

5.2 ALGEBRA

Worked Example 1

Factorise completely the following:

(a) $3x(x + 2) - 6x - 12$

(b) $24p^2 + 18pq - 27q^2$

Solution:

$$\begin{aligned} \text{(a)} \quad 3x(x + 2) - 6x - 12 &= 3x^2 + 6x - 6x - 12 \\ &= 3(x^2 - 4) \\ &= 3(x + 2)(x - 2) \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 24p^2 + 18pq - 27q^2 &= 3(8p^2 + 6pq - 9q^2) \\ &= 3(2p + 3q)(4p - 3q) \end{aligned}$$

Worked Example 2

The equation $x^2 + kx - 756 = 0$, where k is a constant, is satisfied by $x = 6$.

(a) Find the value of k .

(b) For this value of k , find another value of x for which the equation is satisfied.

Solution:

$$\begin{aligned} \text{(a)} \quad x^2 + kx - 756 &= 0, \quad x = 6 \\ 6^2 + k(6) - 756 &= 0 \\ \therefore k &= 120 \end{aligned}$$

(b) Let α be the other root of the equation.

$$\begin{aligned} x^2 + 120x - 756 &= 0 \\ (x - 6)(x - \alpha) &= 0 \\ 6\alpha &= -756 \\ \therefore \alpha &= -126 \end{aligned}$$

Worked Example 3

(a) Solve the simultaneous equations.

$$2x^{\frac{1}{3}} + y^{\frac{3}{2}} = 28$$

$$6x^{\frac{1}{3}} - 2y^{\frac{3}{2}} = -51$$

(b) Express x in terms of a , b and c in $\frac{x - a}{x + b} = 4c$.

(c) Make f the subject of the formula $h = \frac{V^2}{2g} \left(a + \frac{4ft}{d} \right)$.

5.8 GRAPHS

Worked Example 1

A is the point $(-2, 3)$, B is the point $(4, 0)$ and O is the point $(0, 0)$.

- Find the gradient of the line AB .
- Find the equation of the line AB .
- Write down the coordinates of C , the point of intersection of the line AB and the y -axis.
- Calculate the area of $\triangle OBC$.
- D is the point on AB such that C is the midpoint of AD . Calculate the coordinates of D .

Solution:

(a) Gradient of $AB = \frac{0 - 3}{4 - (-2)}$
 $= -\frac{1}{2}$

(b) Let equation of AB be

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

Since $B(4, 0)$ is on AB ,

$$0 = -\frac{1}{2}(4) + c$$

$$\therefore c = 2$$

So equation of AB is

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

(c) The point C is $(0, 2)$.

(d) $\triangle OBC = \frac{1}{2}(4)(2)$ sq. units
 $= 4$ sq. units

(e) Let D be (x_1, y_1) .

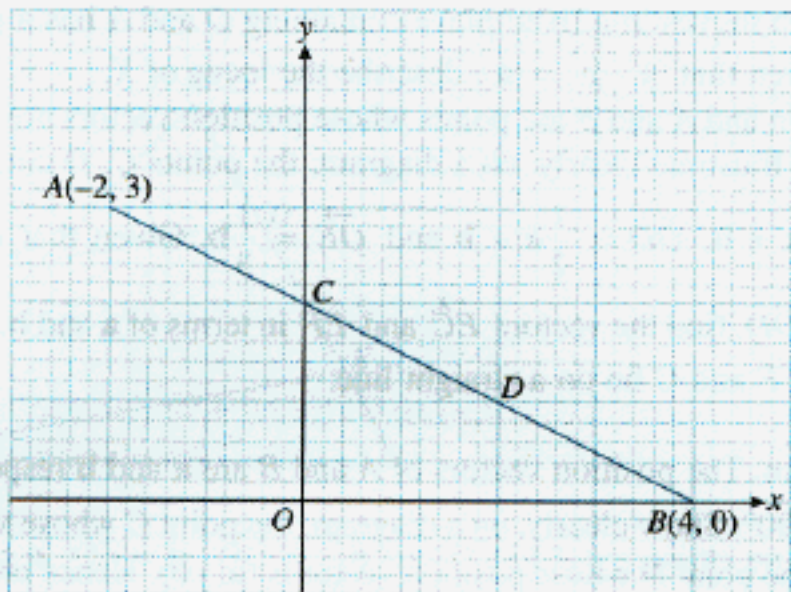
Then $0 = \frac{-2 + x_1}{2}$

$$\therefore x_1 = 2$$

$$2 = \frac{3 + y_1}{2}$$

$$\therefore y_1 = 1$$

$\therefore D$ is $(2, 1)$.



ASSESSMENT PAPER SET A

Paper 1 (answers on p. 253)

80 marks

2 h

All questions may be attempted.

Neither mathematical tables nor electronic calculators may be used in this paper.

1. Find the value of

(a) $\frac{5}{6} + \frac{3}{4}$, [1]

(b) $1\frac{2}{3} \div 0.5$. [1]

2. (a) Arrange the following numbers in descending order:

0.104, -0.401, 0.041. [1]

(b) Share \$24 000 equally among five people. How much does each person get? [1]

3. The Tanglin Bookshop sells 2 400 exercise books at 25¢ each.

(a) Find the total selling price. [1]

(b) If the selling price of each exercise book is increased by 20%, find the increase in total selling price. [1]

4. On a certain day, the highest temperature was 12°C and it occurred at 13 00. The lowest temperature on the same day was -4°C and it occurred at 06 00.

(a) What is the difference between the highest and lowest temperatures? [1]

(b) The temperature at 10 00 was 7°C higher than the lowest temperature. What was the temperature at 10 00? [1]

5. The diagram shows the number of cubes used to build a stair of three steps.

(a) How many extra cubes are needed to build the next step? [1]

(b) Is it possible to build such a stair with exactly 101 cubes? Explain your answer. [1]



6. (a) Find the time that is $1\frac{1}{4}$ hours before 10 10. [1]

(b) A car travels for the first two hours at an average speed of 80 km/h. (i) Find the distance travelled in the first two hours. [1]

(ii) In the next hour, it travels another 100 km. Find the average speed for the whole journey. [1]