

# 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.

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

2. Use **Semi-Circle Through Two Points** (6<sup>th</sup> menu)



to add a semi-circle to the screen with between points **A** and **B**.

3. Use **New Point** (2<sup>nd</sup> menu)



to add a new point on the circle, **C**.

4. Use **Segment between Two Points** (3<sup>rd</sup> menu)



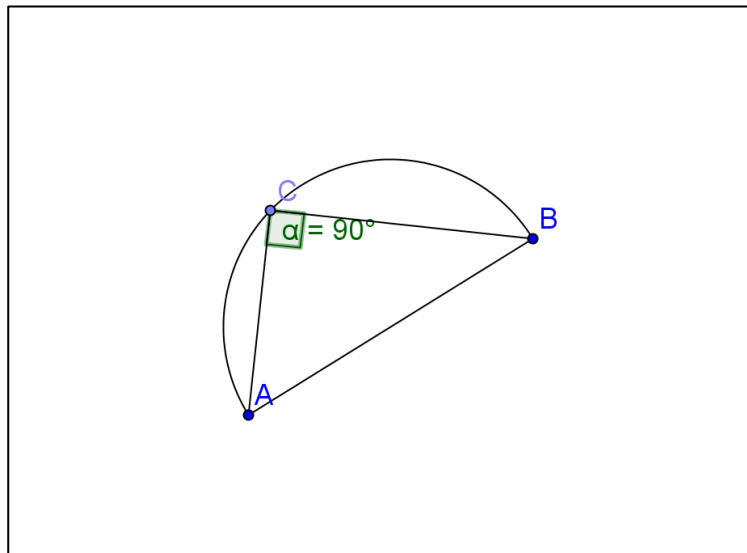
to create segments AB, AC and BC.

5. Use the **Angle** tool (8<sup>th</sup> menu)



to measure the angle ACB.

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  $180^\circ$ .

# MEI GeoGebra Tasks for GCSE

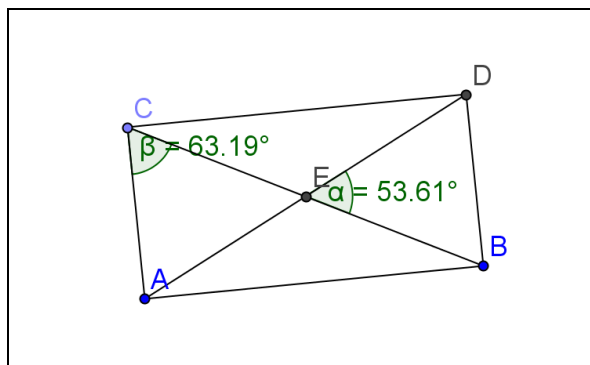
## Geometry 2: Properties of quadrilaterals

### Creating a rectangle

1. Open a new GeoGebra file and hide the axes.
2. Use **New Point** (2<sup>nd</sup> menu)  to add two points, **A** and **B**.
3. Use **Segment Between Two Points** (3<sup>rd</sup> menu)  to add the line segment AB.
4. Use **Perpendicular Line** (4<sup>th</sup> menu)  to create a line perpendicular to AB through A and B.
5. Use **New Point** (2<sup>nd</sup> menu)  to add a point **C**, on the perpendicular through A.
6. Create a **Parallel Line** (4<sup>th</sup> menu) parallel to AB through C. 
7. Use **Intersection of Two Objects** (2<sup>nd</sup> 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:


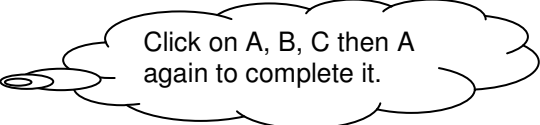
- What other quadrilaterals can you make?


# MEI GeoGebra Tasks for GCSE


## Geometry 3: Similar triangles


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


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

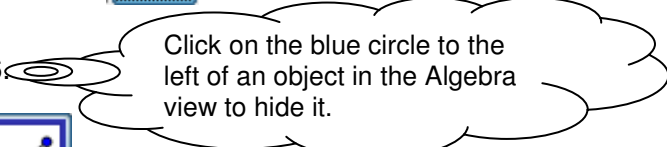
3. Use **Polygon** (5<sup>th</sup> menu)  to create the triangle ABC.  Click on A, B, C then A again to complete it.


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

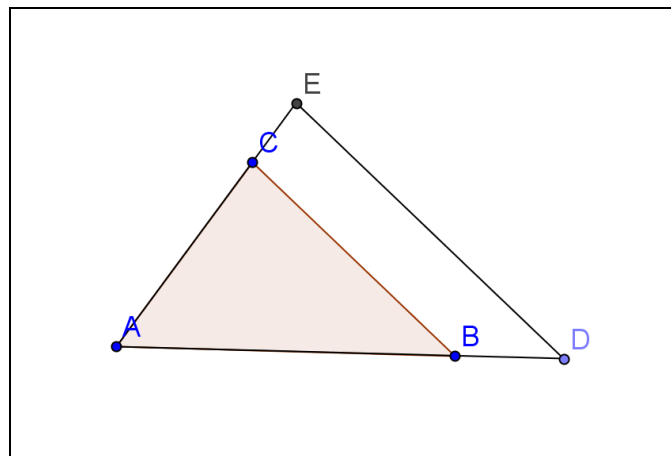
5. Use **New Point** (2<sup>nd</sup> menu)  to add a point, **D**, on the line through A and B.

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

7. Use **Intersection of Two Objects** (2<sup>nd</sup> 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.





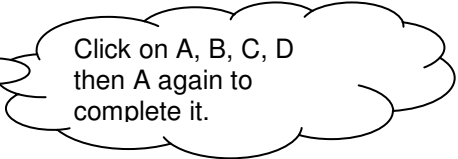



### Questions

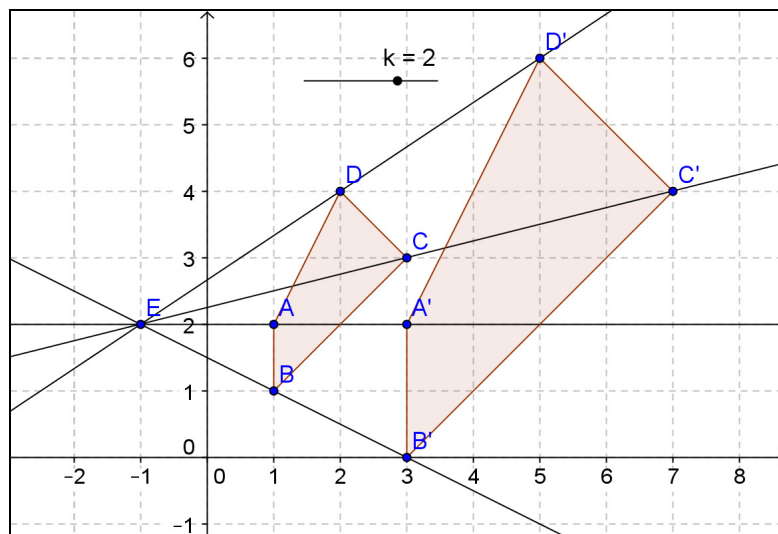
- Which angles are the same?
- What is the relationship between the side lengths?
- How many angles need to be the same for the triangles to be similar?
- Can you find any other ways to construct similar triangles in GeoGebra?

# MEI GeoGebra Tasks for GCSE

## Geometry 4: Transformations

### Enlargement from a point by a scale factor

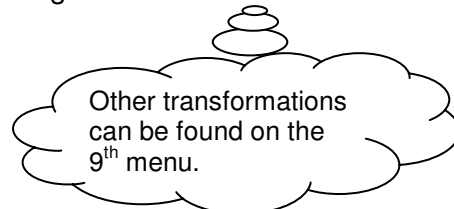
1. Open a new GeoGebra page and show the axes and the gridlines.
2. Use **New Point** (2<sup>nd</sup> menu)  to add four points **A**, **B**, **C** and **D**.
3. Use **Polygon** (5<sup>th</sup> Menu)  to create the quadrilateral **ABCD**. 
4. Add a point **E**.
5. Add a **slider** (11<sup>th</sup> menu)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





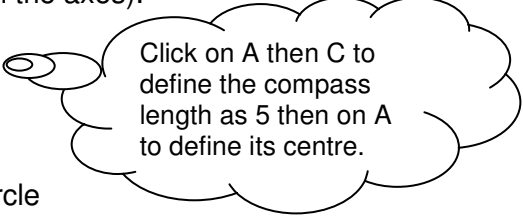


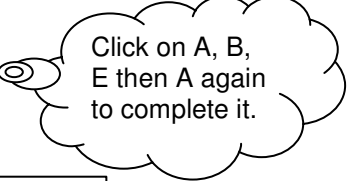
# MEI GeoGebra Tasks for GCSE

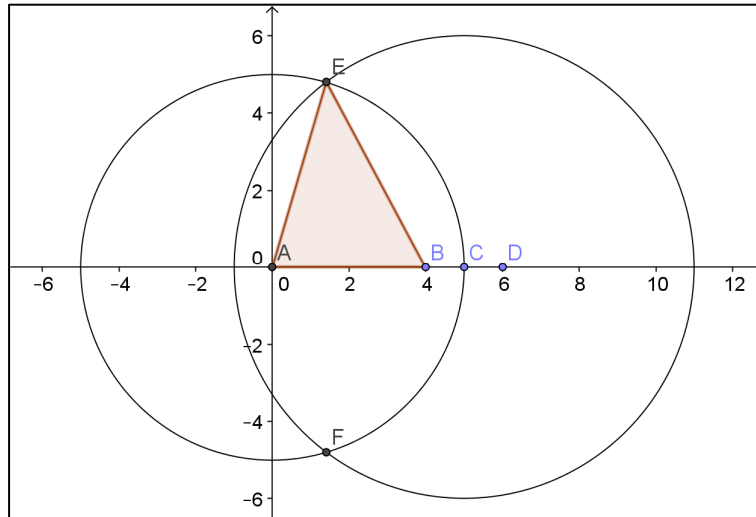
## Geometry 5: Constructions

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** (2<sup>nd</sup> 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** (6<sup>th</sup> menu)  to add a circle centre **A** radius 5 (defined by AC). 
5. Use **Compasses** (6<sup>th</sup> menu) to add a circle centre **C** radius 6 (defined by AD).
6. Use **Intersection of Two Objects** (2<sup>nd</sup> menu)  to find the points of intersection of the two circles, **E** and **F**.
7. Use **Polygon** (5<sup>th</sup> menu)  to create the triangle ABE. 



### Further Tasks

Create similar GeoGebra files to demonstrate the following constructions:

- An angle of  $60^\circ$
- A perpendicular bisector
- An angle bisector
- The perpendicular at a point on a line
- The perpendicular from a point to a line