

MEI GeoGebra Tasks for GCSE

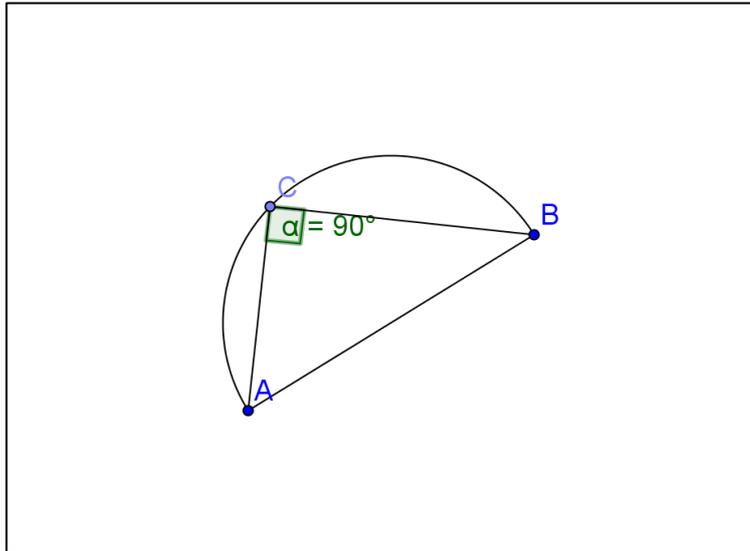
Geometry 1: Circle Theorems

The angle in a semi-circle is a right-angle

1. Open a new GeoGebra file and hide the axes.
2. Use **Semi-Circle Through Two Points** (6th menu)  to add a semi-circle to the screen with between points **A** and **B**.
3. Use **New Point** (2nd menu)  to add a new point on the circle, **C**.
4. Use **Segment between Two Points** (3rd menu)  to create segments AB, AC and BC.
5. Use the **Angle** tool (8th menu)  to measure the angle ACB.

You can do this by displaying clicking on the axes in the Graphics style bar.

With the tool selected click on A, then C, then B.



Further Tasks

Create similar GeoGebra files to demonstrate the following Circle theorems:

- Angles at the circumference in the same segment are equal.
- The radius and tangent at a point are perpendicular.
- The angle at the centre is twice the angle at the circumference.
- The sum of opposite angles in a cyclic quadrilateral is 180° .

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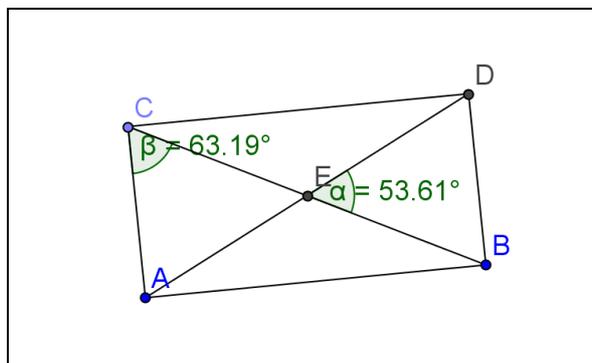
Geometry 2: Properties of quadrilaterals

Creating a rectangle

1. Open a new GeoGebra file and hide the axes.
2. Use **New Point** (2nd menu)  to add two points, **A** and **B**.
3. Use **Segment Between Two Points** (3rd menu)  to add the line segment AB.
4. Use **Perpendicular Line** (4th menu)  to create a line perpendicular to AB through A and B.
5. Use **New Point** (2nd menu)  to add a point **C**, on the perpendicular through A.
6. Create a **Parallel Line** (4th menu) parallel to AB through C. 
7. Use **Intersection of Two Objects** (2nd menu)  to find the intersection point, **D**, of the parallel to AB and the perpendicular through B.
8. Create the sides of the rectangle by hiding the parallel and perpendicular lines and add in line segments for BC, CD and BD.
9. Create line segments for the diagonals of the rectangle and find the point of intersection, **E**, of the diagonals.
10. Use the Angle tool to measure some of the Angles in the rectangle (such as DEB and ACE).

You can do this by displaying the Graphics style bar and clicking on the axes.

You can hide an object by clicking the blue circle next to its name in the Algebra view.



Questions

- What lengths are the same in a rectangle?
- What angles are the same in a rectangle?

The lengths of the sides can be found as segments in the Algebra view.

Create a parallelogram using a similar method:

- What lengths are the same in a parallelogram?
- What angles are the same in a parallelogram?

Other quadrilaterals:

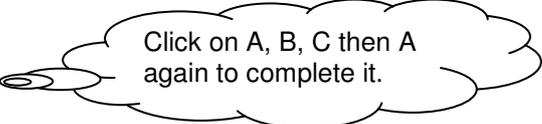
- What other quadrilaterals can you make?

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Geometry 3: Similar triangles

1. Open a new GeoGebra file and hide the axes.

2. Use **New Point** (2nd menu)  to add three points, **A**, **B** and **C**.

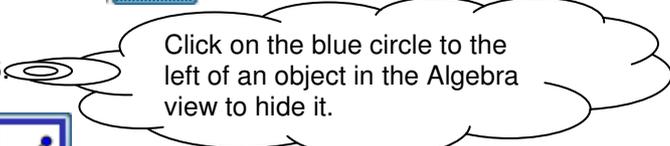
3. Use **Polygon** (5th menu)  to create the triangle ABC.  Click on A, B, C then A again to complete it.

4. Use **Line through Two Points** (3rd menu)  to create lines AB and AC.

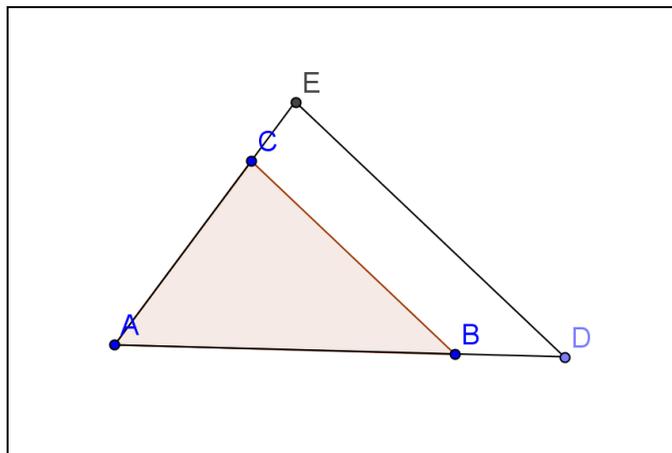
5. Use **New Point** (2nd menu)  to add a point, **D**, on the line through A and B.

6. Create a **Parallel Line** (4th menu) parallel to BC through D. 

7. Use **Intersection of Two Objects** (2nd menu)  to find the point of intersection of the parallel line and the line AC.

8. Hide the lines created in steps 4 and 6.  Click on the blue circle to the left of an object in the Algebra view to hide it.

9. Use **Segment between Two Points**  to create segments AE, AD and DE.



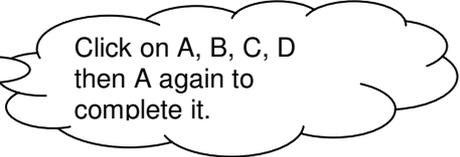
Questions

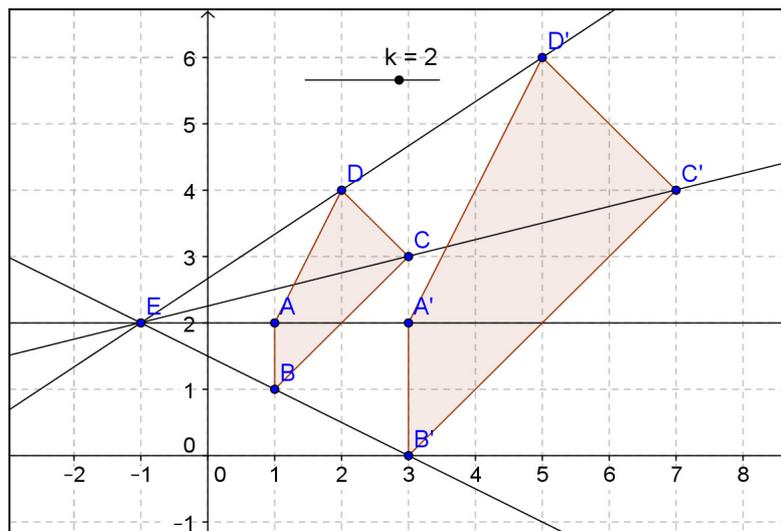
- Which angles are the same?
- What is the relationship between the side lengths?
- How many angles need to be the same for the triangles to be similar?
- Can you find any other ways to construct similar triangles in GeoGebra?

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Geometry 4: Transformations

Enlargement from a point by a scale factor

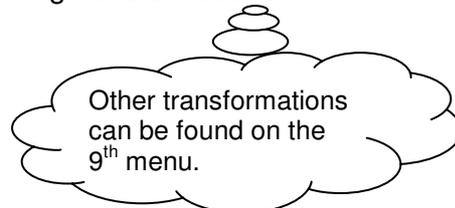
1. Open a new GeoGebra page and show the axes and the gridlines.
2. Use **New Point** (2nd menu)  to add four points **A**, **B**, **C** and **D**.
3. Use **Polygon** (5th Menu)  to create the quadrilateral **ABCD**. 
4. Add a point **E**.
5. Add a **slider** (11th menu)  and name it **k**.
6. Use **Enlarge Object from Point by Factor** (9th menu)  and select the quadrilateral, the point **E** and enter the Scale Factor **k**.
7. Use **Line through Two Points** (3rd menu)  to create lines through **EA**, **EB**, **EC** and **ED**.



Questions

Create similar GeoGebra files to demonstrate the following transformations:

- Rotation about a point (using a slider)
- Reflection about
 - The x -axis
 - The y -axis
 - $y = x$
 - $y = -x$
- Translation by a vector



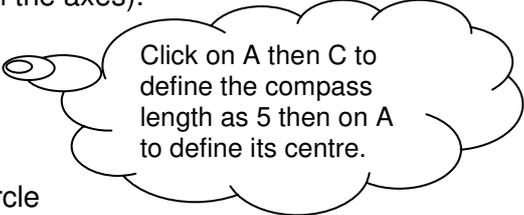
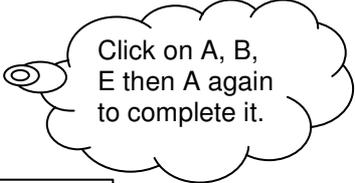
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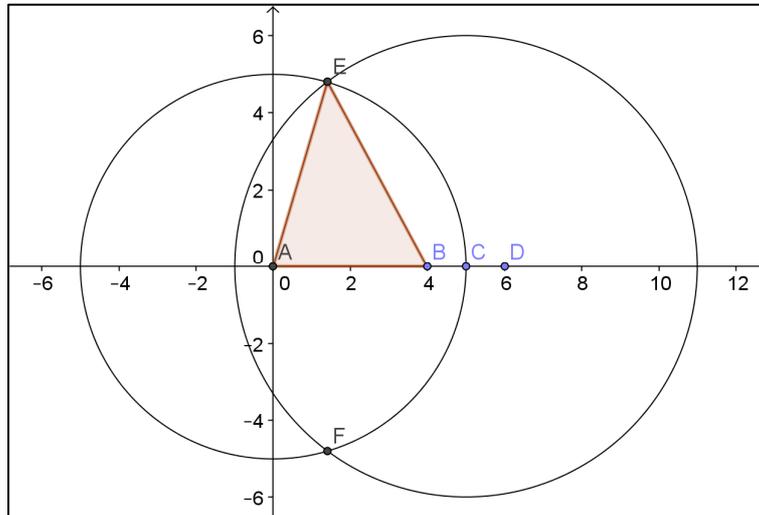
Geometry 5: Constructions

You can practise ruler and compasses constructions by using the **Line through Two Points** and **Compasses** tools:



Constructing a triangle with sides length 4, 5 and 6 units

1. Open a new GeoGebra page with the axes shown..
2. Use **New Point** (2nd menu)  to add a point at the origin, **A**, and points at (4,0), (5,0) and (6,0): **B**, **C** and **D**.
3. Use **New Point** to add a point, **E** (not on the axes).
4. Use **Compasses** (6th menu)  to add a circle centre **A** radius 5 (defined by AC). 
5. Use **Compasses** (6th menu) to add a circle centre **C** radius 6 (defined by AD).
6. Use **Intersection of Two Objects** (2nd menu)  to find the points of intersection of the two circles, **E** and **F**.
7. Use **Polygon** (5th menu)  to create the triangle ABE. 



Further Tasks

Create similar GeoGebra files to demonstrate the following constructions:

- An angle of 60°
- A perpendicular bisector
- An angle bisector
- The perpendicular at a point on a line
- The perpendicular from a point to a line