

Linear Equations

1. Solve $x + 5 = 12$

$$x = 12 - 5$$

$$x = 7$$

2. Solve $3x + 4 = 2x + 10$

$$3x - 2x + 4 = 2x - 2x + 10$$

$$x + 4 = 10$$

$$x = 10 - 4$$

$$x = 6$$

3. Solve $2(x - 3) = 10$

$$2x - 6 = 10$$

$$2x = 10 + 6$$

$$2x = 16$$

$$x = 16 \div 2 = 8$$

4. Solve $4(2x - 3) - 3(x + 5) = 2(x - 1) + 7$

$$8x - 12 - 3x - 15 = 2x - 2 + 7$$

$$5x - 27 = 2x + 5$$

$$3x - 27 = 5$$

$$3x = 32$$

$$x = \frac{32}{3} = 10 \frac{2}{3} = 10.666667$$

Indices

Indices

1. $a^3 \times a^2$

$$a \times a \times a \times a \times a$$

$$a^{3+2} = a^5$$

2. $(2x)^3$

$$2^3 \times x^3$$

$$8x^3$$

3. $(a^2b^3)^2$

$$a^{2 \times 2} b^{3 \times 2}$$

$$a^4 b^6$$

4. $\frac{x^5 y^2}{x^3 y} \times x^5 y^2 \div x^3 y \times$
 $x^5 y^2 \times x^{-3} y^{-1}$

$$x^{5-3} y^{2-1}$$

$$x^2 y$$

5. $(3x^2y^3)^2 \div (x^2y)^3$

$$3^2 x^{2 \times 2} y^{3 \times 2} \div x^{2 \times 3} y^{1 \times 3}$$

$$9x^4 y^6 \div x^6 y^3$$

$$9x^{4-6} y^{6-3}$$

$$9x^{4-6}y^{6-3}$$

$$9x^{-2}y^3 = \frac{9y^3}{x^2}$$

Quadratics - Factorising

1. $x^2 - 7x + 12$

$$x^2 - 7x = -12$$

Two numbers that multiply to give 12 and add to give -7.

$$(x-3)(x-4)$$

$$\Rightarrow x = 3 \text{ or } x = 4$$

2. $x^2 - 5x - 14$

Multiplies to give -14

Adds to give -5

$$(x-7)(x+2)$$

$$\Rightarrow x = 7 \text{ or } x = -2$$

3. $3x^2 - 14x - 5$

Multiplies to give $3x-5 = -15$

Adds to give -14

$$3x^2 - 15x + x - 5$$

$$(3x^2 - 15x) + (x - 5)$$

$$(3x^2 - 15x) + (x - 5)$$

$$3x(x - 5) + 1(x - 5)$$

$$(3x + 1)(x - 5)$$

$$x = -\frac{1}{3} \quad x = 5$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$1. \quad \overset{a}{6}x^2 - \overset{b}{7}x - \overset{c}{3}$$

$$x = \frac{7 \pm \sqrt{-7^2 - 4 \times 6 \times -3}}{2 \times 6}$$

$$= \frac{7 \pm \sqrt{49 + 72}}{12}$$

$$= \frac{7 \pm \sqrt{121}}{12}$$

$$= \frac{7 \pm 11}{12}$$

$$x = \frac{7 + 11}{12} = 1.5$$

$$x = \frac{7 - 11}{12} = -0.333 \dots$$

$$x = \frac{7+11}{12} = 1.5$$

$$x = \frac{7-11}{12} = -0.333\dots$$

$$2. \quad 5x^2 + 17x + 6$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4 \times 5 \times 6}}{2 \times 5}$$

$$x = \frac{-17 \pm \sqrt{289 - 120}}{10}$$

$$x = \frac{-17 \pm \sqrt{169}}{10}$$

$$= \frac{-17 \pm 13}{10}$$

$$x = \frac{-17+13}{10} = -\frac{2}{5}$$

$$x = \frac{-17-13}{10} = -3$$

3. A rectangular room has an area of 120 m^2 . The length of the room is 4m longer than the width. What are the dimensions of the room?

$$\text{width} = w$$

$$\text{length} = w + 4$$

$$w(w+4) = 120$$

$$w^2 + 4w = 120$$

$$w^2 + 4w - 120 = 0$$

$$w = \frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times -120}}{2 \times 1}$$

$$w = \frac{-4 \pm \sqrt{16 + 480}}{2}$$

$$w = \frac{-4 \pm \sqrt{496}}{2}$$

$$w = \frac{-4 \pm 22.27}{2}$$

$$w = \frac{-4 + 22.27}{2} = 9.14 \text{ m} \checkmark$$

$$w = \frac{-4 - 22.27}{2} = -13.14 \text{ X}$$

$$L = w + 4 = 9.14 + 4 = 13.14 \text{ m}$$

4. A triangular garden has a length 2m less than its base. If the area is 30m^2 , find the base & length.

$$\text{base} = b$$

$$\text{length} = l = b - 2$$

$$b \times (b - 2) = 30$$

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$$0.5 \times b \times (b-2) = 30$$

$$b \times (b-2) = 30 \times 2$$

$$b \times (b-2) = 60$$

$$b^2 - 2b = 60$$

$$b^2 - 2b - 60 = 0$$

$$b = \frac{2 \pm \sqrt{-2^2 - 4 \times 1 \times -60}}{2 \times 1}$$

$$b = \frac{2 \pm \sqrt{4 + 240}}{2}$$

$$b = \frac{2 \pm \sqrt{244}}{2}$$

$$b = \frac{2 \pm 15.62}{2}$$

$$b = \frac{2 + 15.62}{2} = 8.81 \text{ m}$$

$$L = b - 2 = 8.81 - 2 = 6.81 \text{ m}$$

$$\frac{b \times (b-2)}{2} = 30$$