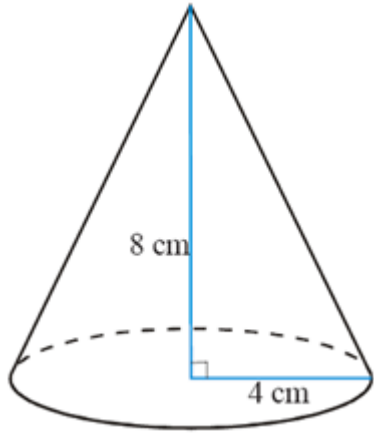
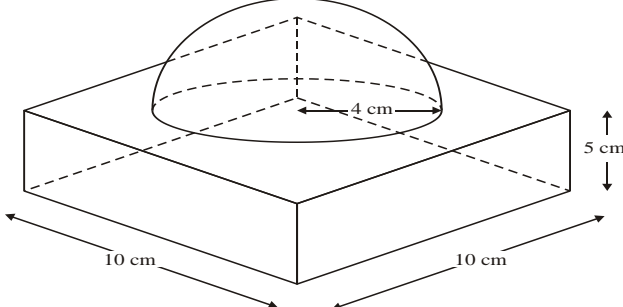
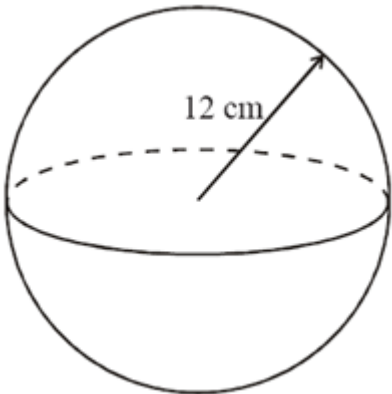


# THOUGHTS AND CROSSES

## TOPIC: volume and surface area

<p><b>A</b> <b>*</b></p>		<p>A pepper pot consists of a cylinder and a hemisphere. The cylinder has a diameter of 5cm and height of 7cm. The pepper inside the pot takes up half of the total volume of the entire pot. Find the depth of the pepper in the pot.</p>	<p>A solid cone has base radius 5cm and slant height 12cm. Calculate the total surface area of the cone. Give your answers in terms of <math>\pi</math></p>	<p>A container in the shape of a cone, base radius 10cm and vertical height 19cm, is full of water. The water is poured into an empty cylinder of radius 15cm. How high is the water in the cylinder?</p>
<p><b>A</b> <b>*</b></p>	<p>A block of wood, 9cm by 11cm by 12cm, has a hole of radius 2.5cm drilled out. Calculate the mass of the wood if the density is <math>0.95 \text{ g/cm}^3</math></p>		<p>A metal sphere of radius 15cm is melted down and recast into a solid cylinder of radius 6cm. Calculate the height of the cylinder</p>	<p>A square-based pyramid of length 12cm and width 10cm. If the weight is 828g and density is <math>2.3 \text{ g/cm}^3</math>, calculate the height of the pyramid.</p>
<p><b>A</b></p>		<p>Calculate, to a suitable degree of accuracy, the radius of a sphere whose surface area is <math>150 \text{ cm}^2</math></p>	<p>Find the total surface area of a cone whose base radius is 3cm and slant height is 5cm. Give your answers in terms of <math>\pi</math></p>	<p>A crystal is in the form of 2 square based pyramids joined together by their bases. The length of one of the sides of the base is 3cm and the crystal's total height is 7cm. The crystal has a mass of 31.5g. What is the density?</p>


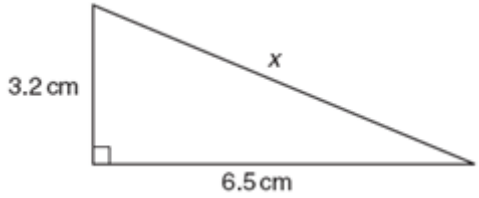
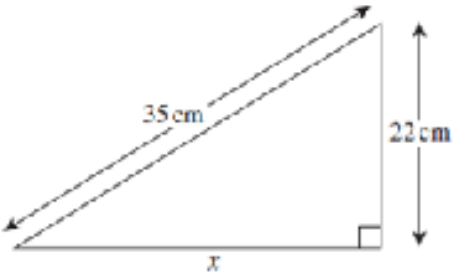
# THOUGHTS AND CROSSES

## TOPIC: estimates and upper and lower bounds

A*	<p>The density of kryptonite is 2489 kg/m<sup>3</sup>.</p> <p>Writing your answers correct to an appropriate degree of accuracy, work out:</p> <p>(a) The mass of a piece of kryptonite which has a volume of 2.49 m<sup>3</sup></p> <p>(b) The volume of a piece of kryptonite whose mass is 1 199 kg.</p>	$T = 5.467 \times \sqrt{\frac{L}{g}}$ <p><math>L = 2.36</math> correct to 2 decimal places.  <math>g = 8.8</math> correct to 1 decimal place.</p> <p>(a) Find the upper bound of <math>T</math>, giving your answer to 2 decimal places</p>	$T = 5.467 \times \sqrt{\frac{L}{g}}$ <p><math>L = 2.36</math> correct to 2 decimal places.  <math>g = 8.8</math> correct to 1 decimal place.</p> <p>(a) Find the lower bound of <math>T</math>, giving your answer to 2 decimal places</p>
A	<p>The area of a rectangle, correct to 2 significant figures, is 460 cm<sup>2</sup>.</p> <p>The length of the rectangle, correct to 2 significant figures, is 22 cm.</p> <p>Writing your answers correct to an appropriate degree of accuracy:</p> <p>(a) Calculate the upper bound for the width of the rectangle</p>	$x = \frac{5.49 \times 12.28}{6.8}$ <p>5.49 and 12.28 are correct to 2 decimal places.          6.8 is correct to 1 decimal place.</p> <p>Write the calculation that gives the lower bound for <math>x</math></p>	$x = \frac{5.49 \times 12.28}{6.8}$ <p>5.49 and 12.28 are correct to 2 decimal places.          6.8 is correct to 1 decimal place.</p> <p>Write the calculation that gives the upper bound for <math>x</math></p>
B	<p>The maximum temperature in Salford last year was 25°C to the nearest °C , and the minimum temperature was 7°C to the nearest °C.</p> <p>Calculate the range of temperatures.</p>	<p>Sameera runs 100m (to the nearest 10m) in 12 seconds (correct to the nearest second). Last time she ran the race her maximum possible speed was 8.2 metres per second</p> <p>Can she be sure that she has run faster his time? Give a reason for this answer</p>	<p>Work out the value of</p> $4.5^2 - \sqrt{4.9}$ <p>Write down all the figures on your calculator display.          Write your answer to part correct to 4 significant figures.</p>
C	<p>A sports commentator reported that 25 000 people attended a snowboarding competition.</p> <p>The number of people had been rounded to the nearest 1 000.</p> <p>(a) Write down the least possible number of people in the audience.</p> <p>(b) Write down the greatest possible number of people in the audience.</p>	<p>Juana walks 17 000 steps every day, on average.</p> <p>She walks approximately 1 mile every 3 500 steps.</p> <p>Work out an estimate for the average number of miles that Juana walks in one year.</p>	<p>Use your calculator to evaluate</p> $\frac{36.2 \times 14.6}{22.4 - 12.9}$ <p>(a) Write down all the figures on your calculator display          (b) Write your answer to part (a) to an appropriate degree of accuracy.</p>

# THOUGHTS AND CROSSES

## TOPIC: Pythagoras and trigonometry

A	<p>In triangle <math>ABC</math></p> <p><math>AC = 5</math> cm</p> <p><math>BC = 9</math> cm</p> <p>Angle <math>BAC = 100^\circ</math></p> <p>Calculate the size of angle <math>ABC</math>.</p>	<p>In triangle <math>ABC</math> (not accurately drawn)</p> <p><math>AB = (2x + 1)</math> metres.</p> <p><math>BC = (x + 4)</math> metres.</p> <p>Angle <math>ABC = 30^\circ</math>.</p> <p>The area of the triangle <math>ABC</math> is <math>4\text{m}^2</math>.</p> <p>Calculate the value of <math>x</math>.</p> <p>Give your answer correct to 3 significant figures.</p>	<p>In triangle <math>ABC</math></p> <p><math>AC = 8</math> cm, <math>BC = 14</math> cm and Angle <math>ACB = 69^\circ</math>.</p> <p>Calculate the length of <math>AB</math>. Give your answer correct to 3 significant figures.</p> <p>Calculate the size of angle <math>BAC</math>.</p>
B	<p><math>ABD</math> and <math>BCD</math> are two right angled triangles placed back to back. <math>AB = 12\text{CM}</math>, <math>CD = 8\text{CM}</math> AND <math>\angle BAD = 30^\circ</math></p> <p><math>ADC</math> is a straight line.</p> <p>Calculate the length of <math>BC</math></p>	<p>The circles with centres <math>A</math> and <math>B</math> have radii of <math>10</math> cm and <math>6</math> cm respectively. The line segment <math>BC</math> is a tangent to both circles.</p>  <p>Calculate the length <math>BC</math></p>	<p><math>CD</math> represents a vertical cliff <math>16\text{m}</math> high.</p> <p>A boat, <math>B</math>, is <math>25</math> m due east of <math>D</math>.</p> <p>Calculate the size of the angle of elevation of <math>C</math> from <math>B</math>.</p> <p>Give your answer correct to 3 significant figures.</p> <p>What is the angle of depression of <math>B</math> from <math>C</math>?</p> <p>Give a mathematical reason for this.</p>
C			<p>A ladder <math>6.8\text{m}</math> long is leaning against a wall, as shown in the diagram. The foot of the ladder is <math>1.5\text{m}</math> from the wall.</p> <p>Calculate the distance the ladder reaches up the wall. Give your answer to a sensible degree of accuracy.</p>

# THOUGHTS AND CROSSES

## TOPIC: vectors

A

\*

ABCDEFGH is a regular octagon.

AB is represented by the vector **a** and BC by the vector **b**.

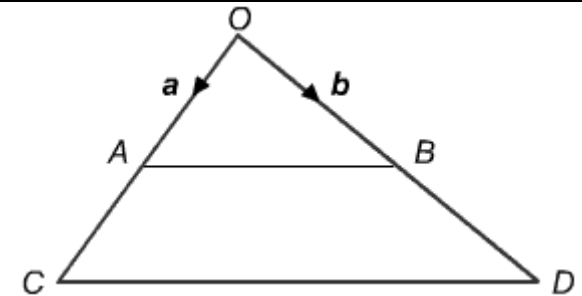
By means of a diagram or otherwise show that the vector

$$\mathbf{CD} = \sqrt{2}\mathbf{b} - \mathbf{a}$$

In a scalene triangle ABC, the longer side is AC. There is a slightly shorter side AB and then the final small side of BC. M is the midpoint of line BC.

Vector AB = **s** and Vector AC = **t**

Find Vector AM in terms of s and t.



Write down  $\vec{OC}$  in terms of a and b.

Write down  $\vec{AB}$  in terms of a.

A

\*

The points P,Q,R lie on a straight line. The vector PQ is  $2\mathbf{a}+\mathbf{b}$  where a and b are vectors. Which of the following could be the vector PR?

- $2\mathbf{a}+2\mathbf{b}$
- $4\mathbf{a}+2\mathbf{b}$
- $2\mathbf{a}-\mathbf{b}$
- $-6\mathbf{a}-3\mathbf{b}$

The points P,Q,R lie on a straight line. The vector PQ is  $3\mathbf{a}-\mathbf{b}$  where a and b are vectors. Write down any other vector that could represent the vector PR?

A second vector is PS

How can you tell from the vector PS that S lies on the same straight line as P,Q,R?

Use a vector diagram to show that

$$\mathbf{a} + (\mathbf{b} + \mathbf{c}) = (\mathbf{a} + \mathbf{b}) + \mathbf{c}$$

A

A is the point (3,2) and B is the point (-1,0)

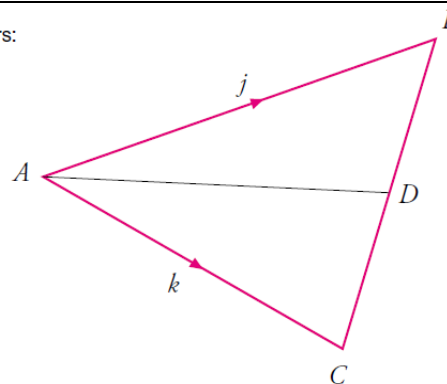
(a) Find  $\vec{AB}$  as a column vector.

(b) C is a point such that  $\vec{AC} = \begin{pmatrix} 4 \\ 9 \end{pmatrix}$

Write down the co-ordinates of the point C.

Work out the vectors:

- (a)  $\vec{BC}$
- (b)  $\vec{BD}$
- (c)  $\vec{AD}$



Given that  $\mathbf{a} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$   $\mathbf{b} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$   $\mathbf{c} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

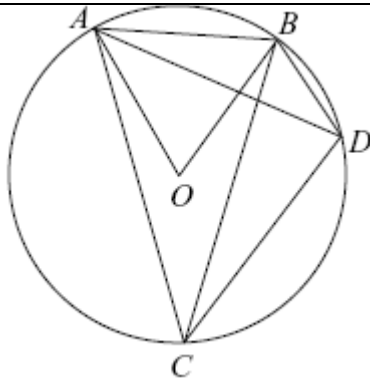
Work out the following:-

- (a)  $2\mathbf{a}$
- (b)  $\mathbf{a} + 2\mathbf{b}$
- (c)  $\mathbf{a} - \mathbf{b} + \mathbf{c}$
- (d)  $2\mathbf{a} + \mathbf{b} - \mathbf{c}$
- (e)  $\frac{1}{2}\mathbf{a}$

# THOUGHTS AND CROSSES

## TOPIC: circle theorems

A



Given that O is the centre of the circle and that  $\angle AOB = 75^\circ$ ,  $\angle CBD = 62^\circ$ ,  $\angle BAD = 30^\circ$  calculate :

**ACB, BCA, ABD**

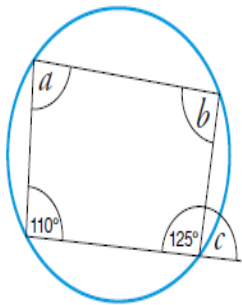
prove that the opposite angles in a cyclic quadrilateral add up to  $180^\circ$

The cyclic quadrilateral PQRT has  $\angle ROQ$  equal to  $38^\circ$  where O is the centre of the circle. POT is a diameter and parallel to QR.

Calculate the following:

- $\angle ROT$
- $\angle QRT$
- $\angle QPT$

B

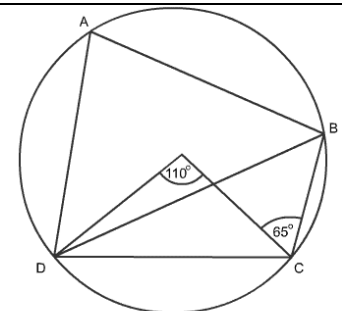
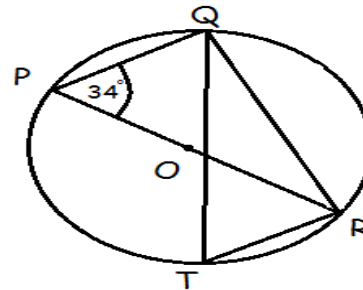


(a) Work out the size of these angles.

Give a reason for each answer.

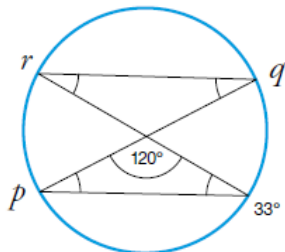
- Angle  $a$
- Angle  $b$
- Angle  $c$

a) What is the size of angle PQR?



NOT TO SCALE

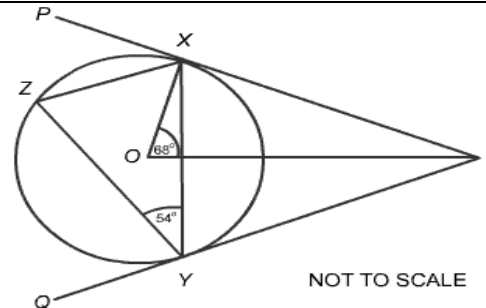
B



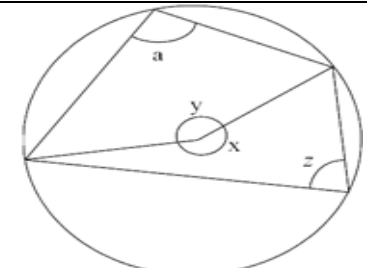
(b) Work out the size of these angles.

Give a reason for each answer.

- Angle  $p$
- Angle  $q$
- Angle  $r$



NOT TO SCALE



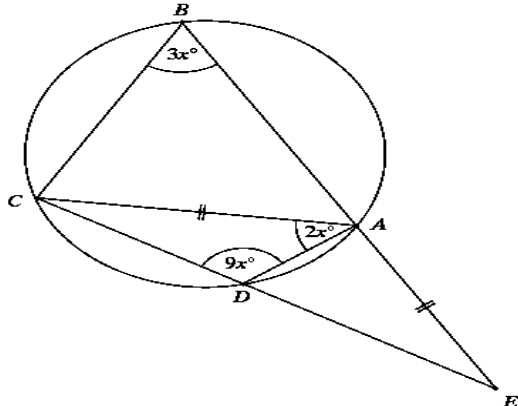
Express angle  $a$  in terms of  $x$

# THOUGHTS AND CROSSES

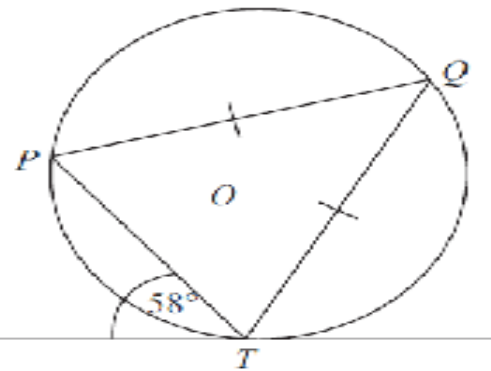
## TOPIC: circle theorems

A

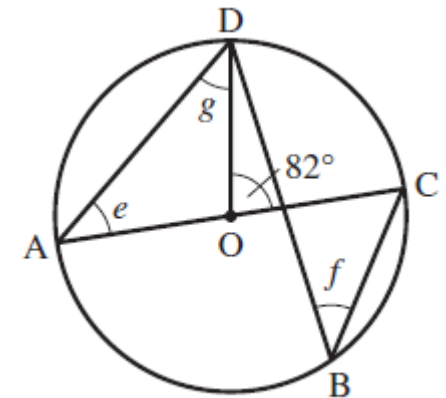
Not drawn accurately



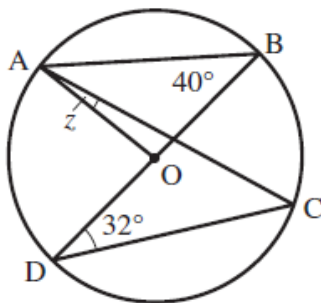
CALCULATE X AND ANGLE EAD



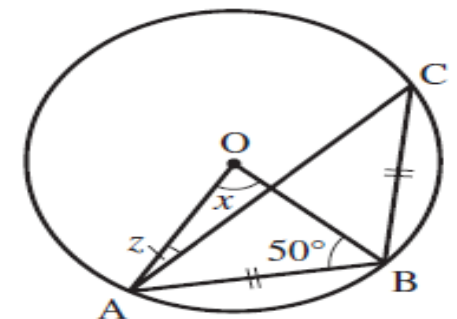
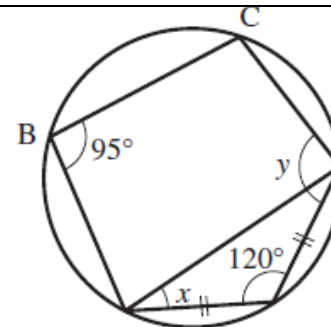
Calculate the size of angle  $OTQ$ .  
Give a reason for each stage in your working.



A

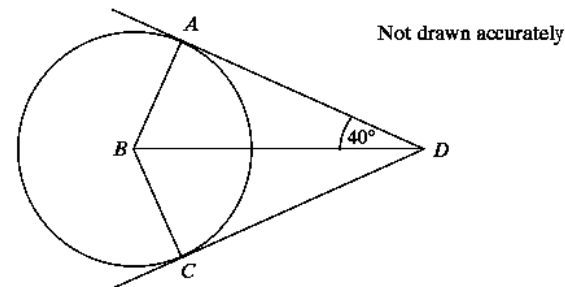
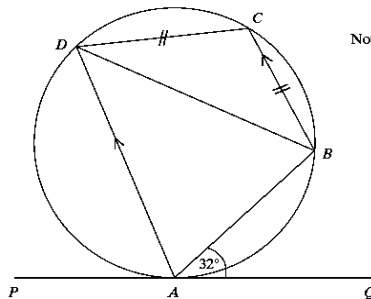


Find the size of angle  $BAD$

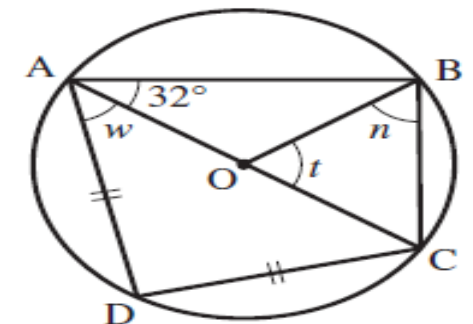


A

Not drawn accurately

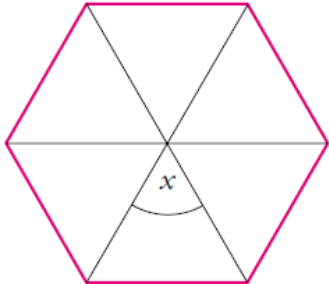
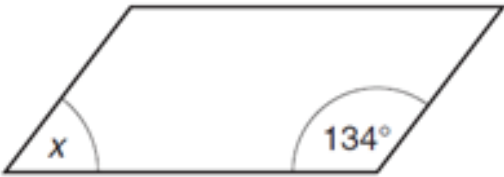
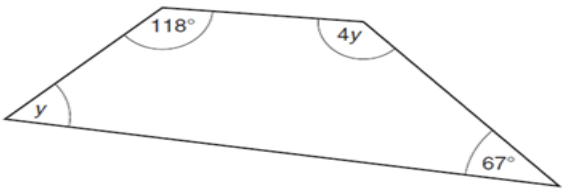
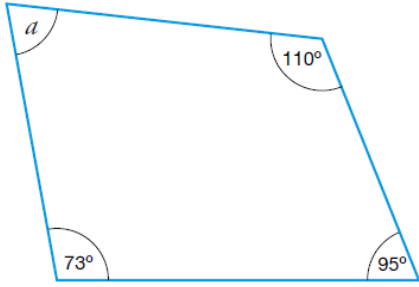
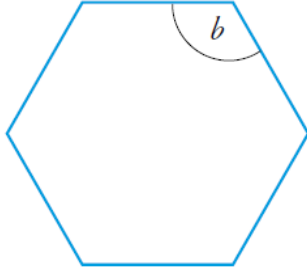
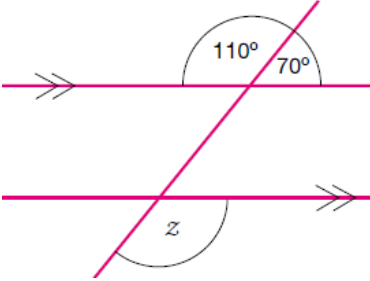
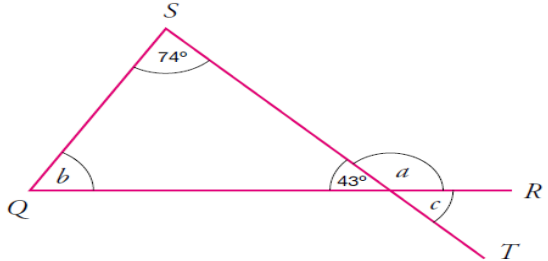
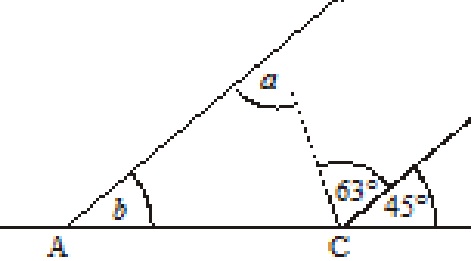
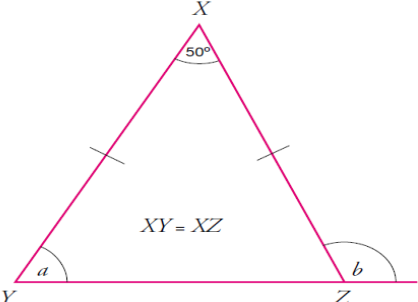
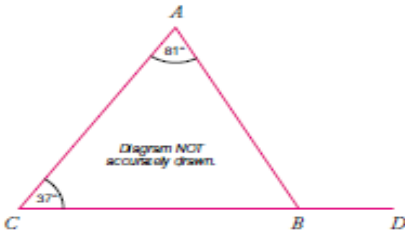
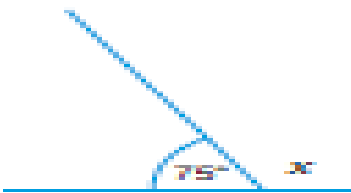
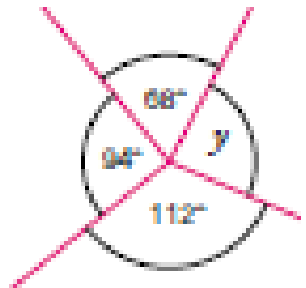


Explain why angle  $ABC = 100^\circ$



# THOUGHTS AND CROSSES


## TOPIC: angles

C			 <p>NOT TO SCALE</p>
D			
E			
F	<p>In the diagram below, work out the size of...</p> <p>(a) angle <math>ABC</math> (b) angle <math>ABD</math></p> 	<p>i) Work out the size of the angle marked <math>x</math></p> <p>(ii) Give a reason for your answer</p> 	<p>Work out the size of the angle marked <math>y</math></p> 



# THOUGHTS AND CROSSES

TOPIC: measures

C	A car takes 15 minutes to travel 24 miles. Find its speed in MPH	Jane runs 200 metres in 21.4 seconds Work out Jane's average speed in metres per second. Give your answer correct to 1dp.	The length of a swimming pool is 50 metres. Alex swims a total distance of 1.4 kilometres.  How many lengths did Alex swim								
D	Change 2.8m <sup>2</sup> to cm <sup>2</sup> .	Daniel leaves his house at 07 00. He drives 87 miles to work. He drives at an average speed of 36 miles per hour. At what time does Daniel arrive at work?	A plane flies 1440 miles at a speed of 240mph. How long does it take?								
F	(a) Change 250 millimetres to centimetres (b) Change 3.7 litres to millilitres (c) Change 400 seconds to minutes and seconds	<table><tr><td>The weight of a small bag of crisps</td><td>25 grams</td></tr><tr><td>The distance from Manchester to London</td><td>328 .....</td></tr><tr><td>The height of a man</td><td>183 .....</td></tr><tr><td>The volume of petrol in a car's petrol tank</td><td>45 .....</td></tr></table>	The weight of a small bag of crisps	25 grams	The distance from Manchester to London	328 .....	The height of a man	183 .....	The volume of petrol in a car's petrol tank	45 .....	Estimate the height of the man, in metres. Estimate the height of the giraffe, in metres.  
The weight of a small bag of crisps	25 grams										
The distance from Manchester to London	328 .....										
The height of a man	183 .....										
The volume of petrol in a car's petrol tank	45 .....										