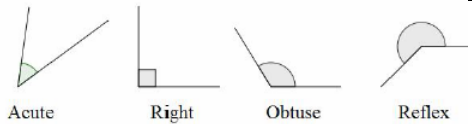
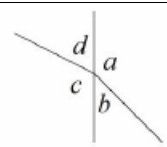
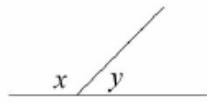
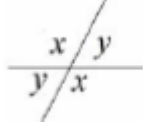
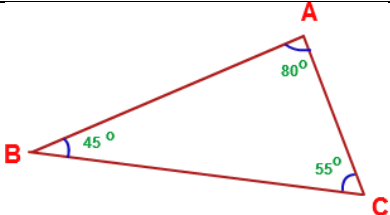
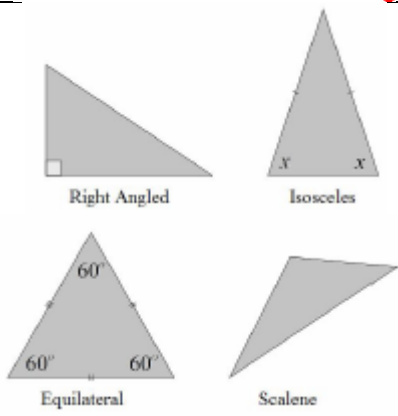
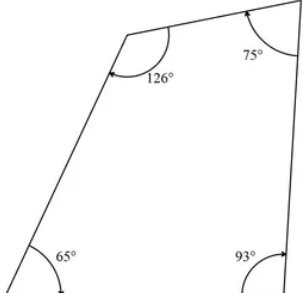
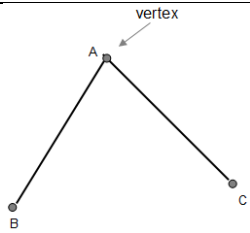
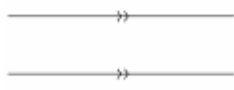
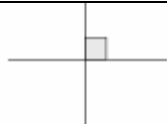
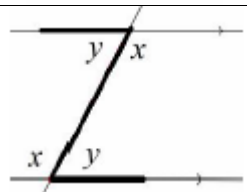
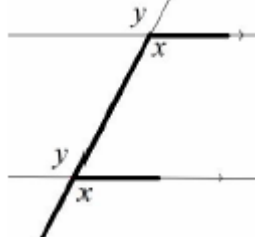
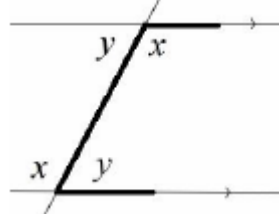
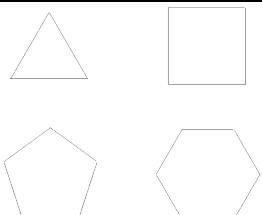
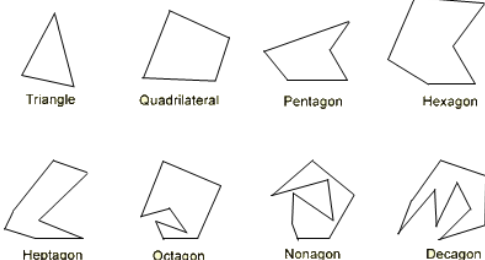
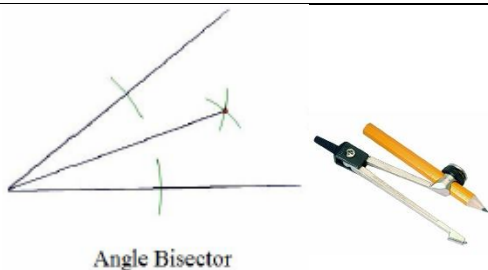
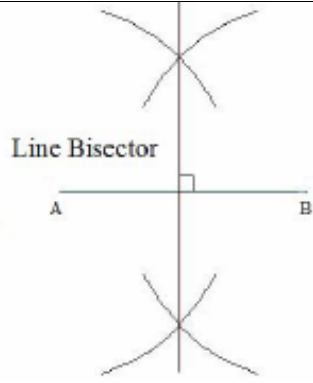
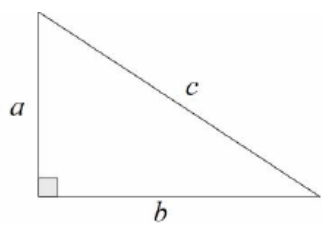
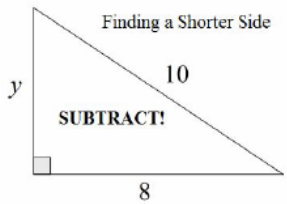
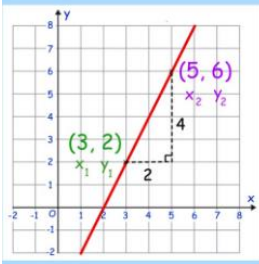
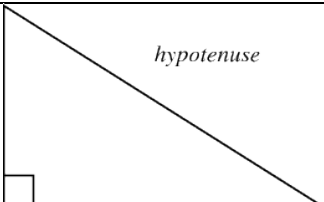
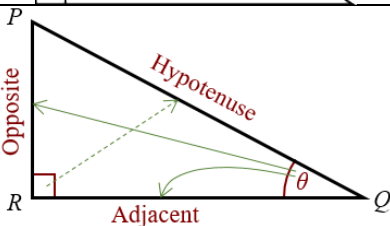
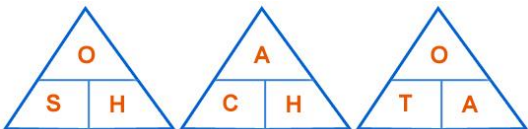
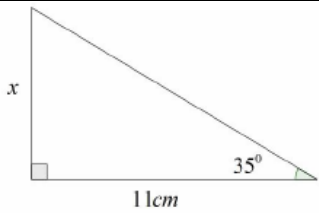
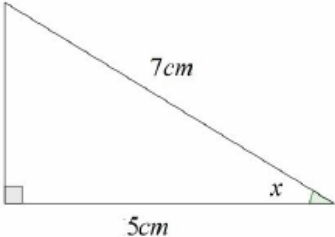


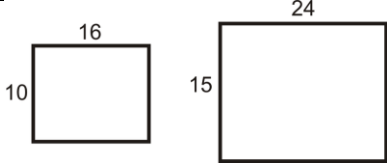
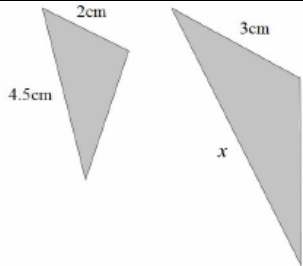
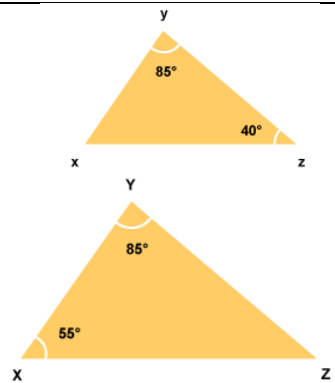
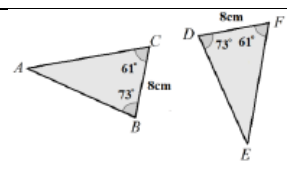
Topic: Angles

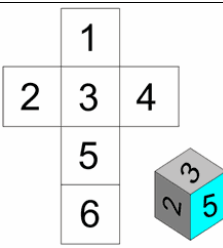
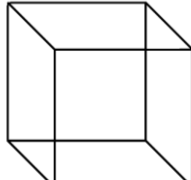
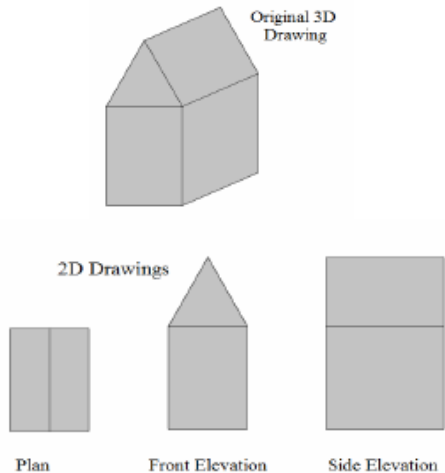
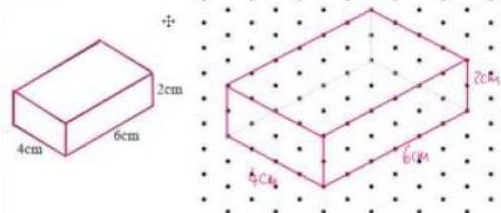
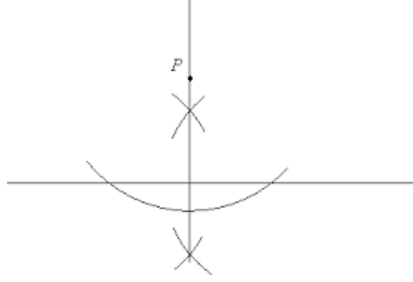
Topic/Skill	Definition/Tips	Example
Types of Angles	Acute angles are less than 90°. Right angles are exactly 90°. Obtuse angles are greater than 90° but less than 180°. Reflex angles are greater than 180° but less than 360°.	 Acute Right Obtuse Reflex
Angles at a Point	Angles around a point add up to 360°.	 $a + b + c + d = 360^\circ$
Angles on a Straight Line	Angles around a point on a straight line add up to 180°.	 $x + y = 180^\circ$
Opposite Angles	Vertically opposite angles are equal.	
Angles in a Triangle	Angles in a triangle add up to 180°.	
Types of Triangles	Right Angle Triangles have a 90° angle in. Isosceles Triangles have 2 equal sides and 2 equal base angles. Equilateral Triangles have 3 equal sides and 3 equal angles (60°). Scalene Triangles have different sides and different angles. Base angles in an isosceles triangle are equal.	 Right Angled Isosceles Equilateral Scalene
Angles in a Quadrilateral	Angles in a quadrilateral add up to 360°.	

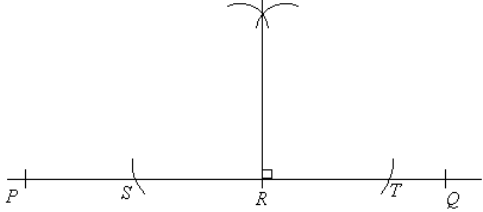
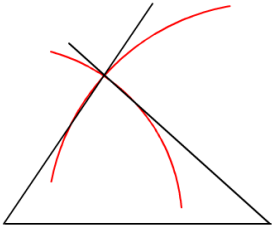
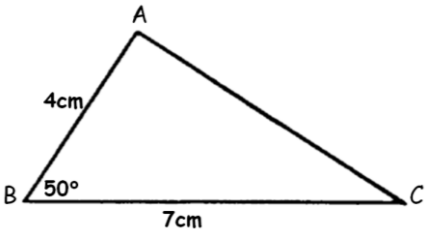
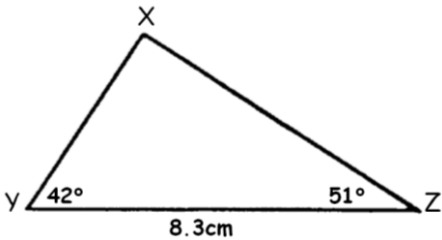
Vertex	A corner or a point where two lines meet.	
Parallel	Parallel lines never meet.	
Perpendicular	Perpendicular lines are at right angles. There is a 90° angle between them.	
Alternate Angles	Alternate angles are equal. They look like Z angles, but never say this in the exam.	
Corresponding Angles	Corresponding angles are equal. They look like F angles, but never say this in the exam.	
Co-Interior Angles	Co-Interior angles add up to 180°. They look like C angles, but never say this in the exam.	
Polygon	A 2D shape with only straight edges .	Rectangle, Hexagon, Decagon, Kite etc.
Regular	A shape is regular if all the sides and all the angles are equal .	
Names of Polygons	3-sided = Triangle 4-sided = Quadrilateral 5-sided = Pentagon 6-sided = Hexagon 7-sided = Heptagon/Septagon 8-sided = Octagon 9-sided = Nonagon 10-sided = Decagon	 Triangle Quadrilateral Pentagon Hexagon Heptagon Octagon Nonagon Decagon

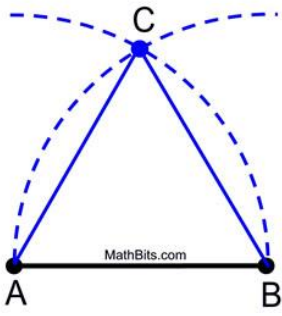
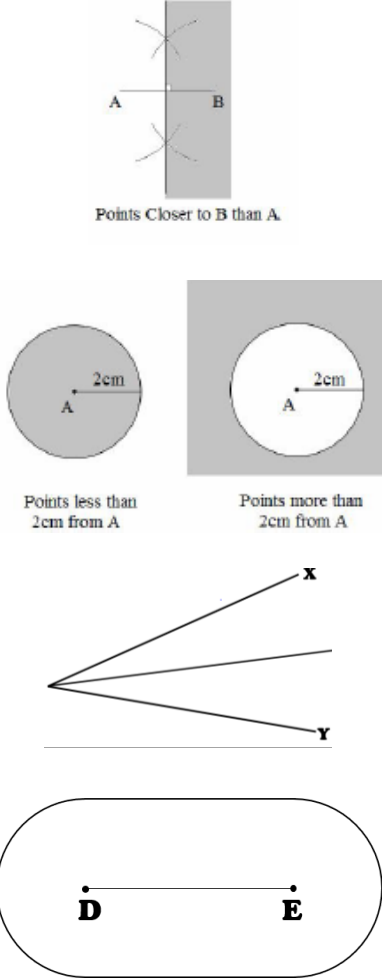
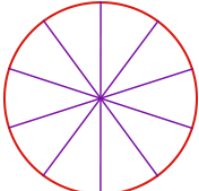
Sum of Interior Angles	$(n - 2) \times 180$ where n is the number of sides.	Sum of Interior Angles in a Decagon = $(10 - 2) \times 180 = 1440^\circ$
Size of Interior Angle in a Regular Polygon	$\frac{(n - 2) \times 180}{n}$ You can also use the formula: $180 - \text{Size of Exterior Angle}$	Size of Interior Angle in a Regular Pentagon = $\frac{(5 - 2) \times 180}{5} = 108^\circ$
Size of Exterior Angle in a Regular Polygon	$\frac{360}{n}$ You can also use the formula: $180 - \text{Size of Interior Angle}$	Size of Exterior Angle in a Regular Octagon = $\frac{360}{8} = 45^\circ$
Angle Bisector	Angle Bisector: Cuts the angle in half. 1. Place the sharp end of a pair of compasses on the vertex. 2. Draw an arc, marking a point on each line. 3. Without changing the compass put the compass on each point and mark a centre point where two arcs cross over. 4. Use a ruler to draw a line through the vertex and centre point.	 Angle Bisector
Perpendicular Bisector	Perpendicular Bisector: Cuts a line in half and at right angles. 1. Put the sharp point of a pair of compasses on A. 2. Open the compass over half way on the line. 3. Draw an arc above and below the line. 4. Without changing the compass, repeat from point B. 5. Draw a straight line through the two intersecting arcs.	 Line Bisector
Pythagoras' Theorem	For any right angled triangle : $a^2 + b^2 = c^2$  Used to find missing lengths. a and b are the shorter sides, c is the hypotenuse (longest side).	Finding a Shorter Side  $a = y, b = 8, c = 10$ $a^2 = c^2 - b^2$ $y^2 = 100 - 64$ $y^2 = 36$ $y = 6$

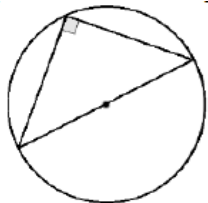
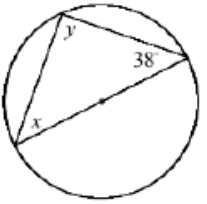
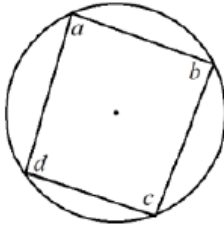
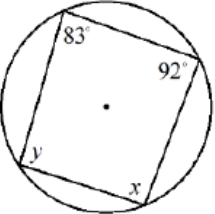
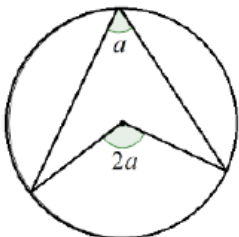
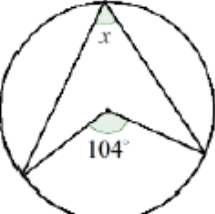
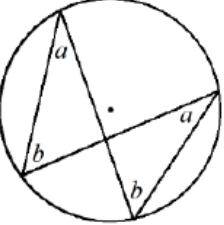
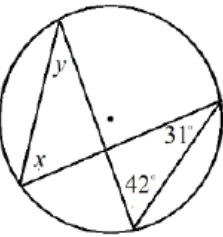
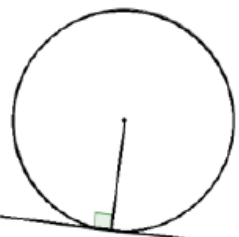
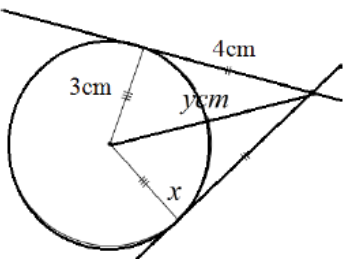
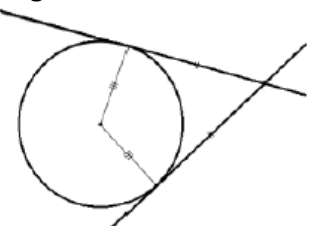
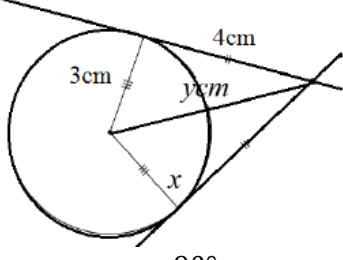
Distance between two points	- Find the horizontal distance i.e the difference in x between the two co-ordinates ($x_2 - x_1$) - Find the vertical distance i.e the difference in y between the two co-ordinates ($y_2 - y_1$) - Use pythagoras	 $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $d = \sqrt{(2)^2 + (4)^2}$ $d = \sqrt{4 + 16}$ $d = \sqrt{20} \text{ or } 4.47$
Trigonometry	The study of triangles .	
Hypotenuse	The longest side of a right-angled triangle. Is always opposite the right angle.	
Adjacent	Next to	
Trigonometric Formulae	Use SOHCAHTOA. $\sin \theta = \frac{O}{H}$ $\cos \theta = \frac{A}{H}$ $\tan \theta = \frac{O}{A}$  When finding a missing angle, use the 'inverse' trigonometric function by pressing the 'shift' button on the calculator.	 Use 'Opposite' and 'Adjacent', so use 'tan' $\tan 35 = \frac{x}{11}$ $x = 11 \tan 35 = 7.70\text{cm}$  Use 'Adjacent' and 'Hypotenuse', so use 'cos' $\cos x = \frac{5}{7}$ $x = \cos^{-1}\left(\frac{5}{7}\right) = 44.4^\circ$
Similar Shapes	Shapes are similar if they are the same shape but different sizes .	

	The proportion of the matching sides must be the same, meaning the ratios of corresponding sides are all equal.	
Scale Factor	The ratio of corresponding sides of two similar shapes. To find a scale factor, divide a length on one shape by the corresponding length on a similar shape.	 Scale Factor = $15 \div 10 = 1.5$
Finding missing lengths in similar shapes	1. Find the scale factor. 2. Multiply or divide the corresponding side to find a missing length. If you are finding a missing length on the larger shape you will need to multiply by the scale factor. If you are finding a missing length on the smaller shape you will need to divide by the scale factor.	 Scale Factor = $3 \div 2 = 1.5$ $x = 4.5 \times 1.5 = 6.75\text{cm}$
Similar Triangles	To show that two triangles are similar, show that: 1. The three sides are in the same proportion 2. Two sides are in the same proportion, and their included angle is the same 3. The three angles are equal	
Congruent Shapes	Shapes are congruent if they are identical - same shape and same size. Shapes can be rotated or reflected but still be congruent.	
Congruent Triangles	4 ways of proving that two triangles are congruent: 1. SSS (Side, Side, Side) 2. RHS (Right angle, Hypotenuse, Side) 3. SAS (Side, Angle, Side) 4. ASA (Angle, Side, Angle) or AAS <u>ASS does not prove congruency.</u>	 $BC = DF$ $\angle ABC = \angle EDF$ $\angle ACB = \angle EFD$ $\therefore$ The two triangles are congruent by AAS.

Net	A pattern that you can cut and fold to make a model of a 3D shape .	
Properties of Solids	Faces = flat surfaces Edges = sides/lengths Vertices = corners	A cube has 6 faces, 12 edges and 8 vertices. 
Plans and Elevations	This takes 3D drawings and produces 2D drawings. Plan View: from above Side Elevation: from the side Front Elevation: from the front	
Isometric Drawing	A method for visually representing 3D objects in 2D .	
Perpendicular from an External Point	The perpendicular distance from a point to a line is the shortest distance to that line. 1. Put the sharp point of a pair of compasses on the point. 2. Draw an arc that crosses the line twice. 3. Place the sharp point of the compass on one of these points, open over half way and draw an arc above and below the line. 4. Repeat from the other point on the line. 5. Draw a straight line through the two intersecting arcs.	

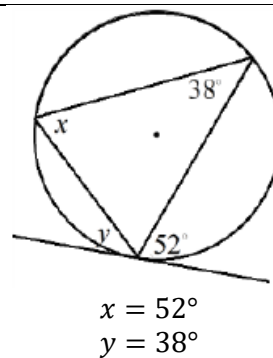
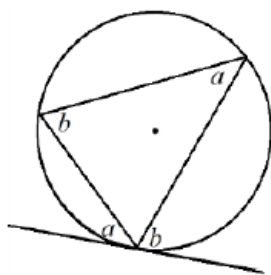
Perpendicular from a Point on a Line	Given line PQ and point R on the line: 1. Put the sharp point of a pair of compasses on point R. 2. Draw two arcs either side of the point of equal width (giving points S and T) 3. Place the compass on point S, open over halfway and draw an arc above the line. 4. Repeat from the other arc on the line (point T). 5. Draw a straight line from the intersecting arcs to the original point on the line.	
Constructing Triangles (Side, Side, Side)	1. Draw the base of the triangle using a ruler. 2. Open a pair of compasses to the width of one side of the triangle. 3. Place the point on one end of the line and draw an arc. 4. Repeat for the other side of the triangle at the other end of the line. 5. Using a ruler, draw lines connecting the ends of the base of the triangle to the point where the arcs intersect.	
Constructing Triangles (Side, Angle, Side)	1. Draw the base of the triangle using a ruler. 2. Measure the angle required using a protractor and mark this angle. 3. Remove the protractor and draw a line of the exact length required in line with the angle mark drawn. 4. Connect the end of this line to the other end of the base of the triangle.	
Constructing Triangles (Angle, Side, Angle)	1. Draw the base of the triangle using a ruler. 2. Measure one of the angles required using a protractor and mark this angle. 3. Draw a straight line through this point from the same point on the base of the triangle. 4. Repeat this for the other angle on the other end of the base of the triangle.	

Constructing an Equilateral Triangle (also makes a 60° angle)	1. Draw the base of the triangle using a ruler. 2. Open the pair of compasses to the exact length of the side of the triangle. 3. Place the sharp point on one end of the line and draw an arc. 4. Repeat this from the other end of the line. 5. Using a ruler, draw lines connecting the ends of the base of the triangle to the point where the arcs intersect.	
Loci and Regions	A locus is a path of points that follow a rule. For the locus of points closer to B than A, create a perpendicular bisector between A and B and shade the side closer to B. For the locus of points equidistant from A, use a compass to draw a circle, centre A. For the locus of points equidistant to line X and line Y, create an angle bisector. For the locus of points a set distance from a line, create two semi-circles at either end joined by two parallel lines.	
Equidistant	A point is equidistant from a set of objects if the distances between that point and each of the objects is the same.	

Circle Theorem 1	Angles in a semi-circle have a right angle at the circumference. 	 $y = 90^\circ$ $x = 180 - 90 - 38 = 52^\circ$
Circle Theorem 2	Opposite angles in a cyclic quadrilateral add up to 180°.  $a + c = 180^\circ$ $b + d = 180^\circ$	 $x = 180 - 83 = 97^\circ$ $y = 180 - 92 = 88^\circ$
Circle Theorem 3	The angle at the centre is twice the angle at the circumference. 	 $x = 104 \div 2 = 52^\circ$
Circle Theorem 4	Angles in the same segment are equal. 	 $x = 42^\circ$ $y = 31^\circ$
Circle Theorem 5	A tangent is perpendicular to the radius at the point of contact. 	 $y = 5\text{cm (Pythagoras' Theorem)}$
Circle Theorem 6	Tangents from an external point are equal in length. 	 $x = 90^\circ$

Circle Theorem
7

Alternate Segment Theorem



Where else is the Angles topic used in maths?

Transformations

Algebra

Links to other subjects