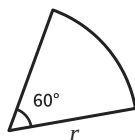


### 1 Arc length

This sector has an angle of  $60^\circ$  and a perimeter of 30 cm.

- Show that  $r = \frac{90}{6 + \pi}$
- Work out the area of the sector to 3 significant figures.



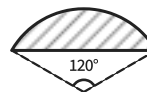
Not drawn accurately

$$\begin{aligned} \text{a) } 2r + \pi r \div 3 &= 30, \text{ so } 6r + \pi r = 90 \\ r(6 + \pi) &= 90 \\ \text{b) } r &= 9.8451, \pi r^2 \div 6 = 50.8 \text{ cm}^2 \end{aligned}$$

### 2 Arc length

An arc of a circle has length  $4\pi$  cm and an angle of  $120^\circ$  at the centre.

- Find the radius.
- A chord joins the ends of the arc. Find the exact perimeter of the shaded segment.

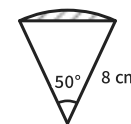


Not drawn accurately

$$\begin{aligned} \text{a) } 120 \div 360 \times 2\pi r &= 4\pi, r = 6 \text{ cm} \\ \text{b) chord} &= 2 \times 6 \times \sin 60^\circ = 6\sqrt{3} \\ 4\pi + 6\sqrt{3} \text{ cm} \end{aligned}$$

### 3 Area of a sector

- Work out the shaded area to 3 significant figures.
- Show that a segment cut off by a  $90^\circ$  angle in a circle of radius 6 cm has area  $9(\pi - 2) \text{ cm}^2$ .



Not drawn accurately

$$\begin{aligned} \text{a) } 50 \div 360 \times 64\pi - \frac{1}{2} \times 8 \times 8 \times \sin 50^\circ \\ = 27.93 - 24.51 = 3.41 \text{ cm}^2 \\ \text{b) } \frac{1}{4} \times 36\pi - \frac{1}{2} \times 6 \times 6 = 9\pi - 18 = 9(\pi - 2) \end{aligned}$$

### 4 Area of a sector

- A sector has an area of  $24\pi \text{ cm}^2$  and an arc of  $4\pi$  cm. Find its radius and its angle.
- A sector has area  $A$  and radius  $r$ . Show that its arc length is  $\frac{2A}{r}$ .

$$\begin{aligned} \text{a) area} &= \frac{1}{2} \times r \times \text{arc: } 24\pi = 2\pi r, r = 12 \text{ cm} \\ 4\pi \div 24\pi \times 360 &= 60^\circ \\ \text{b) } A &= \theta \div 360 \times \pi r^2 \\ \text{arc} &= \theta \div 360 \times 2\pi r = 2A \div r \end{aligned}$$

## Area and volume 2

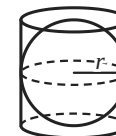
### revision mat answers

### 5 Volume of cones, spheres and pyramids

Cone:  $V = \frac{1}{3}\pi r^2 h$  Sphere:  $V = \frac{4}{3}\pi r^3$

A sphere of radius  $r$  fits exactly in a cylinder.

- Show that the sphere is two thirds of the cylinder's volume.
- A cone has the same base and height as the cylinder. Find cone : sphere : cylinder.



$$\begin{aligned} \text{a) cylinder } \pi r^2 \times 2r &= 2\pi r^3 \\ \text{sphere } 4\pi r^3 \div 3, \text{ two thirds of } 2\pi r^3 \\ \text{b) } 2\pi r^3 \div 3 : 4\pi r^3 \div 3 : 2\pi r^3 &= 1 : 2 : 3 \end{aligned}$$

### 6 Volume of cones, spheres and pyramids

Pyramid:  $V = \frac{1}{3} \times \text{area of base} \times \text{height}$

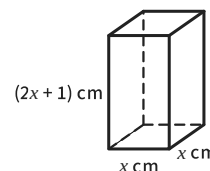
- A metal sphere of radius 6 cm is melted and recast as cones of radius 2 cm and height 3 cm. How many cones?
- A square based pyramid is as tall as it is wide. It has the same volume as a cube of side 4 cm. Find its width to 2 decimal places.

$$\begin{aligned} \text{a) sphere } 288\pi, \text{ cone } 4\pi, 288\pi \div 4\pi &= 72 \text{ cones} \\ \text{b) } x^3 \div 3 &= 64, x = \text{cube root of } 192 = 5.77 \text{ cm} \end{aligned}$$

### 7 Surface area of cuboids

This cuboid has a square base.

- Show that its surface area is  $10x^2 + 4x$ .
- Its surface area is  $102 \text{ cm}^2$ . Work out its volume.



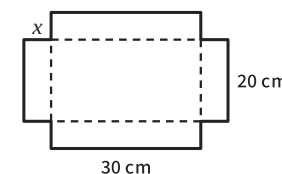
Not drawn accurately

$$\begin{aligned} \text{a) } 2x^2 + 4 \times x(2x + 1) &= 10x^2 + 4x \\ \text{b) } 5x^2 + 2x - 51 &= 0, (5x + 17)(x - 3) = 0 \\ x &= 3, 3 \times 3 \times 7 = 63 \text{ cm}^3 \end{aligned}$$

### 8 Surface area of cuboids

Squares of side  $x$  cm are cut from the corners. The sides fold up into an open box.

- Show that the box uses  $600 - 4x^2 \text{ cm}^2$  of card.
- It uses  $536 \text{ cm}^2$ . Work out its volume.



Not drawn accurately

$$\begin{aligned} \text{a) } 30 \times 20 - 4 \times x^2 &= 600 - 4x^2 \\ \text{b) } 4x^2 &= 64, x = 4, 22 \times 12 \times 4 = 1056 \text{ cm}^3 \end{aligned}$$