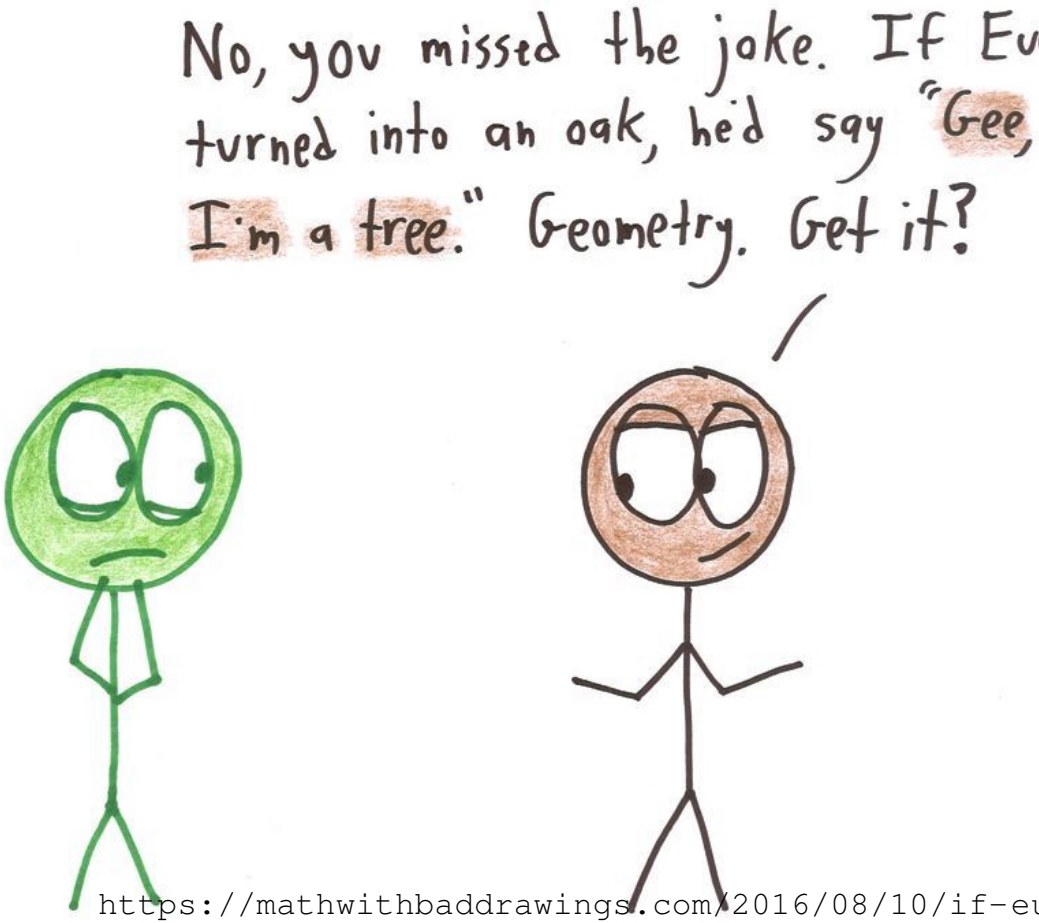
# Math 3610: Introduction to Geometry

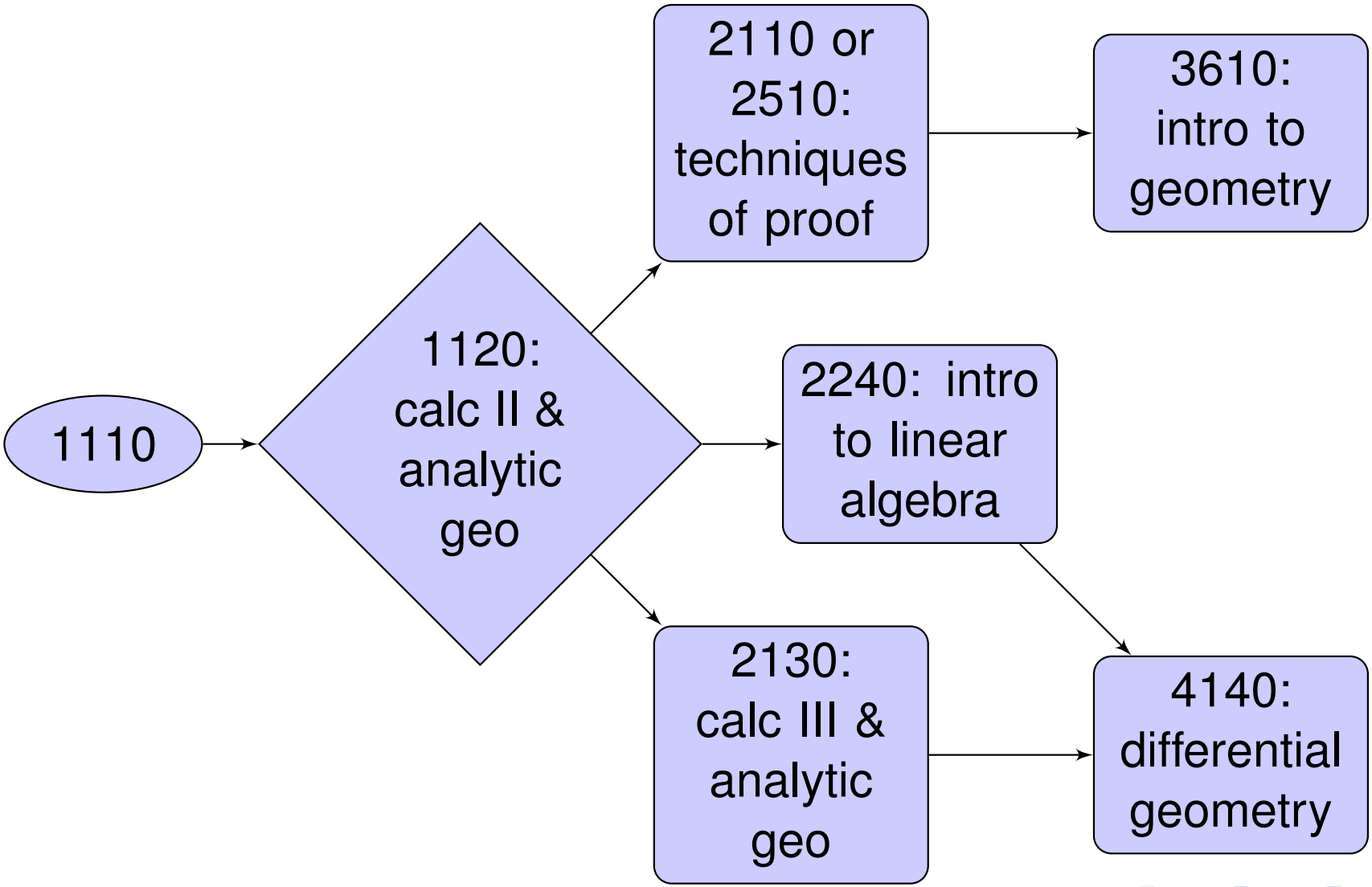



https://mathwithbaddrawings.com/2016/08/10/if-euclid-became-an-oak/

- axiom systems
- constructions
- Euclidean and non-Euclidean
- measurement
- parallel postulate
- polyhedra
- similarity

- foundations of geometry through the lenses of mathematical reasoning and proofs, manipulatives, Interactive Geometry Software (IGS), and more
- multiple perspectives and concept development
- connections among mathematical perspectives

# Geometry in the Mathematics Major at Appalachian



# *Grading and Policies*

- Effective Class Engagement 10%
- Projects 30%
- Reflections 20%
- Exams 40%

No late work, but lowest project and reflection is dropped and accommodations for emergencies with documentation.

- work due start of class (can send it with another student)
- under my office door sometime before I leave for class
- or even turn in on ASULearn if need be, but I prefer printed

# *Where to Get Help*

- Class
- Office hours
- Google *Dr. Sarah* for course calendar
- ASULearn Forums

I care about you and your success!



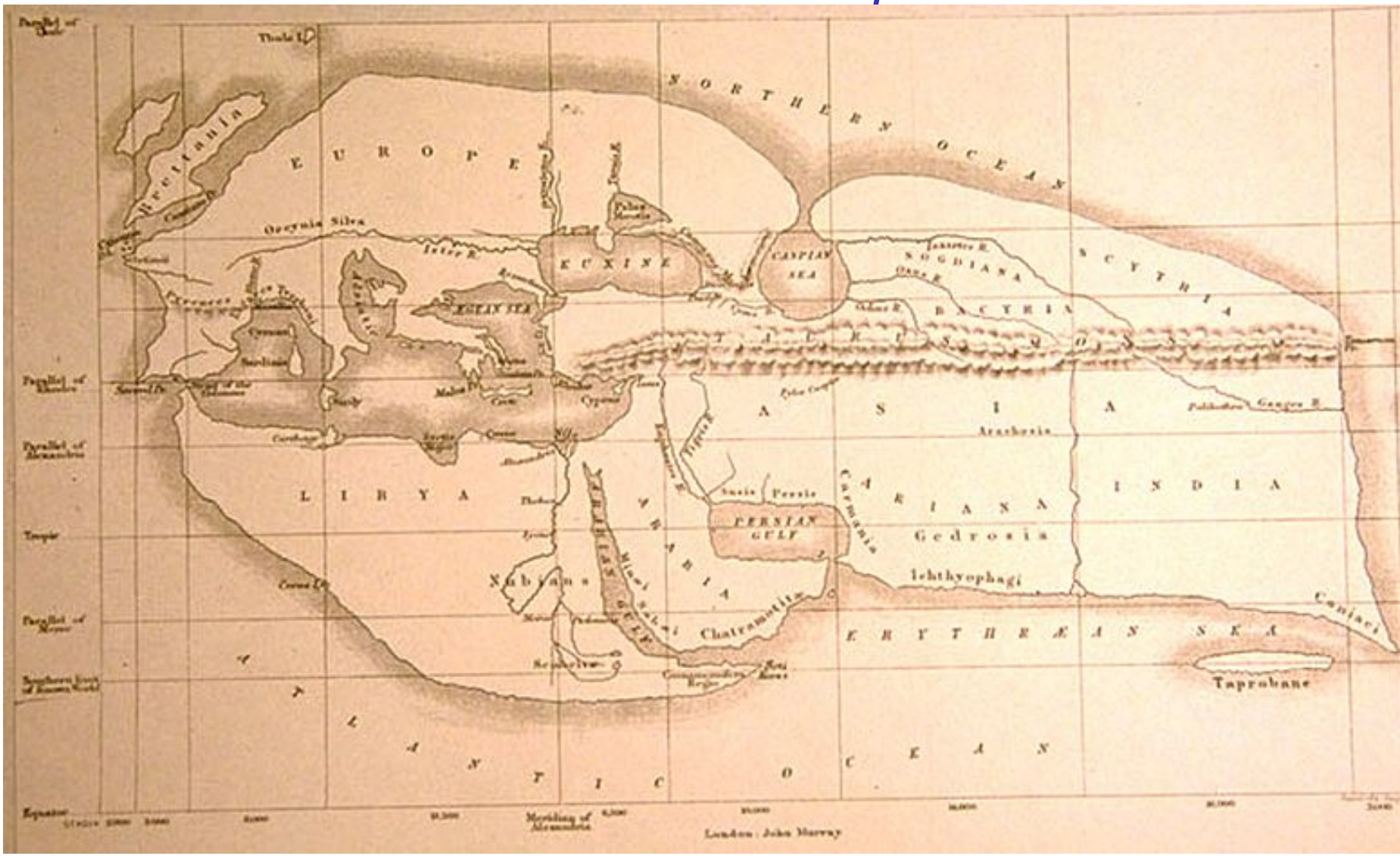
http://alangregerman.typepad.com/.a/6a00d83516c0ad53ef0168e783575e970c-800wi

# *Discussion Question*

How could we know that the earth is round without using modern technology from the 20th or 21st centuries?

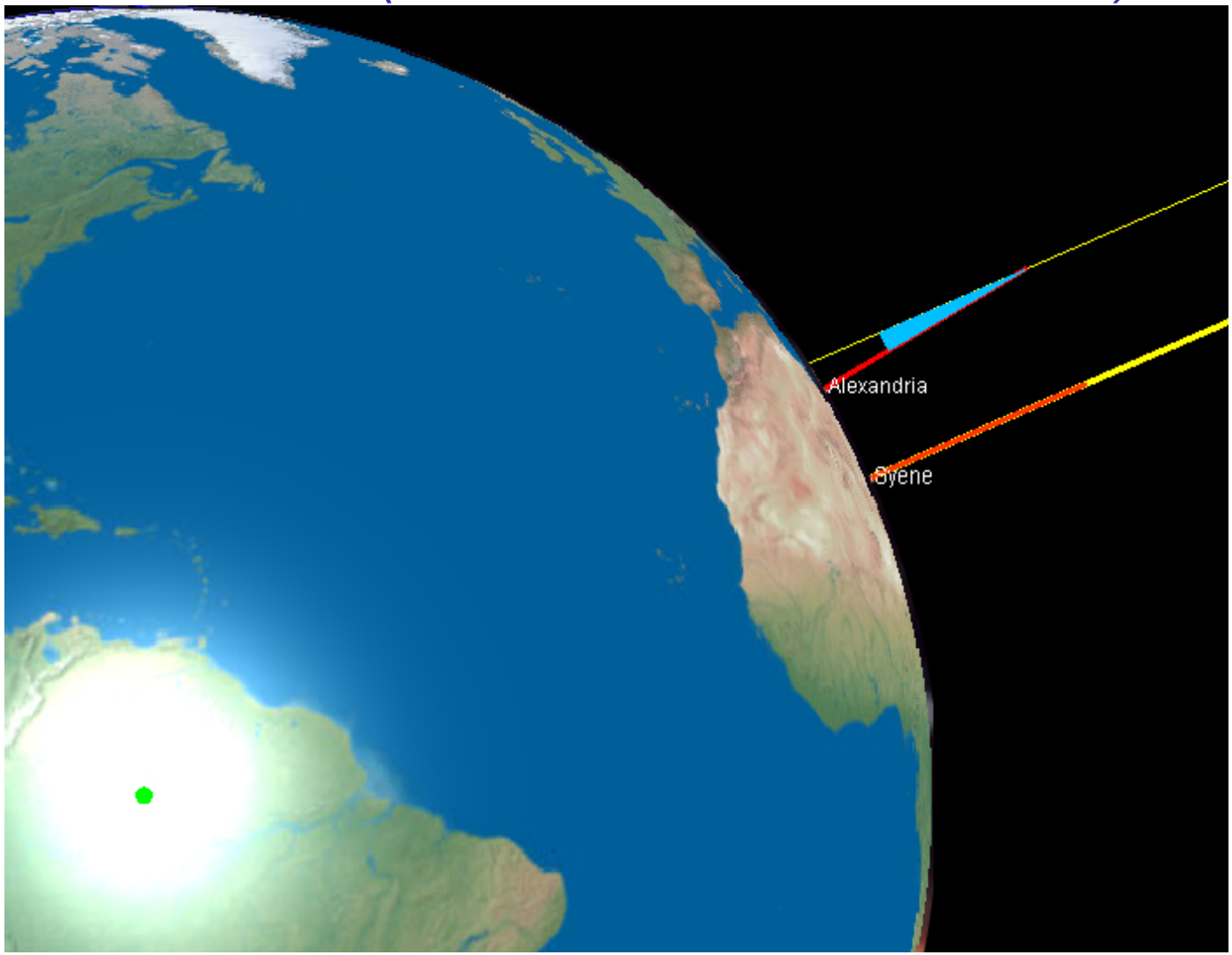

http://gstene.files.wordpress.com/2008/08/flat_earth.jpg

# A View of the Earth—Once Upon a Time




E.H. Bunbury

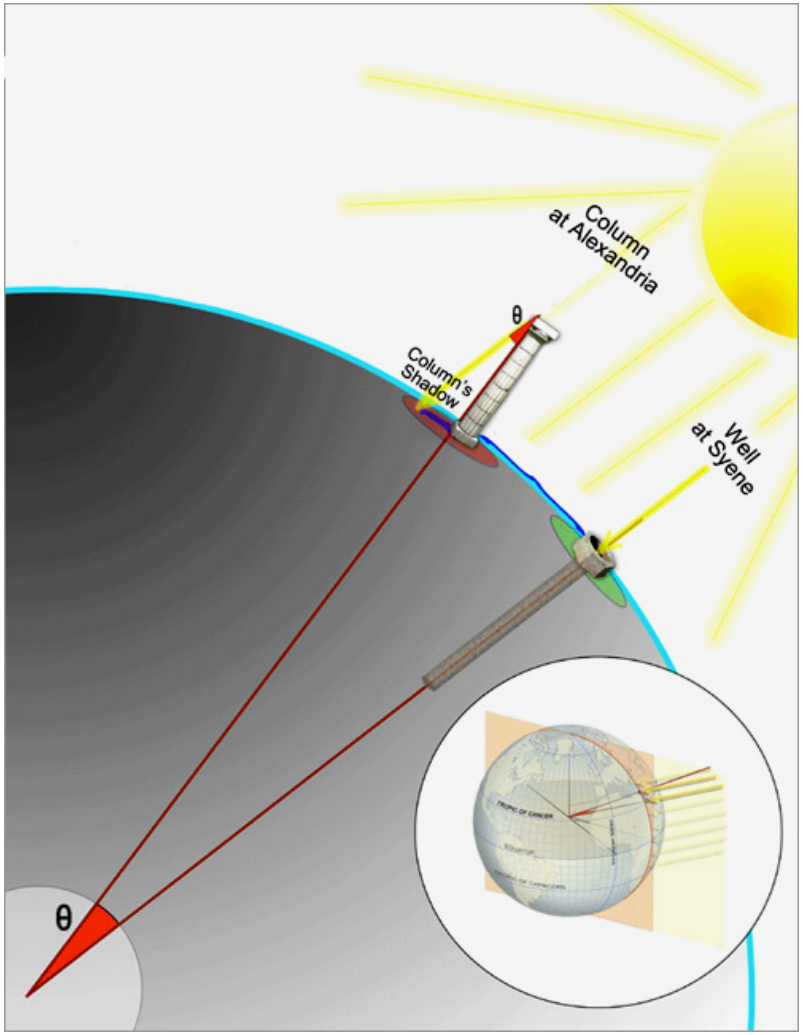
# *Eratosthenes' (~276 BCE – ~195 BCE) Data*






http://weelookang.blogspot.sg/2012/06/ejs-open-source-eratosthenes-measures.html

# *Eratosthenes Thinks Big (Globally!)*




http://www.freewebtown.com/gr_math/mathimatikoi_astr/eratosthenes_of_cyrene_m.htm

# *Local to Global: Multiple Perspectives*

How could we know that the earth is round without using modern technology?

Geography
Philosophy
Physics & Astronomy
Navigation
Weather

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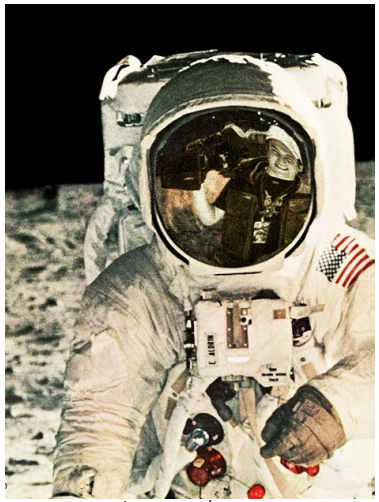
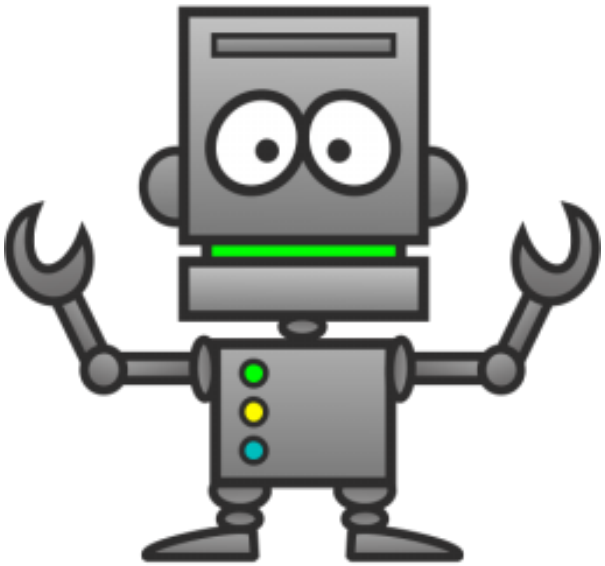
Still controversial? flat earth society (rapper BoB, NBA stars...)



http://www.icis.com/blogs/asian-chemical-connections/FlatEarth.jpg
http://img.dailymail.co.uk/i/pix/2008/04_01/aprilfool60104_468x627.jpg

# *Axiomatic Systems, Measurement, and Constructions*

Peanut Butter and Jelly Robot



Martin Berube

# *Axiomatic System: Minesweeper*

- Axiom 1) Each square is a number or a mine.
- Axiom 2) A numbered square represents the number of neighboring mines in the blocks immediately above, below, left, right, or diagonally touching (or a subset of those if a block is on a boundary)

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| | A | B | C |
|---|---|---|---|
| 1 | | | 1 |
| 2 | 2 | | * |
| 3 | | | 1 |

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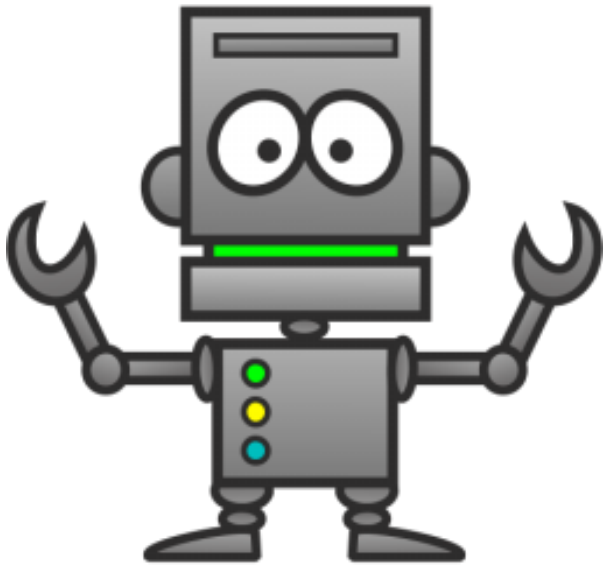

http://img.gamefaqs.net/screens/a/1/8/gfs_45331_3_3.jpg

# *Axiomatic System: Incidence Geometry*

- Axiom 1) For each two distinct points there exists a unique line on both of them.
- Axiom 2) For every line there exists at least two distinct points on it.
- Axiom 3) There exist at least three distinct points.
- Axiom 4) Not all points lie on the same line.

Consistent?

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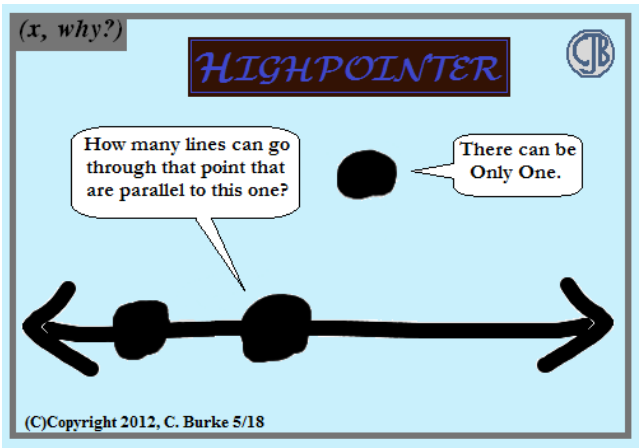
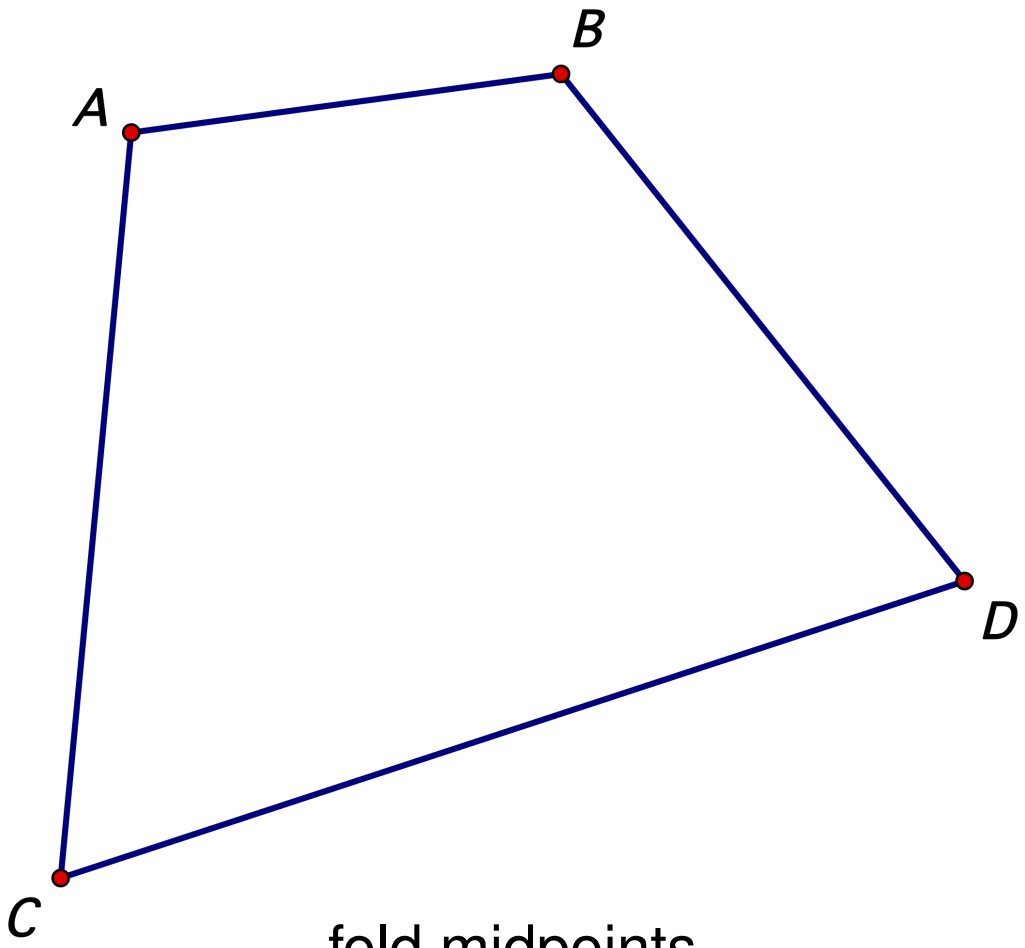


# *Measurements & Constructions: Quadrilateral Midpoints*




fold midpoints

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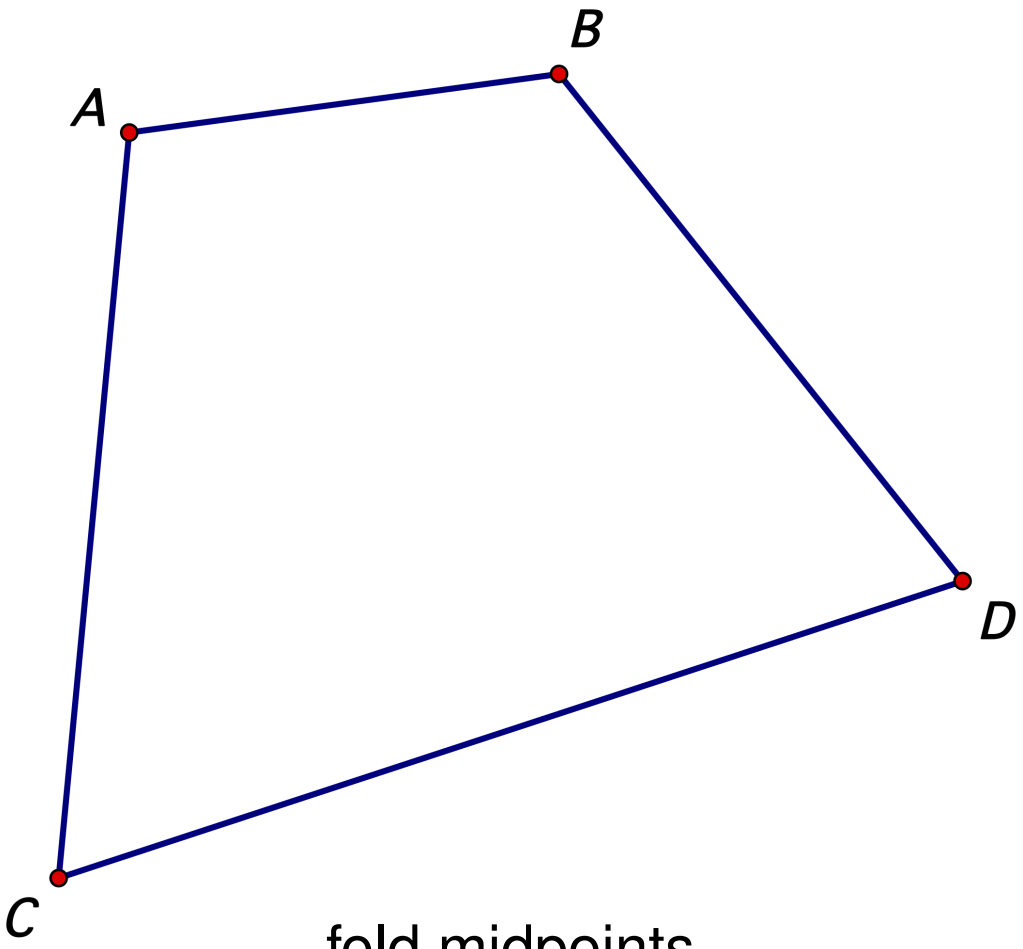


fold midpoints

fold segments connecting adjacent midpoints

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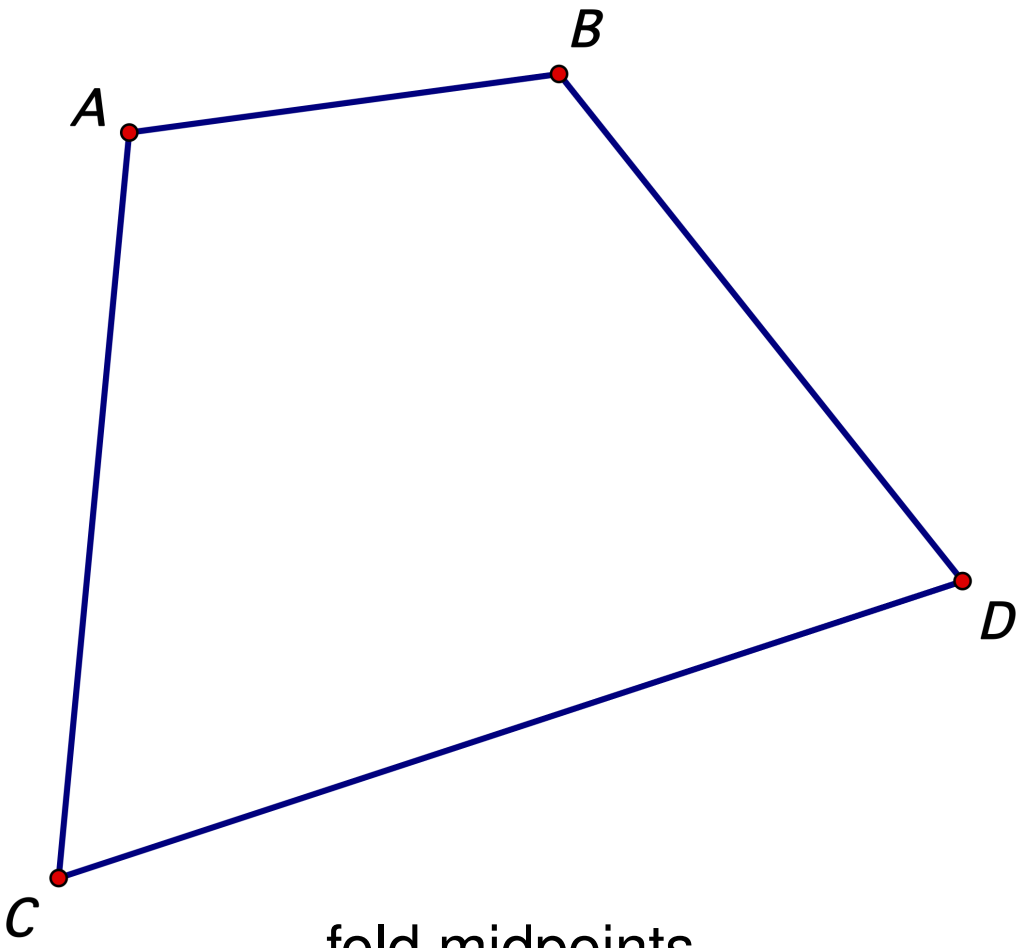


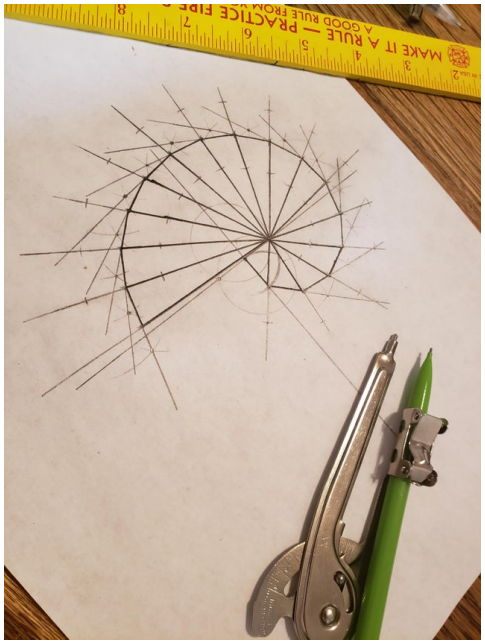

fold midpoints

fold segments connecting adjacent midpoints

`https://www.geogebra.org/geometry`

# *Geometric Constructions*

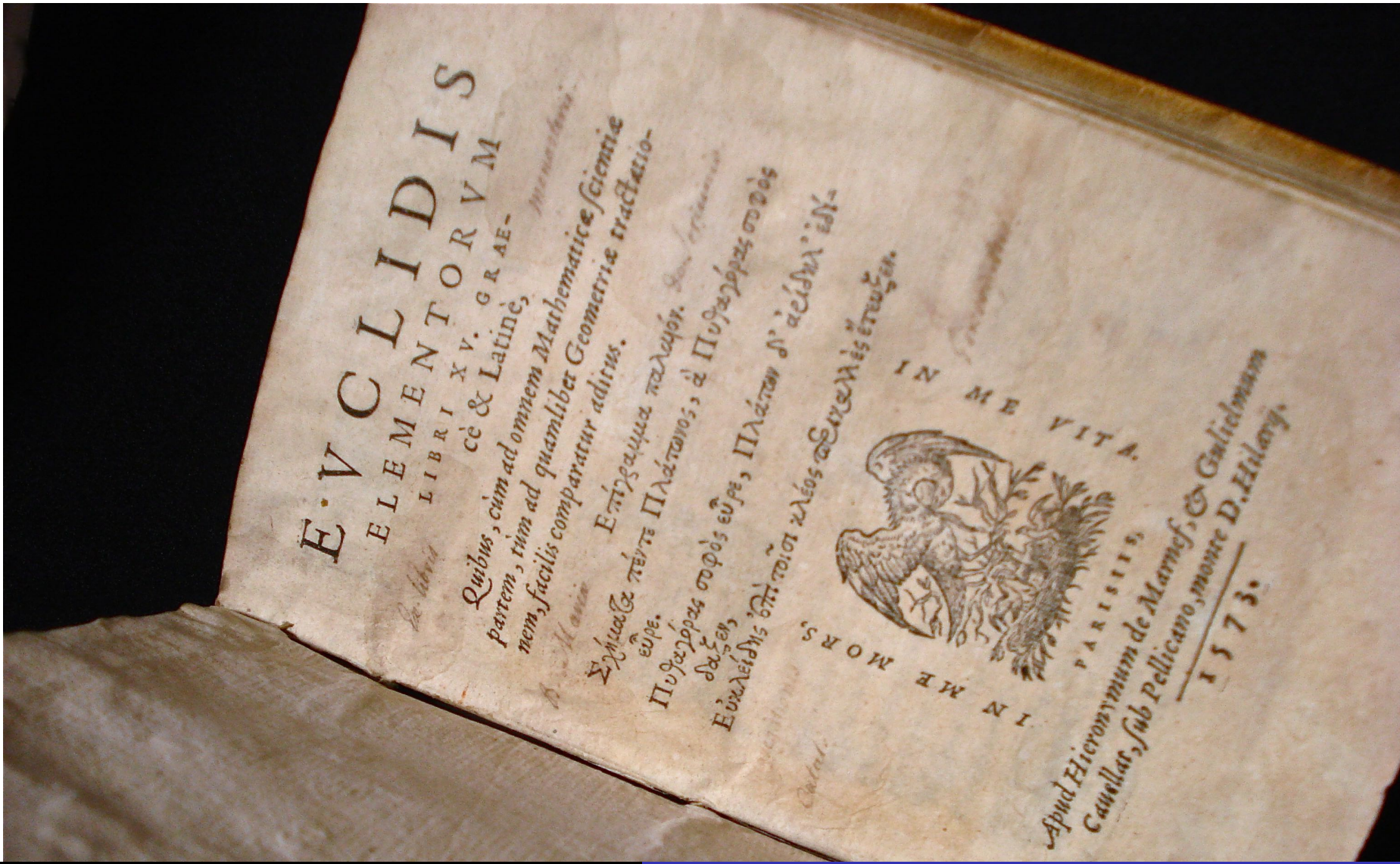
- straightedge and compass
- paper folding—isometries of the plane (linear transformations that preserve length)
- Interactive Geometry Software (IGS) move geometric figure—configuration like the skeletal system of the human body or a mechanical device with interconnected parts, levers, and linkages—preserves dependency relationships to reveal invariants



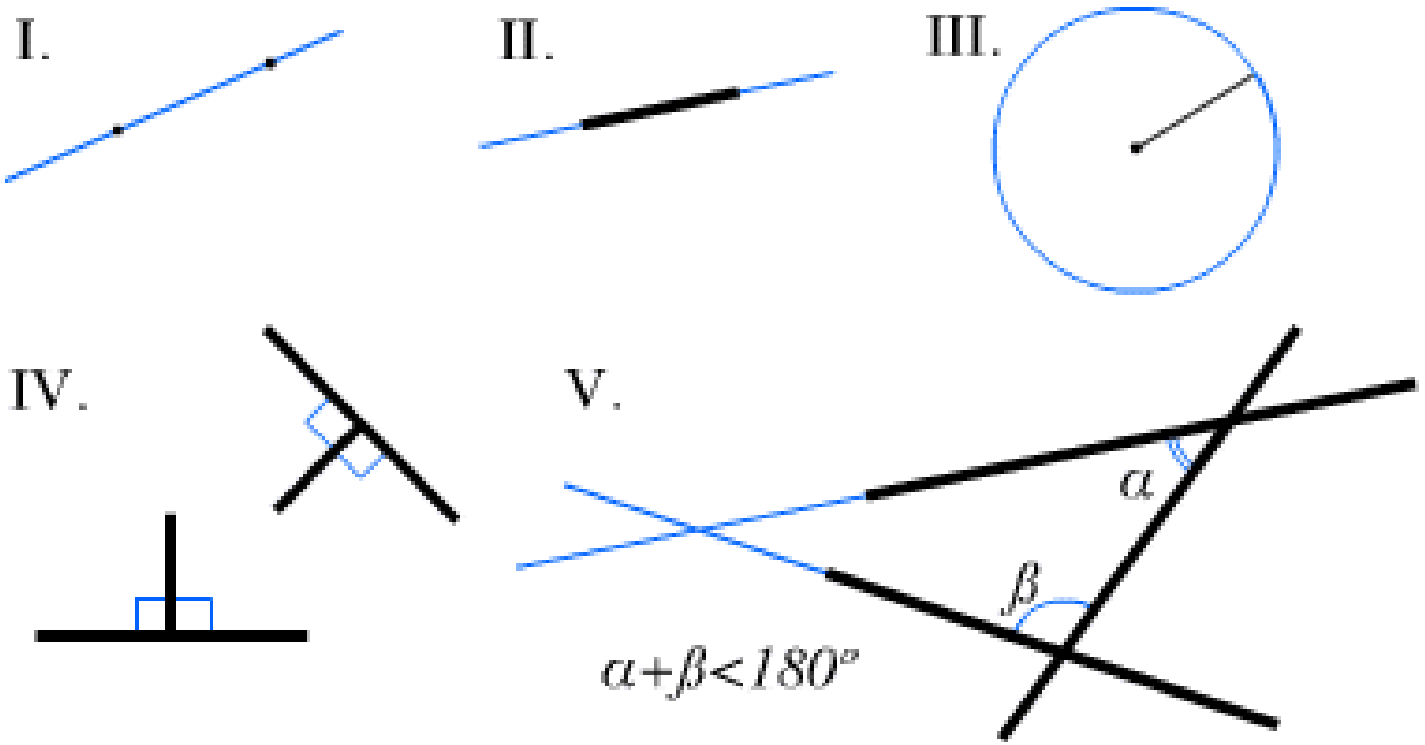

https://www.reddit.com/r/GeometryIsNeat/comments/b4rgv4/a_ruler_and_compass_

# *Euclid's Elements*

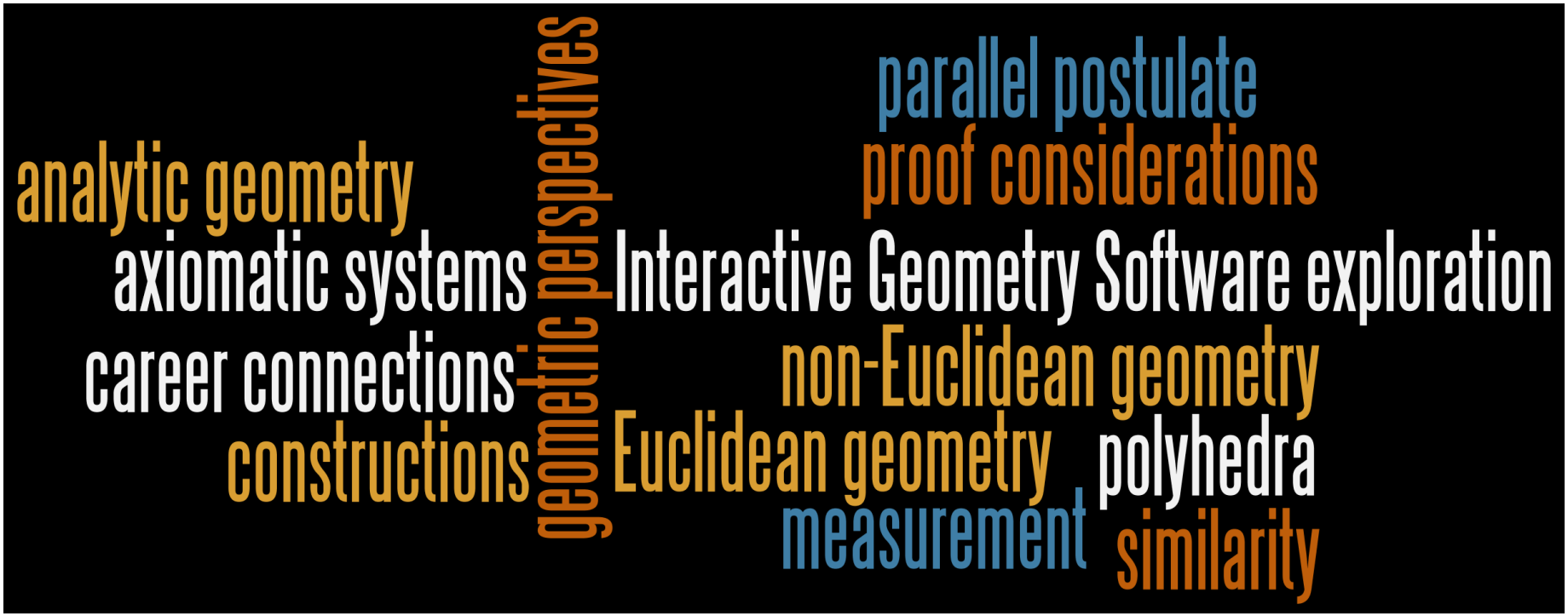
CC BY-SA 3.0 *Euclid's Elements* 1573 Edition. Private collection Hector Zenil.

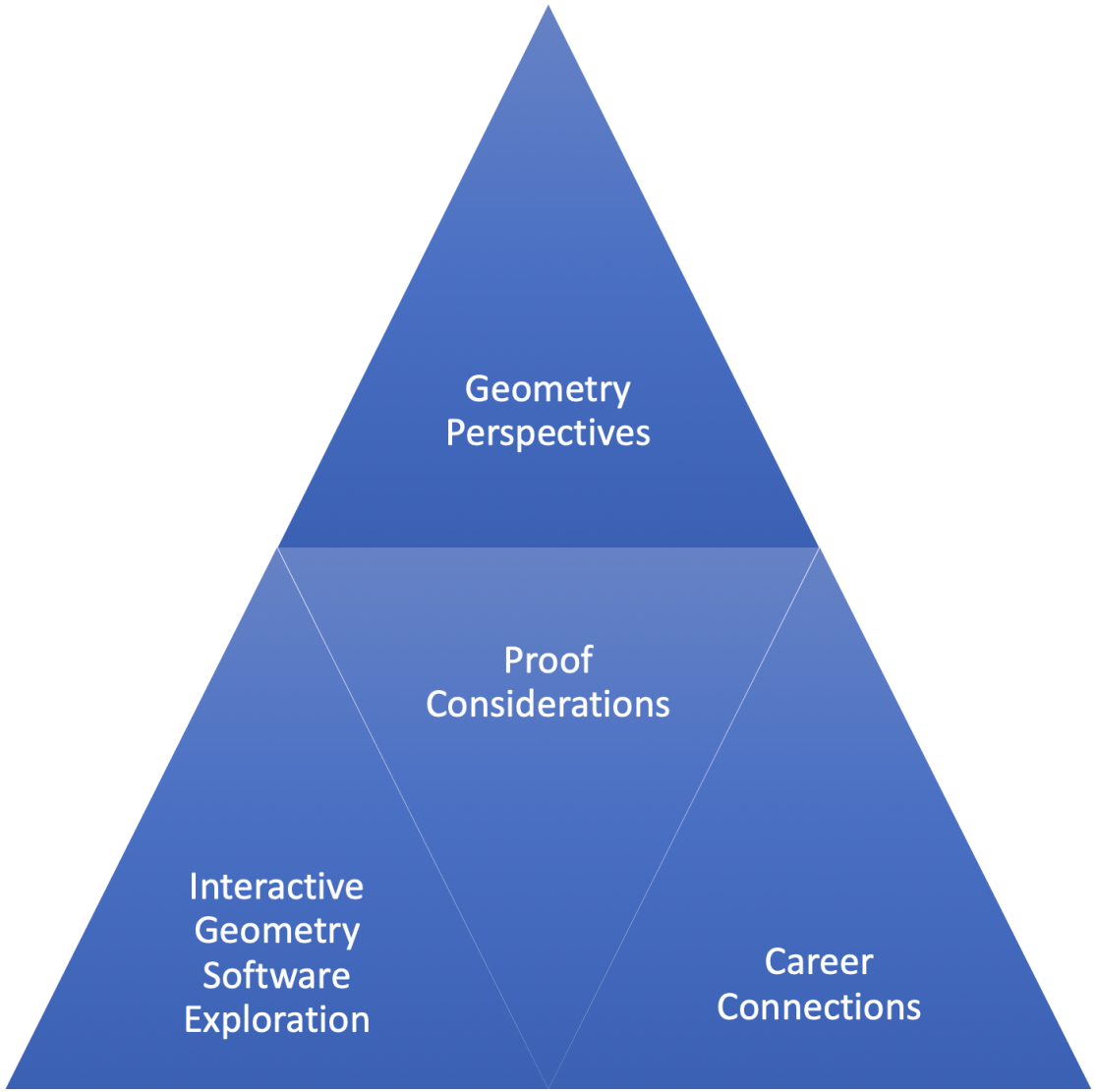


# *Euclid's Elements Postulates*




https://www.storyofmathematics.com/hellenistic_euclid.html


parallel postulate
analytic geometry
proof considerations
axiomatic systems
geometric perspectives
Interactive Geometry Software exploration
career connections
non-Euclidean geometry
constructions
Euclidean geometry
polyhedra
measurement
similarity


Geometry
Perspectives
Proof
Considerations
Interactive
Geometry
Software
Exploration
Career
Connections

# Where is North?


Leo Reynolds