

Topic 5: Linear Equations

Notes:

Mathematical Sentence and Linear Equations:

1. An open **mathematical sentence** is a sentence with one or more variables, which can be true or false.

For example:

- (i) $12 + y = 32$
- (ii) x is a factor of 16

2. An **equation** is an open mathematical sentence that contains "equal" (=).

For example:

- (i) $x - 5 = 3$
- (ii) $2x + 21 = 73$
- (iii) $x^2 - x = 3$
- (iv) $\frac{x+1}{4} = 4x - 2$

*Equations that contain only **one** variable with index of **1** such as **(i)**, **(ii)**, and **(iv)** are considered **linear equations**. **(iii)** has x^2 which is **not** index of **1** but index of **2**.

Solving Linear Equations:

3. To **solve** an equation means to find the value of the unknown variable in the equation such that this value found makes the equation into a “true” or correct mathematical statement. This value can be found for the variable is called the **solution** or **root** of the problem.
4. Since the solution/root makes the equation true, they **satisfy** the equation.
5. Solving a linear equation requires one or more of the following steps:
 - (a) **Simplify the given equation where possible:**
Simplifying the equation can involve expansion with brackets removed (**Apply Distributive Law**) or changing an equation with fraction into one without fraction by multiplying the LCM of the denominators of the fractions on both sides of the equation (**Multiply LCM and remove denominator**).
 - (b) **Grouping the unknown variable(s) to one side of the equation to make things organized:**
The grouping can be done either by adding, subtracting, multiplying, or dividing **BOTH** sides of the equations with the **SAME** quantity.
For example:

(i) If $x + 3 = 5$, then $x + 3 - 3 = 5 - 3$
 $\rightarrow x = 2$

(ii) If $4x = 16$, then $\frac{4x}{4} = \frac{16}{4}$
 $\rightarrow x = 4$

(iii) If $2x - 3 = x + 2$, then $2x - x = 2 + 3$
 $\rightarrow x = 5$

Solving Fractional Equations:

6. A fractional equation is like a linear equation, just that it has one or more **fractional expressions**. We can use multiplication to transform simple fractional equations to linear equations (check **5(a)**)

Construction of Formulae:

7. A **formula** uses **variables** to express a rule in algebraic terms (We have learnt how to make formulae during **Number Patterns Topic 7**)

For example:

If A represents the area of a rectangle, l represents the length of the rectangle, and b represents the breadth of the rectangle, then the formula to find the area of the rectangle would be $A = lb$

Problem Solving with Algebra:

8. To solve word problems using algebra,
 - (a) Let x be the unknown variable which is required to be found.
 - (b) Use the information given in the question to form an equation involving the variable x .
 - (c) Solve the equation in x , e.g. find the value(s) of x .