C if U can

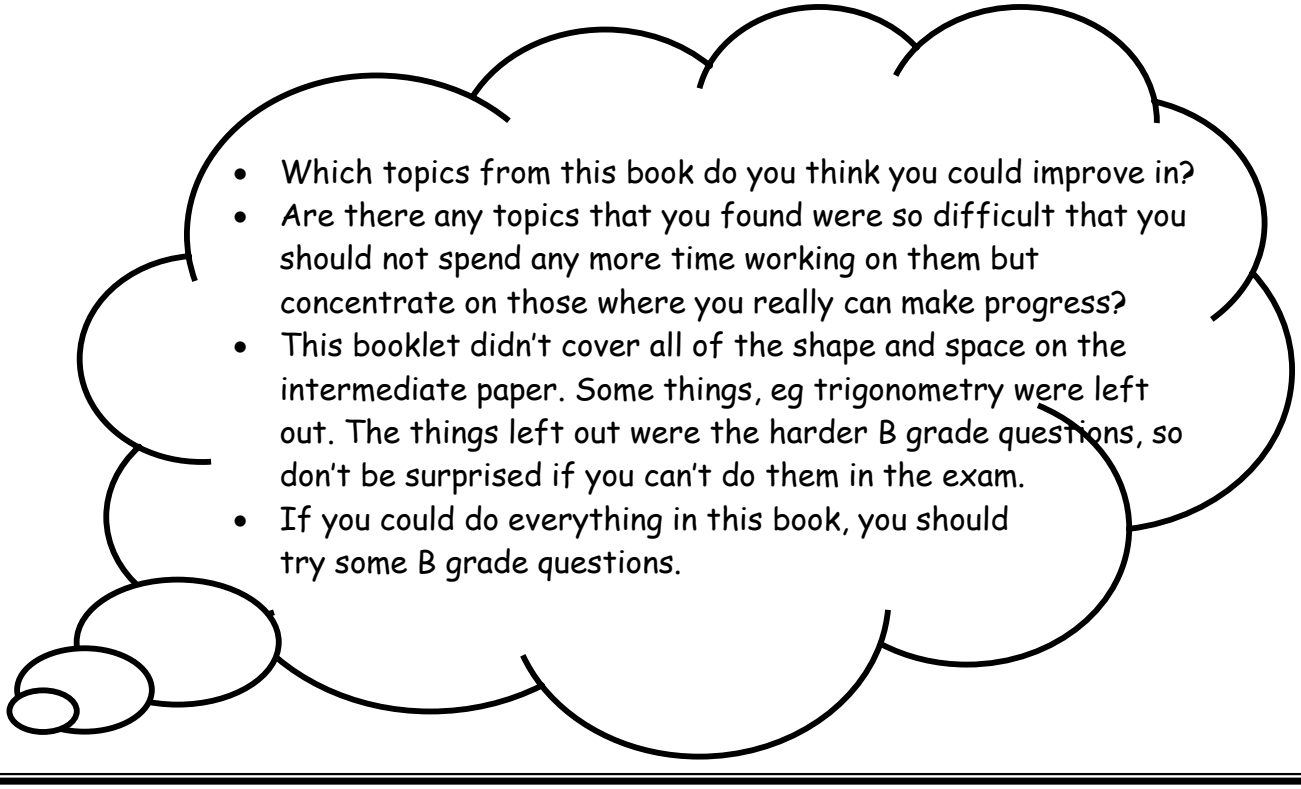
Shape and space

Birmingham City Council
Learning and Culture

Name .....

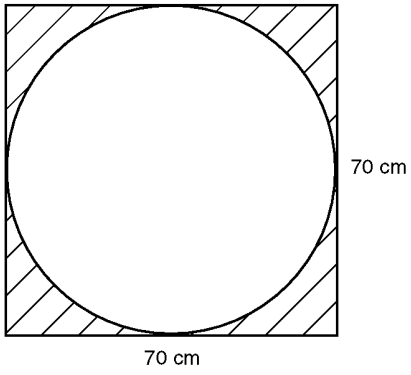
How will this booklet help you to move from a D to a C grade?

- The topic of shape and space is split into five units – angles, transformations, the circle, area and volume and Pythagoras and trigonometry
- For each unit, you start by thinking about which types of question you are confident with, which types you're not sure about and which types cause you a real problem and assess yourself using the grid
- You then try some questions similar to those you have seen before – usually D grade questions so you can see whether your self assessment is accurate
- You then have some questions to try which are harder – these are C grade questions. There are hints to help you if you don't know where to start
- There are also some C grade questions with even bigger hints available from your teacher if you need them and there are also some C grade questions with no help (also available from your teacher) for when you feel brave enough!



Sometimes harder questions use more than one topic

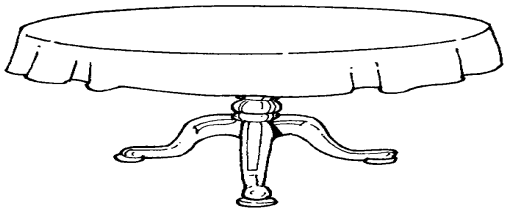
Now C if U can do these……



The diagram shows a circle of diameter 70 cm inside a square of side 70 cm.

Work out the area of the shaded part of the diagram
Give your answer correct to 3 significant figures

CLUE:-
Don't forget, you need the radius to find the area of the circle – then subtract from the area of the square



Mary has a circular dining table with a radius of 0·65 m

a. **work out the area of the top of the table.** Give your answers correct to 3 significant figures

The perimeter of the circular table cloth is 5 m

b. **work out the diameter of the table cloth**

CLUE:-
For the table cloth, you need the formula for the circumference but the unknown will be the diameter, so change the subject of the formula

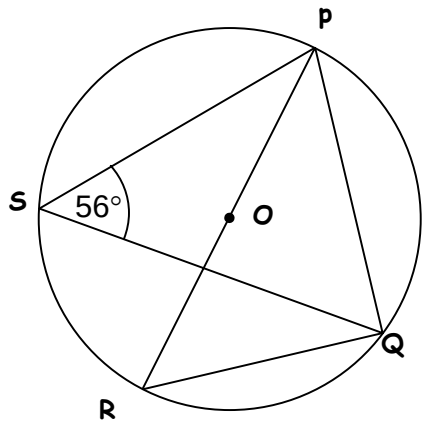


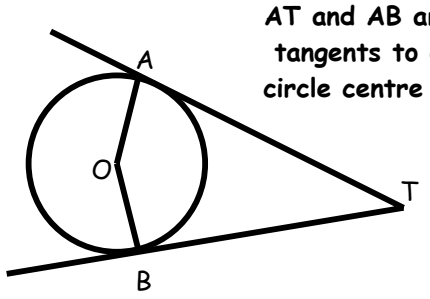
Diagram not accurately drawn

P, Q, R and S are points on the circumference of a circle, centre O.
PR is a diameter of the circle.
Angle PSQ = 56°

a. **find the size of angle PQR. Give a reason for your answer**
b. **find the size of angle PRQ. Give a reason for your answer**
c. **find the size of angle POQ. Give a reason for your answer**

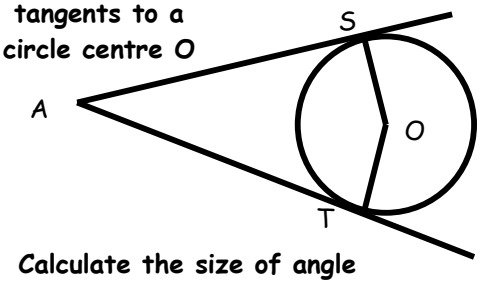
CLUE:-
Draw a line from O to Q if it helps

AT and AB are tangents to a circle centre O



If angle AOB is 140°
a. **name any right angles**
b. **find the size of angle ATB**

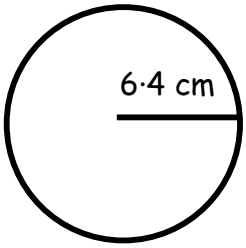
AS and AT are tangents to a circle centre O



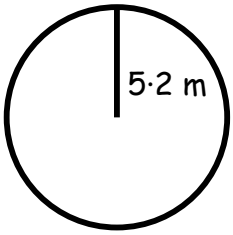
Calculate the size of angle SAO if angle SOA is equal to 48°

You have seen simple questions like these before

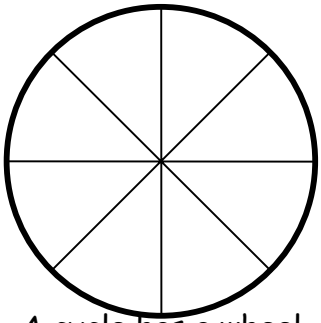
C een it B4



The radius of a circle is 6·4 cm.
Work out the area of the circle. Give your answer correct to 3 sig. figs.



The radius of a circle is 5·2 m
Work out the circumference of the circle. Give your answer correct to 2 d. p.



A cycle has a wheel diameter of 0·8m. the wheel goes round 25 times. How far has the cycle moved. Give your answer to 3 sig. figs

*Assess how well you think you understand this topic before you start. Are you **confident, close** or **clueless?***

C if U can Area and volume

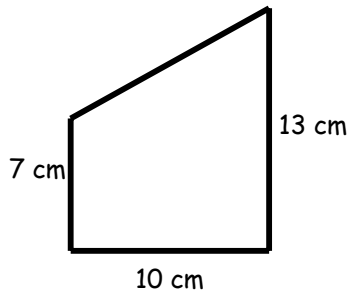
	Confident	Close	Clueless
Calculate the perimeter of 2D shapes			
Calculate the area of 2D shapes			
Calculate the volume of cuboids and prisms			
Calculate the surface area of 3D shapes with triangular and rectangular faces			
Solve problems involving volumes of 3D shapes			

At the end of the section, think about your self assessment. Were you right?

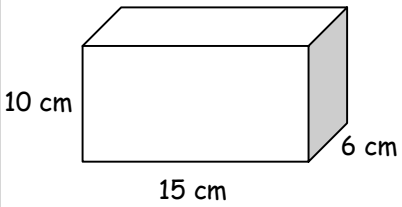
You should recognise this type of question

C een it B4

Work out the area of this trapezium.



Work out the volume of this cuboid.



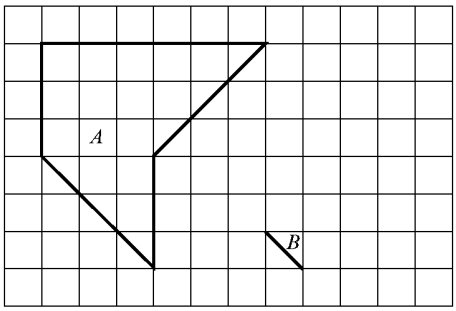
A cuboid has
Height = 3 m
Length = 9 m
Width = 5 m
What is its volume?

*Assess how well you think you understand this topic before you start. Are you **confident, close** or **clueless**?*

C if U can Circles

	Confident	Close	Clueless
Know and use the vocabulary associated with circles			
Calculate the circumference of a circle given either the length of the radius or the diameter			
Calculate the area of a circle given either the length of the radius or the diameter			
Solve problems involving the circumference and area of a circle			
Know and use angles associated with circles			

At the end of the section, think about your self assessment. Were you right?



Shape A is shown in the diagram.
Shape A is enlarged to obtain the shape B

a. **write down the scale factor of the enlargement**
b. **Complete the drawing of shape B on the diagram**

CLUE:-
Sometimes 'enlarged' doesn't really mean enlarged, does it?

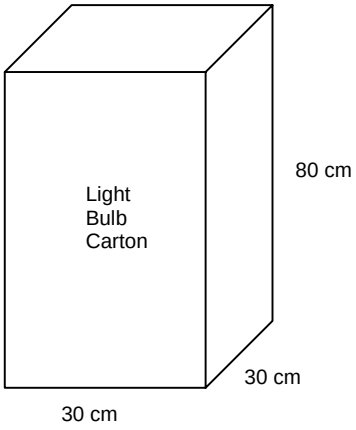
Remember, a cube is a cuboid with all edges equal in length

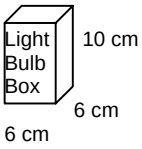
A cuboid has
Volume = 163 cm^3
Length = 8 cm
Height = 4 cm
Work out the width of the cuboid

A box in the shape of a cube has sides of length 2 cm.
These cube boxes are placed into a larger cuboid box with dimensions
Height = 8 cm
Length = 10 cm
Width = 6 cm
How many cubed boxes fit into the cuboid box exactly?

Trickier ones!

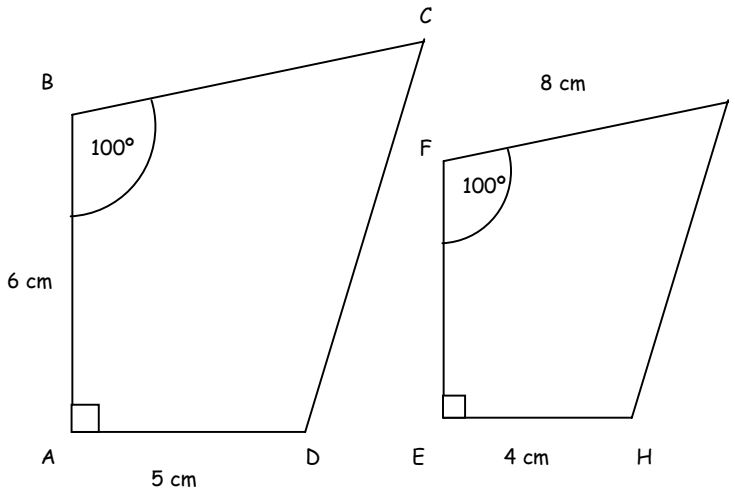
Now C if U can do these……





A light bulb box measures 6 cm by 6 cm by 10 cm.
Light bulb boxes are packed into cartons.
A carton measures 30 cm by 30 cm by 80 cm
Work out the number of light bulb boxes which can completely fill one carton

CLUE :-
Work out how many fit on the bottom layer first



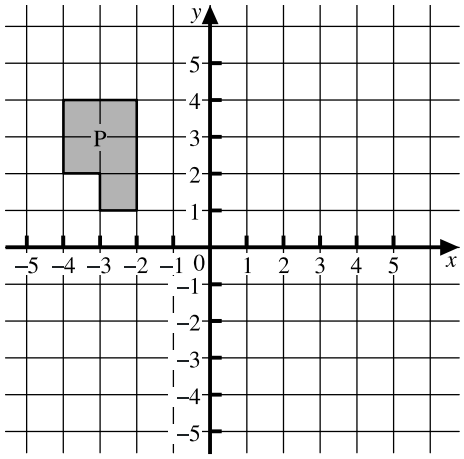
Shapes ABCD and EFGH are mathematically similar.

a. calculate the length of BC
b. calculate the length of EF

CLUE :-
Look at the relationship between AD and EH first

More complicated questions

Now C if U can do these……



The shape P has been drawn on the grid.

a. **Reflect the shape P in the *y* axis. Label the image Q**
b. **Rotate the shape Q through 180° about (0,0). Label this image R.**
c. **Describe fully the single transformation which maps the shape P to the shape R**

CLUE:-
Most people find the rotation is the tricky bit. You could use tracing paper to help.

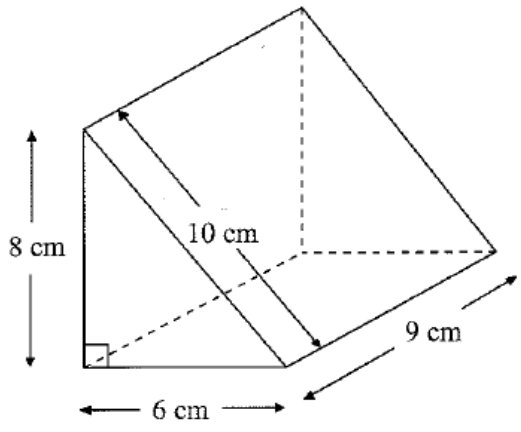
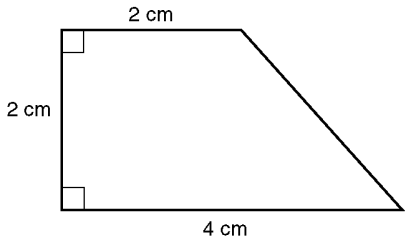


Diagram **NOT** accurately drawn

Work out the surface area of the triangular prism.
State the units with your answer.

CLUE:-
Imagine the net of this shape – work out the area of each face. Don't forget the units

Diagram **NOT** accurately drawn



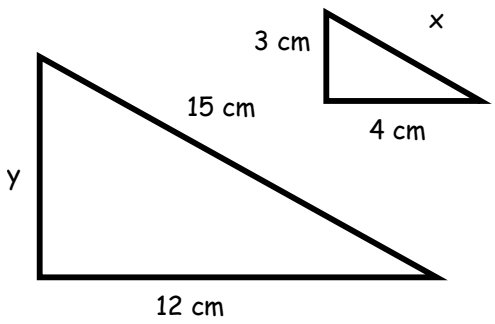
This shape is the cross section of a prism 10 cm long

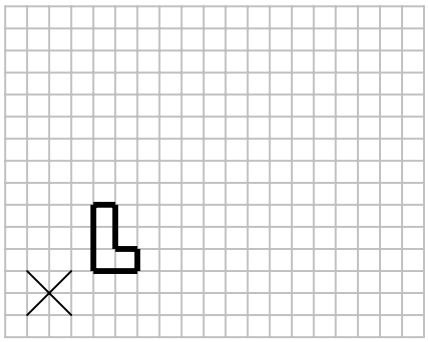
Calculate the volume of the prism

CLUE:-
Split the shape into a rectangle and a triangle first to find the cross sectional area

Remember, scale factor 2 means twice as big

The big triangle is a scale factor enlargement of the smaller triangle. Find x and y





Enlarge this shape by scale factor 2 about point x

Simple questions first.

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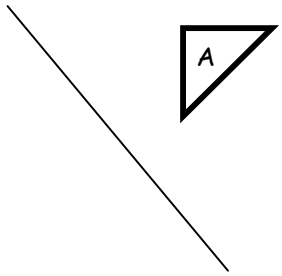
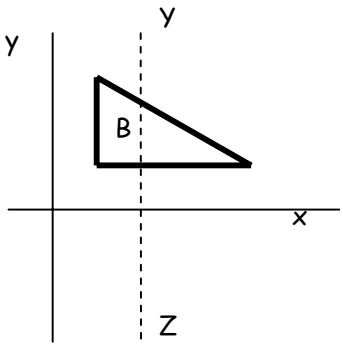
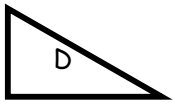


Draw a reflection of triangle A in the given line



a. reflect triangle B in the x axis
b. reflect triangle B in the line YZ

Rotate triangle D 45° clockwise about the point A.
Label the new triangle D'



A ●

*Assess how well you think you understand this topic before you start. Are you **confident, close** or **clueless?***

C if U can Pythagoras

	Confident	Close	Clueless
Use Pythagoras theorem to find the hypotenuse (longest side) of a right angle triangle			
Use Pythagoras theorem to find one of the two shorter sides of a right angle triangle			
Use Pythagoras theorem to solve problems			
Use Pythagoras theorem to solve problems that need other maths as well in the same question			
Work out what kind of maths is needed to answer a question			

At the end of the section, think about your self assessment. Were you right?

Easy questions

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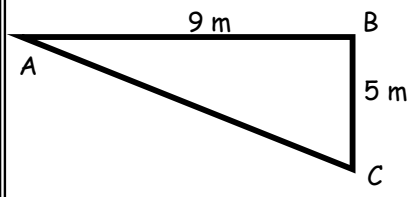
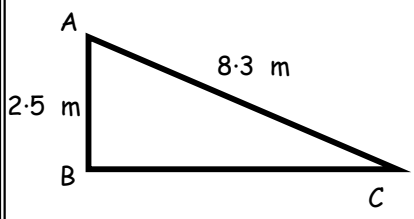
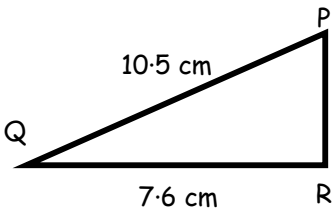


Use Pythagoras to work out the length of AC



Work out the length of BC



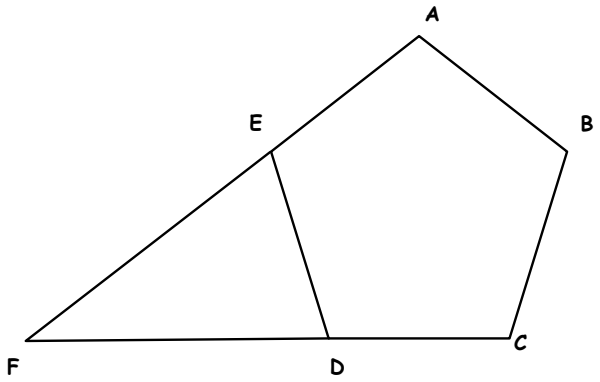
Work out the length of PR

C if U can Transformations

Can you cope with these?

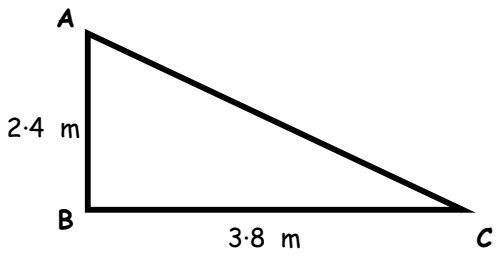
	Confident	Close	Clueless
Reflect a 2D shape in a vertical, horizontal or diagonal line and state the equation of the line.			
Rotate a 2D shape about a point and state the angle, direction and centre of rotation			
Translate a 2D shape and describe the translation in words.			
Enlarge 2D shapes using positive scale factors			
Use scale factors to solve problems involving similar shapes			

At the end of the section, review your self assessment. Were you right?



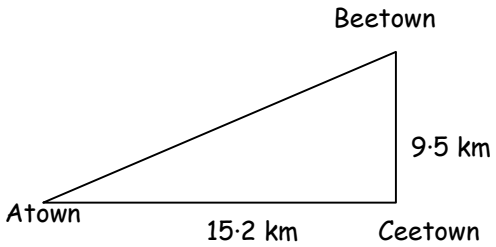
ABCDEF is a regular pentagon.
AEF and CDF are straight lines.
Work out the size of angle DFE.
Give a reason for your answer.

CLUE:-
Think about how you might find angle FDE or DEF. How might this help?



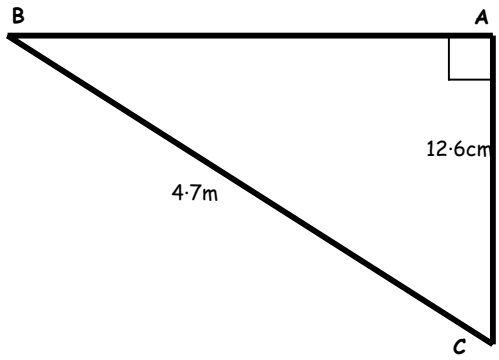
Find the length of AC

Find the distance from Atown to Beetown



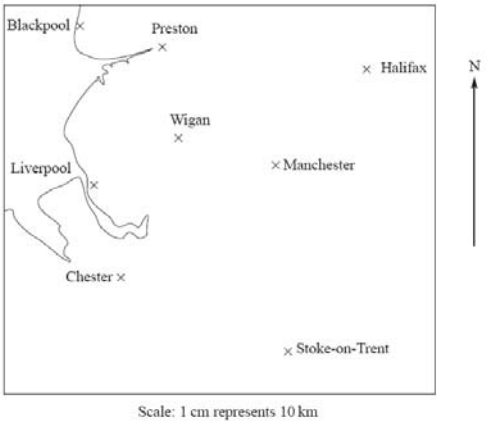
Getting harder

Now C if U can do these……



Angle ABC = 90°
AC = 12·6cm
BC = 4·7cm
Work out the length of AB.
Give your answer correct to 3 significant figures

CLUE:-
Don't forget to round your answer at the end



Measure and write down the bearing of

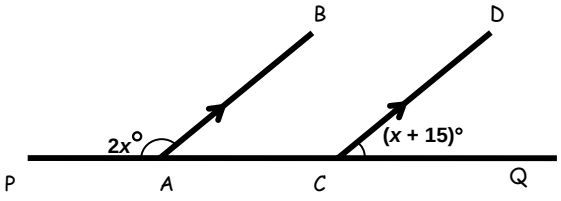
a. Halifax from Wigan

b. Preston from Manchester

CLUE:-
Remember bearings are measured clockwise from North – part b is trickier

You'll have to think harder for these

Now C if U can do these……

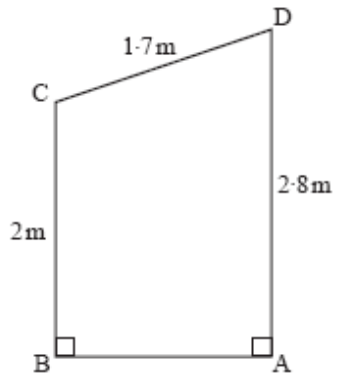


PACQ is a straight line.
AB and CD are parallel.
Angle PAB = (2x)°
Angle QCD = (x + 15)°

Work out the value of x

CLUE:-
What do 2x + x + 15 add up to?

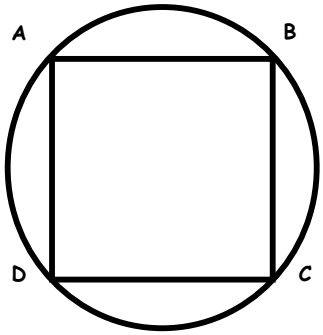
The diagram shows the end, ABCD, of a shed.
The shed is standing on horizontal ground.



Not to scale

Calculate the area of the end of the shed

CLUE:-
Draw a line to make this shape a rectangle and a triangle. Use Pythagoras to work out the width of the rectangle

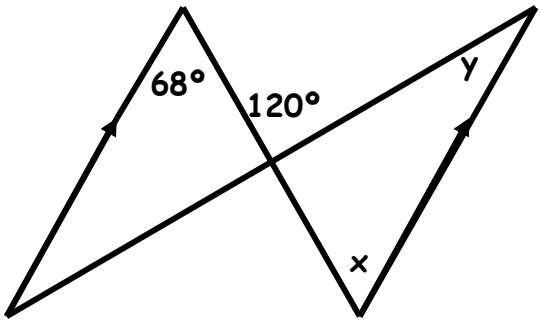


A, B, C and D are four points on the circumference of a circle.
ABCD is a square with sides 20 cm long.
Work out the diameter of the circle
Give your answer correct to 3 significant figures.

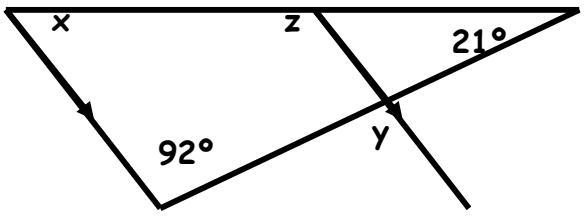
CLUE:-
Pythagoras might help! The diameter of the circle is the diagonal of the square!

You sometimes have to calculate other angles to get to the ones you need

Find angles **x** and **y**. Give reasons for your answers



Find all of the missing angles in this question, giving a reason for each.



These should be fairly simple to answer

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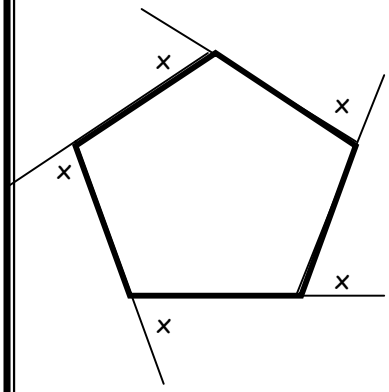
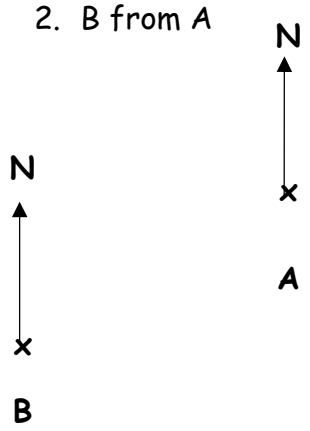


a. What do the external angles total?
b. What is the value of x?

Construct this triangle accurately……
AB = 5·3 cm, BC = 6 cm
angle ABC =112°

Measure the bearing of
1. A from B
2. B from A



*Assess how well you think you understand this topic before you start. Are you **confident, close** or **clueless?***

C if U can
Angles

	Confident	Close	Clueless
Work out angles involving parallel lines, around a point, on a straight line and inside circles			
Work out angles in polygons (shapes with straight edges)			
Draw and measure bearings accurately			
Construct 2D shapes, perpendicular bisectors (at right angles) and angle bisectors (cut in two)			
Construct scale drawings			

At the end of the section, think about your self assessment. Were you right?