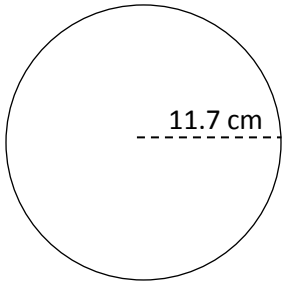
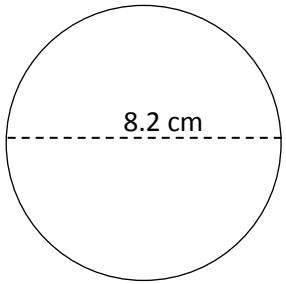
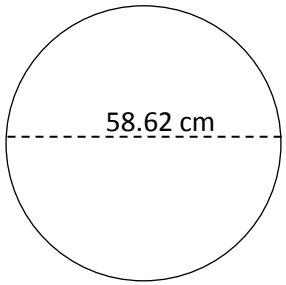
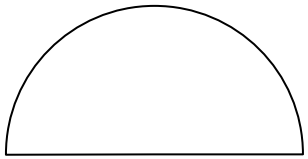
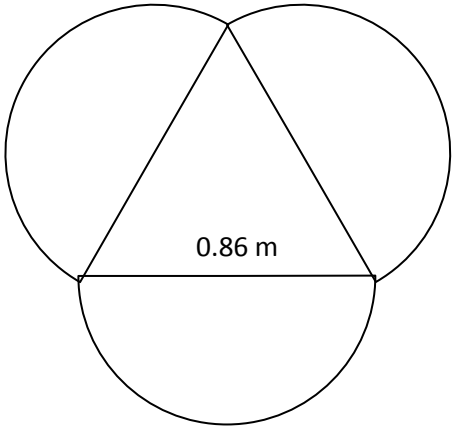
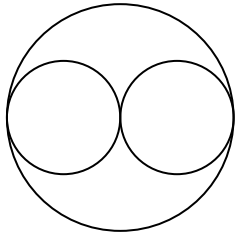
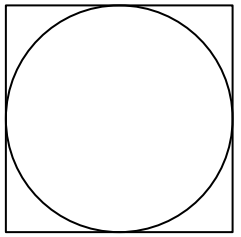
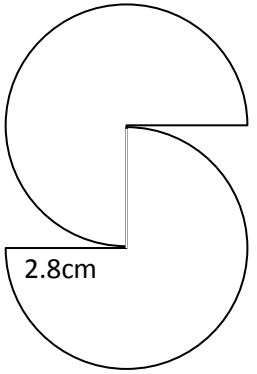
Year 8 Maths – Space and Shape

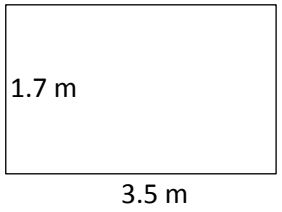
Level 1 Questions	Level 2 Questions	Level 3 Questions	Challenge Questions
These question types represent the minimum requirements of the course. They are easier questions, normally with only one rule being applied at any time, they are mostly single step questions. These question types represent the minimum passing level for the course, a C level.	These questions represent a level of understanding above the minimum and often require more than one rule to be applied in a multi-step approach. The starting point or the approach to the question is not as clear. These question types represent a level of understanding at about the B level.	These questions represent of understanding well above what is required. They are questions with multiple steps and often with a range of different skills and thought processes embedded. The starting point is generally not given and may not even be clear as is the approach. These question types represent a level of understanding at about the A level.	Challenge questions appear at the end of the booklet. These questions can be very difficult and often require a range of different skills and thinking. They are questions where you need to think "out of the box" Other than knowing the questions are based on the current terms work you are given no indication of where to start or how to approach it.

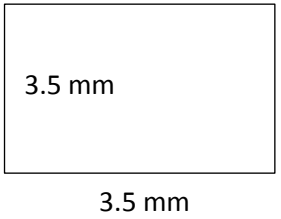
Circumference (Any 3 Questions)

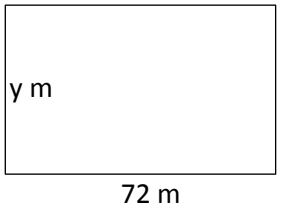
Level 1	Level 2	Level 3
Find the circumference of the following circles   	A circle has a circumference of 158.6 m, what is the radius of the circle. Calculate the perimeter of the shape opposite if the base of the shape is 92.7 mm long.  The shape below was constructed by connecting half circles to each side of an equilateral triangle, what is the perimeter of the shape 	Create a convincing argument to prove whether the circumference of the two smaller circles is less than, more than, or equal to the circumference of the larger circle.  The circle is inscribed in the square so that it is touching each side. How big would the side of the square need to be to make sure that the circumference of the circle is 10 to 12 cm less than the perimeter of the square  The letter S shown opposite is made by connecting two ¾ circles together and connecting the centre to the outside with a straight line. If the straight parts of this shape are 2.8 cm long, then calculate the total perimeter of the shape. 

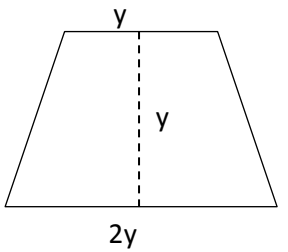
Area (Any 6 Questions – Level 1 must have 1 of each shape)

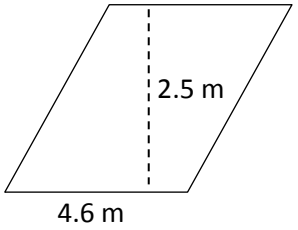
Level 1	Level 2	Level 3
Find the area of the following shapes	Find the value of y if we know that the area of all shapes is 130 m^2	Find the value of y if we know that the area in all cases is 250 cm^2

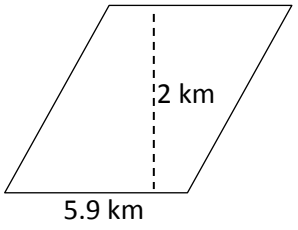


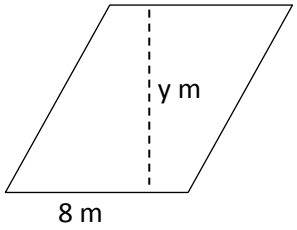


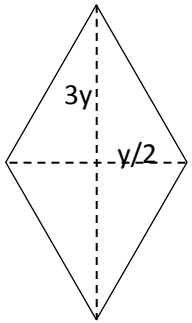


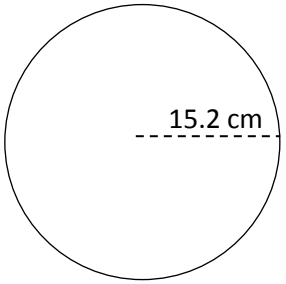


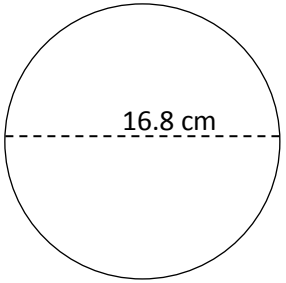


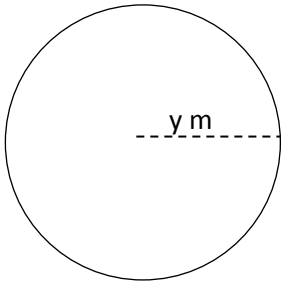


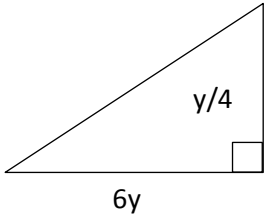


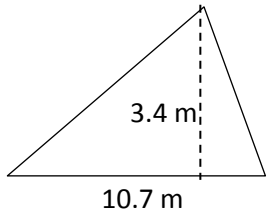
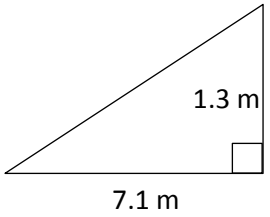
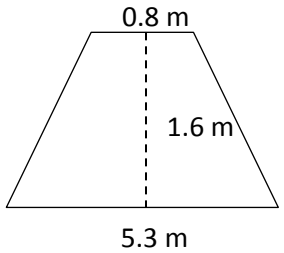
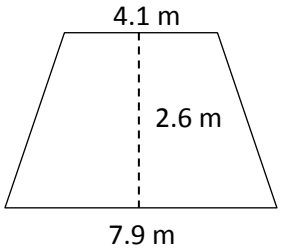
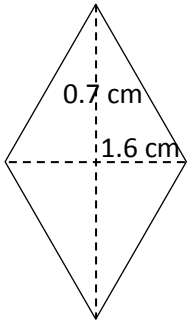
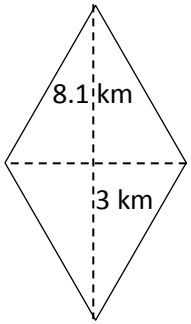
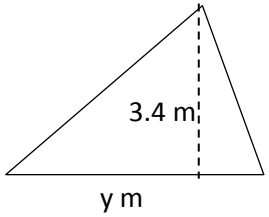
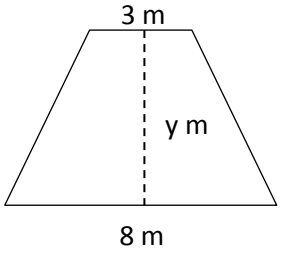
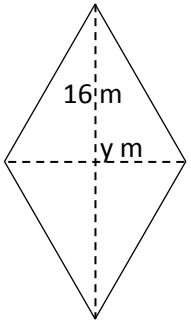




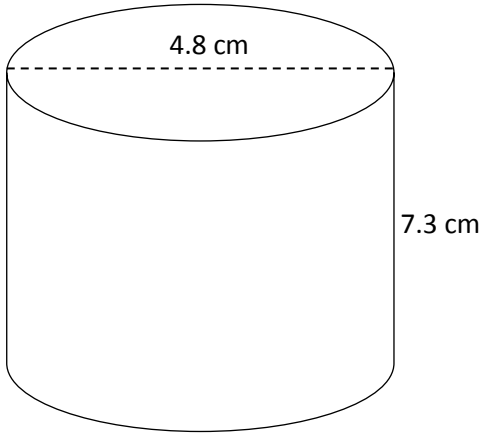
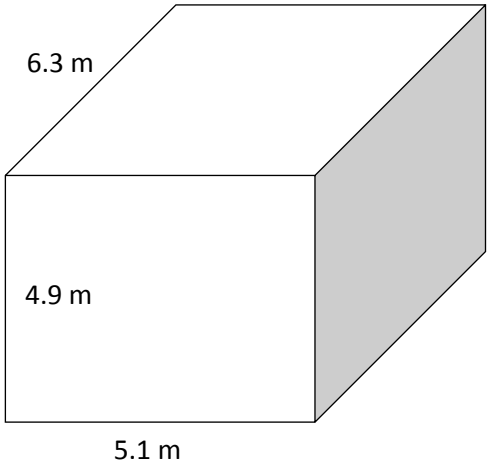
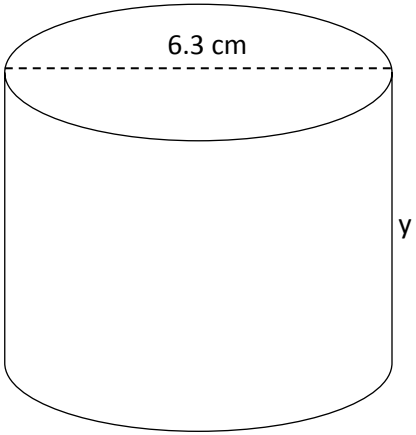
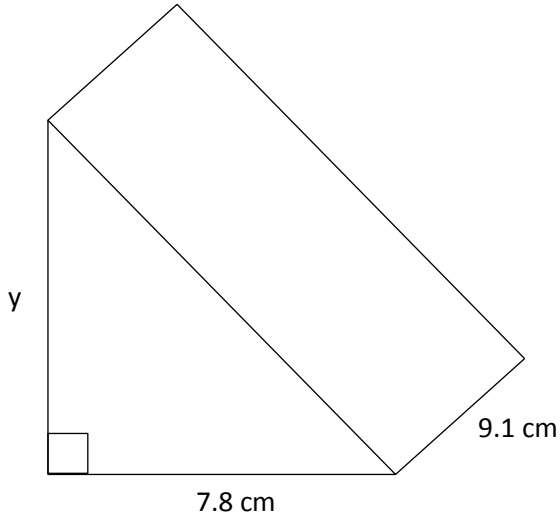
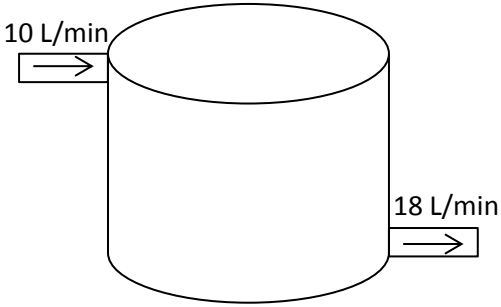


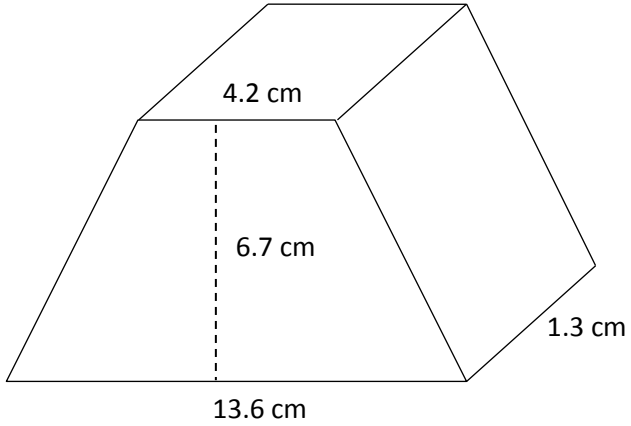
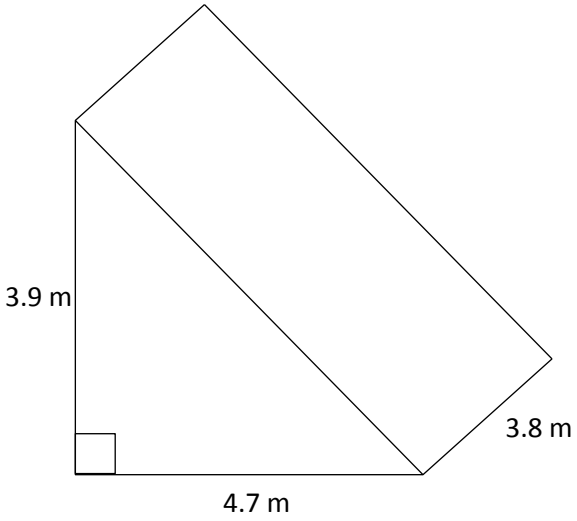
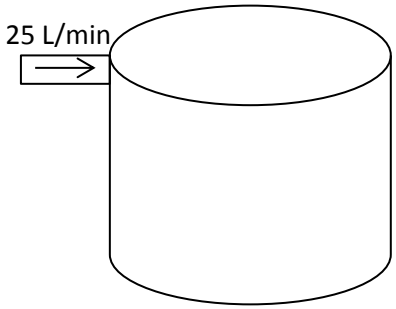
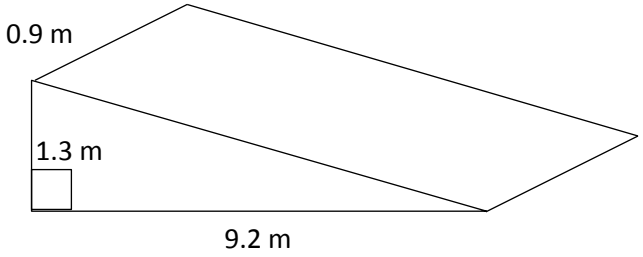
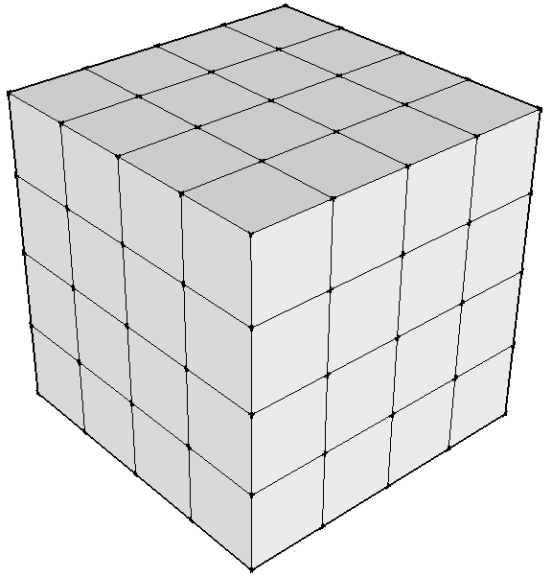




Level 1	Level 2	Level 3
.Find the area of the following shapes      	  	Write 3 sets of dimensions for each shape that give an area of 125 m^2. All sides must not be integer values. a) Triangle (define the base and height) b) Trapezium (define the height, and both the top and bottom lengths. Given a fixed area of 125 m^2, explain whether you can create three different sets of dimensions for a square. Give clear reasons for your choice

Volume (Any 4 Questions)

Level 1	Level 2	Level 3
 	The volume of the following shapes are 250 cm^2 find the value of y that makes this true  	Give 3 different sets of standard dimensions for each of the following solids such that the total volume is equal to 938 cm^3. a) Cylinder b) Triangular Prism Rainwater fills a tank that is 3.2 m wide and 3.2 m high at a rate of 10 L per min. When it is full a tap at the bottom automatically opens and empties at 18 L per min so that more water can flow in. If the tap at the bottom gets stuck open and the water is still flowing in at the top. How long would it take to empty the tank? 

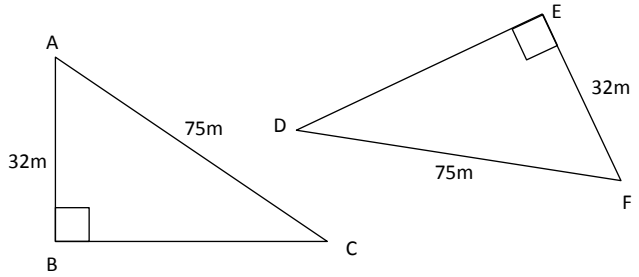
Level 1	Level 2	Level 3
 	A rainwater tank with a radius of 1.3 m and a height of 2.1 m has a inlet that fills at 25 L per min. if the tank starts empty, how long will it take to fill the tank.  A wheelchair ramp designed for a new building has the dimensions shown below. This ramp costs $800 for cement. If the ramp height needs to be increased to 1.5 instead of 1.3 m, what would be the new ramp cost. 	A larger cube is made up of smaller cubes so that there are 4 cubes along each edge. If the volume of the large cube is 729 cm^3 what are the dimensions of the smaller cubes? 

Congruence of Triangles (Any 4 questions)

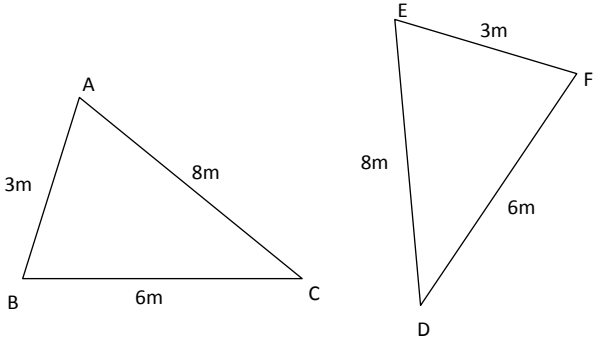
Level 1

The following pairs of triangles are congruent. Write congruence statements to show what rule has been used to prove congruence. A reminder that the congruence rules are SSS, AAS, RHS and SAS

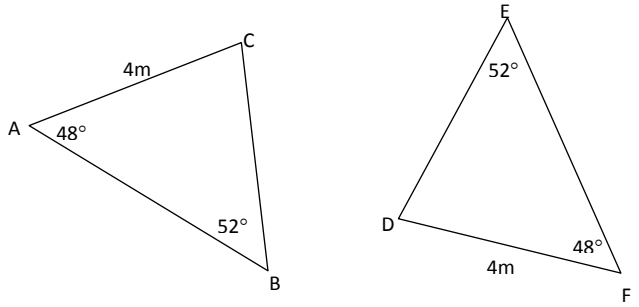
1.



2.

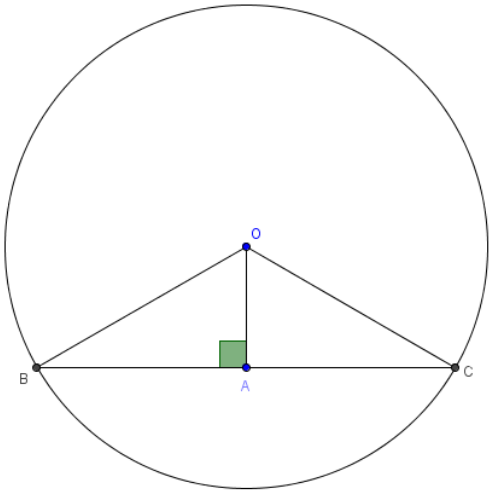


3.

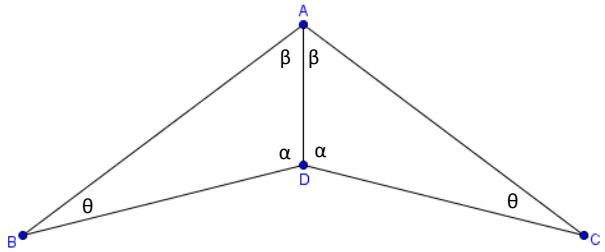


Level 2

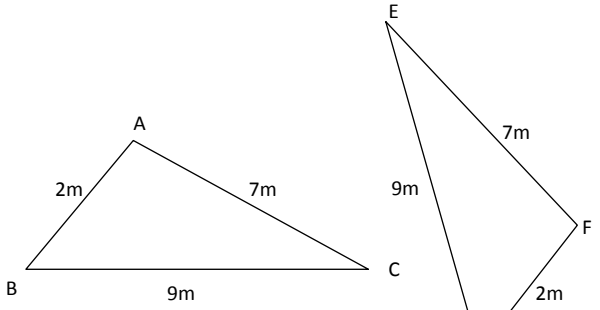
1. Prove that $\overline{AB} = \overline{AC}$ (O is the circle centre)



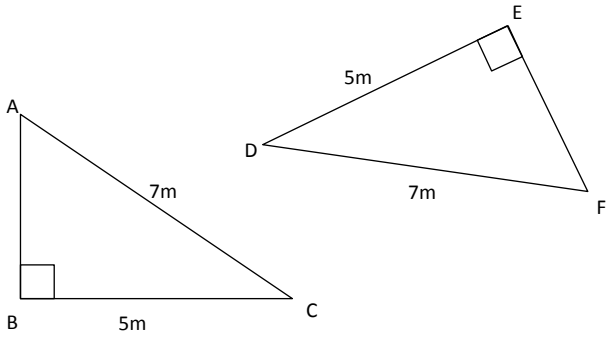
2. Prove $\overline{DB} = \overline{DC}$



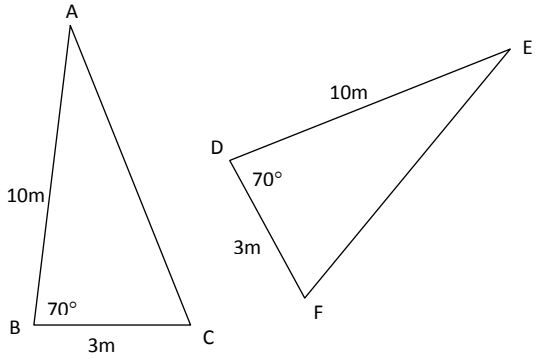
4.



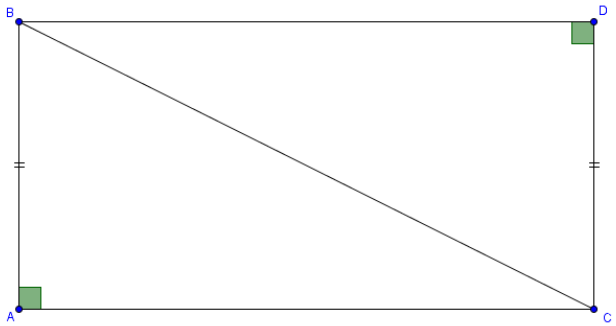
5.



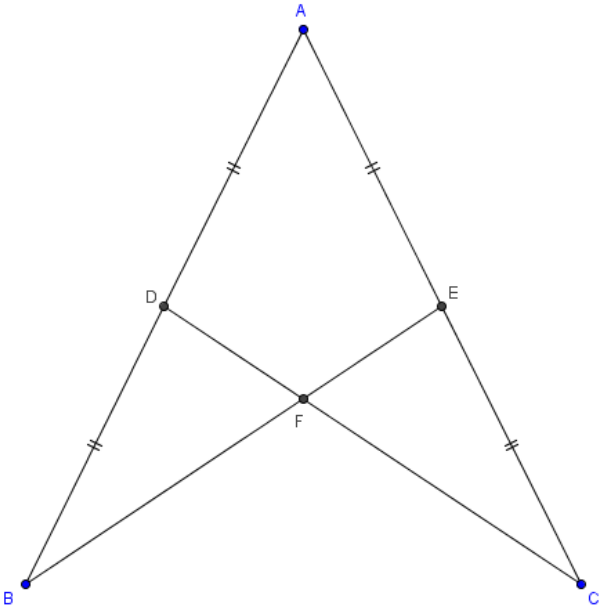
6.



3. Prove $\overline{BD} = \overline{AC}$

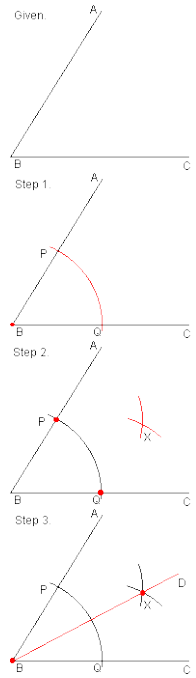


4. Prove $\overline{BE} = \overline{CD}$



Level 3

1. Use congruent triangles to prove that the method below is a valid one for constructing an angle bisector



<u>Method</u>

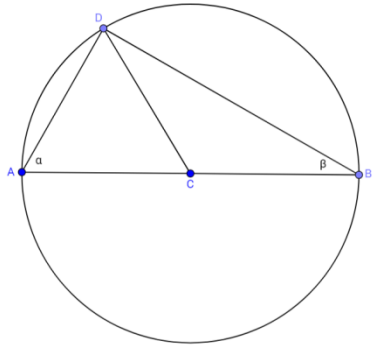
Given. An angle to bisect. For this example, angle ABC.

Step 1. Draw an arc that is centred at the vertex of the angle. This arc can have a radius of any length. However, it must intersect both sides of the angle. We will call these intersection points **P** and **Q**

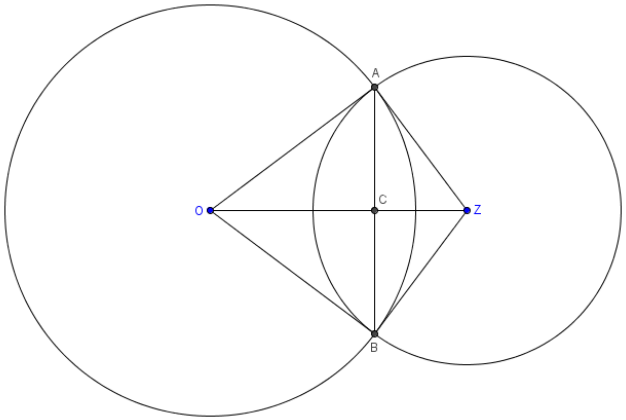
Step 2. Draw two more arcs. The first arc must be centred on one of the two points **P** or **Q**. It can have any length radius. The second arc must be centred on whichever point (P or Q) you did NOT choose for the first arc. The radius for the second arc MUST be the same as the first arc. Make sure you make the arcs long enough so that these two arcs intersect in at least one point. We will call this intersection point **X**.

Step 3. Draw a line that contains both the vertex and **X**. Since the intersection points and the vertex all lie on the angle bisector, we know that the line which passes through these points **must** be the angle bisector.

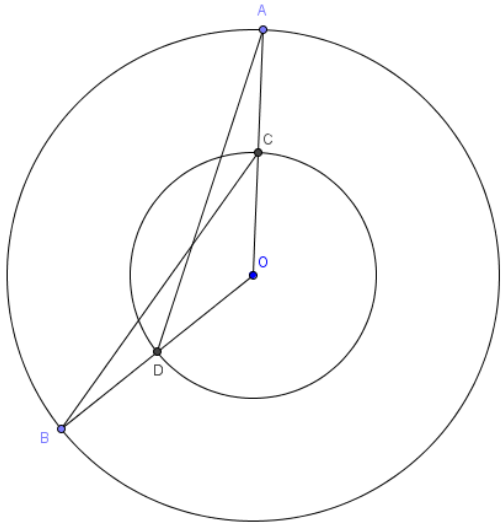
2. There is a theorem in mathematics that says that if a triangle is drawn inside a semicircle, the angle at the curve is a right angle. This is shown in the image below. If C is the centre of the circle use the given the information show that $\angle \mathrm{ADB} = 90°$



3. Prove that $\Delta OAZ \cong \Delta OBZ$ hence show $\angle \mathrm{AOC} = \angle \mathrm{BOC}$. Next show that $\Delta OAC \cong \Delta OBC$ and hence show that $\overline{OZ}$ is a perpendicular bisector of $\overline{\mathrm{AB}}$. (O and Z are circle centres)



4. Prove that $\angle \mathrm{OBC} = \angle \mathrm{OAD}$ (O is the centre of both circles)



Challenge Questions