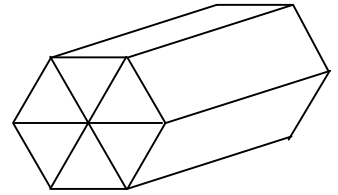
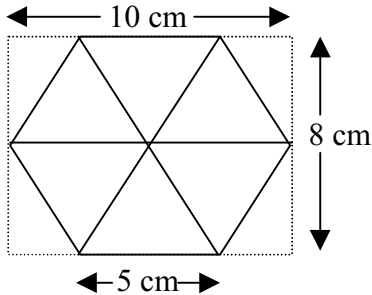


# SAT REVISION; Shape & Space

## ALL LEVELS.

1) A box for coffee is in the shape of a hexagonal prism.

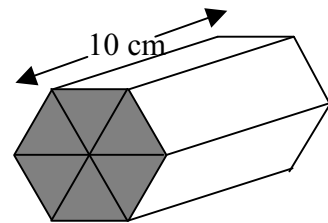
One end of the box is shown below. Each of the 6 triangles in the hexagon has the same dimensions.



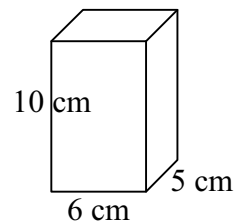
a) Calculate the total **area** of the hexagon.

b) The box is **10 cm long**. Find the capacity of the box in  $\text{cm}^3$ .

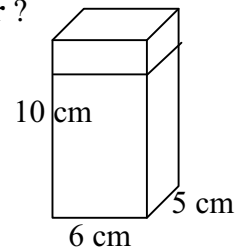
c) After packing, the coffee fills **80%** of the box.  
How many **grams** of coffee are in the box?  
{The mass of  $1 \text{ cm}^3$  of coffee is 0.5 grams.}



2) a) What is the volume of this **standard size** box of salt.

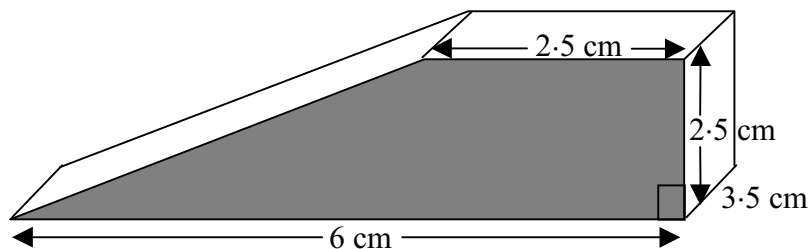


b) What is the volume of this **special offer** box of salt, which is **20% bigger** ?



c) The **standard size** box contains enough salt to fill up to **10** salt pots.  
How many salt pots may be filled up from the **special offer** box of salt ?

3) This door wedge is in the shape of a prism.



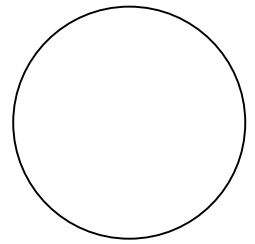
a) The shaded face of the door wedge is a trapezium. Calculate the area of the shaded face.

b) Calculate the volume of the door wedge.

- 4) A circular table has **diameter 5.5 metres**. It is claimed that 50 people can sit around the table.

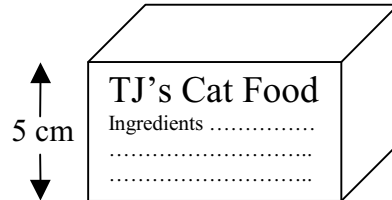
Assume that each person needs 45 cm around the circumference of the table.

Is it possible for 50 people to sit around the table. **Show your working.**

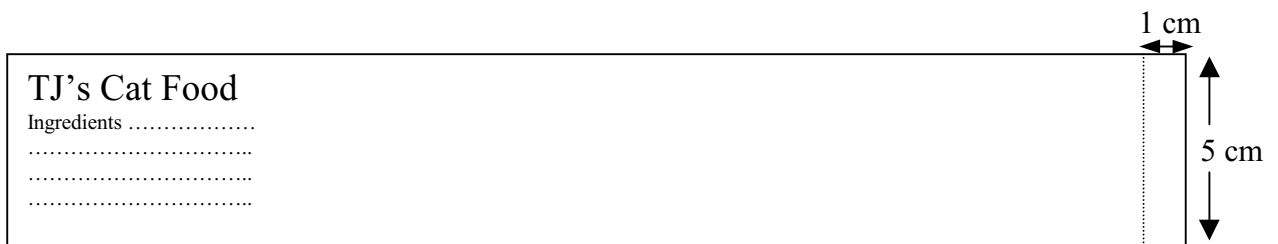


- 5) TJ's Cat Food is sold in tins shaped like this. Each tin has an internal height of 5 cm.

- a) The area of the lid of the tin is  $35 \text{ cm}^2$ .  
Work out the volume of cat food that the tin contains.



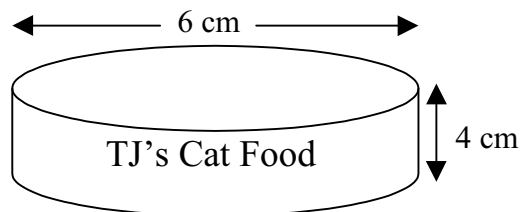
- b) The label that goes around the tin overlaps by 1 cm. The area of the label is  $134 \text{ cm}^2$ .



Work out the distance around the tin.

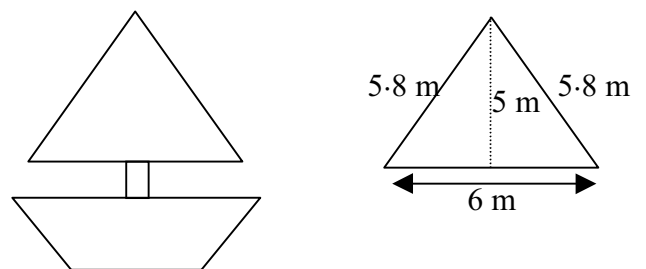
- c) TJ's Cat Food plans to use tins that are the shape of cylinders. The internal measurements of a tin are shown.

Work out the volume of cat food that the tin contains.

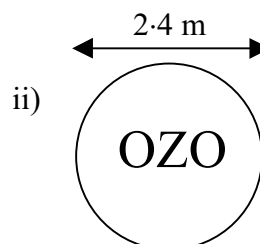
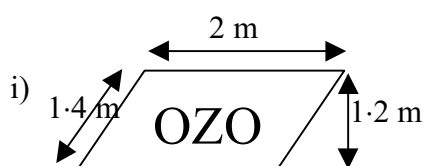


- 6) In a competition all boats have sails the same size.

- a) Work out the area of the sail.

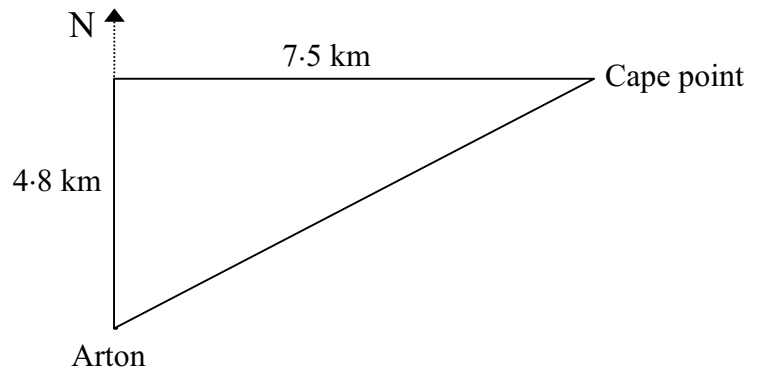


- b) The OZO company has designed the following advertisements to cover the sails. Work out the area of each logo.

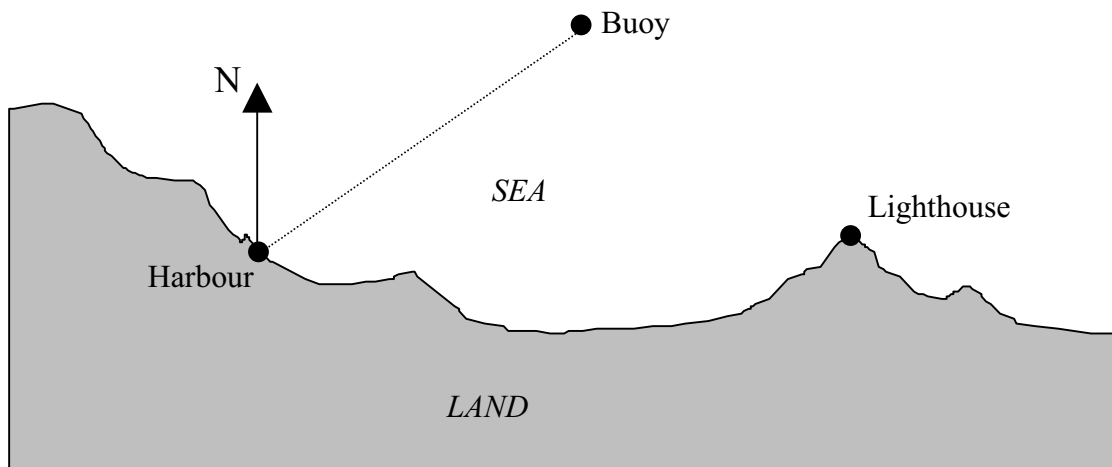


- 7) Cape Point is 7.5 km east and 4.8 km north of Arton.

Calculate the direct distance from Arton to Cape Point.

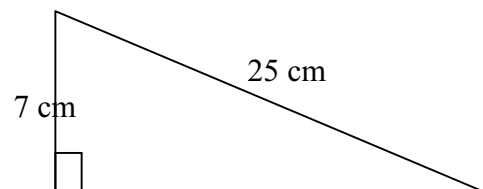


- 8) A boat sails from the harbour to the buoy.  
The buoy is 6 km to the east and 4 km to the north of the harbour.

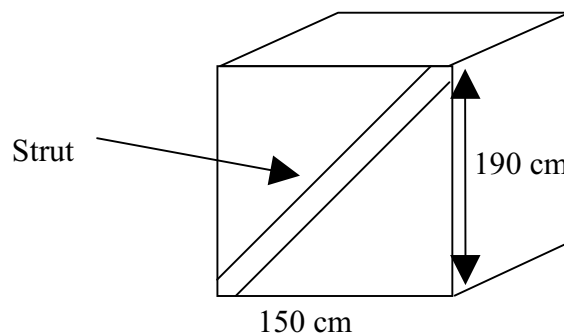


Calculate the distance between the harbour and the buoy.

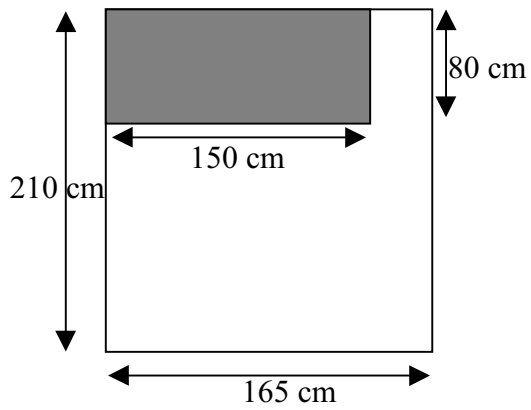
- 9) Calculate the area of this triangle.



- 10) A cupboard needs to be strengthened by putting a strut on the back of it like this.

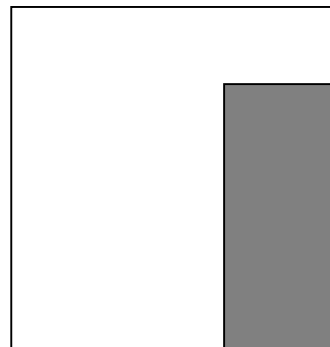
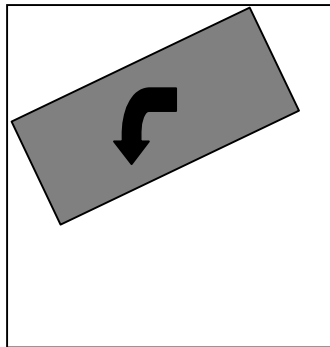


- a) Calculate the length of the diagonal strut.  
b) In a small room the cupboard is in this position.



VIEW LOOKING DOWN  
ON THE ROOM

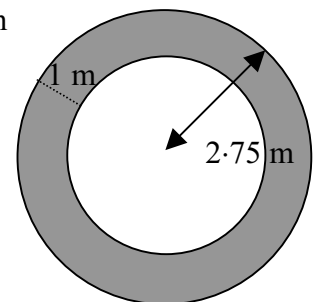
Calculate if the room is large enough to turn the cupboard like this and put it in its new position.



NEW POSITION

- 11) A circular pond is surrounded by a circular lawn of width 1 m as shown in the diagram.

Calculate the area of the lawn.



- 12) Sally is using her bike to measure distances. The wheels on her bike have diameter 60 cm.

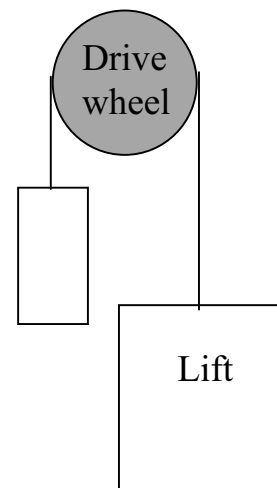
a) Calculate how far, in metres, Sally's bike moves whenever a wheel revolves once.

b) Sally cycles a distance of 200 metres. Calculate how many complete revolutions the front wheel of her bike makes.

- 13) The drive wheel on a lift has a diameter of 2.4 metres.

a) How far will the lift rise when the drive wheel revolves once?

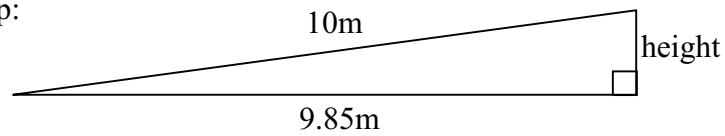
b) How many times does the wheel revolve when it raises the lift 50 metres?



**LEVELS 6–8 ONLY.**

- 1) Ramps help people going into buildings. A ramp that is **10m long** must not have a **height** greater than **0.83m**.

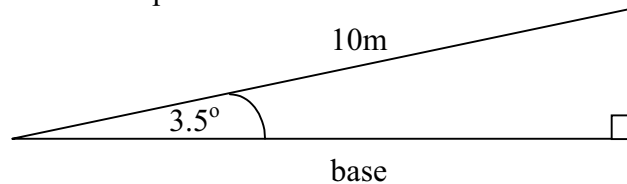
a) Here are the plans for a ramp:



NOT TO SCALE

Is this ramp too high? You **must** show calculations to explain your answer.

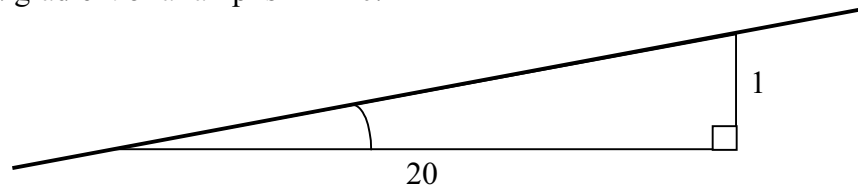
b) Here are the plans for a **different** ramp:



NOT TO SCALE

How long is the base of this ramp? You **must** show your calculations.

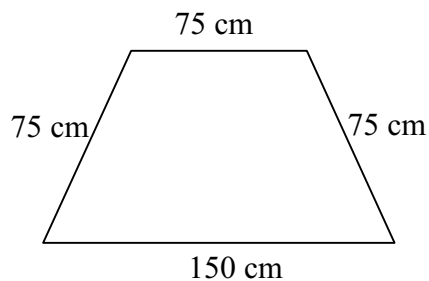
c) The recommended gradient of a ramp is 1 in 20.



NOT TO SCALE

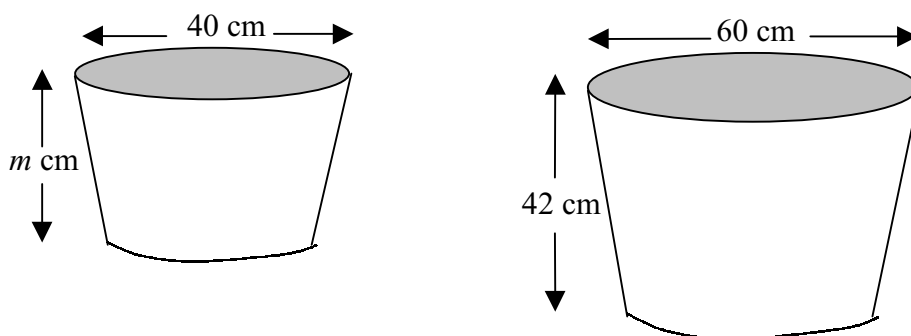
What angle gives the recommended gradient? You **must** show your calculations.

- 2) A table top is in the shape of a trapezium.



Calculate the **area** of the table top. Show your working.

- 3) These plant pots are mathematically similar. The internal dimensions are shown.

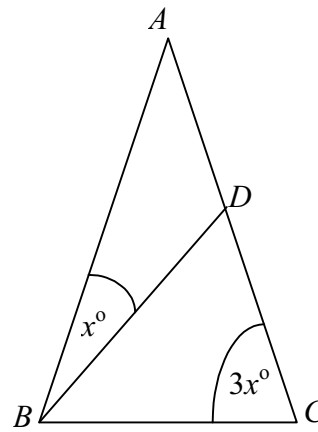


Calculate the value of  $m$ . Show your working.

4) Look at the diagram:

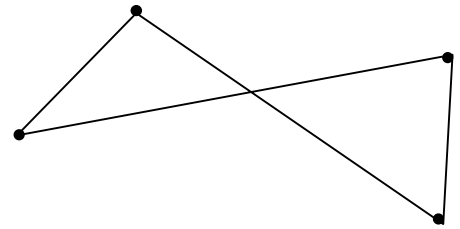
Side  $AB$  is the same length as side  $AC$ .  
Side  $BD$  is the same length as side  $BC$ .

Calculate the value of  $x$ . Show your working.

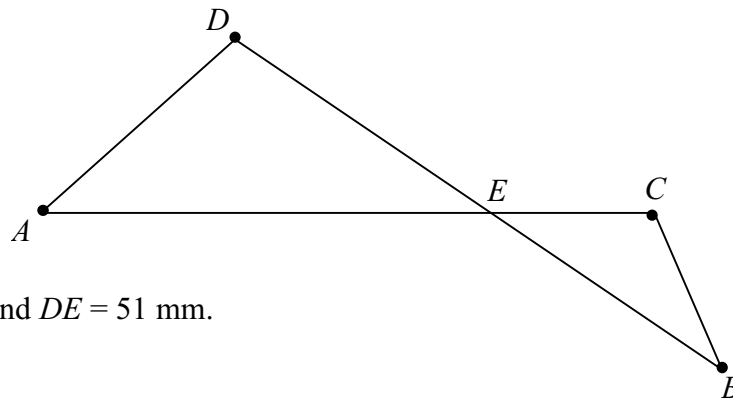


5) Edwyn is making shapes by using 4 pins and an elastic band.

a) Edwyn has moved the pins until triangles  $AED$  and  $BEC$  are mathematically similar.



In this position, angle  $EDA$  is equal to angle  $ECB$ .



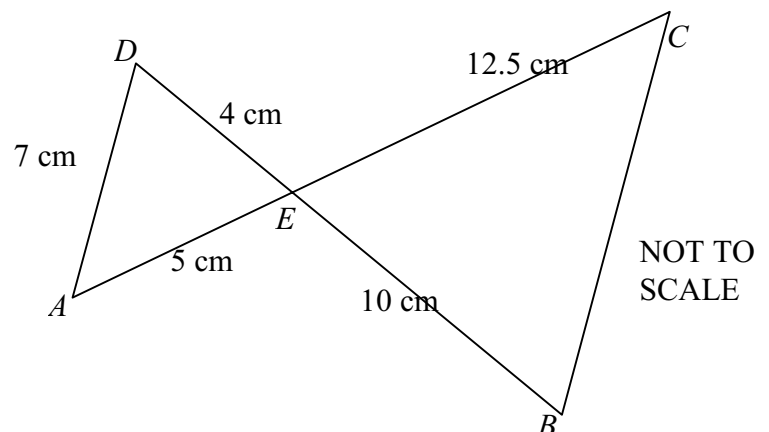
$AD = 72$  mm,  $BC = 48$  mm and  $DE = 51$  mm.

NOT TO SCALE

Calculate length  $CE$ .

b) With the pins in another position, triangles  $AED$  and  $BCE$  are again mathematically similar.  
In this position, angle  $EDA$  is equal to angle  $EBC$ .

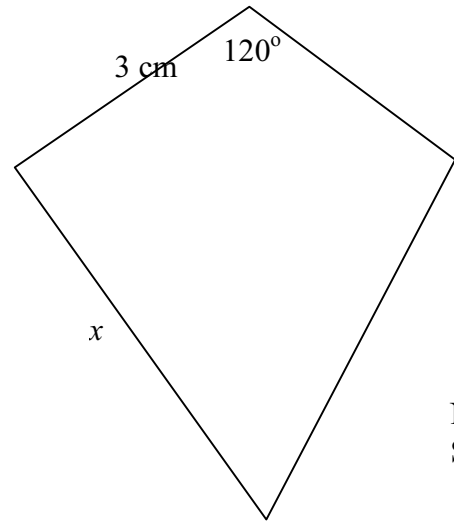
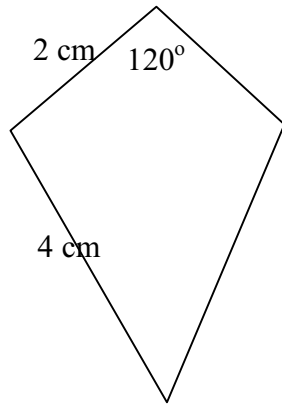
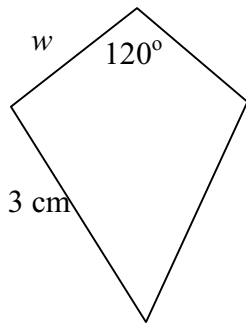
The lengths of the sides are shown.



NOT TO SCALE

Calculate length  $BC$ .

6) Ingrid has made these photocopies of a drawing of a kite. The photocopies are of different sizes.



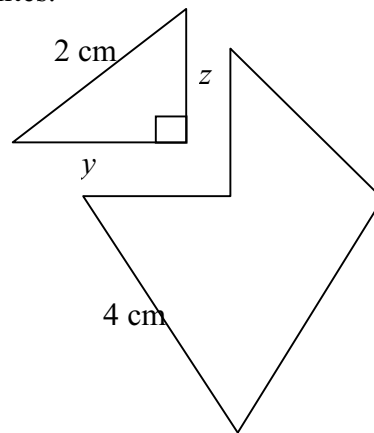
NOT TO SCALE

a) Work out lengths  $w$  and  $x$ .

Ingrid cuts off a right-angled triangle from one of the kites.

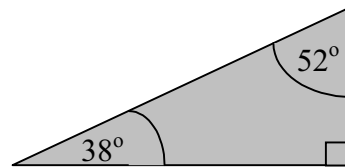
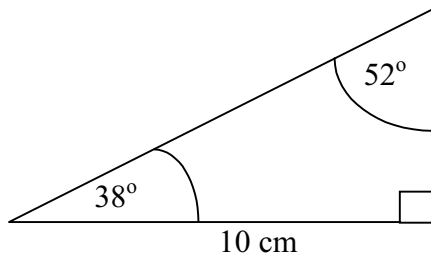
b) Work out length  $y$ .

c) Work out length  $z$ .

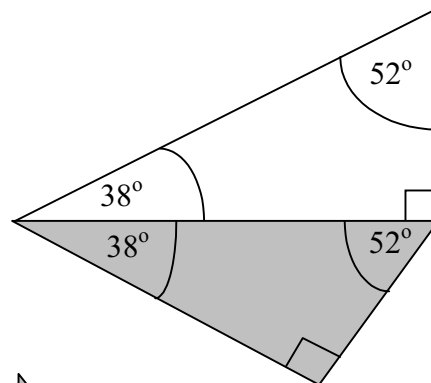


NOT TO SCALE

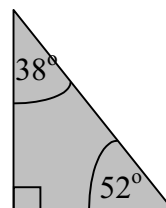
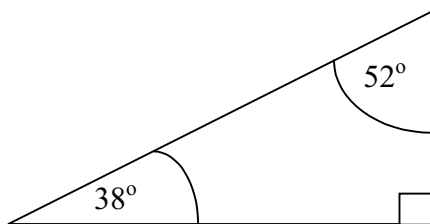
7) Cassie made 2 similar triangles.



They fitted together **exactly** like this.



Would they also fit together **exactly** like this?



Use any of sine, cosine or tangent to find out.

## ANSWERS.

### ALL LEVELS.

- 1) a)  $60 \text{ cm}^2$ , b)  $600 \text{ cm}^3$ , c) 240 grams.
- 2) a)  $300 \text{ cm}^3$ , b)  $360 \text{ cm}^3$ , c) 12.
- 3) a)  $10 \cdot 625 \text{ cm}^2$ , b)  $37 \cdot 1875 \text{ cm}^3$ .
- 4) Circumference of table =  $17 \cdot 27875959$  metres. 50 people require  $22 \cdot 5$  metres.  
It is not possible to seat 50 people around the table.
- 5) a)  $175 \text{ cm}^3$ , b)  $25 \cdot 8 \text{ cm}$ , c)  $113 \cdot 1 \text{ cm}^3$ .
- 6) a)  $15 \text{ m}^2$ , b) i)  $2 \cdot 4 \text{ m}^2$ , ii)  $4 \cdot 523893421 \text{ m}^2$ .
- 7)  $8 \cdot 9 \text{ km}$ .
- 8)  $7 \cdot 2 \text{ km}$ .
- 9)  $84 \text{ cm}^2$ .
- 10) a)  $242 \cdot 1 \text{ cm}$ , b) The room is NOT large enough.
- 11)  $14 \cdot 1 \text{ m}^2$ .
- 12) a)  $1 \cdot 884955592$  metres, b) 106 complete revolutions.
- 13) a)  $7 \cdot 539822369 \text{ m}$ , b) 6 complete revolutions.

### LEVELS 6–8 ONLY.

- 1) a) {Use Pythagoras} Height =  $1 \cdot 726 \text{ m}$ ; too high!  
b) {Use COS button} base =  $9 \cdot 98 \text{ m}$ ,  
c) {Use inv/shift TAN}  $2 \cdot 862^\circ$ .
- 2) {Use Pythagoras to find the distance between the parallel sides etc.}  
 $7307 \cdot 089344 \text{ cm}^2$ .
- 3) {Find the scale–factor etc.}  $28 \text{ cm}$ .
- 4) {Use the 2 sets of isosceles triangles to form an equation in  $x$ }  $x = 22 \cdot 5^\circ$ .
- 5) a) {Find the scale–factor etc.}  $34 \text{ mm}$ ,  
b) {Careful with this scale–factor!}  $17 \cdot 5 \text{ cm}$ .
- 6) a)  $w = 1 \cdot 5 \text{ cm}$ ,  $x = 6 \text{ cm}$ ,  
b) {Use SIN button}  $y = 1 \cdot 7320508 \text{ cm}$ ,  
c) {Use Pythagoras or COS button}  $z = 1 \text{ cm}$ .
- 7) {Make use of the  $10 \text{ cm}$  length on each triangle and use  $S_{\text{H}}^{\text{O}}C_{\text{H}}^{\text{A}}T_{\text{A}}^{\text{O}}$  to calculate the appropriate lengths of  $7 \cdot 813 \text{ cm}$  and  $7 \cdot 88 \text{ cm}$ } The triangles will not fit together.