BUCKS COLLEGE GROUP ASSESSMENT

Mathematics Diagnostic Assessment

Calculator paper • Total marks: **52**

Surname		**Group name**	
First names		**Date**	

Instructions

- Answer **all** questions.
- Write your answers in the spaces provided.
- You may use a calculator.
- Diagrams are not drawn to scale.

Information

- The paper has **13 questions**.
- The marks for each question are shown in brackets [ ].

Question marks

Question	Marks
1	8
2	2
3	8
4	5
5	6
6	4
7	3
8	2
9	2
10	2
11	3
12	3
13	4
Total	**52**

Formula sheet

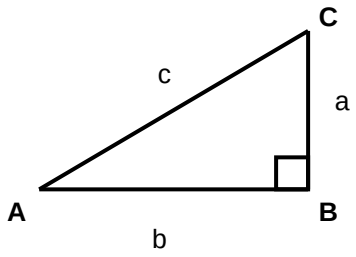
Use these formulae where appropriate. Diagrams are not drawn to scale.

Perimeter, area and volume

- Circumference of a circle: **$C = 2\pi r$** or **$C = \pi d$**
- Area of a circle: **$A = \pi r^2$**
- Arc length: **$L = (\theta/360) \times 2\pi r$**
- Area of a sector: **$A = (\theta/360) \times \pi r^2$**
- Volume of a prism: **V = area of cross-section × length**
- Volume of a pyramid: **V = (1/3) × base area × perpendicular height**
- Volume of a cone: **$V = (1/3) \times \pi r^2 h$**
- Surface area of a sphere: **$A = 4\pi r^2$**
- Volume of a sphere: **$V = (4/3)\pi r^3$**

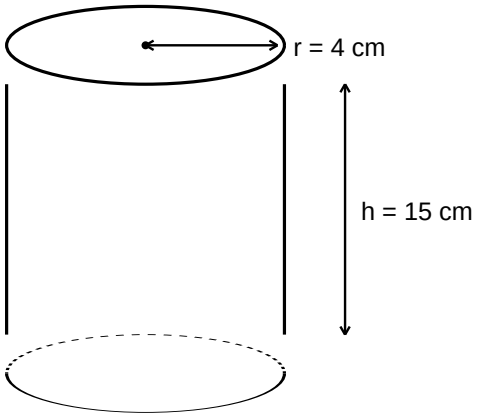
Pythagoras and trigonometry

- Pythagoras' theorem: **$a^2 + b^2 = c^2$**
- $\sin \theta$ = opposite / hypotenuse
- $\cos \theta$ = adjacent / hypotenuse
- $\tan \theta$ = opposite / adjacent



1. Tin: 3D shape, area and volume [8 marks]

The diagram shows a tin with radius 4 cm and height 15 cm.



(a) Name the 3D shape.

.....

[1]

(b) Work out the area of one circular face. Give your answer to **2 d.p.**

.....

.....

[2]

(c) Work out the volume of the tin. Give your answer to **2 d.p.**

.....

.....

[2]

.....

(d) Work out the total surface area of the tin, including the top and the bottom. Give your answer to **2 d.p.**

.....

.....

[2]

.....

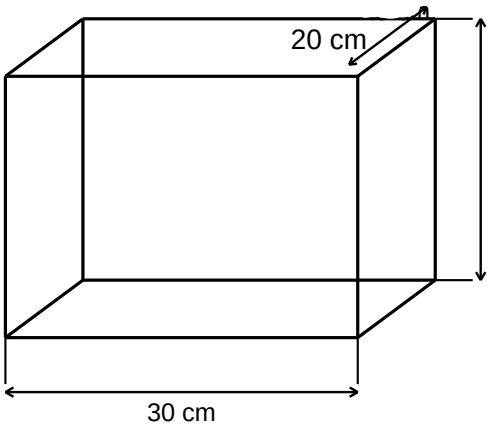
(e) A tin holds 0.75 litres. Is this tin large enough? Tick **Yes** or **No**.

☐ Yes ☐ No **[1]**

Working space:

2. Cuboid: volume and capacity [2 marks]

The diagram shows a cuboid-shaped tank.



(a) Work out the volume of the tank in cm^3.

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..... **[1]**

.....

(b) Work out the capacity of the tank in litres.

.....

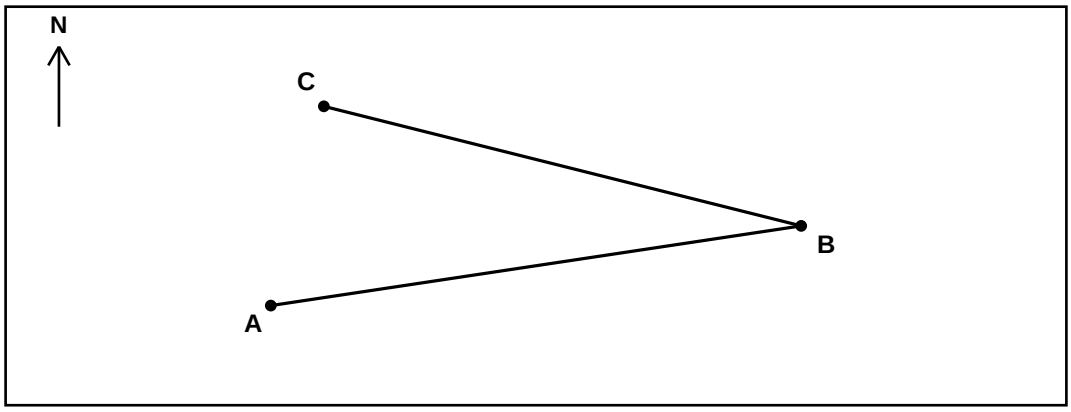
..... **[1]**

.....

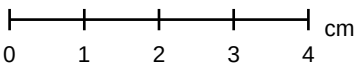
Working space:

3. Scale and bearings [8 marks]

The diagram shows part of a map.



Scale: 1 : 50 000



(a) Work out the real distance from A to B in km. **[2]**

(b) The real distance from B to C is 2.6 km. Work out the map distance in cm. **[2]**

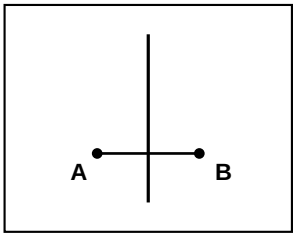
(c) Find the three-figure bearing of C from B. **[2]**

(d) A hiker walks from A to B then from B to C. Work out the total distance walked in km. **[2]**

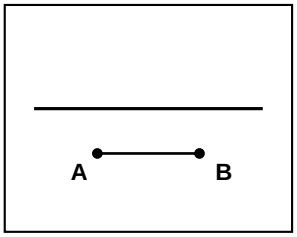
4. Construction and loci (multiple choice) [5 marks]

A and B are two points 8 cm apart.

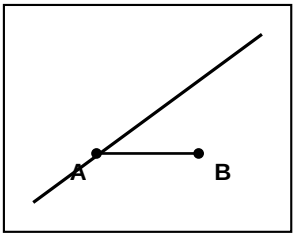
(a) Which diagram shows the correct construction of the perpendicular bisector of AB? Circle A, B, C or D. **[1]**



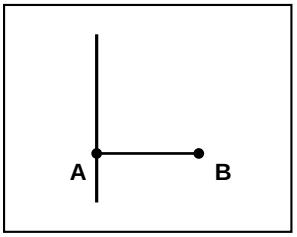
A



B

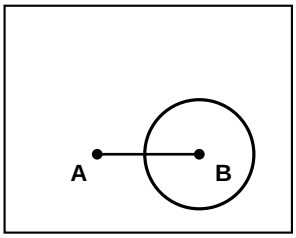


C

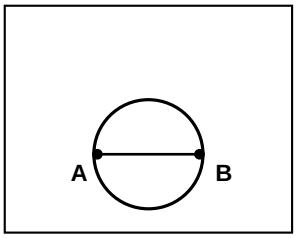


D

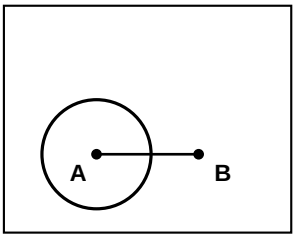
(b) Which diagram shows the locus of points 4 cm from A? Circle A, B, C or D. **[1]**



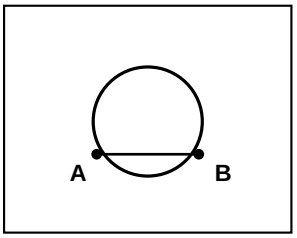
A



B

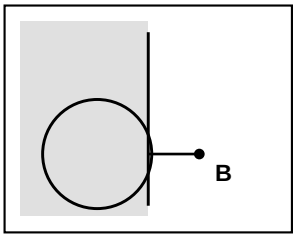


C

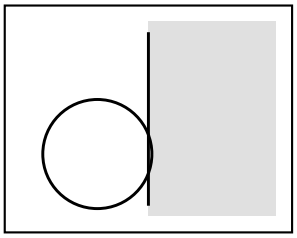


D

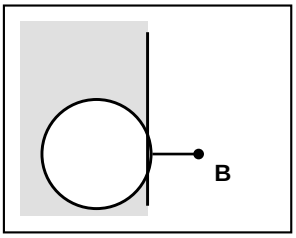
(c) Which diagram shows the region closer to A than B and at least 4 cm from A? Circle A, B, C or D. **[1]**



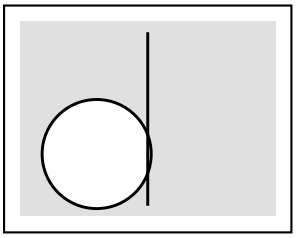
A



B



C



D

(d) The locus of points 5 cm from B is a: circle / line / rectangle / triangle **[1]**

.....

(e) The locus of points equidistant from A and B is a: circle / perpendicular bisector / radius / chord **[1]**

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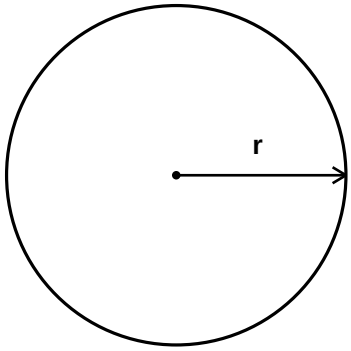
5. Circles: diameter, circumference and area [6 marks]

The diagram shows a circle with radius 4.2 m.



r = 4.2 m

(a) What is the diameter of the circle? **[1]**

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(b) Work out the circumference of the circle. Give your answer to **2 d.p.** **[2]**

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.....

(c) Work out the area of the circle. Give your answer to **2 d.p.** **[3]**

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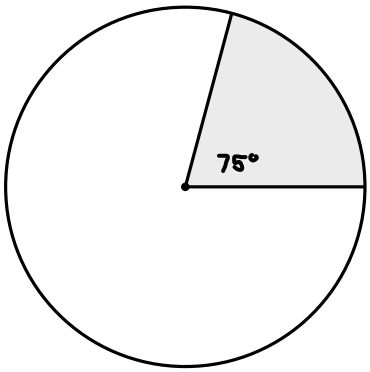
Working space:

6. Arc length and sector area [4 marks]

The diagram shows a sector of a circle with radius 12 cm and angle 75°.



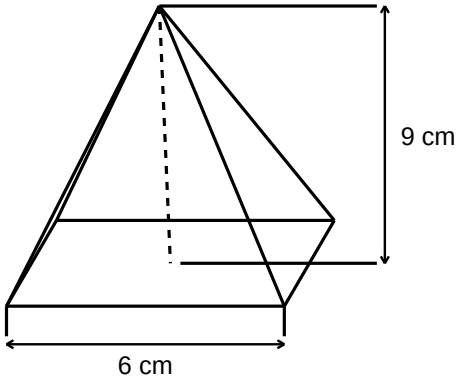
(a) Work out the arc length of the sector. Give your answer to **2 d.p.** **[2]**

(b) Work out the area of the sector. Give your answer to **2 d.p.** **[2]**

Working space:

7. Pyramid volume [3 marks]

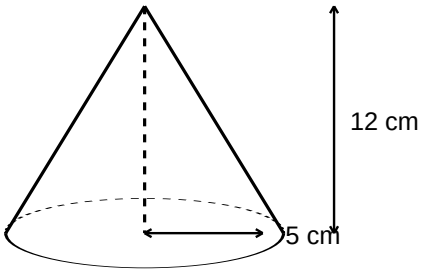
The diagram shows a square-based pyramid.



Work out the volume of the pyramid in cm³. Give your answer to **2 d.p.** **[3]**

8. Cone volume [2 marks]

The diagram shows a cone.

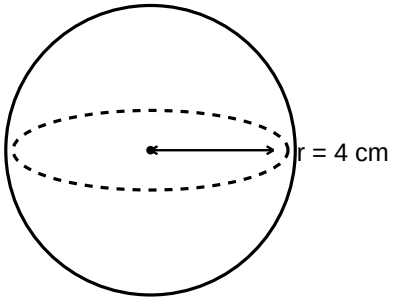


Work out the volume of the cone in cm³. Give your answer to **2 d.p.** **[2]**

Working space:

9. Sphere surface area [2 marks]

The diagram shows a sphere with radius 4 cm.



Work out the surface area of the sphere. Give your answer to **2 d.p.** **[2]**

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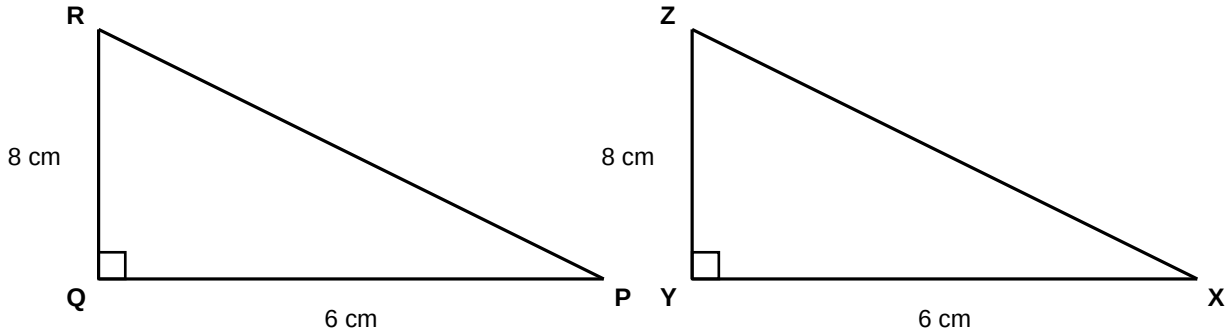
10. Congruent triangles [2 marks]

The triangles **PQR** and **XYZ** are congruent.



Work out the missing length **PR**. Give your answer to **2 d.p.** if needed. **[2]**

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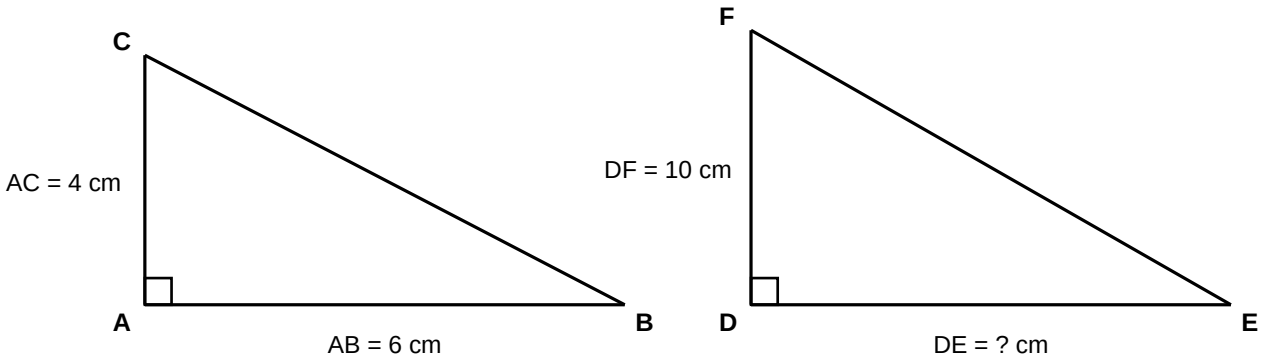
11. Similar triangles [3 marks]

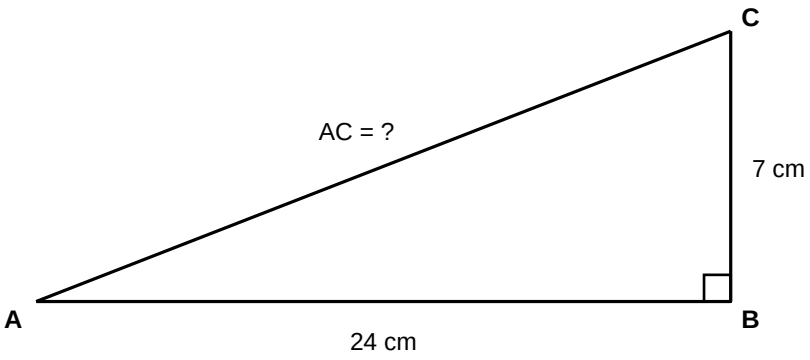
The triangles **ABC** and **DEF** are similar.



Work out the missing length **DE**. **[3]**

12. Pythagoras' theorem [3 marks]

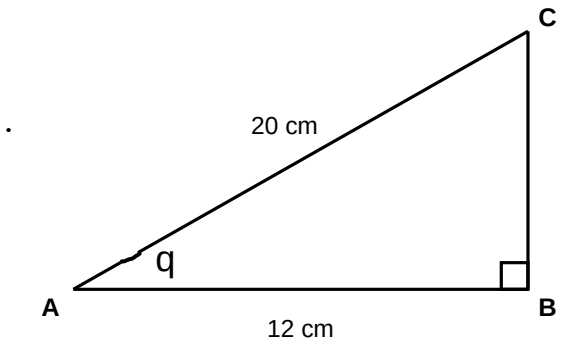
The diagram shows a right-angled triangle.

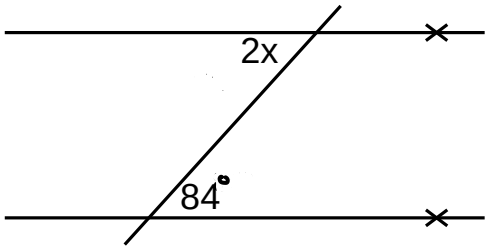


Work out the length **AC**. Give your answer to **2 d.p.** if needed. **[3]**

13. Trigonometry and parallel lines [4 marks]

Answer both parts.





(a) Work out angle **q**. Give your answer to the nearest degree. **[2]**

(b) The lines are parallel. Work out **x**. **[2]**

END OF PAPER