	669.	681	694	707.	719.	731	45
15	591	605	619.	632.	646	659.	672	685.	697.	710.	722	734.	30
30	594.	608	622	636.	649.	662	675.	688.	700	713.	725.	737.	15
45	598.	612.	625	639.	652	665	678.	691	704	716	728.	740.	0

m	48	49	50	51	52	53	54	55	56	57	58	59	
0	743.	754.	766.	777.	788	798	809.	819.	829	838.	848	857	45
15	746	757.	768.	779	790	801.	811	821	831.	841	850	859	30
30	748.	760	771	782	792	803.	814.	824	834	843.	852	861	15
45	751	763.	774.	785	796.	806	816	826	836.	845	854	863	0
m	60	61	62	63	64	65	66	67	68	69	70	71.	
0	866	874.	882.	891.	898.	906	913.	920	927	933	939.	945.	45
15	868	876.	884.	892	900	908	915	922	928	935.	941	946	30
30	870	.878	887.	894	902	909.	917	923	930	936.	942	948	15
45	872	880	889	896.	904	911	918	925	932	938	944	949	0
m	72	73	74	75	76	77	78	79	80	81	82	83.	
0	951	956.	961	965	970	974	978	981.	984.	987.	990	992.	45
15	952	957.	962	967.	971	975	979.	982.	985	988	990.	993	30
30	953	958.	963.	968	972	976	979.	983.	986	989	991.	993.	15
45	955	960	964.	969	973	977	980.	984	986	989.	992	994	0
m	84	85	86	87	88	89	90						
0	994.	996	997.	998	999	999	1000						45
15	994	996	997.	998	999	999	1000.		Finis Tabulæ Sinuum				30
30	995	996	998	999	999	999	1000						15
45	995	997	998.	999	999	999	1000		Hesdinij in Artesia 1632 3° Marij				0

Appendix de sinubus tangentibus et secantibus. Definitiones.

1a. Sinus tangens, quem alij prosinum vocant seu adscriptam, est linea perpendiculariter, et in puncto tangens semidiametrum circuli simul et extimam circuli superficiem, ut linea AD est tangens, quae tangit circulum una cum semidiametro CA in puncto A.



2a. Secans quam alij hypotenusam vocant, seu transsinuosam, est linea recta ex centro per eundem arcum, quem secat, ad tangentem usque ducta, cum qua angulum facit; ut linea CD. basis denique est semidiameter eiusdem circuli, super quam lineae praedictae fundantur ad constituendum triangulum rectangulum, cuius basis semper est sinus totus.

Fabrica tabulae tangentium et secantium, ex tabulis sinuum.

Ex tabulis sinuum rectorum construes tabulam sinuum tangentium et secantium sic: si sinus arcus cuiuslibet in sinum totum multiplicetur, quod fiet facile, si ei ad dexteram tot, 0, quot in sinu toto continentur, nempe tria (ut nobis) vel 5 si sinus totus sit 5. 0, productusque numerus dividatur per sinum complementi eiusdem arcus, invenietur tangens illius arcus, cuius sinum rectum in totum multiplicasti; ut si tangens graduum 30 quaeratur, adiungemus eius sinui 500, tria, 0, hoc modo 500000, et hunc numerum per 866 sinum complementi eiusdem arcus partieris, nam quotiens dabit tangentem arcus graduum 30, scilicet 577. iterum si sinus totus in seipsum multiplicetur, numerusque productus per sinum complementi cuiusvis arcus dividatur, reperietur secans illius arcus per cuius sinum complementi divisio facta est; ut si secans 30 gr. quaeretur, divide quadratum sinus totius per 866 sinum complementi arcus 30 graduum; numerus quotiens 1154 dabit quaesitum; non secus in aliis facies.

Tabula

Tabula sinuum tangentium et secantium.

	Tangens	Secans	Tangens	Secans	Tang.	Secans	Tang.	Secans	Tangens	Secans	Tangens	Secans
	10		11		12		13		14		15.	
0	176	1015	194	1018	212	1022	230	1026	249	1030	267	1035
15	180	1016	198	1019	217	1023	235	1027	253	1031	272	1036
30	185	1017	203	1020	221	1024	240	1028	258	1032	277	1037
45	189	1017	208	1021	226	1025	244	1029	263	1034	282	1039
	16		17		18		19		20		21	
0	286	1040	305	1045	324	1051	344	1057	363	1064	383	1071
15	291	1041	310	1047	329	1052	349	1059	368	1065	388	1072
30	296	1042	315	1048	334	1054	354	1060	373	1067	393	1074
45	300	1044	320	1049	339	1056	359	1062	378	1069	398	1076
	22		23		24		25		26		27	
0	404	1078	424	1086	445	1094	466	1103	487	1112	509	1122
15	409	1080	429	1088	450	1096	471	1105	493	1114	515	1124
30	413	1082	434	1090	455	1098	476	1107	498	1117	520	1127
45	419	1084	440	1092	461	1101	482	1110	504	1119	526	1129
	28		29		30		31		32		33.	
0	531	1132	554	1143	577	1154	600	1166	624	1179	649	1192
15	537	1135	560	1146	583	1157	606	1169	630	1182	655	1195
30	542	1137	565	1148	589	1160	612	1171	637	1185	661	1199
45	548	1140	571	1151	594	1163	618	1175	643	1189	668	1202
	34		35		36		37		38		39	
0	674	1206	700	1220	726	1236	753	1252	781	1269	809	1286
15	680	1208	706	1224	733	1240	760	1256	788	1273	817	1291
30	687	1213	713	1228	739	1244	767	1260	795	1276	824	1295
45	693	1217	719	1232	746	1248	774	1264	802	1282	828	1300
	40		41		42		43		44		45	
0	839	1305	869	1325	900	1345	932	1367	965	1390	1000	1414
15	846	1310	876	1330	908	1350	940	1372	974	1396	1008	1420
30	854	1315	884	1335	916	1356	948	1378	982	1402	1017	1426
45	861	1320	892	1340	924	1361	957	1384	991	1408	1026	1433
	46		47		48		49		50		51	
0	1035	1439	1072	1466	1110	1494	1150	1524	1191	1555	1234	1589
15	1044	1446	1081	1473	1120	1501	1160	1531	1202	1561	1245	1594
30	1053	1452	1091	1480	1130	1509	1170	1539	1213	1572	1257	1606
45	1063	1459	1100	1487	1140	1516	1181	1547	1223	1580	1268	1615
	52		53		54		55		56		57.	
0	1279	1624	1327	1661	1376	1701	1428	1743	1482	1788	1539	1836
15	1291	1633	1339	1671	1389	1711	1441	1754	1496	1799	1554	1848
30	1303	1642	1351	1681	1401	1722	1455	1761	1510	1811	1569	1861
45	1315	1652	1363	1691	1414	1232	1468	1776	1525	1823	1583	1874

Min.	tangens	secans	tangens	secans	tangens	secans	tangens	secans	tangens	secans
Min.	58		59		60		61		62	
0	1600	1887	1664	1941	1732	2000	1804	2062	1880	2130
15	1615	1900	1680	1955	1749	2015	1822	2079	1900	2147
30	1631	1913	1697	1970	1767	2030	1841	2095	1920	2165
45	1647	1927	1714	1985	1785	2046	1861	2112	1941	2184
Min.	63		64		65		66		67	
0	1962	2202	2056	2281	2144	2366	2246	2458	2355	2559
15	1983	2221	2073	2301	2169	2388	2272	2482	2384	2585
30	2005	2241	2096	2322	2194	2411	2299	2507	2414	2613
45	2026	2260	2120	2344	2219	2434	2327	2533	2444	2640
Min.	68		69		70		71		72	
0	2475	2669	2605	2790	2747	2923	2904	3071	3077	3236
15	2506	2698	2639	2822	2784	2959	2945	3111	3123	3280
30	2538	2728	2674	2855	2823	2995	2988	3151	3171	3325
45	2571	2759	2710	2891	2863	3033	3032	3193	3220	3372
Min.	73		74		75		76		77	
0	3270	3420	3487	3627	3732	3863	4010	4173	4331	4445
15	3322	3469	3545	3684	3798	3927	4086	4207	4419	4531
30	3375	3520	3605	3741	3866	3993	4105	4283	4510	4620
45	3430	3573	3667	3801	3937	4062	4246	4362	4605	4713
Min.	78		79		80		81			
0	4704	4809	5144	5240	5671	5758	6313	6392		
15	4807	4910	5267	5361	5819	5904	6497	6573		
30	4915	5015	5395	5487	5975	6058	6691	6765		
45	5027	5125	5530	5619	6140	6221	6896	6968		

Finis Laus Deo. V: M: Marie

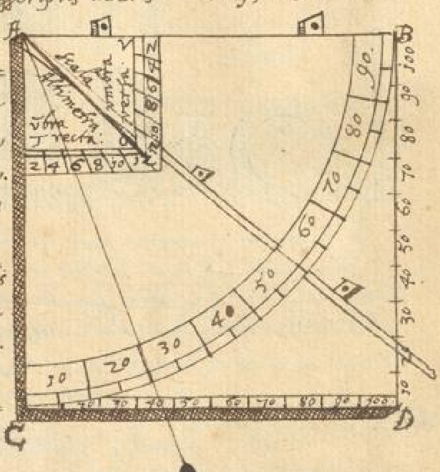
André Weicque a faict cela en la ville de Hesdin
An: 1632, troisiesme iour de May.

Pars 2a Applicatoria. De Instrumentorum Geometricorum confectione.

Consistit tota Geometria practica in 3bq; jo in lineaꝝ rectarū dimensiōe, q etiā ideo gramo=metria dr̄, ad qm reuocant omnium altitudinum, longitudinū et profunditatum dimensiōes. 2o in superficierū inuestigōe, q et planimetria dr̄, ad qm reuocant Ichnographia, Geodesia, Chorographia, qbq adde geographiā, qbq expediunt agroꝝ, syluaꝝ, montiū, regionū, et prouinciaꝝ dimensōes. 3o in corporū solidoꝝ dimensōe, q et stereometria dr̄, ad qm reducunt conorū, columnarū, cuboꝝ, vasorū, sphæraꝝ, similiūq accurata dimensio. de qbq oibq in serie huiq tractatq.

Problema j. quadrantem et quadratū Geometricū delineare.

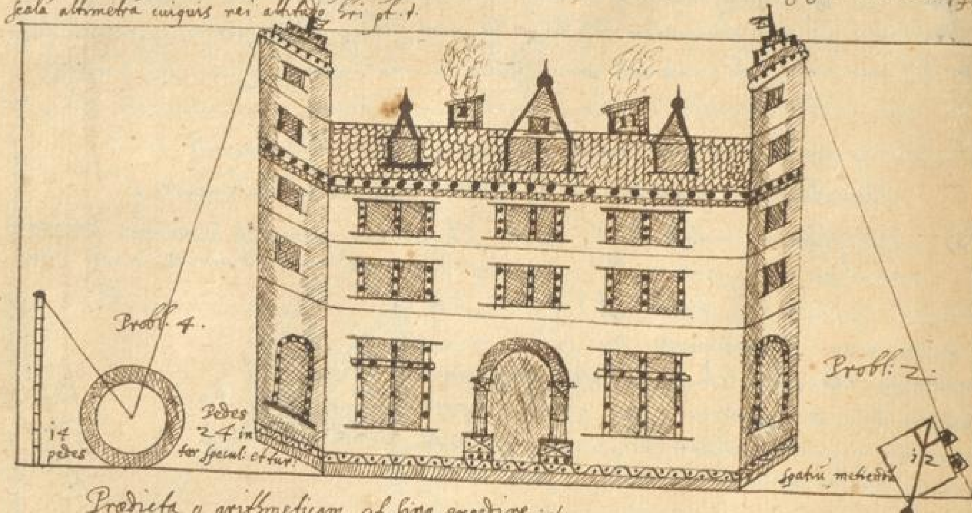
Fiat ex ligno solido aut metallo tabula quadrata A B C D, ex puncto A describatur quadrans B C, q accuratissē iuxta ppoēm 5 pbl. 5. in 90 gradq cū asscriptis numeris diuidatur; iuxta hunc quadrantem describatur aliud quadratum A I V O, cuiq latq I O diuidatur in 12 aequales partes, sicut et latq O V. vocabiturque latq I O umbra recta, q nil ē aliud, qm spatium tale, in qd si cadat ppendiculū, semp abscindit lineam, v: umbrā minorem re eleuata seu gnomone, A I. latq v. O V vocatur umbra versa, qd nil aliud ē, qm spatiū illud, in qd si cadat ppendiculū, aut linea fiducia, ostendit spatiū illud eē maiq re eleuata seu gnomone A I. His ita positis maiq quadratū A B C D circa quadrantem B C descriptū sic diuides, latera D C et C B diuides in 100 aequales partes. His n. rite descriptis, imponantur lateri A B duo dioptra seu pinicidia, deinde ex puncto A quadrantis, demittatur ppendiculū, vel filū cū plumbo, una cū regula mobili suis instructa dioptris, et paratū habebis instrumentum.



Probl. 2. Data quauis turri, domo etc. unica statioē earū altitudinē absq ulla aritmetica, subsidio quadrantis metiri. Cum volueris metiri rem aliqm altā, et liberū accessū hre potueris, pone regulā in scala altimetra sup 12 punctū, libratoq instrumento p ppendiculum accede et recede, donec aspicias rei eleuatae fastigiū, hīs factis metire spatiū inter te et turrim, nā quot passq, aut pedes inueneris, tot turrim vel domū passibq pronūtiabis altam eē, sine ulteriore inuestigōe, (addita interim illi spatio tua statura usq ad oculos). si v. aspecto fastigio ppendiculū ceciderit in punctū 6 umbrae rectae, nūerabis spatiū inter te et rem eleuatam, hoc n. duplicatū dabit altitudinē rei. 6 n. ad 12 ē in dupla pportioē, qd si 24 pedes inueneris, dices domū eē altā 48 pedibq, qbq semp adjicies tuā staturā, si v. ceciderit in punctū 4 umbrae ~~recta~~ aspecto fastigio, dimenso spatio inter te et rem eleuatā, dices umbrā

3plā

3plā eē int̄ te et rem eleuatam: quare si inuentos pedes vg 20 3ples, dices rem eē altam 60 pedibq; si iterū ceciderit in 3 punctū vmbræ rectæ, dices vmbrā eē 4ruplā ad rem eleuatam. qđ si ceciderit ppendiculum in vmbrā versam, atq adeo in 3 partem, dices vmbrā eē 3plo maiorem, q̄m rem eleuatam, quare inuentorū pedū aut passuū int̄ te et rem eleuatā, 4ta pars dabit altitudinē rei. si in 4 punctū, inuentorū 3a pars. si in 6. inuentorū pedū 2da pars dabit altitnem rei eleuatæ, et sic de cæteris; q̄d sine aritmetica, p solā scalā altimetrā cuiquis rei altitudo sciri pt. +



Prædicta p aritsmeticam et sinq expedire. +

Si ceciderit ppendiculū in punctū p̄uis vg. 6 in supiori seu paruo q̄drato vmbræ rectæ, vel 50 in inferiori, dic: sicut se hīt 6 dimidiū sc. lateris geometrici q̄drati ad 12 totū latq, v: sicut se hīt 50 ad 100, sic se h̄t spatiū int̄ te et rem eleuatā vg. 50 pedū, facta opē iuxta regulā triū inuenies turrim eē altā 100 pedibq. +

Per sinq tangentes et secantes dic: vt totq sinq seu radiq a.c. 1000 partiū se h̄t ad tangentem A G arcq gradū 63 et 30 minut: q tangens ē partiū 2005, sic 50 ad rem mensurandæ tangentē; fractio hæc $\frac{250}{1000}$ et 100 facta opē pdibunt. +

A

Probl. 3. subsidio simplicis styli, eiq̄demq piectiōe vmbræ cuiusq rei altitnem metiri, accipe stylū pedalem A B q̄m in 12 æquales partes diuides et infiges ppendiculariq in lineali B C in 30. 40 aut 50 partes æquales styli partibq diuiso, et h̄is instrntm paratū. Vsq. lucente sole instrnto ad libellam posito hinc inde vertes tā diu, vsq dū stylq solis radijs obuersq vmbrā suā pjciat sup lineale, et statim videbis in partibq ab vmbra abscissis, q̄ntū vmbra styli excedat, v: excedat a stylo. Vg. abscindit 14 partes. quare mensa vmbra turris vel domq, inuentisq vg. 24 pedibq dic. 14 dant 12 q̄ntū 24. et facta opē h̄is sciti.

Probl. 4. p speculū inuestigare altitnes rerum. +

Pone speculū planū in pspectu rei eleuatæ in ipsā superficiem terræ, et para baculū, q tuā vsq ad oculos aeqt staturā, cui certas insculpes diuisiōis notulas vg. 12, iuxta quas rei metiendæ longitudinē depstendas; quo facto accede et recede a speculo, donec rei eleuatæ summitem in speculo p baculi recti extremitatem videas, talis n. erit pportio int̄ ipsū speculū et basin rei metiendæ ad ipsā altitudinē, qualis ē int̄ pedes tuos et

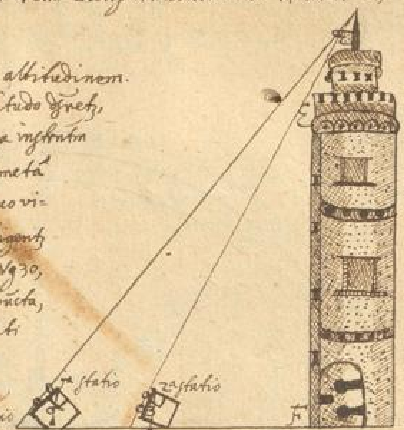
B.

speculū et staturā tuā vsq ad oculū. quare inuentis partibq int̄ te et speculū æqualibq partibq baculi

vg.

Vg. inuentis 14 inter te et speculu, et 24 inter speculu et rem mensurandam dic: 14 dant 12, qd 24. facta ope pdibit rei altitudo. /

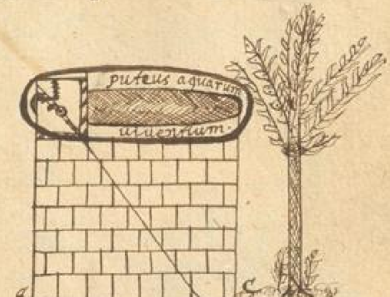
Probl: 5. p duas statioes metiri cuiusq rei altitudinem.



Esto pposita turris EF circumposito lacu impedita, cuius altitudo qrett, elige locu planu duabus stationibus aptu, in pa qo statioe leua instrutu cadente ppendiculo supra punctu 6, viso rei fastigio, signabis qo meta huius stationis pa, pressq alia accedendo et recedendo, vsq du denuo videas fastigiu rei, ponamqq regula abscindere 3 punctu, qd diligent notandu, numerabis deinde passq, q st inter vtramq statioem Vg 30, ablatis autem his 3 punctis a 6 prius inuentis remanebunt 3 pucta, q st 4a pars duodenarij, qo 30 pedes inter duas statioes numerati erunt 4a pars turris; erit igitur turris alta 120 pedum. /

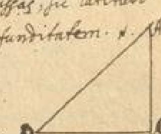
Aliter.

Sit accessu difficilis altitudo EF, stringatq pa radij visualis brsuio obseruao in puncto H et incidat idem radius visualis ad punctu J. cadat autem filu in C aut 12, erit igitur latq ad latq, sicut vnu ad vnu, postmodu retrocedendo 2du radij visualis incidentia, pdenter examiabis, qm partem filu abscindat in latere AB ad punctu E sitq EB partiu 4. qualiu item latq 12, et qa 4 3pla st pportionem ad 12, seruabis tria; his factis subtrahe pu denoiatorem scilt vnu ab vltimo, tribq, remanebunt 2, qbq diuides pedes inter pa et 2da statioem inuentos Vg. 30 et quotiens dabit altinem rei 15. /



Probl. 6. Profunditates reru metiri. /

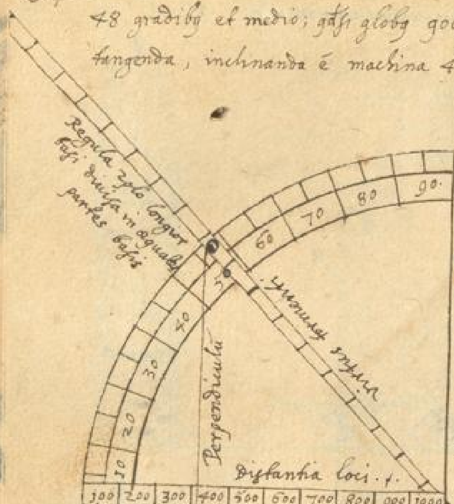
Sit putei AC pfunditas mensuranda, sic ages: statue qdratu tuu sup orificiu putei parallelit, et regula cu dioptris hinc inde verte, vsq du videas superficiem aq 3minantis superficiem muri, his factis nota partes ab regula abscissas, q sint Vg. 3 mensurata demu latitudine fontis, et inuentis 6 Vg. pedibq dic: sicut se ht totu latq qdrati ad partes abscissas, sic latitudo fontis ad sua pfunditatem, dic go p regula aurea 3 dant 12. 6 qntu, facta ope inuenies pfunditatem. /



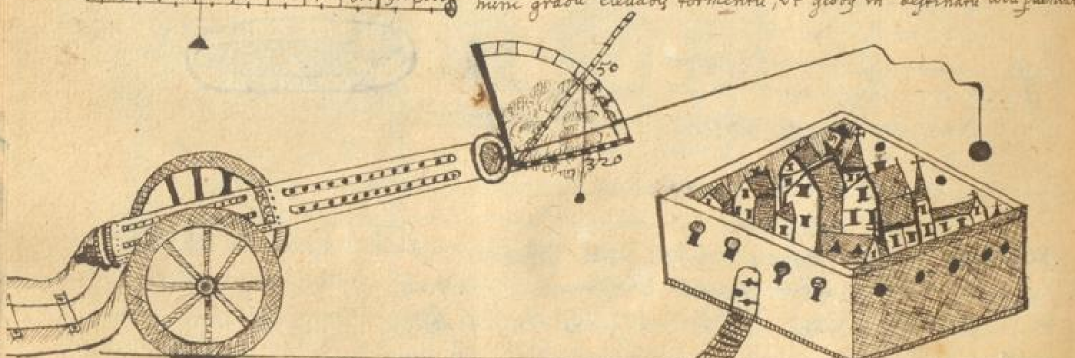
Probl. 7. De Eiaculatione tormentorq. /

Notanda st tria in 3angulo rectangulo, po linea ppendicularis AC. 2o basis CD. 3o hypotenusa AD, qm potissimu obseruare debent artifices tormentoru explodendoru, cuius praxis hec est. Cum qs globu igneu eiicere conatq et certu scopu tangere, oportet illu in primis scire vim illius machina ac deinde distiam loci, in qm eiaculari conatq; cognitis his duabq distijs, q se hnt adinstar basis et hypothenusa, inclinanda e machina iuxta affixi qdrantis normula, vt globq hypothenusa tramitem recte incedat, ac deficiens in cursu suo descendendo cadat in destinatu locu: Ne a. hic artifex erret. NB machina poe impellere globu E graa 800 pedibq aut passibq. inclinandq e qdrans machina affixq vna cu machina 48 gra=

48 gradibus et medio; quasi globus 900 passibus hypothenusa continuare valet, et machina abest a re tangenda, inclinanda est machina 45 grad: verum ut haec omnia in praxi melius videas, construe quadrantem sic:



Basin quadrantis diuides in 500 aut 1000 partes, cuius centro affiges regulam basin 2plo excedentem in aequales, quaelibet partes similes partibus basis diuisam; atque hae diuisiones sufficient quibusuis tormentis explodendis. Usus est iste: explosurus tormentum in ciuitatem inuestiga prius distantiam tormenti a scopo, iuxta geometriam, et inventum numerum pedum a passuum vg. 320 quaere statim in basis quadrantis partibus, et hunc diligenter notato. in hypothenusa deinde quaere virtutem tormenti vg. 600 pedum, hisce m. notatis in regula applica perpendiculum in puncto, 0, dimittatque super basis lineam, deprimendo nunc vel eleuando, usque dum perpendiculum abscindat gradus 320 in linea basis distantiam scilicet inter tormentum et scopum, his factis vide quem gradum in quadrante abscindat regula, et iuxta hunc gradum eleuabis tormentum, ut globus in destinatum locum perueniat.



Probl: 8 Radium Geometricum fabricare.

Accipe baculum ex solido ligno quadratum, quem diuides in 4 aut 5 aequales pedes geometricos, et unumquemque pedem iterum in 12 partes aequales. 2o accipe alium baculum pedale statim in 12 partes aequales diuisum, quem praedicto baculo 5 pedum ita transuersum infiges, ut volui et reuolui pro utentis arbitrio possit ad perpendiculum, et erit instrumentum paratum. Usus: si uis rem metiri sine arith: Elige planum aliquod duabus stationibus aptum, et radium seu baculum eleua versus altitudinem mensurandam, imposito prius ad primam diuisionem transuerso baculo, et ex A. respice per extremitatem utramque cursoris, donec tam apicem quam basin rei mensurandae videas. Hoc facto retrocede 2dum rectam lineam, imposito cursore ad 2dam sectionem pedis, tamque recede, donec iterum basin et apicem rei altae cernas per extremitates cursoris, deinde metire spatium inter primam et 2dam stationem, numerusque inuentus dabit altitudinem rei. Per arithm: dic. 12 dant 60, quantum dant 24 pedes inuenti inter primam et 2dam stationem

De pla=

De Planimetria Geodesia et Ichnographia. +

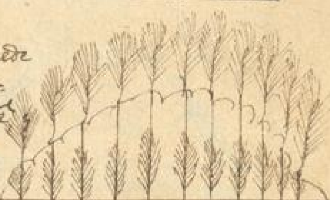
Planimetria seu Geodesia nihil ē aliud, qm scia mensurandi superficies, ichnographia ē scia mensurandi sylvas, montes, agros, oppida, provincias regiones ad pedem cū oībg plateis et angulis ea pportioē, vt oīs earū capacitas statim in pedibg, passibg, slibg, figuris dari poit. +

Probl. 1. latitudinem alicuiq fluvij, prati etc. subsidio qdrantis, a qdrati geometrici metiri. Ascende turrim, aut sle qd, imobilitg collocato qdrato supra lymbū fenestræ, ita vt latera pprdicularia qdrati turri sint parallela, respice signum in littore trans fluviū positū, et nota quale vmbram vel gradū tibi regula abscindat, si n. vltra 12. sextā partem absciderit, dices, altitudinem turris aut domq eē dupla latitudinis, si 4ta, 3pla, si in 3a, qdruplam, si in 12, æquale, sin citra 12 absciderit 6, dicas turrim eē subdupla et sic de religs pportioibg. +

Per Aritbm: sic opabere, cadente linea fiduciæ vltra 12 in 6. dic. 6 dant 12, qntū altitudo rei cui insisto, Vg. 20 pedū, facta opoē pdeunt 40 pedes latitudo fluvij. +

Per sinq tangentes et secantes. qre tangentem gradq in qdrate abscissi, ille n. dabit latitudinem rei, reiecta priq vna figura a dexteris, posita turri 100 pedū. p aritbm. sinuū sic. singtotg 1000 partiū. sit tangentem arcq 60 graduū Vg. 1732, qntm dabit 20. facta opoē prodibit latitudo fluvij. +. +. +. +.

Probl. 2. Radio geometrico qmuis latitudinem metiri.
Designa tibi in vtraq ripa fluminis signū, his positis accede et recede cū baculo geometrico, ponendo cursorem sug pa divisioēm, donec pextremites cursoris videas vtrūq signū in ripis positū; signata igit pa statoē, positoq cursore sug 2a divisioēm retrocedendo, donec pdicta signa demio p extremitates cursoris tibi appareant, his ita factis metire spatiū int vtraq statioē, et nuerq pedū dabit latitudinē rei, n seq mensurabis latitudinē sectorum. +. +



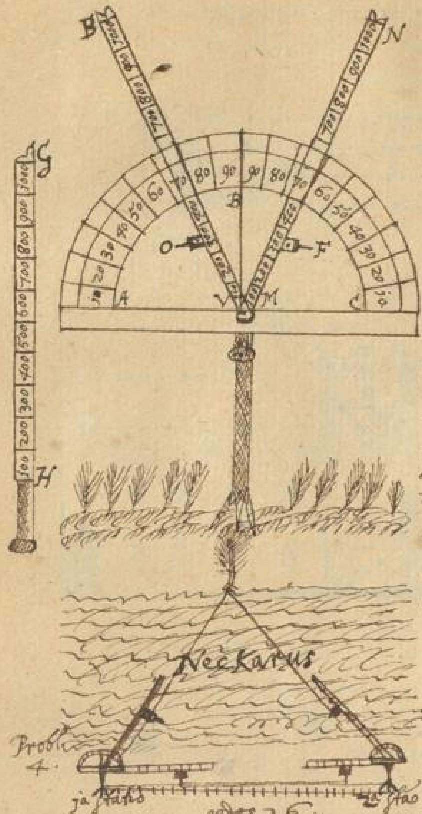
n crescut plures arbores in montibg qm in plano ob lineā pprdicularē. +

Probl. 3. Instrntm Geometricū holometrū fabricare, cuiq subsidio facilla roē cuiqus rei mensurationem expedire poimq. fiat semicirculq ABC ex solido ligno vel ære, cuiq diameter sit pedalis, relicto tn. semicirculi diametrū spatio aliquo indifferentis magnitudinis; semicirculq porro dividat in 180 partes seu in duos qdrantes, hic n. 90 faciut 180, ascriptis nuēris, his factis fiant duæ regulæ ex sli ligno VB, MN, q ita in centro affigent, vt claudi et apiri point, p libitu vtentis, ad modū instrnti partiū, has divides in 1000 æquales partes, posito in vnaquaq vno dioptro mobili OF. his parat is accipe alia regula GH ab alijs separata et libera in 1000 quoq divisa partes, q dicet deinceps applicatoria, NB. tn. in centro apicem poni debere, vbi regulæ centro circuli imponunt; et paraveris instrntm.

Vsq circa +

Vsq circa latitudines investigandas p duas stationes.

Probl. 4.



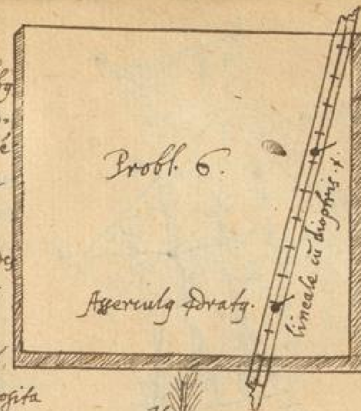
Latitudiné Meni, Rheni etc. p duas stationes investigare. +.
Selige locú aliqm planú in littore, et metire chorda aliqua
spatiú plani qdlibet, cuiq spatij extrema repsentabunt statioes
quare diligent baculo, aut visibili signo notabis. His ita factis
accede 1a statioem, et obverte instrumenti semicirculú versq aquas
vná a. ex mobilibq regulis versq alterius statiois signú. altera v.
regula respice signú trans flumen positú, et firmatis regulis p=
cede ad 2dá stationem, in qua simlit obverso semicirculo aqs
instrumtm cú pede verte, donec p 1á regulá videris prioris
stationis signú, hoc viso numera pedes int 1á et 2á statioem iá
ante p chordá inventos Vg. 26 in eadem regula, q directaé
versq signa stationú, et ad finé volve dioptrú, firmatoq in=
strumto respice signú trans fluen positú p dioptrú utriq iacet
2a regula, quae dioptra tam diu volves sup regulas, donec
cú signo trans fluen posito vná lineá efficiant; his positis
applica baculú separatú GH ab uno dioptro ad alterú, et
abscindet tibi latitudo fluminis in regula. +. +. +.

Probl. 5. Altitudines rerú pdicto instrumto metiri.
Affigat circulq ABC trochlea ad latq pedis instrmti in hunc
finé aptatae, ita ut in altú circulq erectq sit, hoc facto diri-
ge inferiorem regulá versq rem mensurandá, eaq bene firma-
ta, alterá regulá eleva et deprime, donec p dioptra rei
fastigiú appareat, hoc sto firma regulá, et in inferiori regula,
seu fundamentali tot pedes numerabis, qt pedes inventi p certá aliqm mensurá int te et rem
mensurandam, sup ultimú a. pedem pone baculú GH ei ppendiculariter insistentem, et nota
qt pedes abscindant a regula illa GH repsentante hypothenusá, tot n. pedibq alta erit res. +

Probl. 6. instrumtm Ichnographicú, seu Geodeticú fabricare. +.

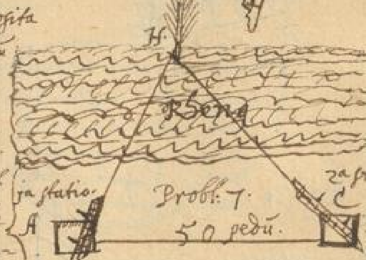
Fac tibi assercululú bene planú, et qdratú cuiqlibet magnitudinis, hoc adaptabis pedi ea róe, ut
imobilit et plané in eo iaceat, folia quoq chartacq cera ita agglutinabis asseri, ut tn. demere,
si libuerit pois, hoc facto ppara unú lineale vel regulá, cuiq media linea utriq extrema pa=
rallela in aequales partes qtlibet Vg. 300 dividat, sup qm pones qntalibet distia, aciculas duas
tanqm dioptra, et instrumtm ichnographicú hbis. +. +. +.

Probl. 7.



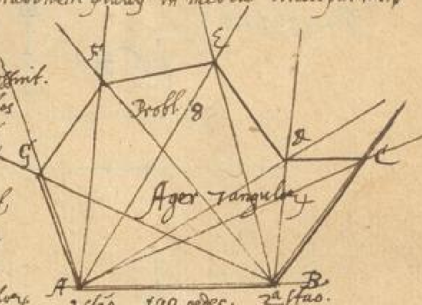
Probl: 7. latitudinẽ qmcũq hoc instrũto ingrere.

Sit fluuiꝫ mensurandꝫ Rhenꝫ Vg. elige locũ duabꝫ stationibꝫ captũ, quarũ interuallũ explorabis virga aut chorda mensoria, inueniaturꝫ 50 pedũ; his factis pone pedem et supra pedẽ asserem in loco A pa statiõe, impositoꝫ lineali sup asserem verte versꝫ signũ C 2da staõis, et duc lineã sup chartam asseri agglutinatã, quo facto intercipe circino ex lineali pedes inter vtramꝫ statiõem ante inuentos et transfer sup lineã, q ducta 2dũ lineale vtraq statiõem respicit; nã in charta extrẽa huiꝫ lineæ repñtabunt duarũ stationum interuallũ in minori licet pportiõe. signatis itaq his punctis A et C posita regula sup A verte in eo seu centro quodã lineale, donec signũ trans fluen positũ p dioptra tibi appareat, ductaq linea ex puncto A iuxta sitũ linealis versꝫ signũ transfluen directi, pcede ad 2a statiõem C, positoꝫ lineali iterũ sup lineam q repñtat interuallũ stationum, respice p dioptra in A, vt situ lineæ prioris statiõis habeatꝫ, hoc fco verte lineale versꝫ signũ H transfluen, et qdem ita, vt q̃dratũ imotũ maneat, silr lineale in centro C tamdiu vertatꝫ, donec p dioptra signũ H. videas. et facta linea iuxta directũ lineale nota intersectiõem prioris lineæ visualis cũ posteriori, hoc n. spatiũ circino interceptum dabit latitudinem fluuij in media linea partiũ.

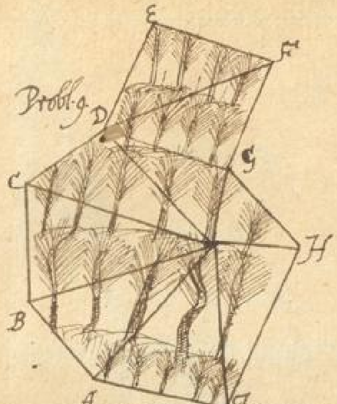


Probl: 8 Ichnographice describere agrũ aliqm quorumlibet laterũ, aut hortũ aut lacũ, cuiꝫ tn. anguli videri possint.

Elige tibi vnũ latꝫ agri mensurandi, ex quo cõmode reliquos angulos videre pois Vg. AB 100 pedũ; pone instrũtm sup B stationem 2dã, et imposito lineali p dioptra respice in A pã statiõem, ductaq sup charta asseris linea, asserem ita firma, vt dimoueri loco nequeat, deinde posito lineali sup punctũ B respice in C, ductaq linea sup asserem 2dũ lineale, iterũ ex B respice in D. ductaq linea demũ ex B. in E. F. G angulos, ductisꝫ lineis ad puncta angulorꝫ pcede ad alterã statiõem A, notato priꝫ signo aliquo visibili in loco B, his positis rectificato instrũtm iuxta priorem situ, firmatoꝫ assere respice p dioptra ex A in B, vt priorem lineã stationũ repias, deinde ex puncto A respice in Angulos. G. F. E. D. C. et diligentꝫ nota in charta intersectiõen linearꝫ visualium pa et 2a stationis, hæc n. intersectio dabit angulũ, quas intersectiões si oes rectis lineis iungas, hbis aream q̃sitã, cũ oibꝫ angulis suis, et limitibꝫ, qd erat faciendum.

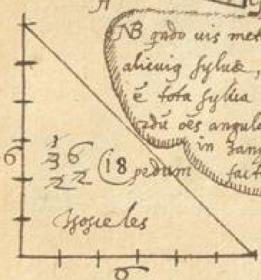


Probl. 9.



Probl: 9. Syluā, cuius anguli aut limites videri nequnt, impedimento montis aut arborū, cdū oēs angulos describere. Sit sylua cuius anguli et limites sint A·B·C·D·E·F· etc. eiusq delineare hoc instrūto, sic ages: pone instrūtm tuū in angulū A respiciens in angulū B p dioptra linealis asseri suprimpositi, mensoq spatio int A et B chordā v: virga aliqua mensoria, inuentos pedes interceptos, ex lineali seu regula in suas partes diuisa transfer sup asseren iuxta situ linealis repñtantis lineā spatij int fact 2ā stationem interiectū, qd sit v.g. 40 perticarū. Hoc notata pa statioē pcede in B positoq lineali sup linea AB rectifica instrūtm et A respice ex B in C, ductaq linea pedes p chordā inuentos int B et C interceptos in lineali partiū, sup asseris lineā iā factā transfer. His factis pcede ad punctū C, rectificatoq instrūto ex C respice in D, factaq linea transfer pedes p chordam inuentos in iā ante factā lineam, iterū ex D in E, ex E in F etc. fac vt prius, et sic circueundo, vsq dū redeas ad priorem locū, diligent interim notando limites, q si oīa rite pfeceris, videbis syluā totā in suos angulos resolutam, quo a· in pedes v: iuga resoluenda sit, dicet in sequente appendice. ↑.

NB quando vis metiri oes pedes alicuius syluae, resoluenda ē tota sylua iā in assere sdū oēs angulos distributa in 3angula, vt hic factum vides.

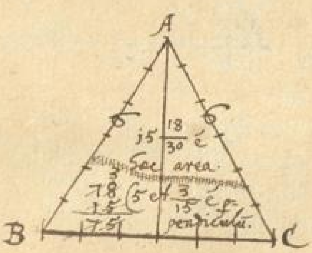


Appendix de computu 3angulorum. Probl. primum.

3angulū rectangulū Isosceles metiri. Duc alterū equaliū laterū in se se, et pducti media pars areā ipsius qdrati dabit, vel si ducas vnū equaliū laterū in dimidiā alterius partem, idē erit area. vt sit 3angulus A B C, sintq latera AB et AC vtrūque 6 pedū, q in se ducta facient 36, cuius medium dabit areā, similiter si operaberis 3angulū scalenū rectangulū, duces latera in se rectū angulū comprehendentes, vt pducti medietas det area capacitatem. ↑.

Problema j

Probl: 2 3anguli oxigonei seu acutanguli aream inuenire, duc vnū equaliū laterū in se, et pductū inde nūerū multiplica p 13, et eū, q demū resultabit, partire p 30, nā quotiens ostendet aream qsitam exempli grā. Sit. △. A.b.c. cuius quolibet latus sit cubitorū 6, hec in se ducta faciunt 36, rursū 36 in 13 ducta faciunt 468, q diuisa p 30 dant p quotiente 15 et $\frac{18}{13}$ seu tres quintas, tot cubitorū erit area; quod si areā p 30 multiplicaueris et pductū diuiseris p 13, quotientis demū radix qdrata dabit singulorum laterū nūerum. Perpendicularem v: sic inuenies: duc vnū et lateribus 6 pedū in 13, et pductū diuide p 15, quotiens

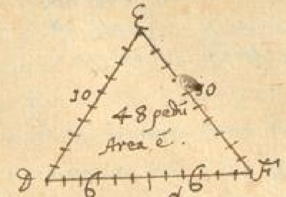


dabit

dabit ppendicularem, quare vt habeas aream, sic age; duc ppen-
dicularem in latus, et dimidiū pducti dabit aream. †

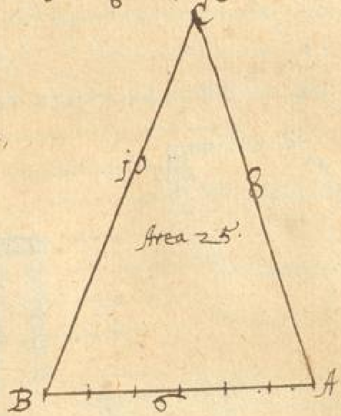
Probl: 3. Isosceles oxigonei areā inuenire. †

Sit Isosceles oxigoneus DEF, cuius duo latera equalia 10 sint cu-
bitorum, ducatur basis dimidiū 6 in sese, fient 36, multiplica rursū
10 in se, fient 100, a quibus auffer 36, relinquuntur 64, radix autem
quadrata huius ē 8, totidem ergo cubitorū ē ppendicularis, duc tā-
dem hanc radicem 8 in basis dimidiū 6, fient 48, tanta erit area.



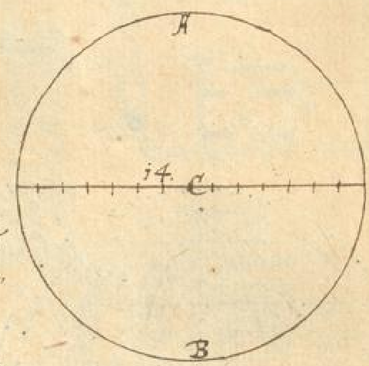
Probl. 4. vniuersali methodo inuenire areas 3an-
gulorum quorūlibet. †

Adde inter se cuiusuis oblati 3anguli latera, et consurgentis inde
nūeri dimidium serua, a quo iterū subtrahe singula 3anguli latera,
diligenter obseruando differentias; iterū dimidiū suma laterū duc in
maiorem differentiam, pductumque in mediā a. 2dā differentiam, et ex hoc 3sur-
gens in vltimā differentiam seu 3ā, cuius pducti dabit areā 3anguli. vt sit
3angulus ABC cuius latus AB 6 cubitorū, AC, 8. BC 10 addantur in
summam vnam, fient 24, quorū dimidiū sit 12; ab hoc dimidio sub-
trahe singula latera, vt 6 a 12 manent 6. 8 a 12 manent 4; 10 a
12 relinquunt 2, has differentias diligenter nota, his factis dimidiū
summa laterū scil. 12, duc in 6 quae ē maior differentia, pdibuntur 72
hoc in 4 mediam differentiam, fient 288, et hoc pductū demū in vlti-
mā differentiam, fient 576, cuius radix quadrata dabit aream 25.



Probl. 5 De circuli dimensione. †

NB. Archimedem demonstrasse aream circuli equalem ēē 3angulo re-
ctangulo, cuius vnū latus ex his, quae rectū comprehendūt angulū ipsius cir-
culi semidiameter, reliquum v. circūferentiae fuerit equale; cū n. semi-
diameter in totam circūferentiam multiplicatur, fit rectangulū totius
circuli, cuius rectanguli dimidiū ē idem 3angulū dato circulo equale,
ex qua subtilissima demonstratione manifestata, quod semidiameter in dimidiū
circūferentiae multiplicata vel contra, rectangulū pducat aream dato
circulo equalem. ē ergo sola difficultas in inuestigatione rectae lineae,

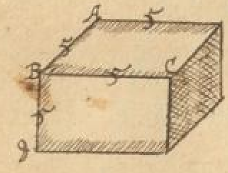


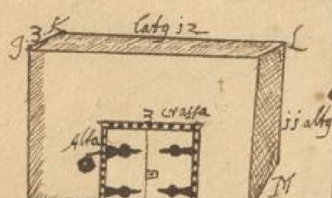
quae circūferentiae circuli sit equalis, quod notis archimedes diu potius quam huiā demonstratione repit, tradiditque; inuenit n.
circūferentiam ad diametrū circuli pportionem obtinere minorem 3pla sesqseptima, maiorem vero tripla
superdecupartiente septuagesimas primas, hoc ē, maiorem 3pla sesq octaua; vt eadem circūferentia ad
ipsā diametrū se habeat, veluti 22 ad 7. quae ratio hactenus obseruata fuit ab oībus, et huic negotio absque
sensibili errore existimatur facere satis. Sit ergo circulus C.B.A. cuius centrū C situsque diameter eius 14 pedū,
igitur

igit[ur] p[er] inventū Archimedis et regulā quatuor proportionalium circumferentia erit cubitorū 42, quorū dimidiū 21, duc itaq semicirculū 21 in semidiametrum 7 fiet area trianguli CD 147, ~~totidem~~ cubitorū e area ipsius circuli. quod si radicē quadrata extrahas de 147, tibi dabit illa latus circulo aequalis quadrati scilicet 12 et $\frac{5}{12}$.

Probl: 6 De solidorū corporum dimensioe.

Cubi aream invenire sit cubus ABCD, cuius unumquodq latus pedū 5, si duxeris itaq ABC quadratum 25 in latus BD 5 pedū, consurgent 125 soliditas cubi; vel duc unū latus in se, utpote 5, et fient 25, hoc rursus in 5 producentes 125, tot n. solidorū pedū e ABCD dati cubi soliditas: quod si duplicaueris 125, fient 250 quorū radix cubica 6 et $\frac{9}{17}$ totidem pedū erit latus cubi, dupli ipsius ABCD et ita de triplo quadruplo indicabis; non secus metiere columnam quadrata, seu parallelogrammum solidū, ut sit parallelogrammum CF EH cuius latus EF sit pedū 6, FH 4: EH 11. duc quod 6 in 4, fiunt 24, quae per 11 multiplicata faciunt 264. Hinc patet, quomodo facile sit rectangulū parietem unica vel pluribus portis aut fenestris itidem rectangulis perforatū metiri; ut sit paries aliquis quadratus, cuius crassities IK sit 3 pedū, latitudo KL 12; altitudo LM 11; sitq in eodem puncto altitudinis 6, porta alta 6 pedū, lata 4. duc quod 12 in 3 fiunt 36, hoc in 11 fiunt 396 crassitudo totius si scilicet omnio solidus esset, vacuitatem a porte sic desscendes multiplica 4 in 3 scil: latitudinem in crassitiem portae et productū in 6 altitudinem portae, habebis 72 quae a toto aufferenda sunt: a 396, ut relinquatur reliqua muri crassities.



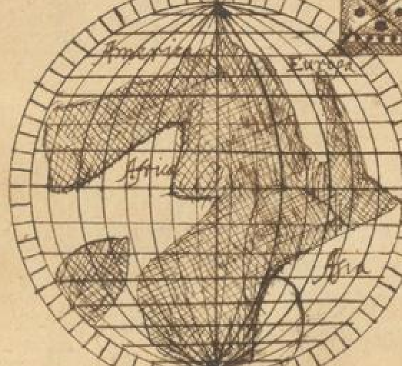


Probl. 7. Aream columnae invenire.

duc circumferiam columnae in altitudinem et summae producti adde bis aream circumferentiae, et habebis superficiem columnarem; ut crassitiem porro habeas, duc aream in columnae altitudinem, et habebis capacitatem, ex quo patet, quomodo capacitas puteorū inveniri posit.

Probl. 8. Sphaerae soliditatem reperire.

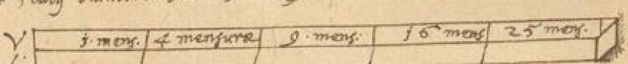
Duc sphaerae diametrū in circumferiam maioris circuli eiusdem sphaerae et productū superficialem sphaerae magnitudinem ostendet; vel duc aream ipsius maximi circuli in 4 et idem habebis quoniam ipsa sphaerae superficies quadrupla e area maximi circuli in eadem sphaera descripti. Sit ergo diameter circuli 14 pedū, quod per antea huius, circumferia erit 44 area v. 154; duc quod 44 in 4 habebis 616, idem inveneris si aream 154 in 4 ducas, totidem igitur totius sphaerae superficies terminativa pedū est, cū autem volueris eiusdem sphaerae metiri crassitiem, sic ages: cuba diametrū, multiplicando productū per 11, quod emerserit, divide



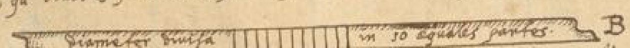
p 21, quotiens dabit crassitiem. Exemplū de terreni globi crassitie. Ex euidentissimis demonstrationibus constat, diametrū mundi eē milliariorū germanicorū 1718, quō circūferia eiusdem iuxta prop. 5 erit 5400 fere, area vero huius 2319300, hisce ductis due diametrū in circūferiam, et ductis totam areā superficiei conti-natiue sphæræ milliar: 9277200, idem inuenies si 4 duxeris in aream circuli maxi, cū autem diameter milliar: astronomicorū vel germanicorū sit 1718, erit huius diametri cubus milliar. 5070718232 qui per 11 multiplicata pereant milliaria 55777900552 qui diuisa per 21 relinquunt in quotiente crassitiem terræ pedū sed 2656090502 $\frac{1}{21}$

Appendix de vasorū dimensione et pparatione virgarū visoriarū cubicę et quadratę.

Probl. 1. Virgam quadratā visoriam describere. pro curabis fieri ex ligno, a lamina ferrea, vel simili materia vasculū aliquod rotundū continens exactissime certā aliquam in ea patria vsitatā mensuram, puta vel mensurā vel quartale, vel si pro maioribus vasis virgam pparare velis, vnā vrnā, sitque hoc fundamentum virgæ pparatoriæ. 2° longitudo huius vasculi repræsentabit longitudinem vasorum quorumuis metiendorū, profunditas eius, quam et diametrū imposterū dicemus, profunditatem vasorum. hoc ductis sic procede. accipe virgam 4. 5 aut 6 pedū longam pro magnitudine vasorū mensurandorū, in hanc virgam transfer diametrū AB vasculi minoris quoties potes, repræsentabuntque hæ equales diuisiones diametros vasorum quorumuis minorū quam sit virga. in exemplo, vasculū pro fundo pparatū sit ABF, cuius diameter AB referat profunditatem vasis, longitudinem v. AF, et sit baculus



super quem transferes longitudinem vasculi seu diametrū AB (quæ repræsentet profunditatem.) toties, quoties poteris, repræsentabit igitur prima diuisio primam virga diametrū, quæ est vnius mensuræ VS. 2da diuisio seu diameter 2dā diametrū 4 mensurarū, 3a 3a diametrū 9 mensurarū. 4a quartam 16 etc. vt vides in baculo VS. quare v. mediæ mensuræ pportionaliter virgæ inscribantur. Nota primo, accipe vnā diametrū, eiusque quantitatem transfer seorsim in lineale aliquod, quod diuides primo in 30 æquales partes. 2° vnamquamque 30 partium iterum in alias 6, vt videre est in lineali



hoc etiam facto sic aggredere pportionalem reliquarū mensurarū inscriptionem, accipe tabulā pro quadratis virgis inscribendis, in qua videbis in prima columna numerū diametrorū virgæ, in 2da numerum mensurarū, in tertia puncta inscribenda, in 4a minuta. vt factū vides pagina sequenti. His ita rite pparatis pone tabulā pro virgis quadratis ante te, applica quoque lineale tuū CB. in 30 partes et vnamquamque harū in 6 alias diuisam, super virgam pparatā, ac in diametros suas æqualiter iā diuisam hac cautione, vt prima diameter semper maneat indiuisa, tali itaque arte applicabis ad virgam, vt lineale ponatur super initiū 2dæ diametri in virga descriptæ, hoc ita posito firmetur lineale, et iuxta puncta mensurarū in tabula signatarū fac signa in virga, et primo occurrent 1 mensura, cui a latere respondent 30 puncta et minuta, 0, quæ repræsentabit primā mensuram diametri indiuisæ; pro diametro duarū mensurarū vero accipe e regione 4 puncta et 8 minuta

quæ in

q in lineali inuenta imprimes virga, in diametro vero triū mensurarū excerpe 7 et j9 minuta, q
inuenta in lineali imprimentur quoq virga, in diametro 4 mensurarū, cū nullus numerus occurrat, scias
eādem diametrū iam in 4 partes diuisā, commoueas igitur lineale ad 3ā diametrū, et in diametro 5 mē-
surarū lege, vt in tabula apparet, et diametro hac quoq absoluta procede ad 4ā et operis semper
quemadmodū in initio, vsq dū ad finem duodecimæ diametri peruenias. ✝. ✝. ✝.

Tabula visoria pro virgis quadratis. ✝. ✝. ✝.

Di:	Me:	Pu:	Mi:	Di:	Mē:	Pu:	Min:	D.	M.	P.	M.	D.	M.	P.	m.	D.	M.	P.	m.	D.	M.	P.	m.
	j	j0	0	5	25	50	0	7	49	70	0		73	85	26		97	98	29	jj	j2j	jj0	0
	2	j4	8		26	50	59		50	70	42		74	86	j		98	98	59		j22	jj0	27
	3	j7	j9		27	5j	57		5j	7j	24		75	86	36		99	99	29		j23	jj0	54
	4	20	0		28	52	55		52	72	6		76	87	j0		j00	j00	0		j24	jjj	2j
2	5	22	2j		29	53	5j		53	73	48		77	87	44	j0	j0j	j00	29		j25	jjj	48
	6	24	28		30	54	46		54	74	29		78	88	j8		j02	j00	59		j26	jj2	j4
	7	26	27		3j	55	40		55	74	9		79	88	52		j03	j0j	29		j27	jj2	4j
	8	28	j7		32	56	34		56	75	49		80	89	25		j04	j0j	58		j28	jj3	8
	9	30	0		33	57	26		57	76	29	9	8j	90	0		j05	j02	28		j29	jj3	35
3	j0	3j	37		34	58	j8		58	76	6		82	90	33		j06	j02	57		j30	jj4	j
	jj	33	9		35	59	j0		59	76	48		83	9j	6		j07	j03	26		j3j	jj4	27
	j2	34	38		36	60	0		60	77	27		84	9j	39		j08	j03	55		j32	jj4	53
	j3	36	3	6	37	60	49		6j	78	6		85	92	jj		j09	j04	24		j33	jj5	j9
	j4	37	25		38	6j	38		62	78	44		86	92	44		jj0	j04	52		j34	jj5	45
	j5	38	43		39	62	26		63	79	22		87	93	j7		jjj	j05	2j		j35	jj6	jj
	j6	40	0		40	63	j4	8	64	80	0		88	93	48		jj2	j05	49		j36	jj6	37
4	j7	4j	j3		4j	64	2		65	80	37		89	94	20		jj3	j06	j8		j37	jj7	2
	j8	42	25		42	64	48		66	8j	j4		90	94	52		jj4	j06	46		j38	jj7	28
	j9	43	35		43	65	34		67	8j	5j		9j	95	23		jj5	j07	14		j39	jj7	54
	20	44	43		44	66	j9		68	82	27		92	95	54		jj6	j07	42		j40	jj8	j9
	2j	45	49		45	67	5		69	83	4		93	96	26		jj7	j08	9		j4j	jj8	44
	22	46	55		46	67	49		70	83	39		94	96	57		jj8	j08	37		j42	jj9	j0
	23	47	57		47	68	33		7j	84	j5		95	97	28		jj9	j09	5		j43	jj9	35
	24	48	59		48	69	j6		72	84	5j		96	97	58		j20	j09	32	j2	j44	j20	0

Absoluta.

Absoluta tandem virga hac methodo, repraesentabit unumquodque punctum, mensuram, vel tale, vel quod placet utentis arbitrio. Longitudines porro vasorum si inscribes. accipe longitudinem A F vasculi A B F et ad alterum latus virgae eam toties, quoties poteris transfer per longitudinem virgae, et ubi ultima longitudo cum ultima diametro virgae convenerint, terminabis quoque virgam reliqua resecando. +

Jesus + Maria + Ignatius + Andreas +

Tabula visoria pro virgis cubicis + + +

	1	0	0		26	9	36		51			77	2	30		103	6	54	130	0	36
	2	2	30	2	27	10	0		52			78	2	42		104	7	1	131	0	42
	3	4	24		28	0	18		53			79	2	54		105	7	10	132	0	54
	4	5	48		29	0	42		54			80	3	5		106	7	18	133	1	3
	5	7	4		30	1	4		55			81	3	16		107	7	26	134	1	6
	6	8	6		31	1	20		56			82	3	24		108	7	36	135	1	12
	7	9	6		32	1	42		57			83	3	36		109	7	45	136	1	24
1	8	10	0		33	2	1		58			84	3	45		110	7	54	137	1	33
	9	0	48		34	2	18		59			85	3	47		111	8	3	138	1	36
	10	1	24		35	2	42		60			86	4	7		112	8	12	139	1	48
	11	2	12		36	2	60		61			87	4	18		113	8	19	140	1	54
	12	2	48		37	3	18		62			88	4	28		114	8	28	141	2	3
	13	3	30		38	3	37		63			89	4	38		115	8	36	142	2	6
	14	4	6		39	3	54	4	64	10	0	90	4	48		116	8	45	143	2	15
	15	4	36		40	4	6		65	0	12	91	4	58		117	8	54	144	2	25
	16	5	6		41	4	24		66	0	24	92	5	8		118	9	2	145	2	32
	17	5	42		42	4	42		67	0	36	93	5	18		119	9	11	146	2	36
	18	6	12		43	4	1		68	0	48	94	5	27		120	9	18	147	2	46
	19	6	36		44	5	18		69	1	0	95	5	36		121	9	25	148	2	49
	20	7	6		45	5	30		70	1	12	96	5	47		122	9	33	149	3	0
	21	7	30		46				71	1	24	97	5	57		123	9	42	150	3	6
	22	8	0		47				72	1	36	98	6	6		124	9	58	151	3	12
	23	8	44		48				73	1	47	99	6	15	5	125	10	0	152	3	18
	24	8	48		49				74	1	58	100	6	24		126	0	7	153	3	30
	25	9	12		50				75	2	9	101	6	33		127	0	12	154	3	36
									76	2	18	102	6	43		128	0	21	155	3	42
																129	0	24	156	3	48
																			157	3	54
																			158	4	0
																			159	4	6
																			160	4	12
																			161	4	18
																			162	4	24
																			163	4	36

Praxis

Praxis pro virga 4drata.

Indagaturus vasis capacitatem demitte virgã p epistomium ppendiculariter, diligenter notando, qd abscindat, postea exempta virga, metire sltr duos fundos vasis, semp notando puncta pfunditatis abscissa; comparata go maiori cũ minori pfundite mediũ huius dabit tibi verã pfunditem, q nihil ẽ aliud, nisi mediũ pportionale inter paruam et magnã qntitatem, vg. deprehendisti demissa uirga p epistomiũ in fundũ vasis 40 puncta, in posteriori v. fundorũ pfunditem 36, mediũ differie horũ nũerorum dabit medietatem rectificata pfunditatis vg. 38 puncta, hanc diligenter nota seorsim; posthac inuersa virga metire quoq longitudinẽ vasis, et demptis exstantijs, et offerũt se vg. 6 longitudines in virga abscissa; multiplica go 6 p 38, longitudinem sc. in pfunditatem, puenient 228 mensura capacitas qsita, q p 4 diuisa pducunt 4talia.

Si vero ñ aquales partes absciderit, sic age: 1o multiplica integra puncta pfunditatis, cũ longitudinũ integris, et pductũ obserua; postea multiplica fracta pfunditatis cũ fractis longitudinũ, et qd puenerit, dabit mensuras, q addita integris dabunt capacitatem vasis. Vg. mensurato vase inuenio 7 4talia, et duo puncta supra 7, item longitudines inuenio 14, multiplico 7 in 14 fient 98 quartalia, postea duo quoq relicta multiplico in 14, puenient 78, septem scilicet 4talia, q addita priori suma 98 pducunt 176 capacitatem uasis.

Notanda p constructione virga cubica.

1o selige tibi vasculũ certa mensura 4talis aut vrna, cuius diameter transuersa dabit verã pfunditis diametrũ; quare toties, quoties poteris, hanc inuentam transferes in virga longitudinem cũ asscriptis nũeris cubicis, reliqua v. puncta pfunditatis ex tabula cubica ñ secq, qm ex 4drata inscribenda sunt. 2o vteris hoc modo: mensurus vas demitte virgam transuersaliter, mediataq pfundite vide, quot puncta abscindant, illa n. dabunt verã vasis pfunditem sine vlteriori arithmetica inuestigaõe.

Amen. Finis Geometria Practica.

Tract: