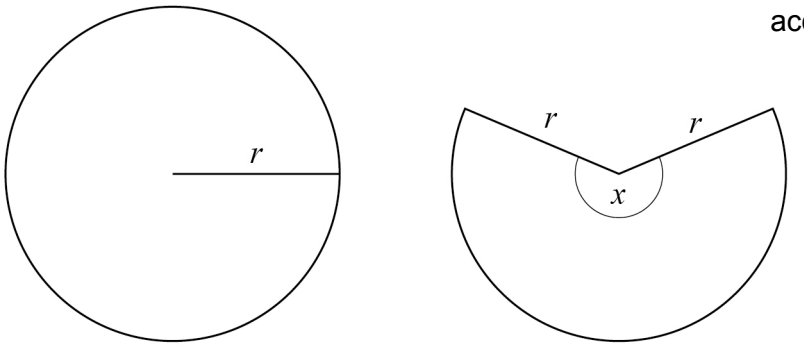
1 Here are a circle and a sector of the circle.

They each have radius r.

Not drawn accurately



circumference of circle = perimeter of sector

Work out the size of angle x.

Give your answer in terms of π

[4 marks]

circumference $= 2\pi r$ (1)

length of arc $= \frac{x}{360} \times 2\pi r$ (1)

perimeter of sector $= \frac{x}{360} \times 2\pi r + 2r$

$2\pi r = \frac{x}{360} \times 2\pi r + 2r$ (1)

$2r(\pi) = 2r\left(\frac{x\pi}{360} + 1\right)$

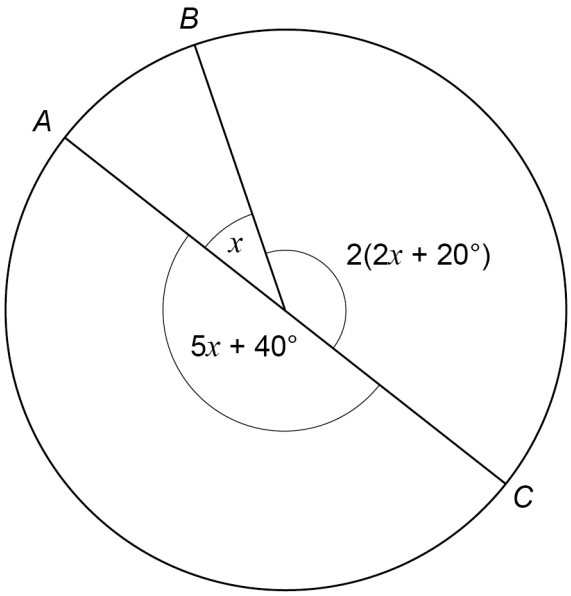
$x = \frac{360\pi - 360}{\pi} = 360 - \frac{360}{\pi}$ (1)

Answer $360 - \frac{360}{\pi}$ degrees

2 *A*, *B* and *C* are three points on a circle.

The radii from *A*, *B* and *C* are shown.

Not drawn accurately



Is *AC* a diameter of the circle?

You **must** show your working.

[3 marks]

(1)

$x + 2(2x + 20^\circ)$

$= x + 4x + 40^\circ$ (1)

$= 5x + 40^\circ$ (1)

Yes.

3 The equation of a circle is $x^2 + y^2 = 11$

Work out the length of the **diameter**.

Circle your answer.

[1 mark]

$\sqrt{11}$ $2\sqrt{11}$ $\sqrt{22}$ 22

r^2

$r = \sqrt{11}$

$d = 2r$

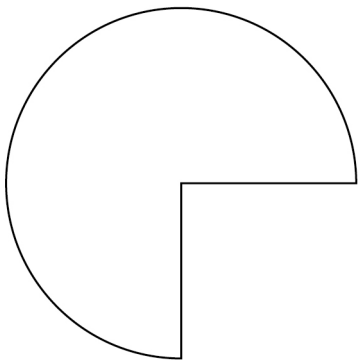
$= 2\sqrt{11}$

1

4 Here are two shapes, P and Q.

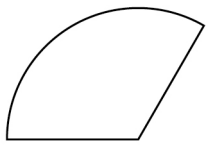
P

$\frac{3}{4}$ of a circle, radius 20 cm



Q

$\frac{1}{3}$ of a circle, radius 15 cm



Not drawn accurately

How many times bigger is the area of P than the area of Q?

You **must** show your working.

[4 marks]

Area of P : $\frac{3}{4} \times (\pi \times 20^2)$

$= \frac{3}{4} \times 400\pi$ (1)

$= 300\pi$ (1)

Area of Q : $\frac{1}{3} \times (\pi \times 15^2)$

$= \frac{1}{3} \times 225\pi$

$= 75\pi$ (1)

$\frac{P}{Q} = \frac{300}{75} = 4$ (1)

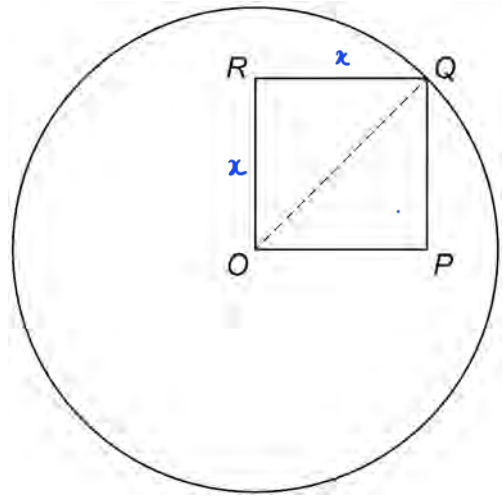
Answer 4

5 A circle, centre *O*, has circumference 20π cm

Q is a point on the circle.

OPQR is a **square**.

Not drawn accurately



perimeter of the square : circumference of the circle = $\sqrt{a}$: π where a is an integer.

Work out the value of a.

You **must** show your working.

[4 marks]

$2 \times \pi \times r = 20\pi$

$r = 10$ (1)

$OQ = 10$

$OQ = \sqrt{x^2 + x^2}$

$= \sqrt{2x^2}$

$100 = 2x^2$

$50 = x^2$ (1)

$x = \sqrt{50} = 5\sqrt{2}$ (1)

perimeter of square : circumference of circle $= 20\sqrt{2} : 20\pi$ $\div 20$

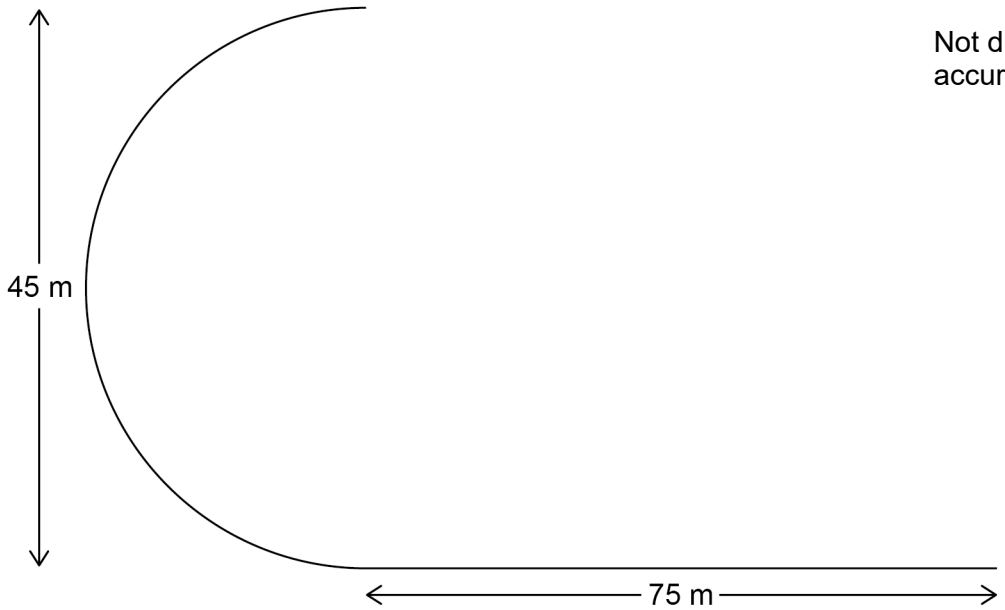
$\sqrt{2} : \pi$

$a =$ 2 (1)

6 Part of a running track is the arc of a semicircle joined to a straight line.

The semicircle has diameter 45 metres.

The straight line has length 75 metres.



Not drawn accurately

Abby runs once along this part of the track in 18 seconds.

Work out her average speed.

Give your answer to 2 significant figures.

[4 marks]

Arc length = $\frac{1}{2} \times \pi \times 45 = 22.5\pi$ (1)

Total length = $22.5\pi + 75$

$= 145.695$ (1)

Average speed = $\frac{145.695}{18}$ (1) $= 8.09$

$= 8.1$ (1)

Answer 8.1 m/s