



1 Solve $(x + 3)(x - 9) = 0$

(2 marks)

If a product of two brackets is 0, one of the brackets must equal 0

$$x + 3 = 0 \text{ gives } x = -3$$

$$x - 9 = 0 \text{ gives } x = 9$$

$$x = -3 \text{ or } x = 9$$

2 Solve $x^2 + 8x + 12 = 0$

(3 marks)

Find two numbers that multiply to 12 and add to 8: they are 2 and 6

Factorise

$$(x + 2)(x + 6) = 0$$

$$\text{So } x = -2 \text{ or } x = -6$$

$$x = -2 \text{ or } x = -6$$

3 Solve $x^2 - 36 = 0$

(2 marks)

$$x^2 - 36 = 0$$

difference of two squares

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

$$x + 6 = 0 \text{ or } x - 6 = 0$$

$$x = -6 \text{ or } x = 6$$

4 Solve $x^2 - 5x - 24 = 0$

(3 marks)

Find two numbers that multiply to -24 and add to -5: they are -8 and 3

Factorise

$$(x - 8)(x + 3) = 0$$

$$\text{So } x = 8 \text{ or } x = -3$$

$$x = 8 \text{ or } x = -3$$

5 Solve $x^2 - 11x + 28 = 0$

(3 marks)

Find two numbers that multiply to 28 and add to -11: they are -4 and -7

Factorise

$$(x - 4)(x - 7) = 0$$

$$\text{So } x = 4 \text{ or } x = 7$$

$$x = 4 \text{ or } x = 7$$

6 Solve $x^2 - 10x + 25 = 0$

(3 marks)

$$x^2 - 10x + 25 = 0$$

two numbers: x to 25, + to -10

-5 and -5

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

$$x - 5 = 0$$

$$x = 5$$

7 Solve $x^2 = 7x$

(3 marks)

Rearrange to make one side zero

$$x^2 - 7x = 0$$

Factorise

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

So $x = 0$ or $x = 7$ (do not divide both sides by x , or the solution $x = 0$ is lost)

$$x = 0 \text{ or } x = 7$$

8 Solve $x^2 - 2x = 35$

(3 marks)

Rearrange to make one side zero

$$x^2 - 2x - 35 = 0$$

Find two numbers that multiply to -35 and add to -2: they are -7 and 5

Factorise

$$(x - 7)(x + 5) = 0, \text{ so } x = 7 \text{ or } x = -5$$

$$x = 7 \text{ or } x = -5$$

9 Solve $x^2 + 5x - 4 = 3x + 11$

(4 marks)

$$\begin{array}{rcl} x^2 + 5x - 4 & = & 3x + 11 \\ -3x & & -3x \\ \hline x^2 + 2x - 4 & = & 11 \\ -11 & & -11 \\ \hline x^2 + 2x - 15 & = & 0 \end{array}$$

two numbers: $\times$ to -15, $+$ to 2

5 and -3

$$(x + 5)(x - 3) = 0$$

$$x = -5 \text{ or } x = 3$$

- 10 A triangle has a base of $(x + 2)$ cm and a perpendicular height of x cm. The area of the triangle is 12 cm^2 .

Work out the value of x .

(4 marks)

$$\begin{array}{rcl} \frac{1}{2} \times (x + 2) \times x & = & 12 \\ \times 2 & & \times 2 \\ (x + 2) \times x & = & 24 \\ x^2 + 2x & = & 24 \\ -24 & & -24 \\ x^2 + 2x - 24 & = & 0 \\ (x + 6)(x - 4) & = & 0 \end{array}$$

$$x = -6 \text{ or } x = 4$$

a length cannot be negative

$$x = 4$$

- 11 The width of a rectangle is w cm.

The length of the rectangle is 3 cm more than its width.

The area of the rectangle is 40 cm^2 .

Find the value of w .

(4 marks)

The length is $(w + 3)$ cm, so the area gives $w(w + 3) = 40$

Expand and rearrange

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

Factorise

$$(w + 8)(w - 5) = 0, \text{ so } w = -8 \text{ or } w = 5$$

A width cannot be negative, so $w = 5$

Check

$$5 \times 8 = 40 \checkmark$$

$$w = 5$$

12

Two positive whole numbers differ by 5.

The product of the two numbers is 84.

By forming and solving a quadratic equation, find the two numbers.

(4 marks)

Let the smaller number be n , so the larger number is $n + 5$

$$\text{Then } n(n + 5) = 84, \text{ so } n^2 + 5n - 84 = 0$$

Find two numbers that multiply to -84 and add to 5: they are 12 and -7

Factorise

$$(n + 12)(n - 7) = 0, \text{ so } n = -12 \text{ or } n = 7$$

The numbers are positive, so $n = 7$ and the numbers are 7 and 12

Check

$$12 - 7 = 5 \text{ and } 7 \times 12 = 84 \checkmark$$

7 and 12

13

A rectangular garden is x metres wide. It is 5 metres longer than it is wide. The area of the garden is 84 m^2 .

a. Show that $x^2 + 5x - 84 = 0$

b. Solve the equation and so work out the perimeter of the garden.

(5 marks)

a)

$$\begin{array}{rcl} x(x + 5) & = & 84 \\ x^2 + 5x & = & 84 \\ -84 & x^2 + 5x - 84 & = 0 \end{array} \quad -84$$

b)

two numbers: x to -84, + to 5

12 and -7

$$(x + 12)(x - 7) = 0$$

$$x = -12 \text{ or } x = 7$$

a width cannot be negative

$$x = 7, \text{ length} = 12$$

$$\text{perimeter} = 2 \times (7 + 12)$$

38 m