

Algebra

Class 1

Example 1 Simplify

- (i) $2a + 3b - 6a + 3b$
- (ii) $2x^2 + 3x - 2x + 7$
- (iii) $3x - 1 - (5x - 6)$

Example 2 Simplify

- (i) $x^2(x^3)$
- (ii) $(ab)(a^2b^3)$

Example 3 Simplify

- (i) $5(6x)$
- (ii) $3x(2y)$
- (iii) $(2x)(3x)$
- (iv) $3ab^2(5a^2b^2)$

Example 4 Simplify each of the following:

- (i) $2a(b + c) - 3b(a + 2c)$
- (ii) $x(x - 1) - 3(x - 1)$

Example 5 Simplify $(x + 3)(x - 2)$

Example 6 Simplify $(5x - 1)(4x - 3)$

Example 7 Simplify $(2x - 3)^2$

Example 8 Simplify $(4x - 3)(x^2 - 5x - 6)$

Example 9 Divide $x^3 - 4x^2 + x + 6$ by $x + 1$

Example 10 Divide $x^3 - 3x + 2$ by $x - 1$

Class 2

Example 1 If $a = 3$ and $b = -4$ find the value of

(i) $(a + 2b)^2$

(ii) $2a^2 - b^2$

Example 2 If $x = \frac{1}{3}$ find the value of $\frac{1}{x+1} + \frac{1}{x+2}$

Example 3 Write as a single fraction $\frac{1}{2} + \frac{1}{3}$

Example 4 Write as a single fraction $\frac{4x-2}{3} - \frac{5x-7}{4}$

Example 5 Write as a single fraction $\frac{1}{2x+1} - \frac{5}{3x+2}$

Example 6 Write as a single fraction $\frac{3}{2x-1} - 6$

Class 3

Example 1 Factorise each of the following

(i) $3x - 4x^2$

(ii) $2a^2b - 4ab^2$

Example 2 Factorise each of the following:

(i) $2ac - 3bd - bc + 6ad$

(ii) $ab + a - b - 1$

Example 3 Factorise each of the following.

(i) $4x^2 - 25$

(ii) $36 - (a - 2b)^2$

Example 4 Factorise each of the following

(i) $2x^3 - 50x$

(ii) $3x^2 - 12$

(iii) $x^4 - y^4$

Class 4

Example 1 Factorise each of the following

(i) $x^2 + 7x + 12$

(ii) $x^2 - 6x + 8$

Example 2 Factorise each of the following:

(i) $x^2 + 5x - 14$

(ii) $x^2 - 5x - 24$

Example 3 Factorise

$$(i) 2x^2 - 13x + 18$$

$$(ii) 3x^2 - x - 14$$

Example 4 Factorise

$$(i) x^2 + 6x + 8$$

$$(ii) x^2 - 7x + 12$$

Example 5 Factorise

$$(i) x^2 - 2x - 8$$

$$(ii) x^2 + 5x - 6$$

Example 6 Factorise

$$(i) 2x^2 - 7x + 6$$

$$(ii) 3x^2 - 2x - 8$$

Class 5

Example 1 Solve $2x + 1 = 9$

Example 2 Solve $5x + 1 = 6x - 5$

Example 3 Solve $4(x - 1) = 6(x + 5)$

Example 4 Solve $\frac{2x - 1}{3} = 4$

Example 5 Solve $\frac{3x - 2}{3} = \frac{x + 1}{2}$

Example 6 Solve $\frac{5}{x - 1} = \frac{4}{x + 3}$

Example 7 Solve $\frac{2x-1}{x-4} = 3$

Example 8 Express each of the following in terms of x .

(i) $ax + b = c$

(ii) $a(x + b) = c$

(iii) $\frac{a+b}{x} = c$

(iv) $ax + b = x + c$

(v) $a + \frac{b}{x} = c - 1$

Example 9 Express p in terms of q , r and s given

(i) $s(p^2 + q) = r$

(ii) $q = \sqrt{\frac{rs}{p^2}}$

Example 10 If $a + 2c = 3b$ write a in terms of b and c and hence if $2a + c = d$ write d in terms of b and c .

Class 6

Example 1 Show each of the following on a number line

(i) $x \leq 3$ where $x \in N$.

(ii) $x \leq 3$ where $x \in Z$.

(iii) $x \leq 3$ where $x \in R$.

(iv) $x < 3$ where $x \in R$.

Example 2 Solve the inequality $1 - 2x \geq -5$, $x \in N$ and show on a number line.

Example 3 Solve the inequality $3x - 2 \leq 2x - 5$ for $x \in R$ and illustrate the solutions on a number line.

Example 4 Solve $5 + x < 3x - 1 \leq 7 + 2x$ for $x \in R$ and illustrate the solutions on a number line.

Example 5 Solve the simultaneous equations

$$4x + y = 11$$

$$5x - 2y = 4$$

Example 6 Solve the equations

$$x + y = -4$$

$$\frac{x}{2} + \frac{y}{3} = -1$$

Class 7

Example 1 Solve each of the following equations

(i) $x^2 - 4x - 32 = 0$

(ii) $x^2 + 9x = 10$

(iii) $x^2 - 16 = 0$

(iv) $x^2 - 8x = 0$

Example 2 Solve for $x^2 - 2x - 5 = 0$ and leave the answer in surd form.

Example 3 Solve $\frac{x-1}{x} - \frac{3x}{x-1} = 2$, $x \neq 0$ and $x \neq 1$ where $x \in R$

Class 8

Example 1 Write $\frac{1}{x+1} + \frac{2}{x-3}$ as a single fraction where $x \neq -1$ and $x \neq 3$.

Hence, or otherwise, find, correct to one place of decimals, the two solutions of

$$\frac{1}{x+1} + \frac{2}{x-3} = 2, \quad x \neq -1 \text{ and } x \neq 3.$$

Example 2 Solve $x^2 + 5x - 6 = 0$ and hence or otherwise solve $(2t-1)^2 + 5(2t-1) - 6 = 0$

Example 3 Solve the equation $x^2 - 13x + 36 = 0$ and hence solve $x^4 - 13x^2 + 36 = 0$.

Class 9

Example 1 When 3 is added to twice a number the result is 15 find the number.

Example 2 When 4 is subtracted from three times a number the result is the same as adding 5 to twice the number. Form an equation and hence find the unknown number.

Example 3 John is five times older than his son. In 6 years time he will be three times older than his son. Form an equation to find John's age now.

Example 4 When a number is added to its square the result is 56, find the number.

Example 5 The diagram below show a rectangular garden surrounded by a path, which is x wide all the way round. If the area of the path is 13 find the value of x .

- Example 6** A man drove a distance of 100km at x km/h. On the return journey he reduced his speed by 5km/h. If it took him 1 hour longer to get home form an equation and find the value of x .
- Example 7** €5,000 was divided among a group of people in equal amounts. If there had been 15 fewer people each would have receive €75 more. Let x represent the number of winners, write an equation in terms of x from the above information and hence find the number of people.
- Example 8** The sum of two numbers is 7. If 3 times the smaller is taken from 5 times the larger the result is 11. Find the two numbers.
- Example 9** A bag contains 36 coins, which are either 20c coins or 50c coins. If there are 36 coins in the bag with a total value of €8 find the number of 20c coins and the number of 50c coins.