AREA AND PERIMETER

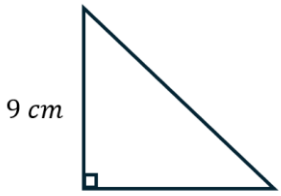
1) Work out the area of the parallelogram.

$Area = base \times height$

$= 9 \times 3$

$= \mathbf{27\ cm^2}$

2) Work out the area of the triangle.

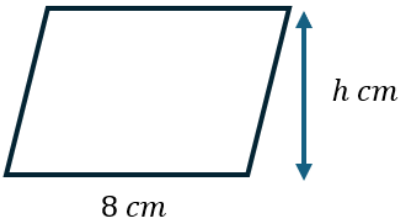


$$Area = \frac{base \times height}{2}$$

$$= \frac{8 \times 9}{2}$$

$$= \mathbf{36\ cm^2}$$

3) The area of the parallelogram is 48 cm^2. Work out the missing height.



$8 \times h = 48$

$\boldsymbol{h = 6}$

4) The diagram of a square is shown below.

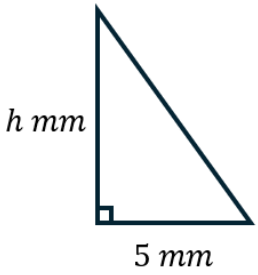
a. Work out the area of the square.

$Area = 4^2 = \mathbf{16\ cm^2}$

b. Work out the perimeter of the square.

$Perimeter = 4 + 4 + 4 + 4 = \mathbf{16\ cm}$

5) The triangle has an area of 37.5 mm^2. Work out the value of h.



$Area = \frac{base \times height}{2}$

$\frac{5h}{2} = 37.5$

$5h = 75$

$\boldsymbol{h = 15}$

6) A square has an area of 81 cm^2. Work out the perimeter of the square.

$Side\ length = \sqrt{81} = 9\ cm$

$Perimeter = 9 \times 4 = \boldsymbol{36\ cm}$

7) A square has a perimeter of 48 cm. Work out the area of the square.

$Side\ length = 48 \div 4 = 12\ cm$

$Area = 12^2 = \boldsymbol{144\ cm^2}$

8) A triangle has an area of 35 cm^2 and a base of 7 cm. Work out the height of the triangle.

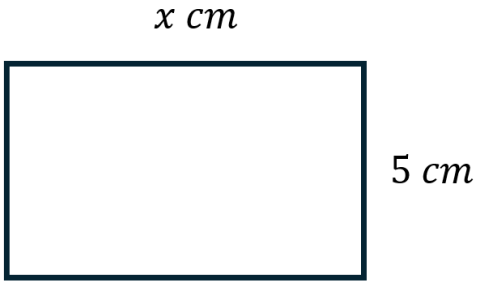
$Area = \frac{base \times height}{2}$

$\frac{7h}{2} = 35$

$7h = 70$

$h = \boldsymbol{10\ cm}$

9) Given that the perimeter of the rectangle shown below is 30 cm, work out the missing length x.



$Perimeter = x + x + 5 + 5 = 30$

$2x + 10 = 30$

$2x = 20$

$\boldsymbol{x = 10}$

10) The diagram shows a parallelogram.

a. Work out the area of the parallelogram.

$Area = base \times height$

$= 11.5 \times 4$

$= \mathbf{46\ mm^2}$

b. Work out the perimeter of the parallelogram.

$Perimeter = 4.5 + 4.5 + 11.5 + 11.5$

$= \mathbf{32\ mm}$

11) A rectangle has an area of 72 mm^2 and a width of 6 mm. Work out the perimeter of the rectangle.

$Area = l \times w$

$l \times 6 = 72$

$l = 12$

$Perimeter = 6 + 6 + 12 + 12 = \mathbf{36\ mm}$

12) A rectangle has a perimeter of 50 cm. The length of the rectangle is 4 cm more than twice its width. Work out the area of the rectangle.

$Width = x$

$Length = 2x + 4$

$x + x + 2x + 4 + 2x + 4 = 50$

$6x + 8 = 50$

$6x = 42$

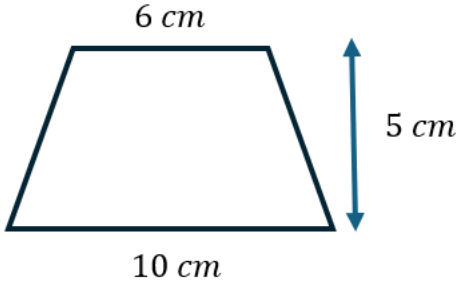
$x = 7$

$Width = 7$

$Length = 2(7) + 4 = 18$

$Area = 18 \times 7 = \mathbf{126\ cm^2}$

13) Work out the area of the trapezium.

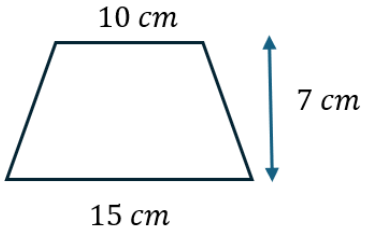


$Area = \frac{1}{2} \times (a + b) \times h$

$= \frac{1}{2} \times (6 + 10) \times 5$

$= \mathbf{40\ cm^2}$

14) Work out the area of the trapezium.



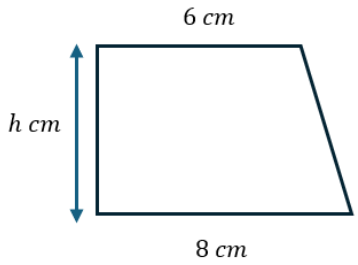
$$Area = \frac{1}{2} \times (a + b) \times h$$

$$= \frac{1}{2} \times (10 + 15) \times 7$$

$$= \frac{1}{2} \times 25 \times 7$$

$$= \mathbf{87.5\ cm^2}$$

15) The area of the trapezium shown below is 35 cm^2. Work out the value of h.



$$Area = \frac{1}{2} \times (a + b) \times h$$

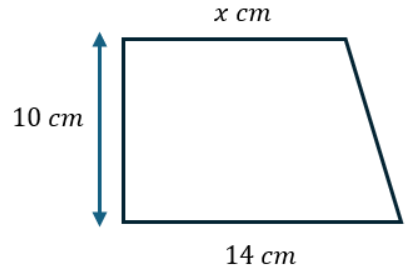
$$\frac{1}{2} \times (6 + 8) \times h = 35$$

$$\frac{1}{2} \times 14 \times h = 35$$

$$7h = 35$$

$$\boldsymbol{h = 5}$$

16) The area of the trapezium shown below is 130 cm^2. Work out the value of x.



$$Area = \frac{1}{2} \times (a + b) \times h$$

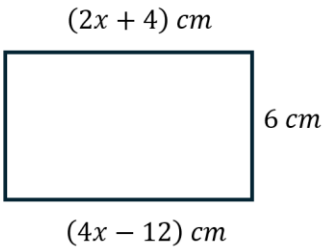
$$\frac{1}{2} \times (x + 14) \times 10 = 130$$

$$5(x + 14) = 130$$

$$x + 14 = 26$$

$$\boldsymbol{x = 12}$$

17) The dimensions of a rectangle are shown below. Work out the area of the rectangle.



Opposite sides of a rectangle are equal

$2x + 4 = 4x - 12$

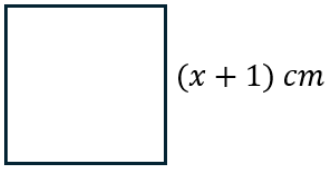
$16 = 2x$

$x = 8$

$Length = 2(8) + 4 = 20$

$Area = 20 \times 6 = \mathbf{120\ cm^2}$

18) The diagram shows a square. The area of the square is 25 cm^2. Work out the value of x.

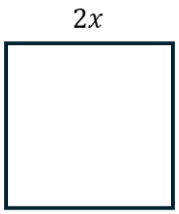


$Side\ length = \sqrt{25} = 5$

$x + 1 = 5$

$\boldsymbol{x = 4}$

19) The diagram shows a square with a side length $2x$.



a. Write a fully simplified expression for the perimeter of the square.

$2x \times 4 = \mathbf{4x}$

b. Given, that the area of the square is 144 mm^2, work out the value of x.

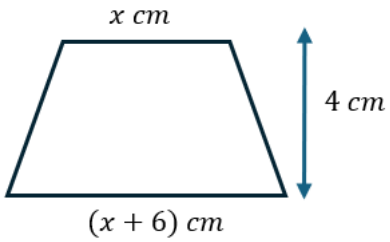
$(2x)^2 = 144$

$4x^2 = 144$

$x^2 = 36$

$\boldsymbol{x = 6\ mm}$

20) The diagram shows a trapezium. Given that the area of the trapezium is 52 cm^2, work out the value of x. You must show clear algebraic working.



$$Area = \frac{1}{2} \times (a + b) \times h$$

$$\frac{1}{2} \times (x + x + 6) \times 4 = 52$$

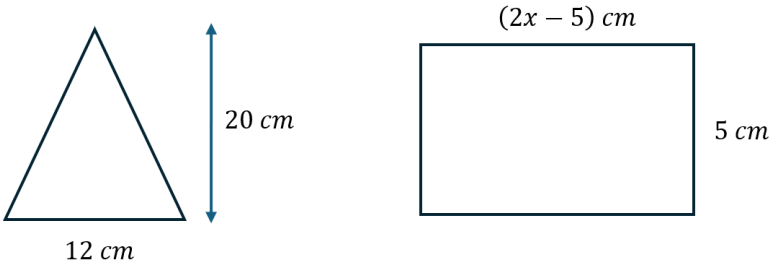
$$2(2x + 6) = 52$$

$$2x + 6 = 26$$

$$2x = 20$$

$$\boldsymbol{x = 10}$$

21) The diagram shows a triangle and a rectangle.



Given that the area of the triangle is four times the area of the rectangle, work out the value of x.

$$Area\ of\ triangle = \frac{12 \times 20}{2} = 120\ cm^2$$

$$Area\ of\ rectangle = 5(2x - 5) = 10x - 25$$

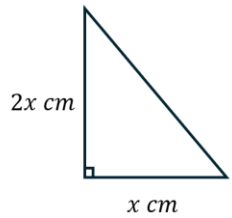
$$120 \div 4 = 30$$

$$10x - 25 = 30$$

$$10x = 55$$

$$\boldsymbol{x = 5.5}$$

22) A right-angled triangle is shown in the diagram below. The area of the triangle is 64 cm^2. Work out the value of x. You must show clear algebraic working.



$$Area = \frac{base \times height}{2}$$

$$\frac{x(2x)}{2} = 64$$

$$x^2 = 64$$

$$\boldsymbol{x = 8}$$

23) A rectangle's length is 3 cm more than its width. Given the area of the rectangle is 40 cm^2, work out its dimensions.

$Width = x$

$Length = x + 3$

$$x(x + 3) = 40$$

$$x^2 + 3x = 40$$

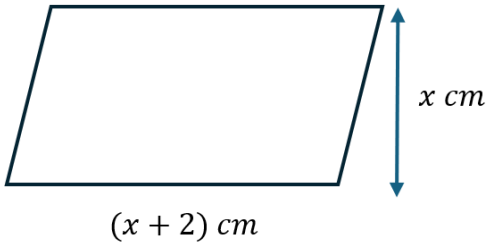
$$x^2 + 3x - 40 = 0$$

$$(x + 8)(x - 5) = 0$$

$$x = -8 \quad or \quad x = 5$$

$$\boldsymbol{Width = 5\ cm} \qquad \boldsymbol{Length = 8\ cm}$$

24) The parallelogram shown in the diagram below has a base of $x + 2$ cm and a height of x cm. Given that the area of the parallelogram is 48 cm^2, work out the value of x. You must show clear algebraic working.



$Area = base \times height$

$$x(x + 2) = 48$$

$$x^2 + 2x = 48$$

$$x^2 + 2x - 48 = 0$$

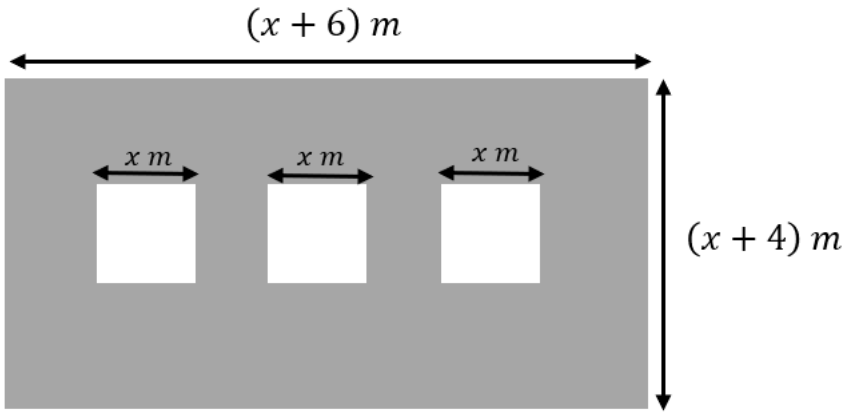
$$(x + 8)(x - 6) = 0$$

$$x = -8 \quad or \quad x = 6$$

$$\boldsymbol{x = 6}$$

Challenge

25) A rectangular garden is paved with three identical square slabs placed side by side, as shown in the diagram. Each square slab has a side length of x metres. The length of the rectangular garden is $x + 6$ metres. The width of the garden is $x + 4$ metres.



The area of the garden that is not covered by slabs is filled with decorative rocks.
Rocks cost £12 per square metre.

Given that the area of the entire garden is 48 m^2, work out the cost of filling the remaining area with rocks. You must show clear algebraic working.

Solve for x

$(x + 6)(x + 4) = 48$
$x^2 + 4x + 6x + 24 = 48$
$x^2 + 10x + 24 = 48$
$x^2 + 10x - 24 = 0$
$(x + 12)(x - 2) = 0$
$x = -12 \quad or \quad x = 2$

$x = 2$

$Area\ of\ 3\ slabs = 3 \times 2^2 = 12$

Square metres needing coverage

$48 - 12 = 36$

$Total\ cost = £12 \times 36 = £\mathbf{432}$