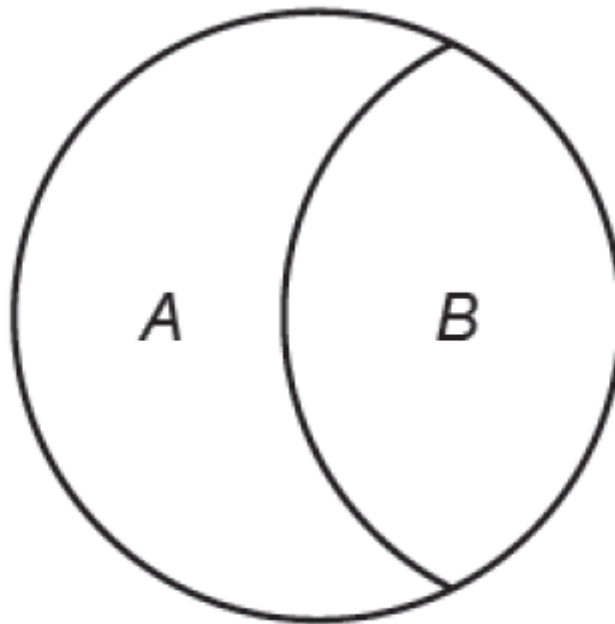


# Circles, Arcs & Sectors (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas

Name:	C. Beale
Total Marks:	

1. The diagram shows a circle split into two regions: A and B.



*Diagram not drawn to scale*

The ratio of the areas of the regions A and B is 2 : 3.  $2 + 3 = 5$

The radius of the circle is 1.5cm.

Calculate the area of region A.

$$\pi \times 1.5^2 = 2.25\pi$$

$$2.25\pi \div 5 = 0.45\pi$$

$$A = 0.9\pi = 2.826$$

$$B = 1.35\pi = 4.237$$

[4]

2. A circular table top has radius 70 cm.

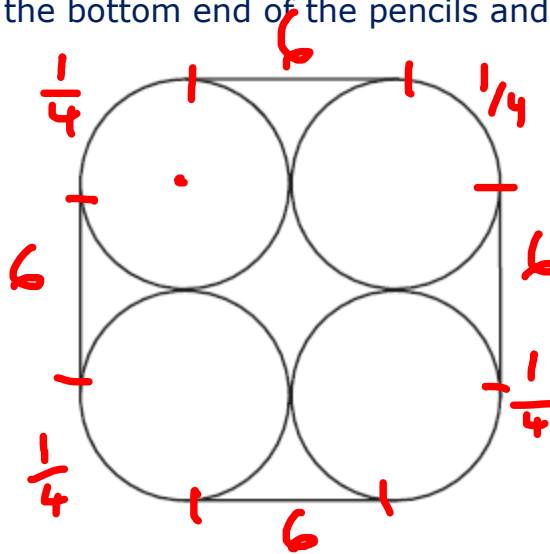
Calculate the area of the table top in  $\text{cm}^2$ , giving your answer as a multiple of  $\pi$ .

$$\pi \times 70^2 = 4900\pi$$

.....  $\text{cm}^2$  [2]

3. Four pencils are held together with a band.

The figure below shows the bottom end of the pencils and the band.



$$4 \times \frac{1}{4} = 1 \text{ circumference}$$

$$\begin{aligned} C &= \pi \times d \\ &= \pi \times 9 \\ &= 28.26 \\ &+ 4 \times 6 = 24 \\ &= 52.26 \end{aligned}$$

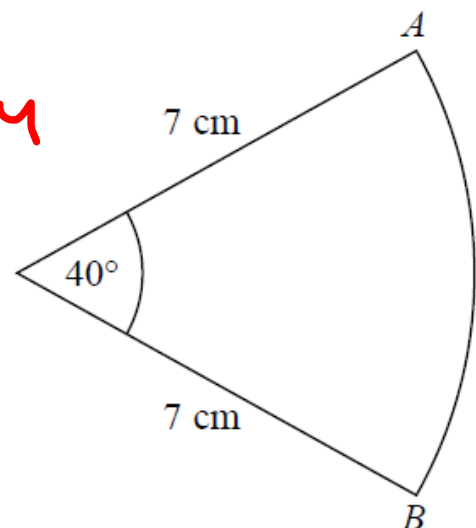
Each of the pencils has diameter 9 mm.

Find the length of the band in this position.

..... **52.26** ..... mm [4]

4. The diagram shows a sector of a circle of radius 7 cm.

$$\frac{40}{360} \times \pi \times 14 = 4.88 \text{ cm}$$



Work out the length of arc  $AB$ .

Give your answer correct to 3 significant figures.

[2]

5. The distance from the Earth to the Sun is 93 million miles.

Assume

$$365 \times 24 = 8760$$

it takes 365 days for the Earth to travel once around the Sun

the Earth travels in a circle with the Sun at the centre.

(a) Work out the average speed of the Earth in miles per hour.

$$S = \frac{D}{T} \quad \frac{93000000}{8760} = 19,376.4 \text{ MPH}$$

$$365.25 \times 24 = 8766$$

[4]

(b) It actually takes  $365 \frac{1}{4}$  days for the Earth to travel once around the Sun.

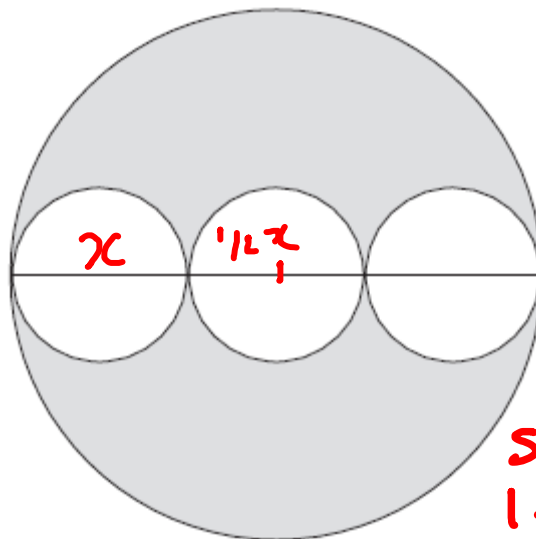
How does this affect your answer to part (a)?

$$\frac{93000000}{8766} = 10609.2 \text{ MPH}$$

It means speed is less fast.

[1]

6. Three identical small circles are drawn inside one large circle, as shown in the diagram.



$$\begin{aligned} \text{Total area} &= \pi \times (1.5x)^2 \\ &= 2.25 \pi x^2 \\ \text{White} &= 3 \times \pi \times \left(\frac{1}{2}x\right)^2 \\ &= \frac{3}{4} \pi x^2 \end{aligned}$$

$$\begin{aligned} 2.25 - 0.75 &= 1.5 \\ \text{Shaded} &= 1.5 \pi x^2 \\ \frac{1.5 \pi x^2}{2.25 \pi x^2} &= \frac{2}{3} \end{aligned}$$

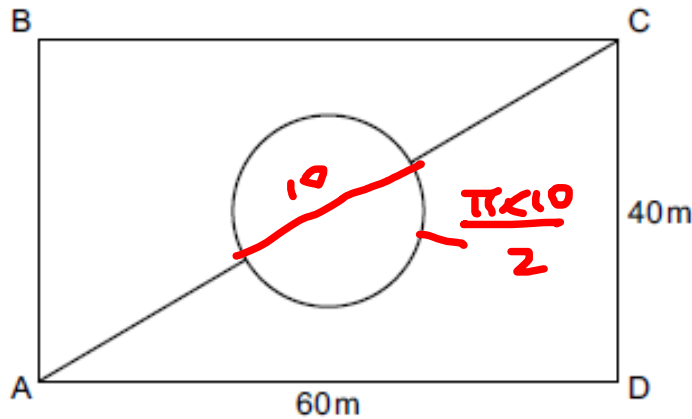
The centres of the small circles lie on the diameter of the large circle.

Find the fraction of the large circle that is shaded.

$$\frac{2}{3}$$

..... [3]

7. The rectangle ABCD represents a park.



Not to scale

The lines show all the paths in the park.

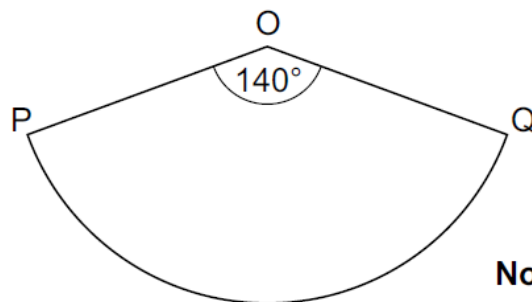
The circular path is in the centre of the rectangle and has a diameter of 10m.

Calculate the shortest distance from A to C across the park, using only the paths shown.

$$\begin{aligned} \sqrt{60^2 + 40^2} &= 72.11 \\ &\quad - 10 \\ &\quad \hline &\quad 62.11 \\ &\quad + 5\pi \\ &\quad \hline &\quad 77.81 \end{aligned}$$

..... m [6]

8. OPQ is a sector of a circle, centre O and radius 9 cm.



Not to scale

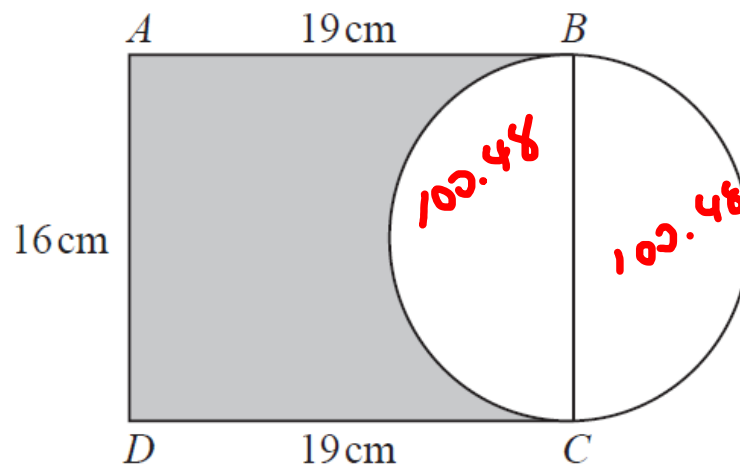
Find the perimeter of the sector.

Give your answer in terms of  $\pi$ .

$$\begin{aligned} \frac{140}{360} \times 18\pi &+ 18 \\ \frac{7}{20} \times 18\pi &+ 18 \\ 7\pi + 18 \end{aligned}$$

..... cm [3]

9. Here is a diagram showing a rectangle, ABCD, and a circle.



$$19 \times 16 = 304$$

$$\frac{\pi \times 8^2}{2} = \frac{200.96}{2}$$

$$= 100.48$$

BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.

Give your answer correct to 1 decimal place.

$$304 - 100.48 = 199.52$$

$$\frac{199.52}{304} = 65.6\%$$

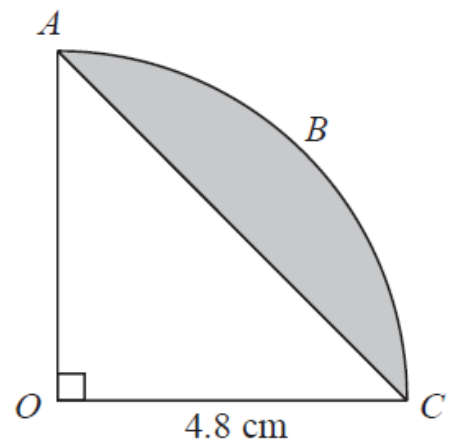
[4]

10. The arc ABC is a quarter of a circle with centre O and radius 4.8 cm.

$$4.8 \times 4.8 = 11.52$$

$$\frac{\pi \times 4.8^2}{4} = 18.08$$

$$18.08 - 11.52 =$$



AC is a chord of the circle.

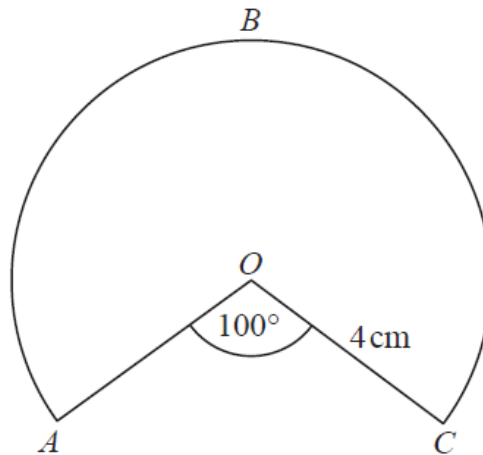
Work out the area of the shaded segment.

Give your answer correct to 3 significant figures.

$$= 6.5664 = 6.57 \text{ cm}^2$$

[3]

11. The diagram shows a sector of a circle of radius 4 cm.



$$\frac{260}{360} \times \pi \times 8 =$$

Work out the length of the arc ABC.

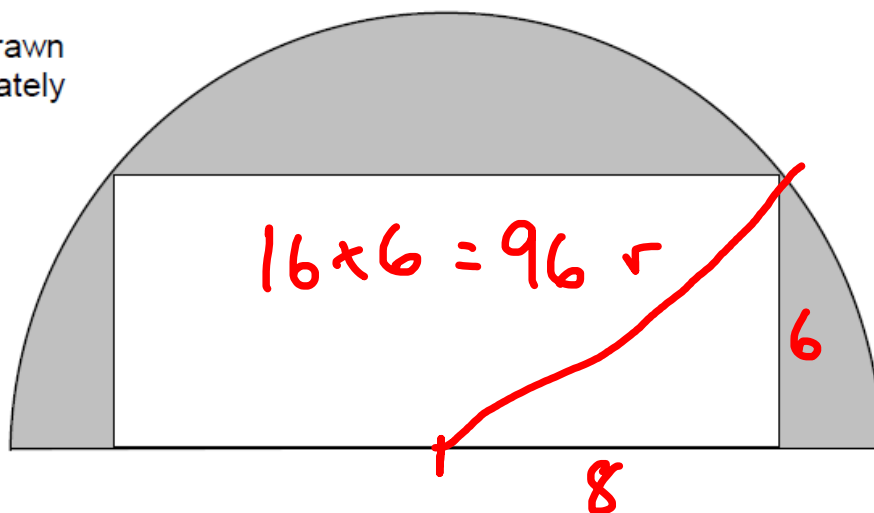
Give your answer correct to 3 significant figures.

$$18.142$$

$$\dots\dots\dots 18.1 \dots\dots\dots \text{ cm [2]}$$

12. The diagram shows a rectangle inside a semicircle.

Not drawn accurately



The rectangle has dimensions 16 cm by 6 cm

Work out the shaded area.

Give your answer in terms of  $\pi$ .

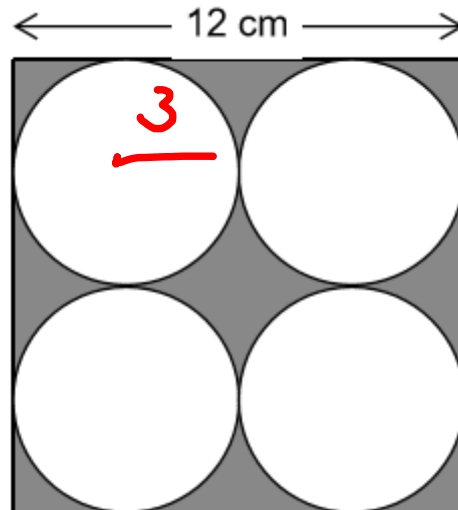
$$r = \sqrt{8^2 + 6^2} = 10$$

$$\pi \times 10^2 = 100\pi$$

$$\text{Shaded} = 100\pi - 96$$

[4]

13. Four identical circles just fit inside a square as shown.



$$12 \times 12 = 144$$

$$3^2 \times \pi \times 4 = 36\pi$$

Not drawn accurately

Work out the area of the shaded section.

Give your answer in terms of  $\pi$ .

$$144 - 36\pi \quad \text{or}$$

$$36(4 - \pi)$$

[4]

## CREDITS AND NOTES

Question	Awarding Body	Question	Awarding Body
1	WJEC Eduqas	8	OCR
2	OCR	9	Pearson Edexcel
3	OCR	10	Pearson Edexcel
4	Pearson Edexcel	11	Pearson Edexcel
5	AQA	12	AQA
6	OCR	13	AQA
7	OCR		

### Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board's (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

### Links:

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/gcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

### Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material

