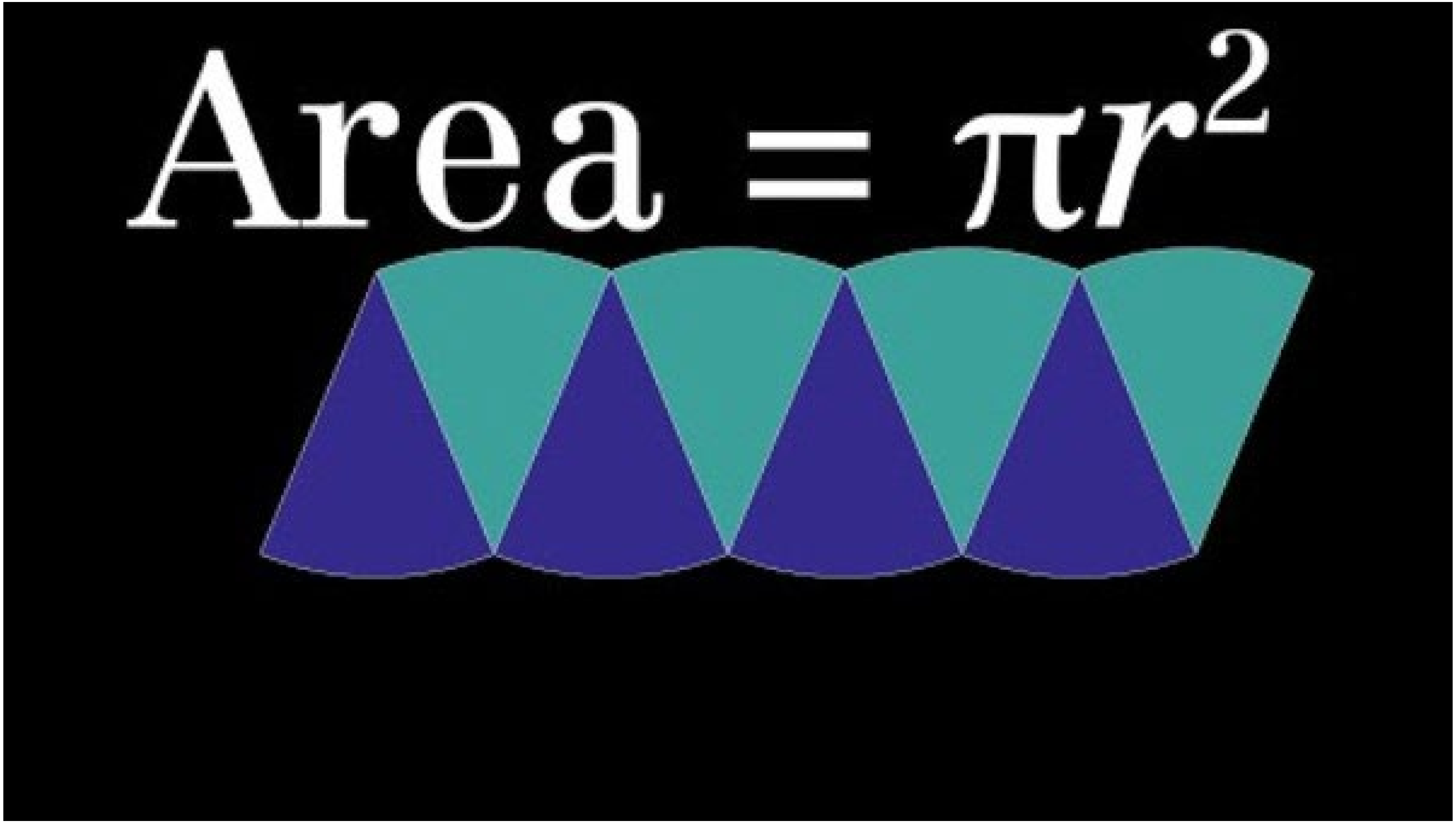
Teaching with Technology: Apps and Innovation in the Maths Classroom

Thomas Sprenger
St Joseph's College, Gregory Terrace
Email: tomsprenger@terrace.qld.edu.au

Overview:

1. Context
2. Background
3. Motivation


Area = πr^2

How do you start your classes?

Technology in the classroom: Purpose

- No matter the teaching strategy, every strategy we use has a purpose.
- It is the purposeful integration of technology that enables us to transform our teaching.
- Technology provides alternative strategies for engaging and working with students and supporting teaching and learning in the classroom.
- The goal **is not** to use technology to tick a box.

Question: How do you identify the purpose?

Technology in the classroom: Understanding

- What do we do well?
- What are the challenges that we face?
- What would we like to do better?
- Conceptual understanding versus ‘just memorise this’.

Question: How can we effectively use technology in the classroom to develop students’ understanding?

Technology in the classroom: Why?

- Technology enables alternative ways of engaging with a concept.
- Dynamic and responsive interactions with mathematics.
- Enables us to ask 'What if...' and then test our ideas to determine their truth.
- Promotes student engagement by repositioning students as equal participants in meaning construction.
- Promotes mathematical conversations by reducing the barriers to entry.

Technology in the classroom: Goal

- To develop resources that engage students and enable mathematical conversations to happen.

- To provide multiple representations so that students of all abilities can engage meaningfully in mathematics.

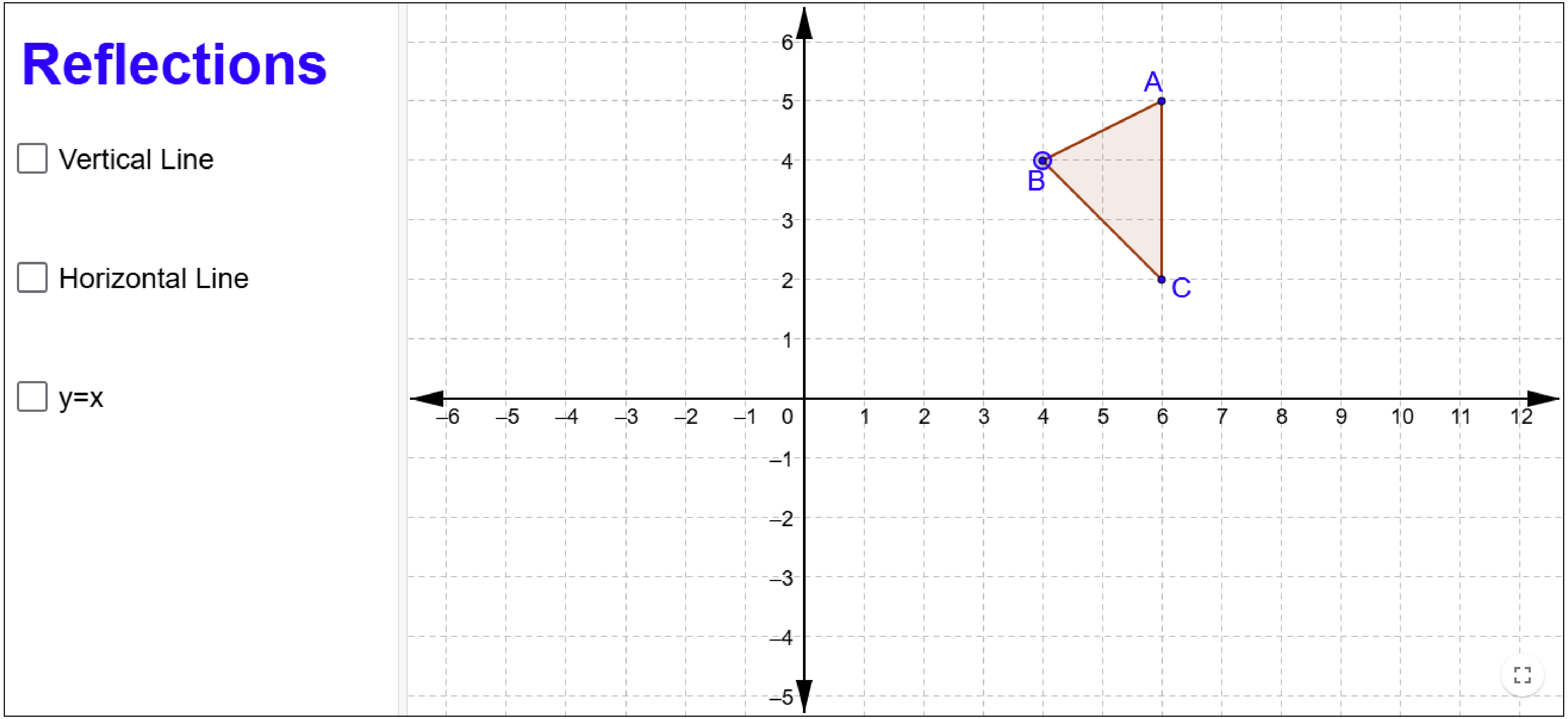
- Position students to construct meaning for themselves. Enable them to ‘discover’ as opposed to being told.

Consider the following:

- Questioning can be used to guide students towards understanding.
- Examples of questioning strategies used to engage students and promote thinking:
    - "What do you observe/notice about…?“
    - "Does anyone notice any patterns?"
- Positioning students to develop their own understanding. Students can actively participate in meaning construction.
- Discussions about mathematics and ideas enables students of all abilities to participate.
- Engage students’ and teachers’ natural curiosity. Encourage students to ask ‘Why?’.

Reflections in the plane

GeoGebra: https://www.geogebra.org/m/EmmRE5Kk



Similarity and Congruence: Is there another way?

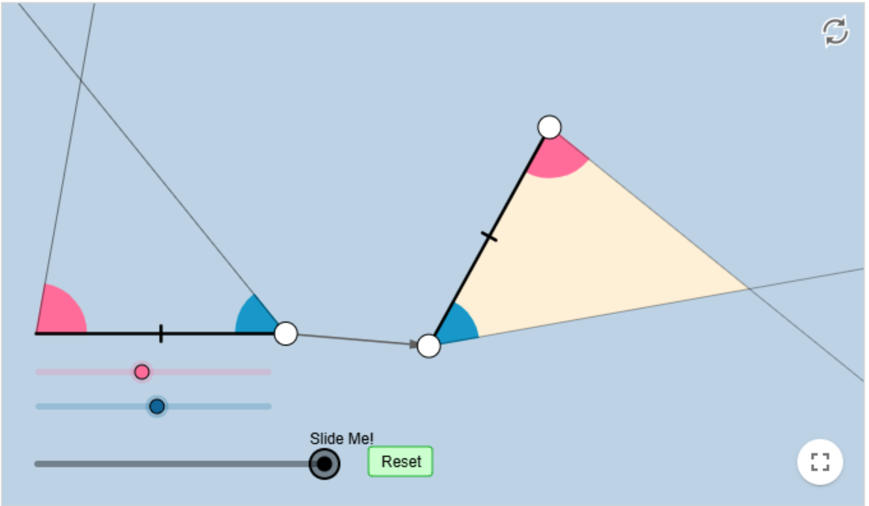
GeoGebra: https://www.geogebra.org/m/mmEVNZHK

ASA Theorem?

Author: Tim Brzezinski

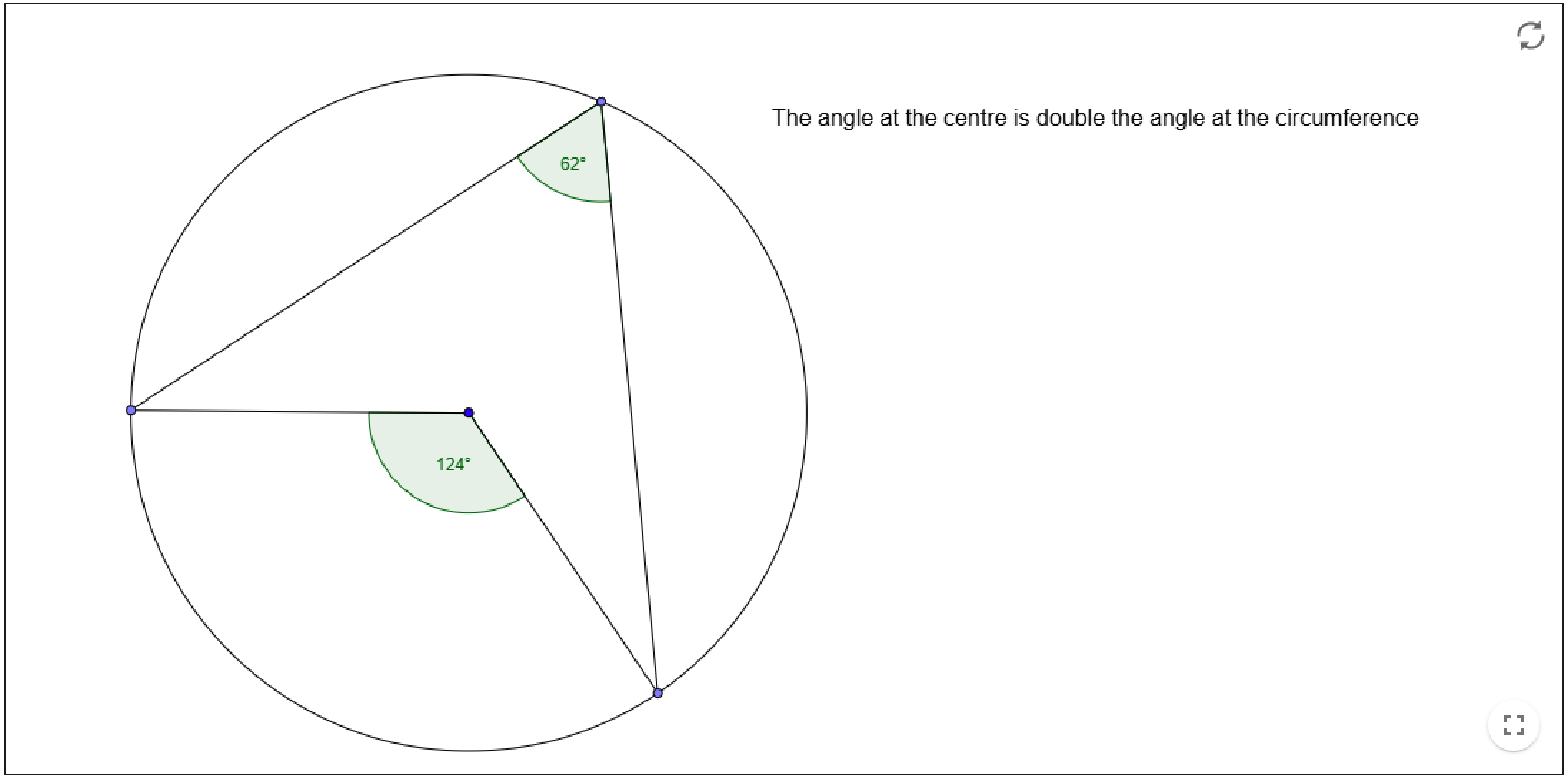
Suppose 2 triangles have 2 pairs of congruent angles. Suppose we also know that the side between each set of given angles (in one triangle) is congruent to the side between this same pair of angles in the other triangle.

Does knowing only this constitute sufficient evidence to prove the triangles congruent? If so, explain how/why with respect to the transformations and/or triangle congruence theorems you've previously learned. If not, clearly explain why not.



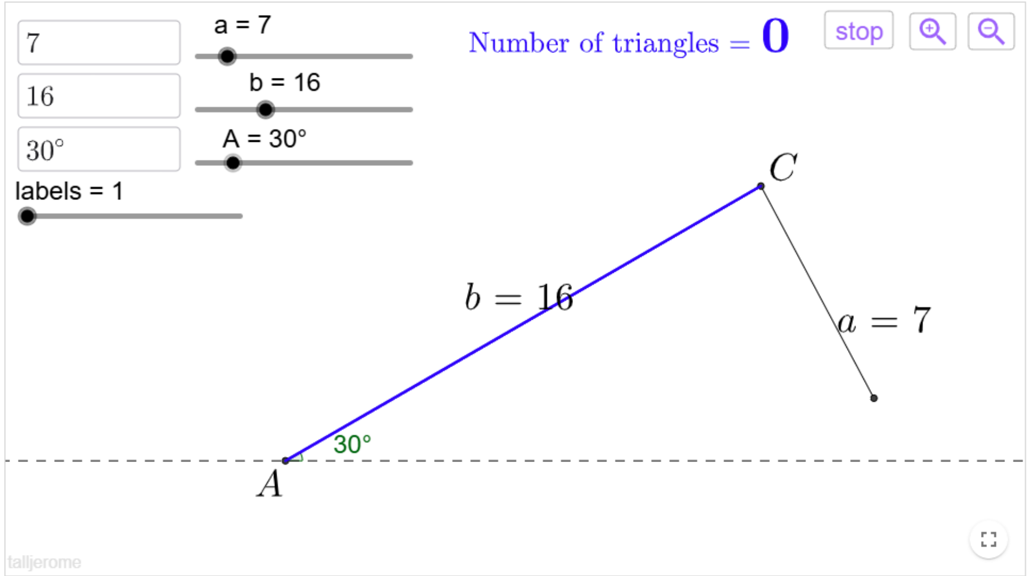
Circle Geometry: How to prove?

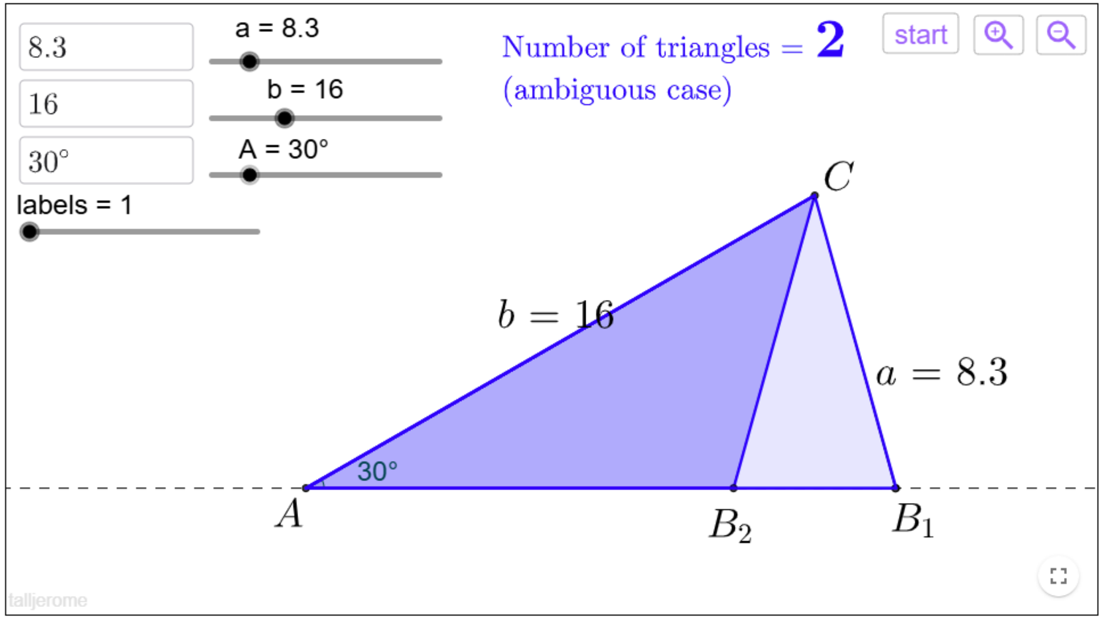
GeoGebra: https://www.geogebra.org/m/EzaeAWNH



Sine rule: Ambiguous no more?

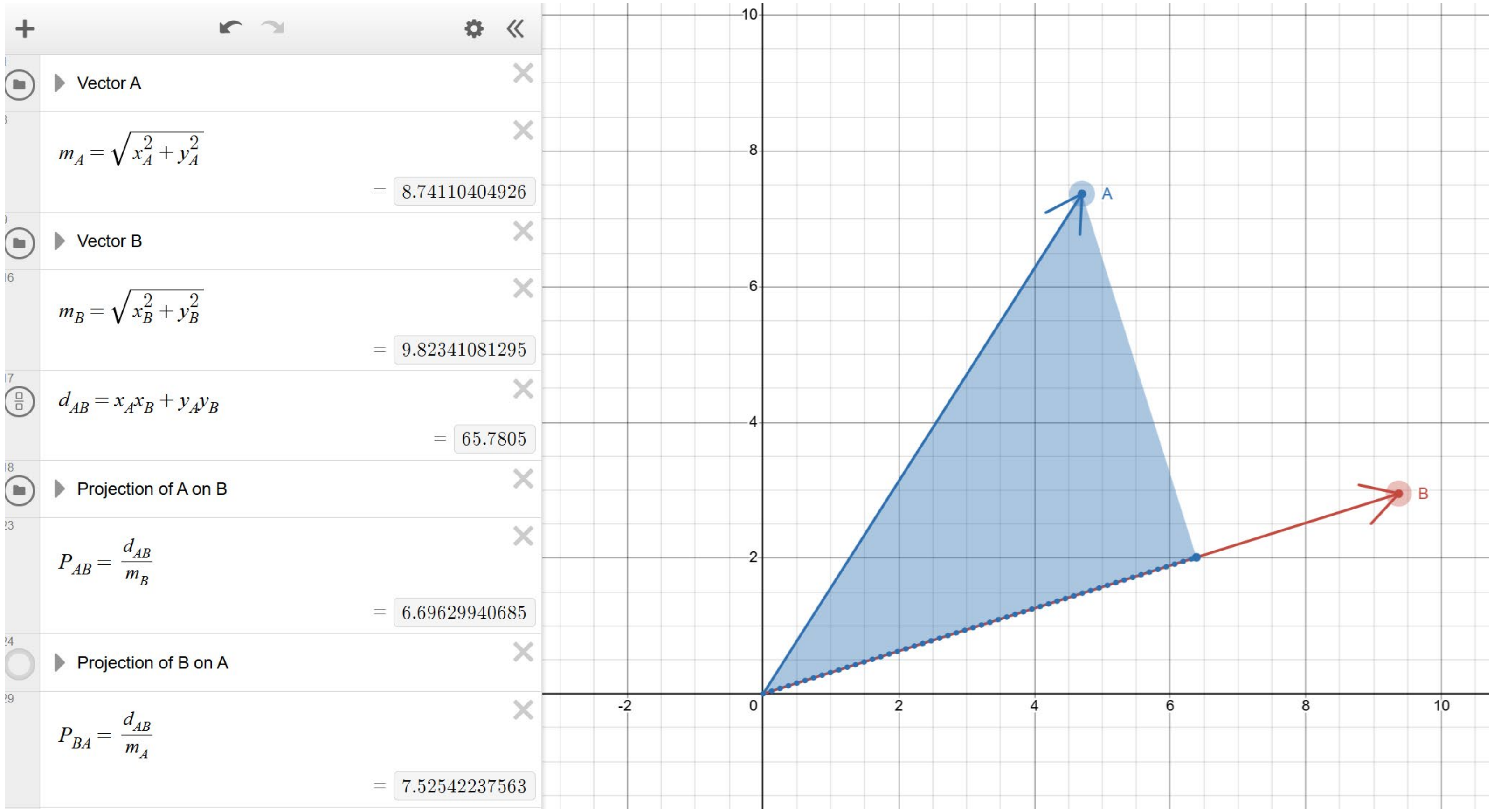
GeoGebra: https://www.geogebra.org/m/CvtkyRM5





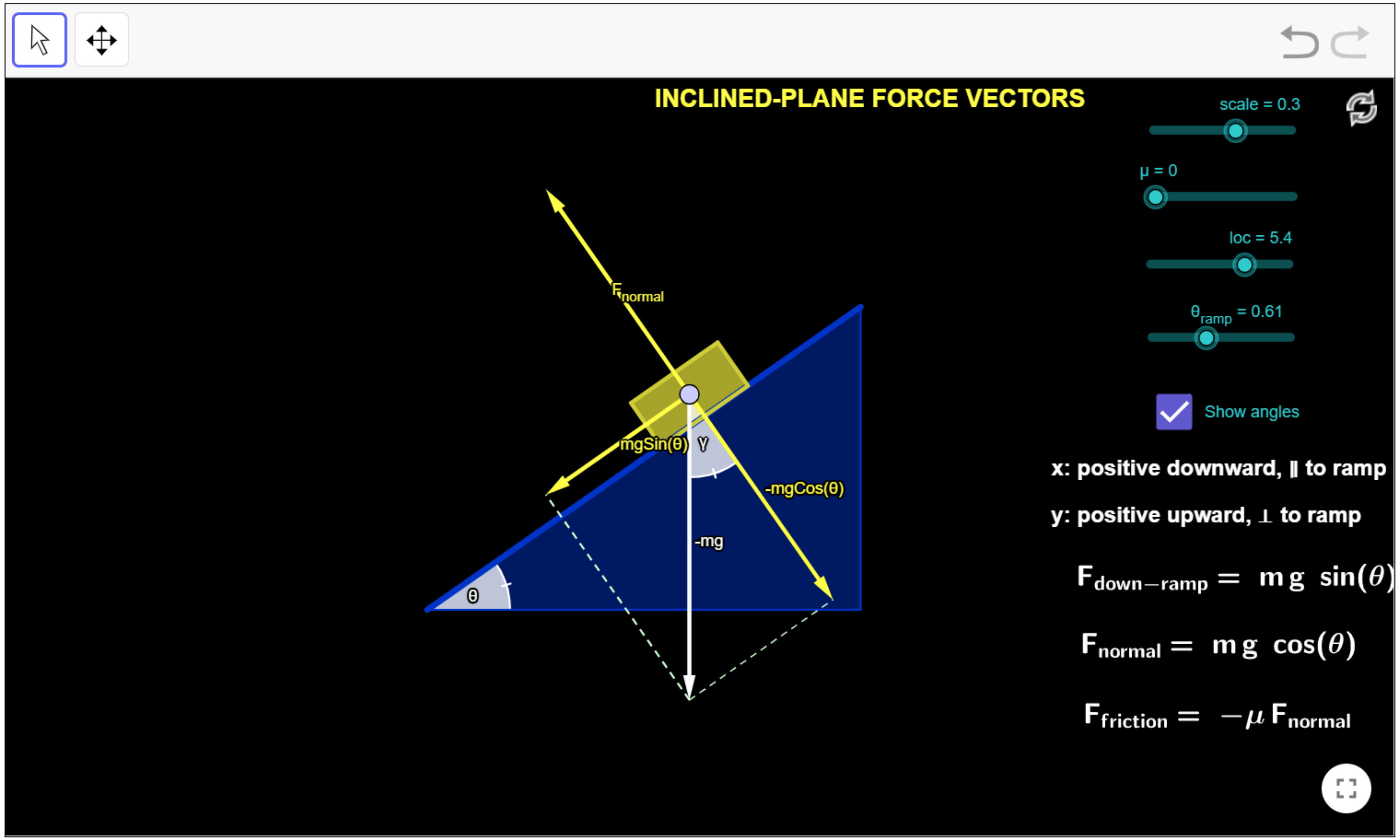
Vector Resolute: Resolved

Desmos: [Vector Projections | Desmos]



Inclined Planes

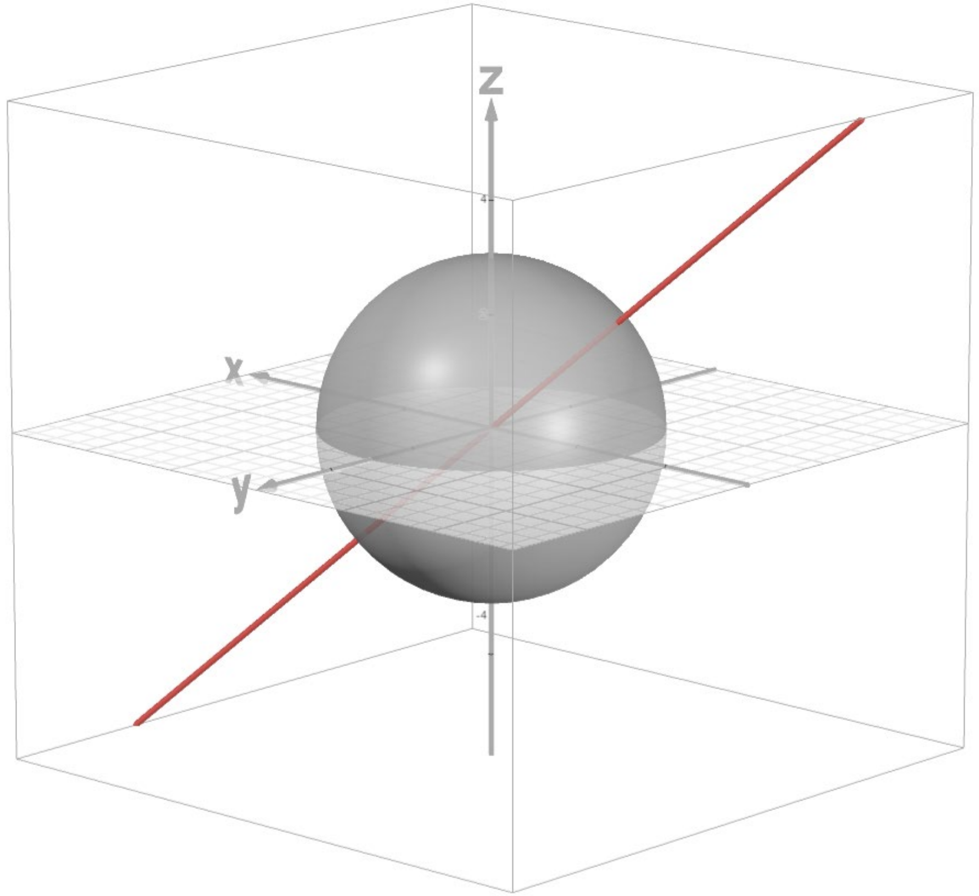
GeoGebra: Inclined plane forces – GeoGebra



Visualising 3D objects

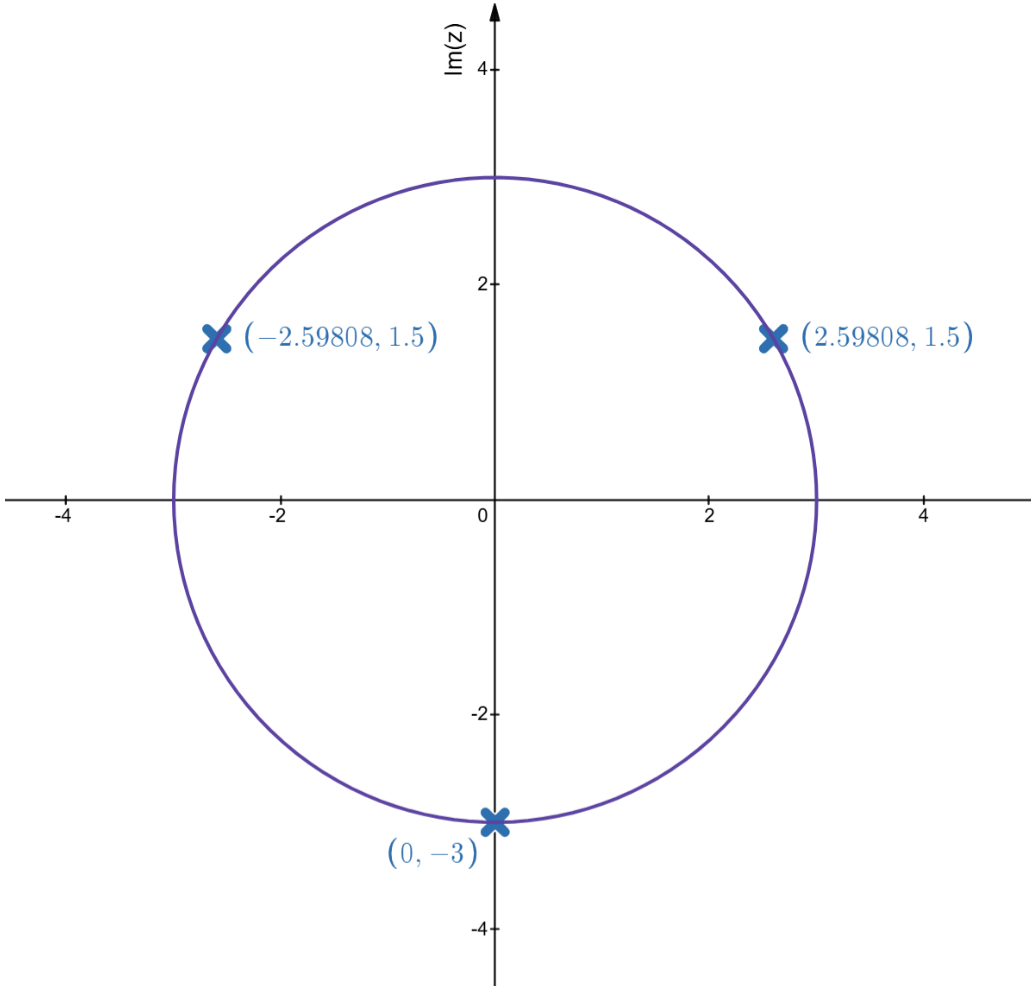
Desmos: https://www.desmos.com/3d/09de2f64a5

- Desmos 3D can be used to support students understanding objects in 3D. This includes spheres, planes, and lines.



Roots of complex numbers

Desmos: https://www.desmos.com/calculator/gpbqtruer1



Projectile motion

Desmos https://www.desmos.com/calculator/quly6uy4yw

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Probability density functions

- Connecting ‘histogram’ to probability density function.
- Area under the curve of $f(x)$ represents probability.
- $F(x) = \int_a^x f(t)\,dt$
- The shape, domain and behaviour of $F(x)$.
- The expected value of $f(x)$ and centre of mass.

Riemann sums and Trapezoidal rule:

- Desmos: https://www.desmos.com/calculator/sezwq775wg

Frequency histogram:

- Desmos: https://www.desmos.com/calculator/w5dj2x3n8b

Mixed concepts:

- Desmos: https://www.desmos.com/calculator/ede49bb4f0

Binomial distribution

- What does X represent? How do we interpret this?
- Probability distributed across all possible outcomes.
- Probability of r successes in n independent trials.
- Varying the parameters n and p. How does this affect the distribution? Does this agree with our intuition?

Visualising the Binomial distribution:
- Desmos: https://www.desmos.com/calculator/wvhka4reyp

Expected value:
- GeoGebra: https://www.geogebra.org/m/umhJzKsm

Final thoughts: A recap

- Questioning can be used to guide students towards understanding.
- Examples of questioning strategies used to engage students and promote thinking:
  - "What do you observe/notice about...?“
  - "Does anyone notice any patterns?"
- Positioning students to develop their own understanding. Students can actively participate in meaning construction.
- Discussions about mathematics and ideas enables students of all abilities to participate.
- Engage students’ and teachers’ natural curiosity. Encourage students to ask ‘Why?’.

A quick note

The resources that I have shared are not entirely my own. Thank you to everyone who has created and shared their resources. These have only enriched the teaching and learning of mathematics.

Visualising the Binomial distribution:

- This is not my creation. I have adjusted the original so that this is easier for me to use and to focus on the concepts I would like to discuss.

Expected value:

- This has been shared in its original form. I have not adjusted this.

Riemann sums and Trapezoidal rule:

- This has been shared in its original form. I have not adjusted this.

Frequency histogram:

- This has been shared in its original form.

Mixed concepts:

- I have adjusted a Desmos graph that looked at the link between a frequency histogram and a pdf.