Preface

This book has been written with the aim to help students get a firm grasp of concepts taught at this level of Mathematics curriculum. The chapters have been written based on the topics of the latest (2021) syllabus. This will enable students to revise their lessons easily and effectively.

Each chapter starts with appropriate notes on related concepts, formulae and examples to guide the students on how to approach problems logically and work independently.

Questions in each chapter have been prepared based on easy to difficult ones in order to develop students' confidence along the way.

The two specimen papers at the end of this book have been designed to let students self-test themselves within the allotted time.

The Answers section provides worked solutions for all the questions. I hope that this book will benefit the students and will serve as an invaluable resource for them.

Contents

1 Linear Graphs and Simultaneous Linear Equation

Graphs of Linear Function

Cartesian Coordinates

- The x-axis is the horizontal axis while the y-axis is the vertical axis. These axes are known as the Cartesian axes.
- A point on the Cartesian axes is denoted by a pair of numbers called coordinates (x, y) – the x-coordinate and the y-coordinate, which represent its position on the Cartesian plane.
- The intersection of the x and y-axes is called the origin. The coordinates of the origin are (0, 0).

Linear graphs

Graphs whose equations are of the following forms:

(i) $y = c$ e.g. $y = -4$, $y = 2$, $y = \frac{1}{3}$

(ii) $y = mx$ e.g $y = -5x$, $y = 8x$, $y = \frac{7}{4}x$

(iii) $y = mx + c$ e.g. $y = -2x + 4$, $y = 9x - 11$, $y = \frac{3}{4}x + 6$

(iv) $x = a$ e.g. $x = 3$, $x = -2$, $x = \frac{1}{2}$

Example 1

Use a scale of 2 cm to represent 1 unit on both axes for $-1 \le x \le 2$ and $-1 \le y \le 2$, draw the graph of

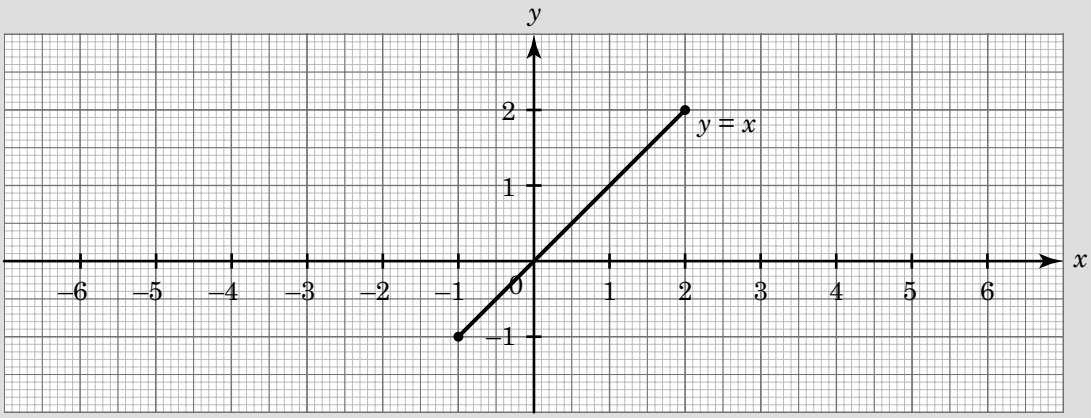
(a) $y = x$

(b) $5y + x = 10$

Solution:

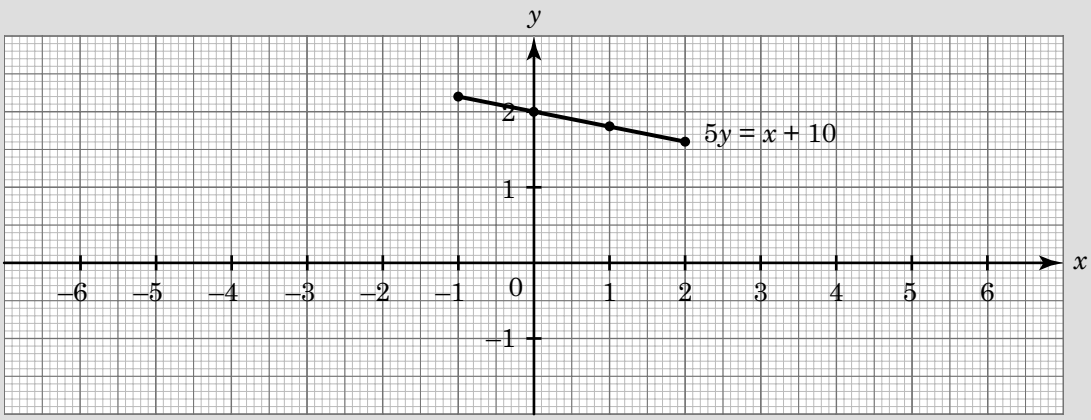
(a) $y = x$

x	−1	0	1	2
y	−1	0	1	2



(b) $5y + x = 10$

x	−1	0	1	2
y	2.2	2	1.8	1.6



Problem solving by formulating simultaneous equations.

Example 5

A lady is 3 times as old as her son. Five years ago she was 5 times as old as her son. Using graphical method, determine how old her son is.

Solution:

Let the son's age be x and the lady's age be y.

$y = 3x$ ..... (1)

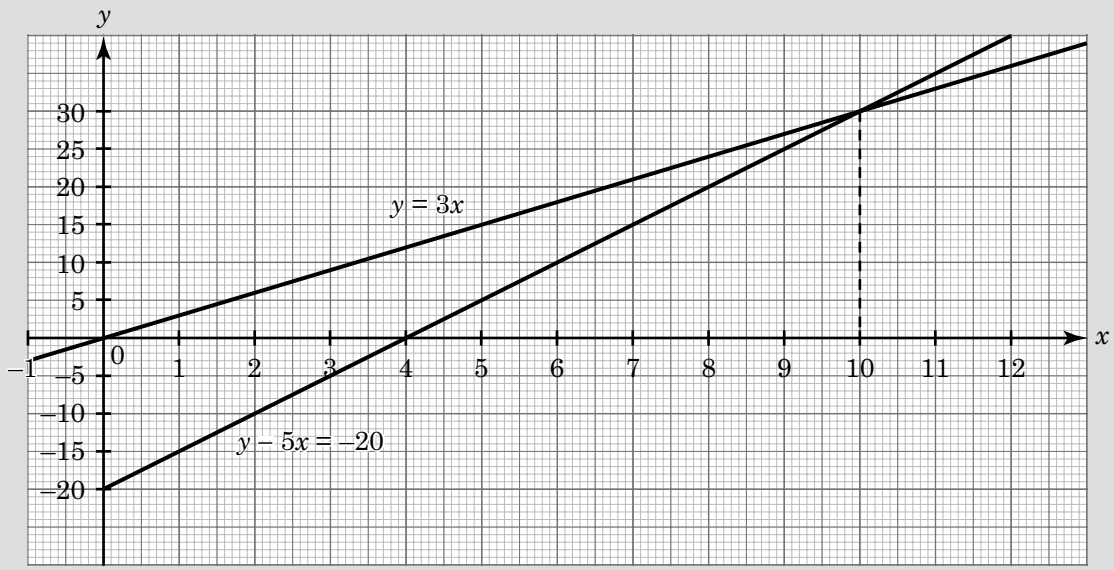
$y - 5 = 5(x - 5)$

$y - 5x = -20$ ..... (2)

Using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 5 units on the y-axis for $0 \leq x \leq 12$ and $-20 \leq y \leq 30$, draw the 2 graphs.

From the graphs, the point of intersection is $(10, 30) \Rightarrow x = 10, y = 30$.

Hence the son is 10 years old.



4 Algebraic Manipulation and Formulae

Algebraic Fractions

Algebraic fractions are fractions which are expressed in the form $\frac{a}{b}$, where a and b are both variables or either a or b is a variable. For the algebraic fraction to be valid, b can never be equal to 0.

Examples are: $\frac{9a}{7+2b-5c}$, $\frac{2x+1}{3}$, $\frac{x-5}{8}$, $\frac{2}{y-7}$, $\frac{9}{p}$

Operations with Algebraic Fractions

Simplifying algebraic fractions

To simplify an algebraic fraction to its lowest term:

- Factorise the numerator and the denominator
- Cancel or divide out the common factors

Example 1

Simplify $\frac{48x^2y^6z^4}{64xy^7z^2}$.

Solution:

$$\frac{48x^2y^6z^4}{64xy^7z^2} = \frac{3xz^2}{4y}$$

Example 2

Simplify $\frac{3b-3}{8b-8}$.

Solution:

$$\frac{3b-3}{8b-8} = \frac{3(b-1)}{8(b-1)}$$

$$= \frac{3\cancel{(b-1)}}{8\cancel{(b-1)}}$$

$$= \frac{3}{8}$$