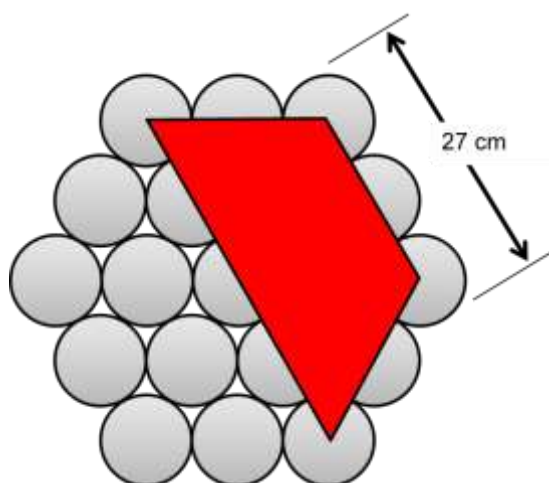


Mathematical Problem Solving

GCSE example

Solution to example 4



This diagram shows 19 identical circles arranged in a hexagon.

All of the vertices of the trapezium are in the centre of a circle.

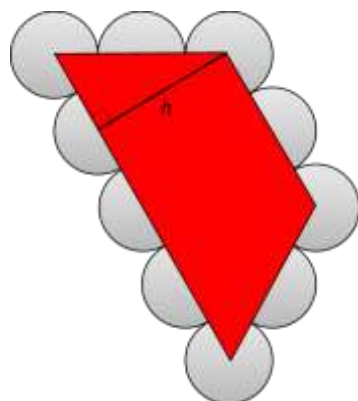
Find the area of the trapezium.

The circles are identical and three diameters together come to 27 cm (using information from both the text and diagram).

Each circle has a diameter of 9 cm and a radius of 4.5 cm.

The shorter of the two parallel sides is made up of one complete diameter and two radii of circles giving a length of 18 cm.

The longer side is made up of three diameters and two radii and so has a length of 36 cm.



The right angled triangle has a hypotenuse of 18 cm (one diameter and two radii) and a side of 9 cm (two radii).

The height can therefore be found using Pythagoras's rule:

$$h^2 = 18^2 - 9^2$$

This can be done without a calculator by first writing

$$h^2 = (2 \times 9)^2 - 9^2$$

$$h^2 = 2^2 \times 9^2 - 9^2$$

and factorising

$$h^2 = 9^2(2^2 - 1)$$

$$h^2 = 9^2 \times 3$$

$$h = 9\sqrt{3} \text{ cm}$$

The area of the trapezium is therefore

$$\frac{1}{2} \times 9\sqrt{3} \times (18 + 36)$$

$$= \frac{1}{2} \times 9\sqrt{3} \times 54$$

$$= 27 \times 9\sqrt{3}$$

$$= 243\sqrt{3} \text{ cm}^2$$