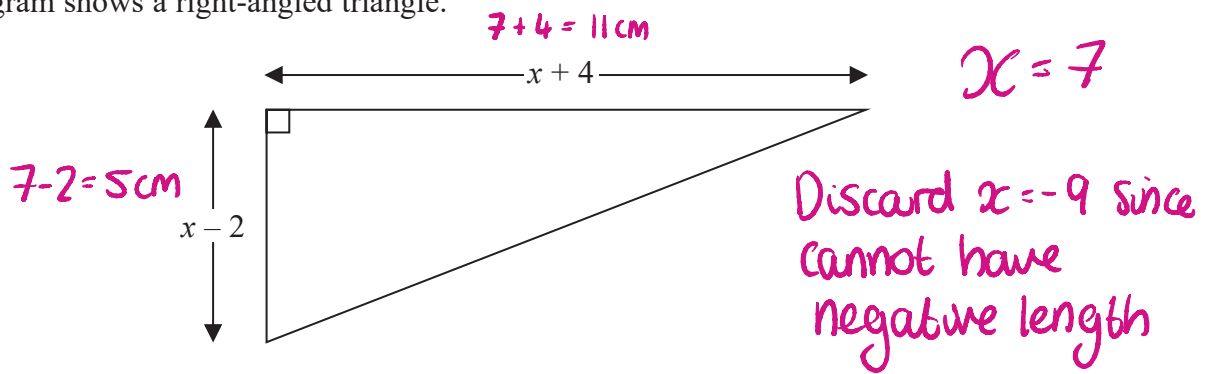


1. The diagram shows a right-angled triangle.



All the measurements are in centimetres.

The area of the triangle is 27.5cm^2

Work out the length of the shortest side of the triangle.
 You must show all your working.

$$\text{Area of Triangle} = \frac{\text{Base} \times \text{Height}}{2}$$

$$\text{Area} = \frac{1}{2} \times (x-2) \times (x+4) \quad \textcircled{1}$$

$$\frac{1}{2} \times (x-2)(x+4) = 27.5 \times 2$$

$$(x-2)(x+4) = 55$$

$$x^2 + 4x - 2x - 8 = 55$$

$$x^2 + 2x - 8 = 55$$

$$x^2 + 2x - 63 = 0 \quad \textcircled{1}$$

$$\begin{aligned} -7 \times 9 &= -63 \\ -7 + 9 &= 2 \end{aligned}$$

$$(x-7)(x+9) = 0$$

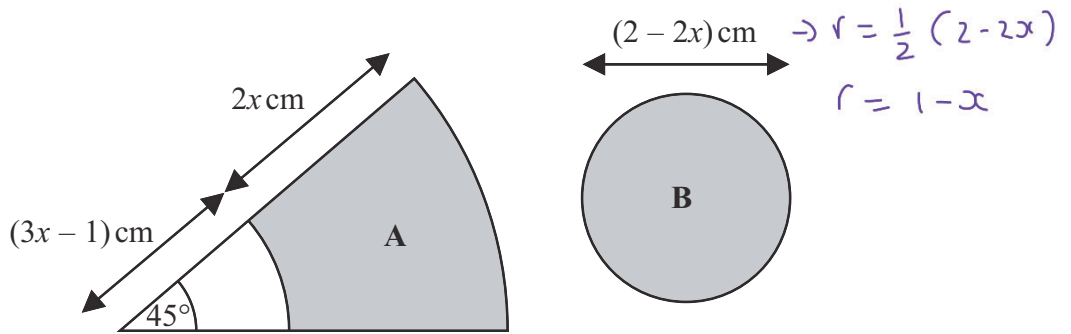
$$\begin{aligned} x-7 &= 0 & x+9 &= 0 \\ x &= 7 & \text{or } x &= -9 \end{aligned} \quad \textcircled{1}$$

$\textcircled{1}$ 5 cm

2. The diagram shows two shaded shapes, A and B.

Shape A is formed by removing a sector of a circle with radius $(3x - 1)$ cm from a sector of the circle with radius $(5x - 1)$ cm.

Shape B is a circle of diameter $(2 - 2x)$ cm.



The area of shape A is equal to the area of shape B.

$$a.o.s = \frac{\theta}{360} \times \pi r^2$$

Find the value of x .

You must show all your working.

Area of shape A = Area of Sector - Cutout.

$$\begin{aligned} \text{Area of sector} &= \frac{45^\circ}{360^\circ} \times \pi \times (5x-1)^2 \text{ cm}^2 \\ &= \frac{1}{8} \times \pi \times (5x-1)^2 \end{aligned}$$

$$\begin{aligned} \text{Cutout} &= \frac{45^\circ}{360^\circ} \times \pi \times (3x-1)^2 \text{ cm}^2 \\ &= \frac{1}{8} \times \pi \times (3x-1)^2 \end{aligned}$$

$$\begin{aligned} &= \frac{1}{8} \pi \left((5x-1)^2 - (3x-1)^2 \right) \quad \begin{matrix} (5x-1)(5x-1) \\ 25x^2 - 5x - 5x + 1 \\ (3x-1)(3x-1) \\ 9x^2 - 3x - 3x + 1 \end{matrix} \\ &= \frac{1}{8} \pi \left((25x^2 - 10x + 1) - (9x^2 - 6x + 1) \right) \\ &= \frac{1}{8} \pi (16x^2 - 4x) \quad \begin{matrix} (1-x)(1-x) \\ 1 - x - x + x^2 \end{matrix} \end{aligned}$$

$$\text{Area of B} = \pi(1-x)^2 = \pi(x^2 - 2x + 1)$$

$$\begin{aligned} x_1, x_2 &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-3 \pm \sqrt{3^2 - 4(2)(-2)}}{2+2} \\ &= \frac{1}{2}, -2 \quad \checkmark_4 \\ x &= \frac{1}{2} \quad \checkmark_5 \end{aligned}$$

$$\begin{aligned} \times 8 \quad \left(\frac{1}{8} (16x^2 - 4x) \right) &= \pi(x^2 - 2x + 1) \\ 16x^2 - 4x &= 8x^2 - 16x + 8 \\ 8x^2 + 12x - 8 &= 0 \\ 2x^2 + 3x - 2 &= 0 \quad \checkmark_3 \end{aligned}$$

(Total for Question is 5 marks)

3. $x^2 = 5x + 24$

$$x^2 = 5x + 24$$

$$x^2 - 5x - 24 = 0 \quad (1)$$

$$(x-8)(x+3) = 0 \quad (1)$$

When $(x-8) = 0$: $x = 8$

When $(x+3) = 0$: $x = -3$

(1)

$$x = 8, x = -3$$

(Total for Question is 3 marks)