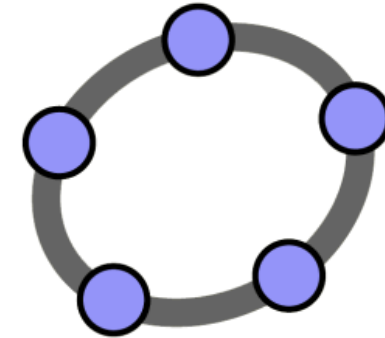


GeoGebra

Conjecture & Proof



Mark Dawes

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mdawes@combertonvc.org

To log on:

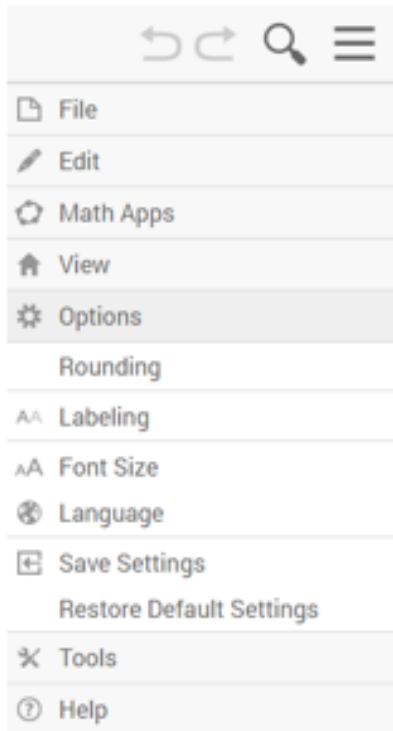
- Open internet browser
- Of the 2 available options, click on the 'Guest User' option
- Terms of use - confirm acceptance
- User ID: **MATHEMATICAL2017**
- Password: **RHULMATHEMATICAL2017**

www.geogebra.org

Some set-up might be needed:

Two menus. On the web app there are two menus on the right-hand side.

The upper one will allow you to load/save files (via 'Files').



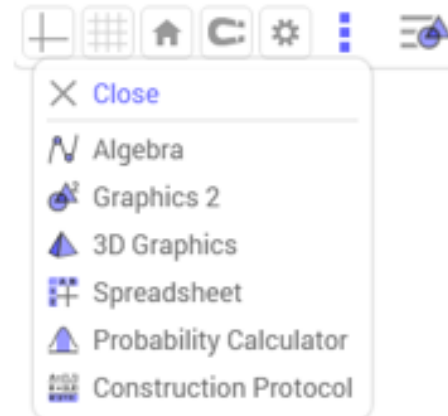
'Options' is particularly useful.

Check that 'Rounding' is set the way you want.

Change 'Labelling' to 'No new objects'?

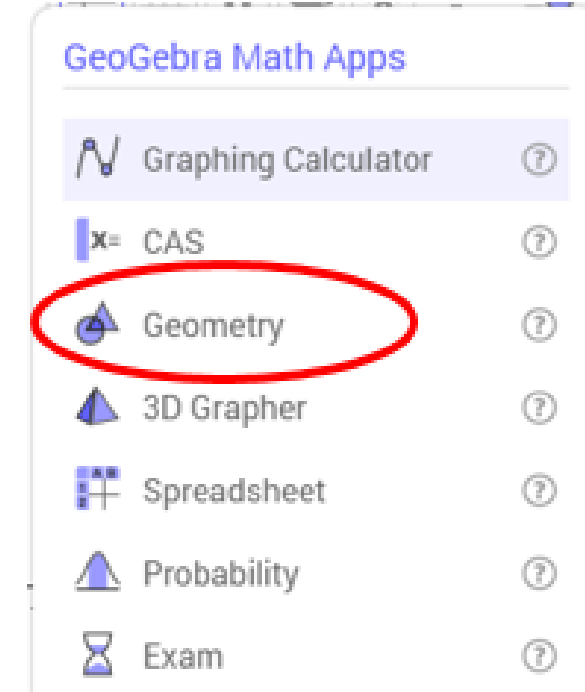
The lower one allows you to have more than one pane available (eg 'Algebra' and 'Graphics') – click on the three dots for this.

You can make changes to axes, grids and also format objects here.

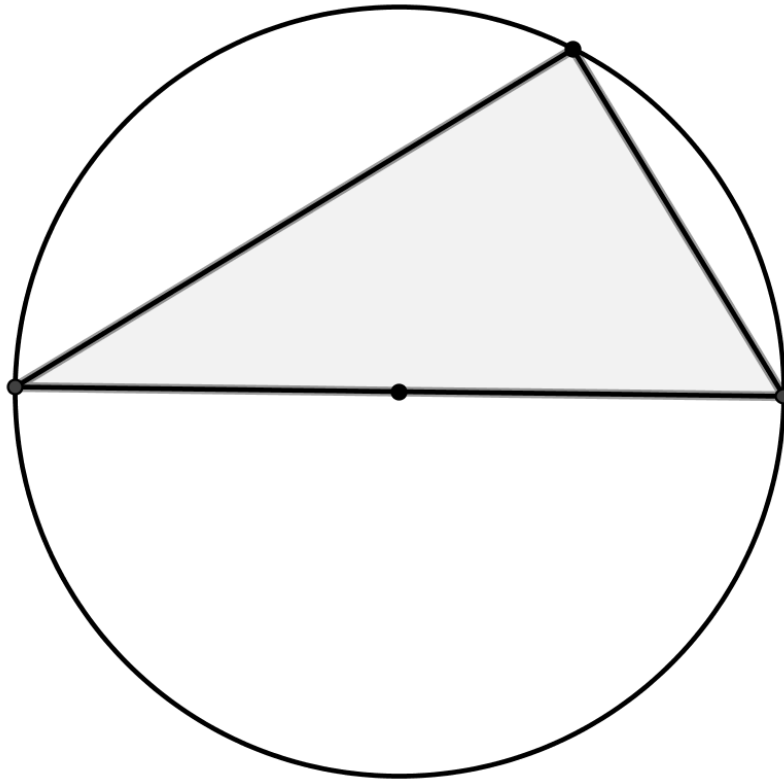


Setting up 2:

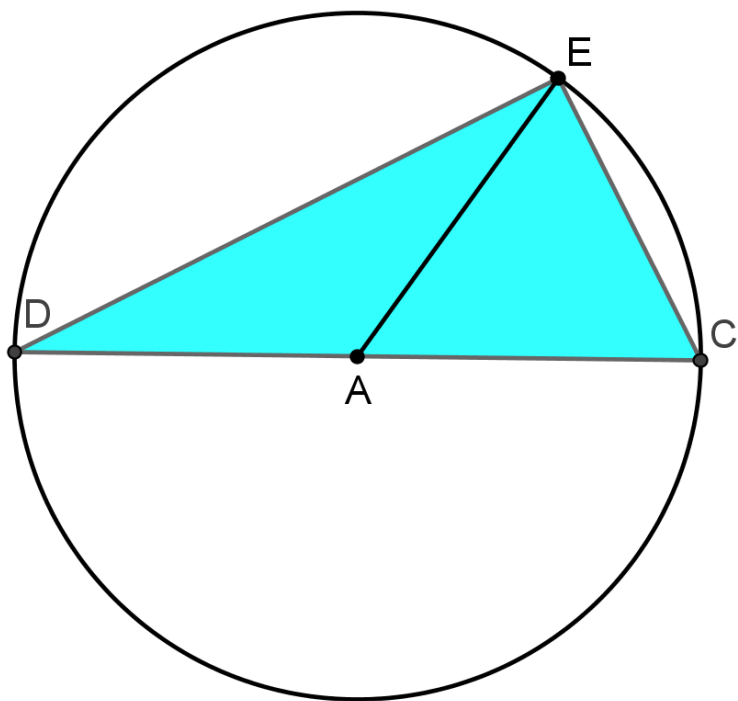
Select 'Graphing Calculator' or 'Geometry'



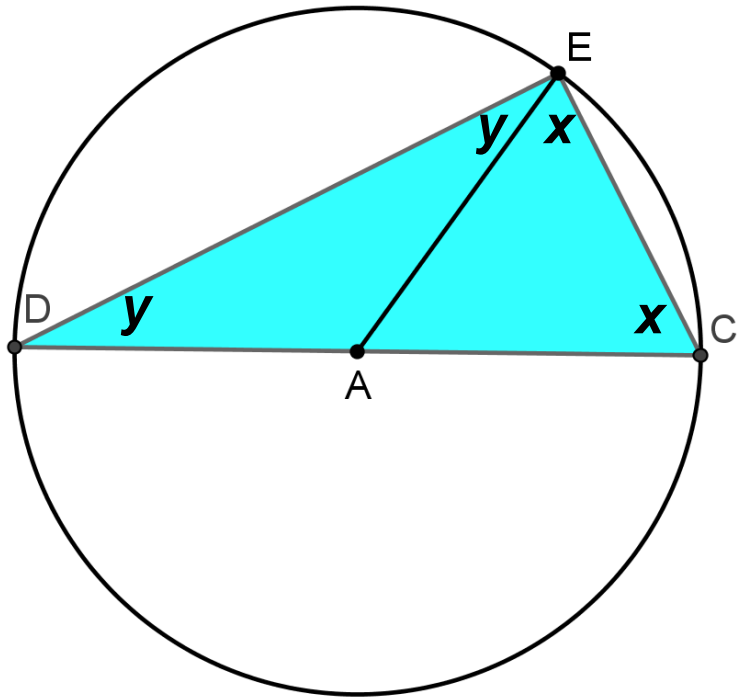
Question: “Make a conjecture about the triangle in a semi-circle. Prove it.”



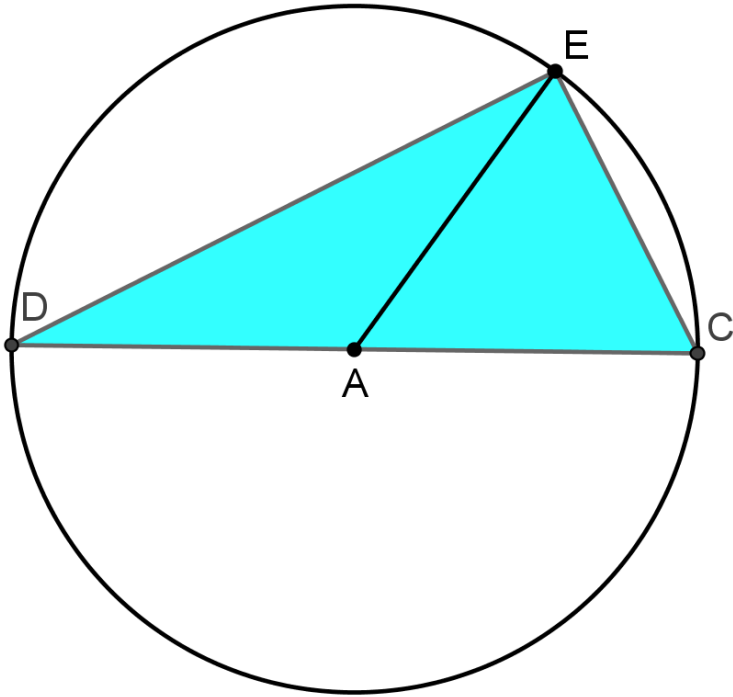
John's Conjecture



My expectation ...

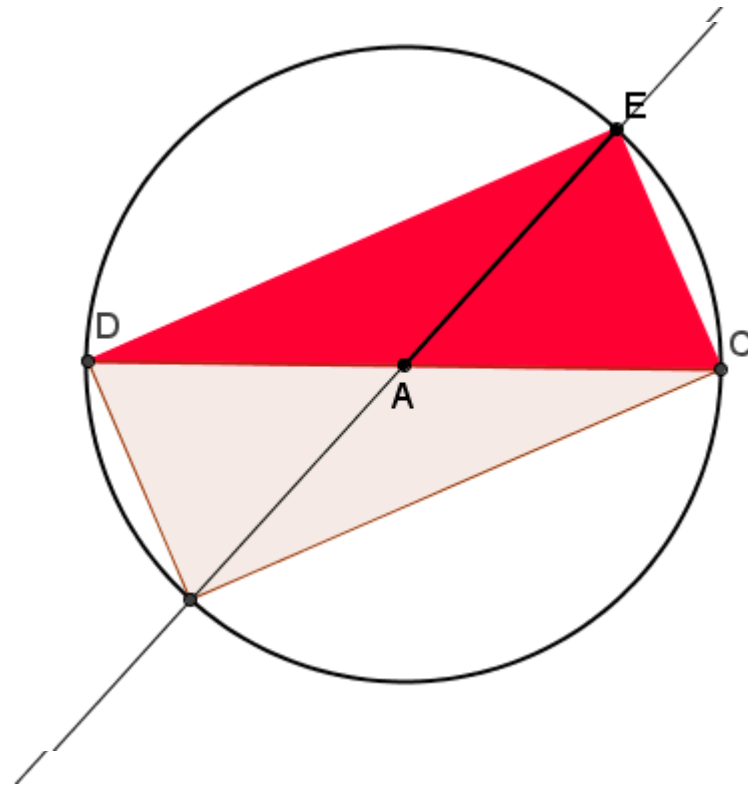


John's Conjecture



The two smaller triangles
have the same area

Maddie's Diagram



Use materials at <https://www.geogebra.org/mark+dawes>

Find the 'book' named for this session.

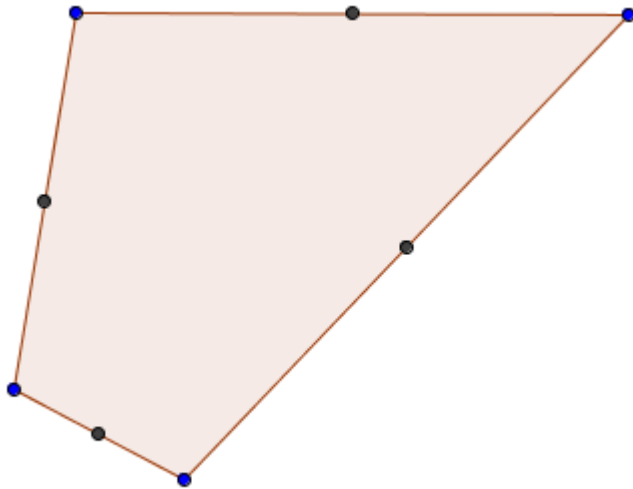


Find the circle

- A circle passes through the x-axis at 2 and 8.
- It is tangent to the y-axis.
- Where is the centre of the circle?

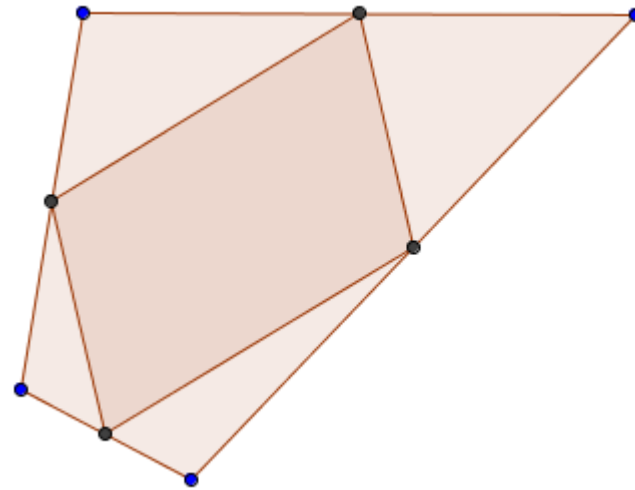
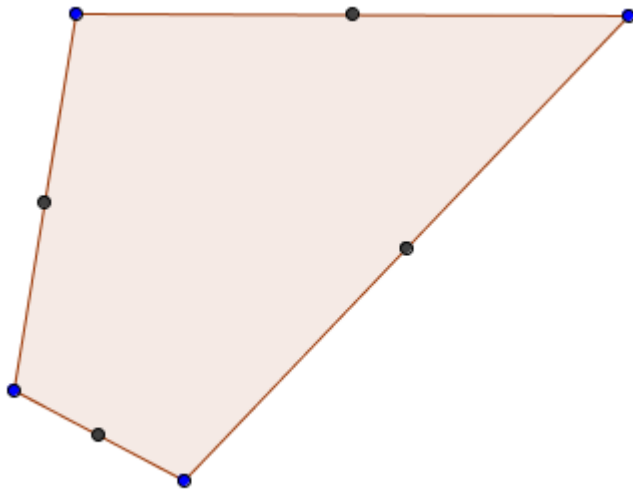
Homework

- “Draw any quadrilateral. Join the midpoints of the sides in order to make a new quadrilateral. What can you tell me about the new quadrilateral?”



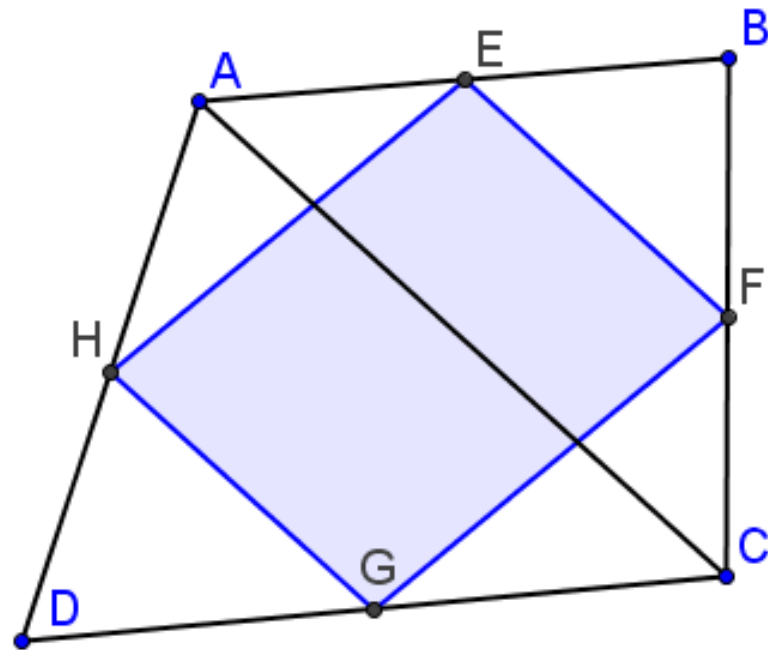
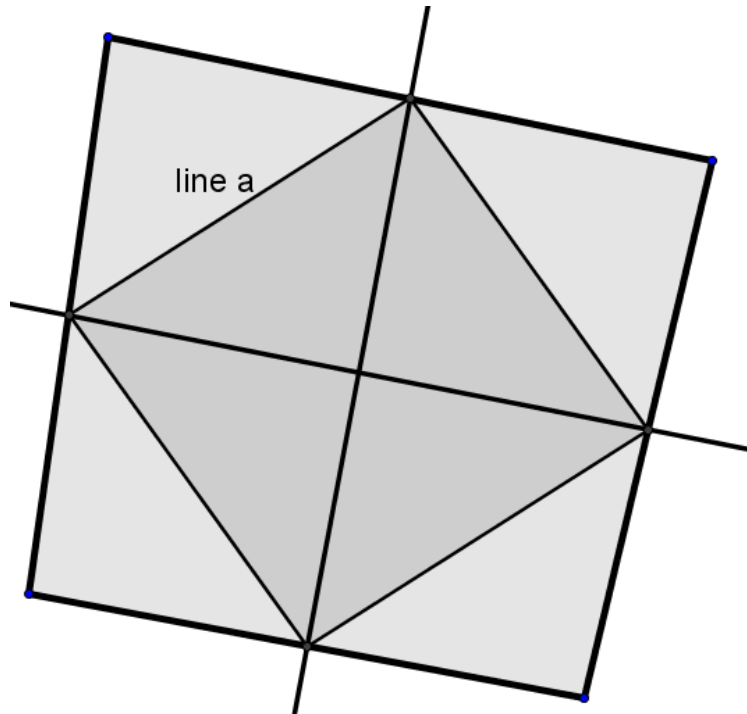
Homework

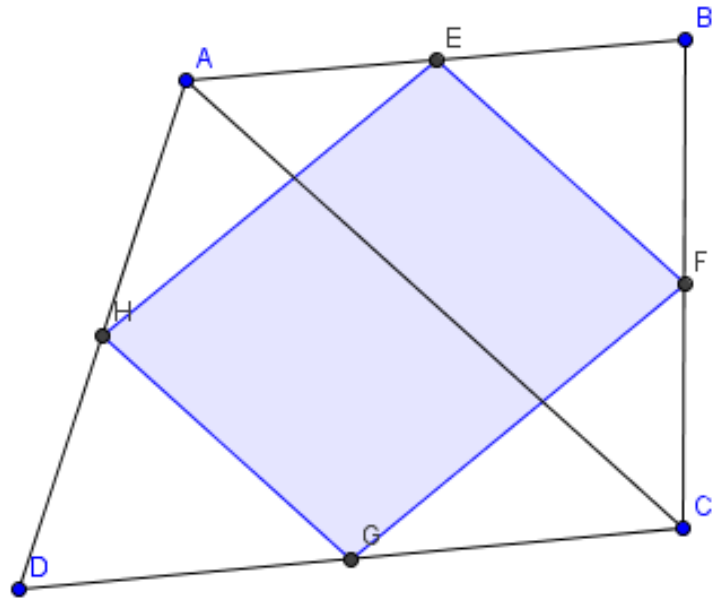
- “Draw any quadrilateral. Join the midpoints of the sides in order to make a new quadrilateral. What can you tell me about the new quadrilateral?”



Homework

- “Draw any quadrilateral. Join the midpoints of the sides in order to make a new quadrilateral. What can you tell me about the new quadrilateral?”

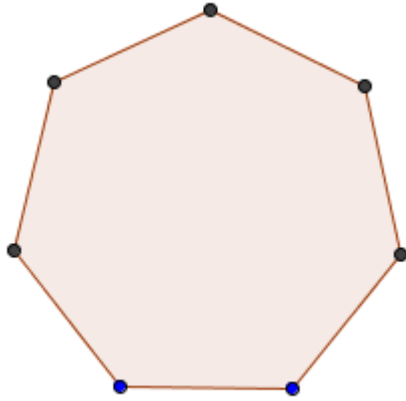




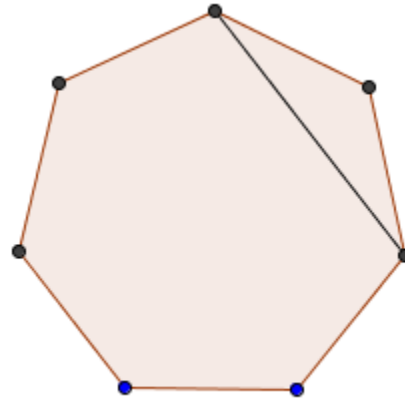
My conjecture is that the inner quadrilateral is a parallelogram.

When we add in a diagonal of the outer quadrilateral, we divide it into two triangles. The triangles are midsegmented by the two sides EF and HG of the inner quadrilateral, and we know this is the middle because they are joined at the midpoints of the outer quadrilateral. This means that the EF and HG are parallel to the diagonal AC, and half as long as it. If the other diagonal was also added, it would be the same for EH and FG. We can tell from this that the inner quadrilateral must be a parallelogram, because it has two pairs of sides which are parallel and of equal length.

Skipping

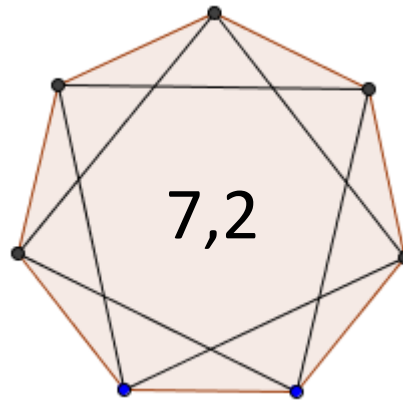


We need a regular polygon.
I choose to start with a regular heptagon.



I then chose to use a 'skip' of 2. I started at the top vertex, went clockwise round the heptagon two vertices.

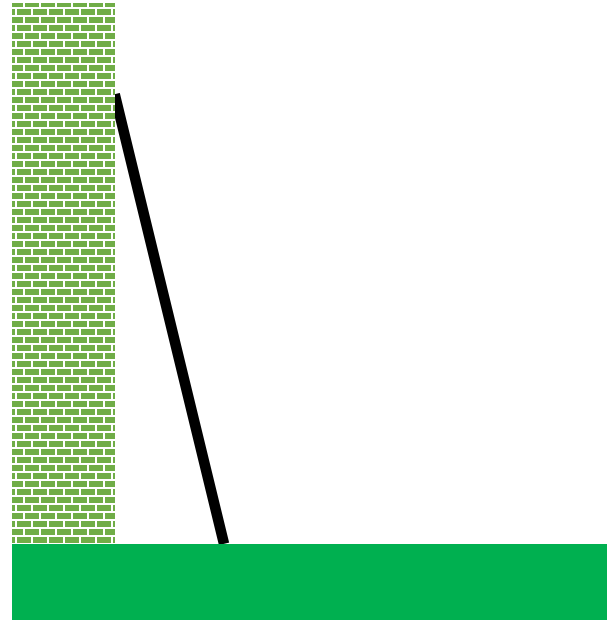
If I continue to use a skip of 2 it eventually gets back to the starting point. I have created this diagram.



Explore what happens for different starting polygons and skip values.

Sliding Ladder

A ladder 10m long (!) rests on horizontal ground against a vertical wall. As the foot of the ladder slips away from the wall, what is the locus of the centre of the ladder?



Quadrilateral Tessellation

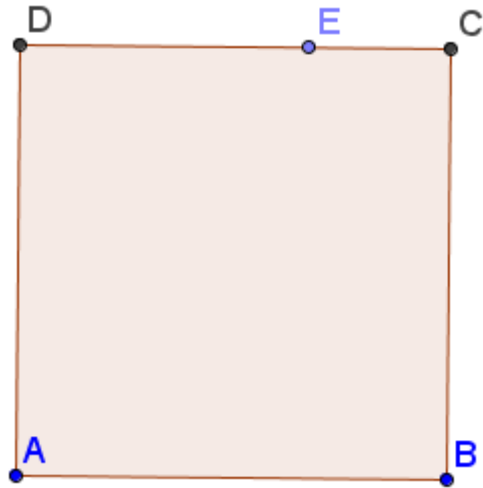
Claim: “Every quadrilateral tessellates.”

Is this true?

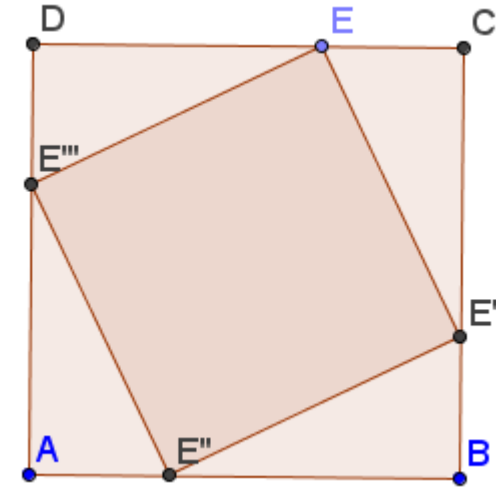
Can you explain why (not) ?

Which is bigger?

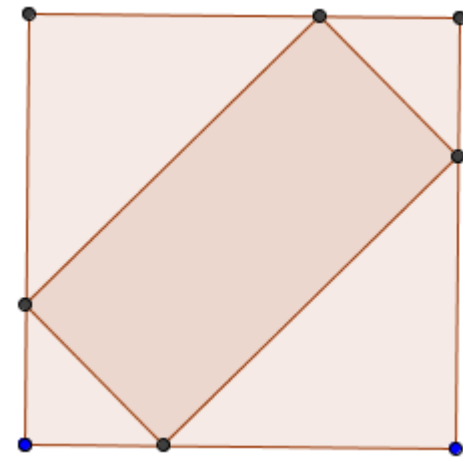
Draw a point on a square.



You can make a new square by rotating this point about the centre of the square.



You can make a new rectangle by reflecting this point in the diagonals of the square.



Conjecture & Proof with GeoGebra

1. The Question
2. Instructions
3. Draw the diagram
4. Solve the problem
5. Record results/ideas/answers
6. Write a proof
7. Decide whether dynamic geometry is worth using

Are these steps in the right order?
Are there any steps missing?