

MATHS



MODEL ANSWERS

AREA OF A SEGMENT

SCORE

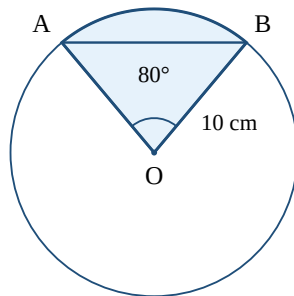
/161

PERCENTAGE

%

STEM UP

- 1 The diagram shows a circle, centre O, with radius 10 cm and angle AOB = 80°. Work out the area of sector AOB. Give your answer correct to 3 significant figures.

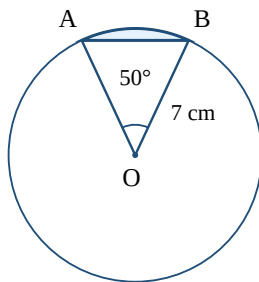


$$\frac{80}{360} \times \pi \times 10^2 = 69.81$$

$$69.8 \text{ cm}^2$$

1 / 1

- 2 The diagram shows a circle with centre O. A and B are points on the circle. The shaded region is a segment of the circle. Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\text{sector} = \frac{50}{360} \times \pi \times 7^2 = 21.38$$

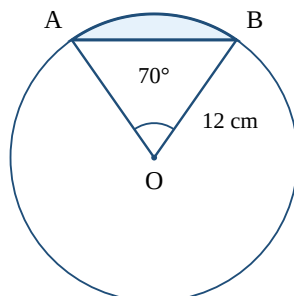
$$\text{triangle} = \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ = 18.77$$

$$\text{segment} = 21.38 - 18.77 = 2.61$$

$$2.61 \text{ cm}^2$$

2 / 2

- 3 The diagram shows a circle, centre O, with radius 12 cm and angle AOB = 70°. Show that the area of the shaded segment is 20.3 cm², correct to 3 significant figures.



$$\text{sector} = \frac{70}{360} \times \pi \times 12^2 = 87.96$$

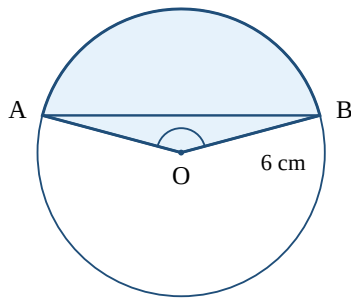
$$\text{triangle} = \frac{1}{2} \times 12 \times 12 \times \sin 70^\circ = 67.66$$

$$\text{segment} = 87.96 - 67.66 = 20.3$$

$$\text{area} = 20.3 \text{ cm}^2$$

2 / 2

- 4 The diagram shows a circle, centre O, with radius 6 cm and angle AOB = 150°. Work out the area of sector AOB. Give your answer correct to 3 significant figures.

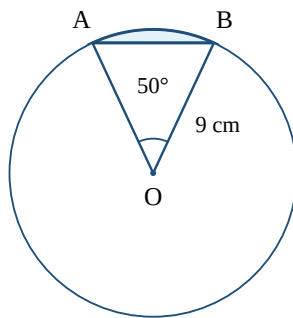


$$\frac{150}{360} \times \pi \times 6^2 = 47.12$$

$$47.1 \text{ cm}^2$$

1 / 1

- 5 The diagram shows a circle, centre O. The shaded region is a segment of the circle. Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\text{sector} = \frac{50}{360} \times \pi \times 9^2 = 35.34$$

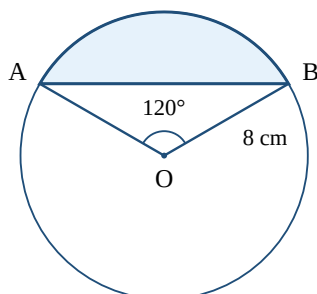
$$\text{triangle} = \frac{1}{2} \times 9 \times 9 \times \sin 50^\circ = 31.02$$

$$\text{segment} = 35.34 - 31.02 = 4.32$$

$$4.32 \text{ cm}^2$$

2 / 2

- 6 The diagram shows a circle, centre O, with radius 8 cm and angle AOB = 120°. Show that the area of the shaded segment is 39.3 cm², correct to 3 significant figures.



$$\text{sector} = \frac{120}{360} \times \pi \times 8^2 = 67.02$$

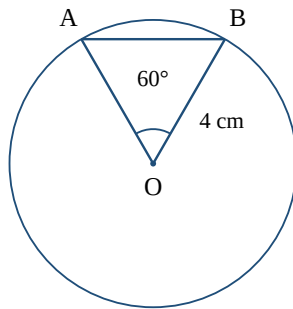
$$\text{triangle} = \frac{1}{2} \times 8 \times 8 \times \sin 120^\circ = 27.71$$

$$\text{segment} = 67.02 - 27.71 = 39.3$$

$$\text{area} = 39.3 \text{ cm}^2$$

2 / 2

- 7 The diagram shows a circle, centre O, with radius 4 cm and angle AOB = 60°. Work out the length of arc AB. Give your answer correct to 3 significant figures.

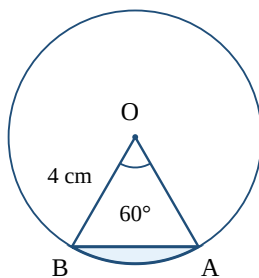


$$\frac{60}{360} \times 2 \times \pi \times 4 = 4.189$$

4.19 cm

1 / 1

- 8 The diagram shows a circle with centre O. A and B are points on the circle. The shaded region is a segment of the circle. Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\text{sector} = \frac{60}{360} \times \pi \times 4^2 = 8.378$$

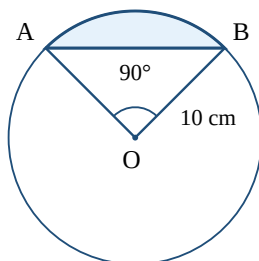
$$\text{triangle} = \frac{1}{2} \times 4 \times 4 \times \sin 60^\circ = 6.928$$

$$\text{segment} = 8.378 - 6.928 = 1.45$$

1.45 cm²

2 / 2

- 9 The diagram shows a circle, centre O, with radius 10 cm and angle AOB = 90°. Work out the exact area of the shaded segment. Give your answer in terms of π .



$$\text{sector} = \frac{90}{360} \times \pi \times 10^2 = 25\pi$$

$$\text{triangle} = \frac{1}{2} \times 10 \times 10 \times \sin 90^\circ = \frac{1}{2} \times 10$$

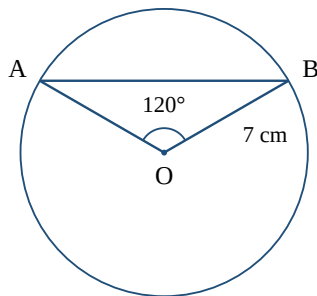
$$\times 10 \times 1 = 50$$

$$\text{segment} = 25\pi - 50$$

25 π - 50 cm²

2 / 2

- 10** The diagram shows a circle, centre O, with radius 7 cm and angle AOB = 120°. Work out the area of triangle AOB. Give your answer correct to 3 significant figures.

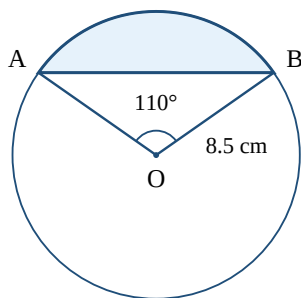


$$\frac{1}{2} \times 7 \times 7 \times \sin 120^\circ = 21.22$$

$$21.2 \text{ cm}^2$$

1 / 1

- 11** The diagram shows a circle, centre O. The shaded region is a segment of the circle. Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\text{sector} = \frac{110}{360} \times \pi \times 8.5^2 = 69.36$$

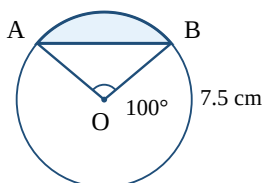
$$\text{triangle} = \frac{1}{2} \times 8.5 \times 8.5 \times \sin 110^\circ = 33.95$$

$$\text{segment} = 69.36 - 33.95 = 35.4$$

$$35.4 \text{ cm}^2$$

2 / 2

- 12** AB is a chord of a circle, centre O. The radius of the circle is 7.5 cm and angle AOB = 100°.
- Work out the area of sector AOB.
 - Work out the area of triangle AOB.
 - Work out the area of the shaded segment.
- Give your answers correct to 3 significant figures.



$$(a) \frac{100}{360} \times \pi \times 7.5^2 = 49.09$$

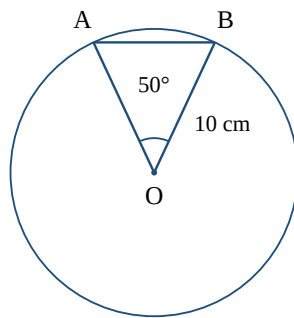
$$(b) \frac{1}{2} \times 7.5 \times 7.5 \times \sin 100^\circ = 27.70$$

$$(c) 49.09 - 27.70 = 21.39$$

$$(a) 49.1 \text{ cm}^2; (b) 27.7 \text{ cm}^2; (c) 21.4 \text{ cm}^2$$

3 / 3

- 13 The diagram shows a circle, centre O, with radius 10 cm and angle AOB = 50°. Work out the area of triangle AOB. Give your answer correct to 3 significant figures.

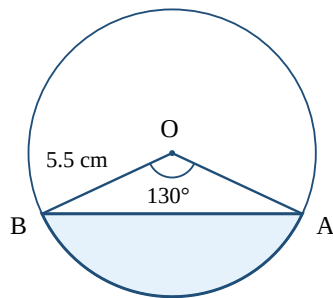


$$\frac{1}{2} \times 10 \times 10 \times \sin 50^\circ = 38.30$$

$$38.3 \text{ cm}^2$$

1 / 1

- 14 AB is a chord of a circle, centre O. The shaded region is a segment of the circle. Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\text{sector} = \frac{130}{360} \times \pi \times 5.5^2 = 34.32$$

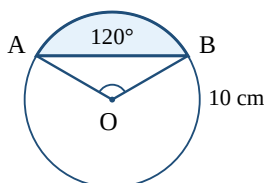
$$\text{triangle} = \frac{1}{2} \times 5.5 \times 5.5 \times \sin 130^\circ = 11.59$$

$$\text{segment} = 34.32 - 11.59 = 22.7$$

$$22.7 \text{ cm}^2$$

2 / 2

- 15 AB is a chord of a circle, centre O. The radius of the circle is 10 cm and angle AOB = 120°.
- Work out the area of sector AOB.
 - Work out the area of triangle AOB.
 - Work out the area of the shaded segment.
- Give your answers correct to 3 significant figures.



$$(a) \frac{120}{360} \times \pi \times 10^2 = 104.7$$

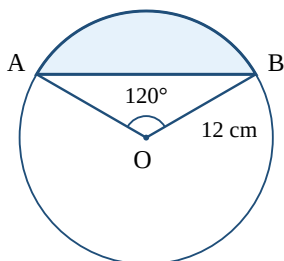
$$(b) \frac{1}{2} \times 10 \times 10 \times \sin 120^\circ = 43.30$$

$$(c) 104.7 - 43.30 = 61.42$$

$$(a) 105 \text{ cm}^2; (b) 43.3 \text{ cm}^2; (c) 61.4 \text{ cm}^2$$

3 / 3

- 16** The diagram shows a circle, centre O, with radius 12 cm and angle AOB = 120°. Work out the exact area of the shaded segment. Give your answer in the form $a\pi - b\sqrt{3}$, where a and b are numbers.



$$\text{sector} = \frac{120}{360} \times \pi \times 12^2 = 48\pi$$

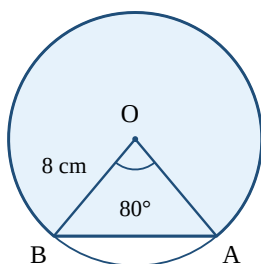
$$\text{triangle} = \frac{1}{2} \times 12 \times 12 \times \sin 120^\circ = \frac{1}{2} \times 12 \times 12 \times \frac{\sqrt{3}}{2} = 36\sqrt{3}$$

$$\text{segment} = 48\pi - 36\sqrt{3}$$

$$48\pi - 36\sqrt{3} \text{ cm}^2$$

3 / 3

- 17** The diagram shows a circle, centre O, with radius 8 cm and angle AOB = 80°. Work out the area of the shaded major segment. Give your answer correct to 3 significant figures.



$$\text{circle} = \pi \times 8^2 = 201.1$$

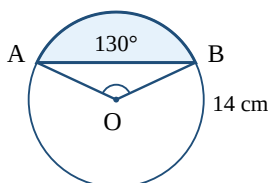
$$\text{minor segment} = \frac{80}{360} \times \pi \times 8^2 - \frac{1}{2} \times 8^2 \times \sin 80^\circ = 13.17$$

$$\text{major segment} = 201.1 - 13.17 = 188$$

$$188 \text{ cm}^2$$

3 / 3

- 18** AB is a chord of a circle, centre O. The radius of the circle is 14 cm and angle AOB = 130°.
- Work out the area of sector AOB.
 - Work out the area of triangle AOB.
 - Work out the area of the shaded segment.
- Give your answers correct to 3 significant figures.



$$(a) \frac{130}{360} \times \pi \times 14^2 = 222.4$$

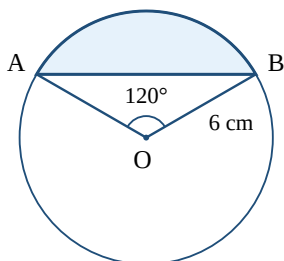
$$(b) \frac{1}{2} \times 14 \times 14 \times \sin 130^\circ = 75.07$$

$$(c) 222.4 - 75.07 = 147.3$$

$$(a) 222 \text{ cm}^2; (b) 75.1 \text{ cm}^2; (c) 147 \text{ cm}^2$$

3 / 3

- 19 The diagram shows a circle, centre O, with radius 6 cm and angle AOB = 120°. Work out the exact area of the shaded segment. Give your answer in the form $a\pi - b\sqrt{3}$, where a and b are numbers.



$$\text{sector} = \frac{120}{360} \times \pi \times 6^2 = 12\pi$$

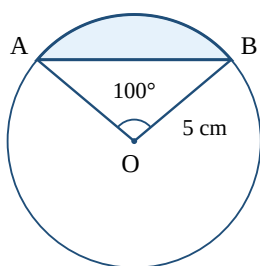
$$\text{triangle} = \frac{1}{2} \times 6 \times 6 \times \sin 120^\circ = \frac{1}{2} \times 6 \times 6 \times \frac{\sqrt{3}}{2} = 9\sqrt{3}$$

$$\text{segment} = 12\pi - 9\sqrt{3}$$

$$12\pi - 9\sqrt{3} \text{ cm}^2$$

3 / 3

- 20 The diagram shows a circle, centre O, with radius 5 cm and angle AOB = 100°. Work out the area of the shaded segment as a percentage of the area of the circle. Give your answer correct to 1 decimal place.



$$\text{segment} = \frac{100}{360} \times \pi \times 5^2 - \frac{1}{2} \times 5^2 \times \sin$$

$$100^\circ = 9.507$$

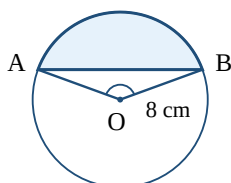
$$\text{circle} = \pi \times 5^2 = 78.54$$

$$9.507 \div 78.54 \times 100 = 12.1\%$$

$$12.1\%$$

3 / 3

- 21 AB is a chord of a circle, centre O. The radius of the circle is 8 cm and angle AOB = 140°. (a) Work out the area of sector AOB. (b) Work out the area of triangle AOB. (c) Work out the area of the shaded segment. Give your answers correct to 3 significant figures.



$$(a) \frac{140}{360} \times \pi \times 8^2 = 78.19$$

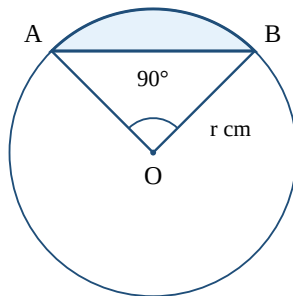
$$(b) \frac{1}{2} \times 8 \times 8 \times \sin 140^\circ = 20.57$$

$$(c) 78.19 - 20.57 = 57.62$$

$$(a) 78.2 \text{ cm}^2; (b) 20.6 \text{ cm}^2; (c) 57.6 \text{ cm}^2$$

3 / 3

- 22 The diagram shows a circle, centre O, and a chord AB. Angle AOB = 90°. The area of the shaded segment is $9\pi - 18 \text{ cm}^2$. Find the radius of the circle.



$$\text{sector} = \frac{90}{360} \times \pi \times r^2 = \frac{1}{4}\pi r^2$$

$$\text{triangle} = \frac{1}{2} r^2$$

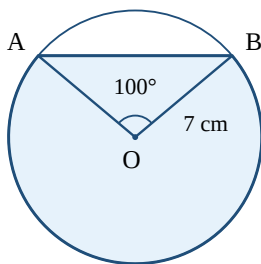
$$\frac{1}{4} r^2 = 9 \text{ so } r^2 = 36$$

$$r = 6$$

6 cm

3 / 3

- 23 The diagram shows a circle, centre O, with radius 7 cm and angle AOB = 100°. Work out the area of the shaded major segment. Give your answer correct to 3 significant figures.



$$\text{circle} = \pi \times 7^2 = 153.9$$

$$\text{minor segment} = \frac{100}{360} \times \pi \times 7^2 - \frac{1}{2} \times 7^2 \times \sin 100^\circ$$

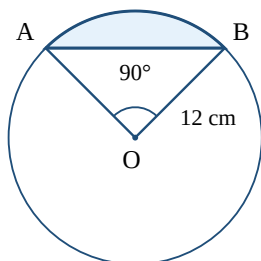
$$\sin 100^\circ = 18.63$$

$$\text{major segment} = 153.9 - 18.63 = 135$$

135 cm²

3 / 3

- 24 The diagram shows a circle, centre O, with radius 12 cm and angle AOB = 90°. Work out the area of the shaded segment as a percentage of the area of the circle. Give your answer correct to 1 decimal place.



$$\text{segment} = \frac{90}{360} \times \pi \times 12^2 - \frac{1}{2} \times 12^2 \times \sin 90^\circ$$

$$90^\circ = 41.10$$

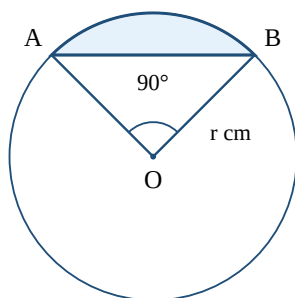
$$\text{circle} = \pi \times 12^2 = 452.4$$

$$41.10 \div 452.4 \times 100 = 9.1\%$$

9.1%

3 / 3

- 25 The diagram shows a circle, centre O, and a chord AB. Angle AOB = 90°. The area of the shaded segment is $36\pi - 72 \text{ cm}^2$. Find the radius of the circle.



$$\text{sector} = \frac{90}{360} \times \pi \times r^2 = \frac{1}{4}\pi r^2$$

$$\text{triangle} = \frac{1}{2} r^2$$

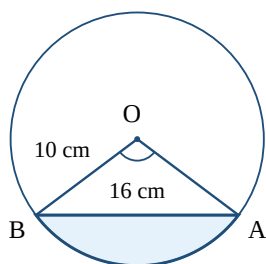
$$\frac{1}{4} r^2 = 36 \text{ so } r^2 = 144$$

$$r = 12$$

12 cm

3 / 3

- 26 The diagram shows a circle, centre O, with radius 10 cm. The chord AB has length 16 cm.
(a) Work out the size of angle AOB. Give your answer correct to 1 decimal place.
(b) Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$(a) \text{ half the chord} = 8$$

$$\sin (AOB \div 2) = \frac{8}{10} = 0.8000$$

$$AOB \div 2 = 53.13^\circ, AOB = 106.3^\circ$$

$$(b) \text{ sector} = \frac{106.3}{360} \times \pi \times 10^2 = 92.73$$

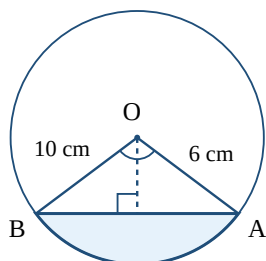
$$\text{triangle} = \frac{1}{2} \times 10 \times 10 \times \sin 106.3^\circ = 48.00$$

$$\text{segment} = 44.7$$

(a) 106.3°; (b) 44.7 cm²

3 / 3

- 27 The diagram shows a circle, centre O, with radius 10 cm. The distance from O to the chord AB is 6 cm.
Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\cos (AOB \div 2) = \frac{6}{10} = 0.6000$$

$$AOB \div 2 = 53.13^\circ$$

$$AOB = 106.26^\circ$$

$$\text{sector} = \frac{106.26}{360} \times \pi \times 10^2 = 92.73$$

$$\text{triangle} = \frac{1}{2} \times 10^2 \times \sin 106.26^\circ = 48.00$$

$$\text{segment} = 44.7$$

44.7 cm²

4 / 4

- 28 Bethan and Owen each cut a segment from a circular pizza base.

Bethan: radius 6 cm, angle at the centre 100° .

Owen: radius 4 cm, angle at the centre 110° .

Who cuts the segment with the larger area? You must show your working.

$$\text{Bethan: } \frac{100}{360} \times \pi \times 6^2 - \frac{1}{2} \times 6^2 \times \sin 100^\circ =$$

$$13.7 \text{ cm}^2$$

$$\text{Owen: } \frac{110}{360} \times \pi \times 4^2 - \frac{1}{2} \times 4^2 \times \sin 110^\circ = 7.84$$

$$\text{cm}^2$$

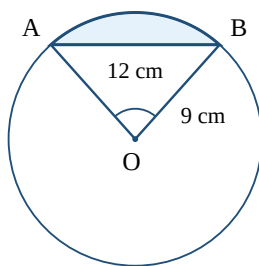
Bethan (13.7 cm^2 compared with 7.84 cm^2)

4 / 4

- 29 The diagram shows a circle, centre O, with radius 9 cm. The chord AB has length 12 cm.

(a) Work out the size of angle AOB. Give your answer correct to 1 decimal place.

(b) Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$(a) \cos AOB = \frac{9^2 + 9^2 - 12^2}{2 \times 9 \times 9} = 0.1111$$

$$AOB = 83.6^\circ$$

$$(b) \text{sector} = \frac{83.6}{360} \times \pi \times 9^2 = 59.11$$

$$\text{triangle} = \frac{1}{2} \times 9 \times 9 \times \sin 83.6^\circ = 40.25$$

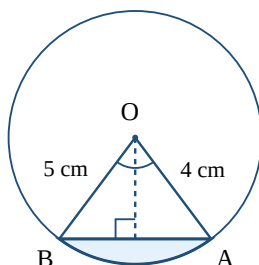
$$\text{segment} = 18.9$$

(a) 83.6° ; (b) 18.9 cm^2

4 / 4

- 30 The diagram shows a circle, centre O, with radius 5 cm. The distance from O to the chord AB is 4 cm.

Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\cos (AOB \div 2) = \frac{4}{5} = 0.8000$$

$$AOB \div 2 = 36.87^\circ$$

$$AOB = 73.74^\circ$$

$$\text{sector} = \frac{73.74}{360} \times \pi \times 5^2 = 16.09$$

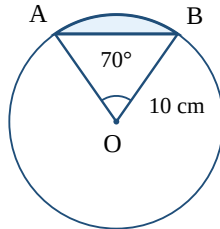
$$\text{triangle} = \frac{1}{2} \times 5^2 \times \sin 73.74^\circ = 12.00$$

$$\text{segment} = 4.09$$

4.09 cm^2

4 / 4

- 31 The diagram shows a circle, centre O, with radius 10 cm and angle $AOB = 70^\circ$.
 (a) Work out the area of the shaded segment.
 (b) Work out the perimeter of the shaded segment.
 Give your answers correct to 3 significant figures.

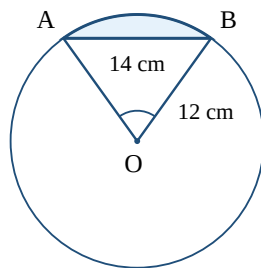


$$\begin{aligned} \text{(a) sector} &= 61.09 \\ \text{triangle} &= 46.98 \\ \text{segment} &= 61.09 - 46.98 = 14.1 \\ \text{(b) arc} &= \frac{70}{360} \times 2 \times \pi \times 10 = 12.22 \\ \text{chord AB} &= 2 \times 10 \times \sin 35^\circ = 11.47 \\ \text{perimeter} &= 12.22 + 11.47 = 23.7 \end{aligned}$$

$$\text{(a) } 14.1 \text{ cm}^2; \text{(b) } 23.7 \text{ cm}$$

4 / 4

- 32 The diagram shows a circle, centre O, with radius 12 cm. The chord AB has length 14 cm.
 (a) Work out the size of angle AOB. Give your answer correct to 1 decimal place.
 (b) Work out the area of the shaded segment. Give your answer correct to 3 significant figures.

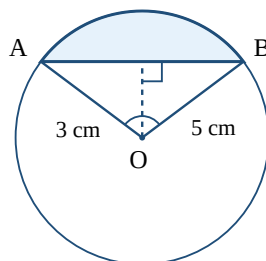


$$\begin{aligned} \text{(a) } \cos AOB &= \frac{12^2 + 12^2 - 14^2}{2 \times 12 \times 12} = 0.3194 \\ AOB &= 71.4^\circ \\ \text{(b) sector} &= \frac{71.4}{360} \times \pi \times 12^2 = 89.69 \\ \text{triangle} &= \frac{1}{2} \times 12 \times 12 \times \sin 71.4^\circ = 68.23 \\ \text{segment} &= 21.5 \end{aligned}$$

$$\text{(a) } 71.4^\circ; \text{(b) } 21.5 \text{ cm}^2$$

4 / 4

- 33 The diagram shows a circle, centre O, with radius 5 cm. The distance from O to the chord AB is 3 cm.
 Work out the area of the shaded segment. Give your answer correct to 3 significant figures.

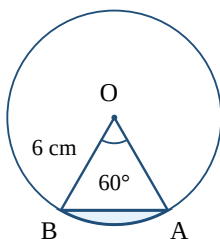


$$\begin{aligned} \cos (AOB \div 2) &= \frac{3}{5} = 0.6000 \\ AOB \div 2 &= 53.13^\circ \\ AOB &= 106.26^\circ \\ \text{sector} &= \frac{106.26}{360} \times \pi \times 5^2 = 23.18 \\ \text{triangle} &= \frac{1}{2} \times 5^2 \times \sin 106.26^\circ = 12.00 \\ \text{segment} &= 11.2 \end{aligned}$$

$$11.2 \text{ cm}^2$$

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- 34 The diagram shows a circle, centre O, with radius 6 cm and angle AOB = 60°.
- (a) Work out the area of the shaded segment.
- (b) Work out the perimeter of the shaded segment.
- Give your answers correct to 3 significant figures.

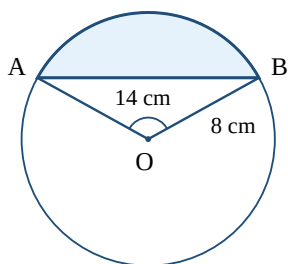


$$\begin{aligned} \text{(a) sector} &= 18.85 \\ \text{triangle} &= 15.59 \\ \text{segment} &= 18.85 - 15.59 = 3.26 \\ \text{(b) arc} &= \frac{60}{360} \times 2 \times \pi \times 6 = 6.283 \\ \text{chord AB} &= 2 \times 6 \times \sin 30^\circ = 6.000 \\ \text{perimeter} &= 6.283 + 6.000 = 12.3 \end{aligned}$$

$$\text{(a) } 3.26 \text{ cm}^2; \text{(b) } 12.3 \text{ cm}$$

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- 35 The diagram shows a circle, centre O, with radius 8 cm. The chord AB has length 14 cm.
- (a) Work out the size of angle AOB. Give your answer correct to 1 decimal place.
- (b) Work out the area of the shaded segment. Give your answer correct to 3 significant figures.

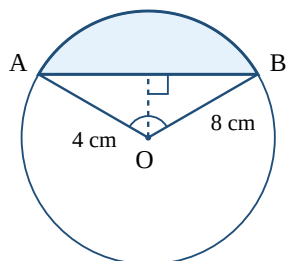


$$\begin{aligned} \text{(a) } \cos AOB &= \frac{8^2 + 8^2 - 14^2}{2 \times 8 \times 8} = -0.5313 \\ AOB &= 122.1^\circ \\ \text{(b) sector} &= \frac{122.1}{360} \times \pi \times 8^2 = 68.19 \\ \text{triangle} &= \frac{1}{2} \times 8 \times 8 \times \sin 122.1^\circ = 27.11 \\ \text{segment} &= 41.1 \end{aligned}$$

$$\text{(a) } 122.1^\circ; \text{(b) } 41.1 \text{ cm}^2$$

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- 36 The diagram shows a circle, centre O, with radius 8 cm. The distance from O to the chord AB is 4 cm.
- Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\begin{aligned} \cos (AOB \div 2) &= \frac{4}{8} = 0.5000 \\ AOB \div 2 &= 60.00^\circ \\ AOB &= 120.00^\circ \\ \text{sector} &= \frac{120.00}{360} \times \pi \times 8^2 = 67.02 \\ \text{triangle} &= \frac{1}{2} \times 8^2 \times \sin 120.00^\circ = 27.71 \\ \text{segment} &= 39.3 \end{aligned}$$

$$39.3 \text{ cm}^2$$

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- 37 Dylan and Megan each cut a segment from a circular pizza base.

Dylan: radius 7 cm, angle at the centre 110° .

Megan: radius 5 cm, angle at the centre 80° .

Who cuts the segment with the larger area? You must show your working.

$$\text{Dylan: } \frac{110}{360} \times \pi \times 7^2 - \frac{1}{2} \times 7^2 \times \sin 110^\circ = 24.0$$

cm^2

$$\text{Megan: } \frac{80}{360} \times \pi \times 5^2 - \frac{1}{2} \times 5^2 \times \sin 80^\circ = 5.14$$

cm^2

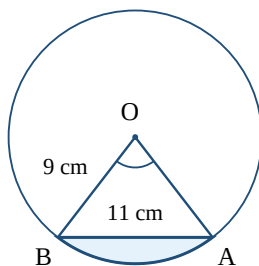
Dylan (24.0 cm^2 compared with 5.14 cm^2)

4 / 4

- 38 The diagram shows a circle, centre O, with radius 9 cm. The chord AB has length 11 cm.

(a) Work out the size of angle AOB. Give your answer correct to 1 decimal place.

(b) Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$(a) \cos AOB = \frac{9^2 + 9^2 - 11^2}{2 \times 9 \times 9} = 0.2531$$

$$AOB = 75.3^\circ$$

$$(b) \text{sector} = \frac{75.3}{360} \times \pi \times 9^2 = 53.25$$

$$\text{triangle} = \frac{1}{2} \times 9 \times 9 \times \sin 75.3^\circ = 39.18$$

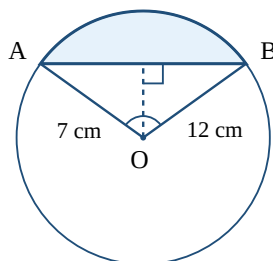
$$\text{segment} = 14.1$$

(a) 75.3° ; (b) 14.1 cm^2

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- 39 The diagram shows a circle, centre O, with radius 12 cm. The distance from O to the chord AB is 7 cm.

Work out the area of the shaded segment. Give your answer correct to 3 significant figures.



$$\cos (AOB \div 2) = \frac{7}{12} = 0.5833$$

$$AOB \div 2 = 54.31^\circ$$

$$AOB = 108.63^\circ$$

$$\text{sector} = \frac{108.63}{360} \times \pi \times 12^2 = 136.5$$

$$\text{triangle} = \frac{1}{2} \times 12^2 \times \sin 108.63^\circ = 68.23$$

$$\text{segment} = 68.3$$

68.3 cm^2

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- 40 Elin and Iwan each cut a segment from a circular pizza base.

Elin: radius 8 cm, angle at the centre 60° .

Iwan: radius 4 cm, angle at the centre 80° .

Who cuts the segment with the larger area? You must show your working.

$$\text{Elin: } \frac{60}{360} \times \pi \times 8^2 - \frac{1}{2} \times 8^2 \times \sin 60^\circ = 5.80$$

cm^2

$$\text{Iwan: } \frac{80}{360} \times \pi \times 4^2 - \frac{1}{2} \times 4^2 \times \sin 80^\circ = 3.29$$

cm^2

Elin (5.80 cm^2 compared with 3.29 cm^2)

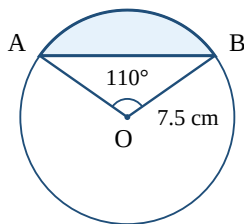
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- 41 The diagram shows a circle, centre O, with radius 7.5 cm and angle $AOB = 110^\circ$.

(a) Work out the area of the shaded segment.

(b) Work out the perimeter of the shaded segment.

Give your answers correct to 3 significant figures.



$$(a) \text{ sector} = 54.00$$

$$\text{triangle} = 26.43$$

$$\text{segment} = 54.00 - 26.43 = 27.6$$

$$(b) \text{ arc} = \frac{110}{360} \times 2 \times \pi \times 7.5 = 14.40$$

$$\text{chord AB} = 2 \times 7.5 \times \sin 55^\circ = 12.29$$

$$\text{perimeter} = 14.40 + 12.29 = 26.7$$

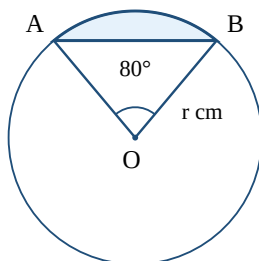
(a) 27.6 cm^2 ; (b) 26.7 cm

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- 42 The diagram shows a circle, centre O, with radius $r \text{ cm}$ and angle $AOB = 80^\circ$.

The area of the shaded segment is 29.6 cm^2 , correct to 3 significant figures.

Work out the value of r . Give your answer as a whole number.



$$\text{area} = \frac{80}{360} \times \pi \times r^2 - \frac{1}{2} \times r^2 \times \sin 80^\circ =$$

$$0.2057 r^2$$

$$r^2 = 29.6 \div 0.2057 = 143.9$$

$$r = 11.99 \approx 12$$

12

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- 43 Megan and Mari each cut a segment from a circular pizza base.

Megan: radius 4 cm, angle at the centre 60° .

Mari: radius 10 cm, angle at the centre 100° .

Who cuts the segment with the larger area? You must show your working.

$$\text{Megan: } \frac{60}{360} \times \pi \times 4^2 - \frac{1}{2} \times 4^2 \times \sin 60^\circ = 1.45$$

cm^2

$$\text{Mari: } \frac{100}{360} \times \pi \times 10^2 - \frac{1}{2} \times 10^2 \times \sin 100^\circ =$$

$$38.0 \text{ cm}^2$$

Mari (38.0 cm^2 compared with 1.45 cm^2)

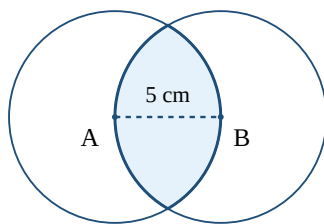
4 / 4

- 44 Two circles, each with radius 5 cm, overlap as shown.

The centre of each circle lies on the circumference of the other circle.

Work out the area of the shaded region.

Give your answer correct to 3 significant figures.



the common chord subtends 120° at each centre

$$\text{one segment} = \frac{120}{360} \times \pi \times 5^2 - \frac{1}{2} \times 5^2 \times \sin$$

$$120^\circ = 15.35$$

$$\text{shaded} = 2 \times 15.35 = 30.7$$

$$30.7 \text{ cm}^2$$

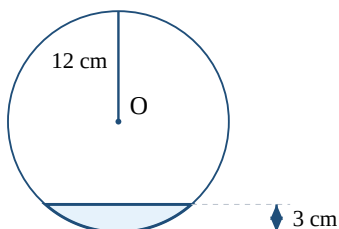
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- 45 The diagram shows a circular pipe of radius 12 cm. The depth of water is 3 cm.

(a) Work out the area of the cross section of the water.

(b) The pipe is 8 m long. Work out the volume of water in the pipe, in litres.

Give your answers correct to 3 significant figures.



(a) surface is $12 - 3 = 9 \text{ cm}$ from the centre

$$\cos (AOB \div 2) = \frac{9}{12}$$

$$AOB = 82.82^\circ$$

$$\text{segment} = \frac{82.82}{360} \times \pi \times 12^2 - \frac{1}{2} \times 12^2 \times \sin 82.82^\circ =$$

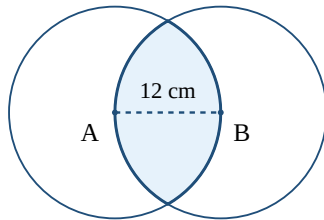
$$32.64$$

$$\text{(b) volume} = 32.64 \times 800 = 26110 \text{ cm}^3 = 26.1 \text{ litres}$$

(a) 32.6 cm^2 ; (b) 26.1 litres

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- 46 Two circles, each with radius 12 cm, overlap as shown.
The centre of each circle lies on the circumference of the other circle.
Work out the area of the shaded region.
Give your answer correct to 3 significant figures.



the common chord subtends 120° at each centre

$$\text{one segment} = \frac{120}{360} \times \pi \times 12^2 - \frac{1}{2} \times 12^2 \times$$

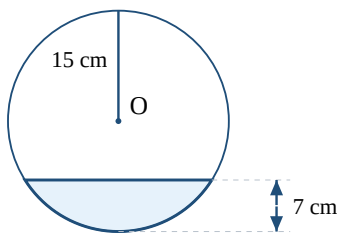
$$\sin 120^\circ = 88.44$$

$$\text{shaded} = 2 \times 88.44 = 177$$

$$177 \text{ cm}^2$$

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- 47 The diagram shows a circular pipe of radius 15 cm. The depth of water is 7 cm.
(a) Work out the area of the cross section of the water.
(b) The pipe is 2 m long. Work out the volume of water in the pipe, in litres.
Give your answers correct to 3 significant figures.



(a) surface is $15 - 7 = 8$ cm from the centre

$$\cos (AOB \div 2) = \frac{8}{15}$$

$$AOB = 115.54^\circ$$

$$\text{segment} = \frac{115.54}{360} \times \pi \times 15^2 - \frac{1}{2} \times 15^2 \times \sin 115.54^\circ =$$

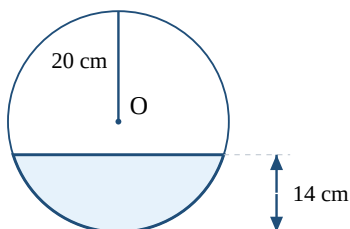
$$125.3$$

$$(b) \text{ volume} = 125.3 \times 200 = 25070 \text{ cm}^3 = 25.1 \text{ litres}$$

(a) 125 cm^2 ; (b) 25.1 litres

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- 48 The diagram shows a circular pipe of radius 20 cm. The depth of water is 14 cm.
(a) Work out the area of the cross section of the water.
(b) The pipe is 3 m long. Work out the volume of water in the pipe, in litres.
Give your answers correct to 3 significant figures.



(a) surface is $20 - 14 = 6$ cm from the centre

$$\cos (AOB \div 2) = \frac{6}{20}$$

$$AOB = 145.08^\circ$$

$$\text{segment} = \frac{145.08}{360} \times \pi \times 20^2 - \frac{1}{2} \times 20^2 \times \sin 145.08^\circ =$$

$$392.0$$

$$(b) \text{ volume} = 392.0 \times 300 = 117600 \text{ cm}^3 = 118 \text{ litres}$$

(a) 392 cm^2 ; (b) 118 litres

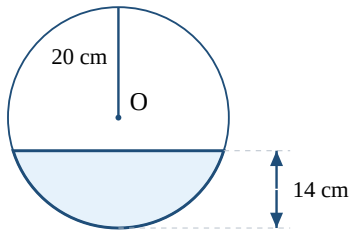
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- 49 The diagram shows a circular pipe of radius 20 cm. The depth of water is 14 cm.

(a) Work out the area of the cross section of the water.

(b) The pipe is 8 m long. Work out the volume of water in the pipe, in litres.

Give your answers correct to 3 significant figures.



(a) surface is $20 - 14 = 6$ cm from the centre

$$\cos(AOB \div 2) = \frac{6}{20}$$

$$AOB = 145.08^\circ$$

$$\text{segment} = \frac{145.08}{360} \times \pi \times 20^2 - \frac{1}{2} \times 20^2 \times \sin 145.08^\circ =$$

$$392.0$$

$$(b) \text{ volume} = 392.0 \times 800 = 313600 \text{ cm}^3 = 314 \text{ litres}$$

(a) 392 cm²; (b) 314 litres

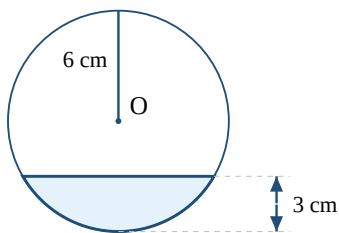
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- 50 The diagram shows a circular pipe of radius 6 cm. The depth of water is 3 cm.

(a) Work out the area of the cross section of the water.

(b) The pipe is 3 m long. Work out the volume of water in the pipe, in litres.

Give your answers correct to 3 significant figures.



(a) surface is $6 - 3 = 3$ cm from the centre

$$\cos(AOB \div 2) = \frac{3}{6}$$

$$AOB = 120.00^\circ$$

$$\text{segment} = \frac{120.00}{360} \times \pi \times 6^2 - \frac{1}{2} \times 6^2 \times \sin 120.00^\circ =$$

$$22.11$$

$$(b) \text{ volume} = 22.11 \times 300 = 6633 \text{ cm}^3 = 6.63 \text{ litres}$$

(a) 22.1 cm²; (b) 6.63 litres

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