UNIT 22 *Algebraic Concepts* Introduction to SIM

Learning objectives

The work in this unit focuses on the foundations of algebra and is crucial for developing your mathematical understanding.

After completing this unit of STUDENT INSTRUCTIONAL MATERIAL (SIM) you should

- be confident in simplifying algebraic expressions, including multiplying and working with brackets
- understand how to solve equations in one unknown
- be able to translate problems in context into equations
- understand how to manipulate algebraic expressions.
- be confident in adding and subtracting algebraic fractions of the form $\frac{1}{x} + \frac{1}{1-x}$, etc.

Key points and principles

- Equations must always balance, that is, the right hand side must be equal to the left hand side.
- Whatever operation you do to *one* side of an equation must also be done to the other side, e.g. adding, subtracting, multiplying or dividing by a number.

Facts to remember

- $\frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab}$

- $a(x+b) = ax + ab$

Glossary of Terms

Simplifying expressions

This means collecting like terms together;

e.g. $2x + 5 + 3x - 4 - x = 4x + 1$

Removing brackets

Multiplying through an expression to remove the brackets;

e.g. $4(5 - 2x) = 4 \times 5 + 4 \times (-2x) = 20 - 8x$

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Equation

This relates an unknown quantity to known quantities, and can be solved to find the value of the unknown quantity: this is called the *solution*.

e.g. $4x + 1 = 9$ (take 1 from both sides)

$4x = 9 - 1$

$4x = 8$ (divide both sides by 4)

$x = \frac{8}{4}$

i.e. $x = 2$

So $x = 2$ is the solution of the equation $4x + 1 = 9$.

Balancing equations

For any equation, the right hand side (RHS) must equal the left hand side (LHS) and any operation you do to one side must be done to the other side (see example above).

Algebraic fractions

These are similar to number fractions except that either the numerator or the denominator (or both) includes an unknown quantity;

e.g. $\frac{x}{2}$, $\frac{3}{x}$, $\frac{4}{2-x}$, $\frac{2(x+3)}{(x-4)}$, etc.