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Linear Equations

IGCSE Mathematics

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Quality Mathematics Education for Students

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1 Introduction to Linear Equations

Note

Linear equations are one of the most important topics in algebra. They appear throughout IGCSE Mathematics and provide the foundation for understanding graphs, simultaneous equations, inequalities, and many real-world problem-solving scenarios.

In this chapter, we will explore:

- What linear equations are and their key properties
- Solving one-step and two-step equations
- Equations with brackets and fractions
- Equations with unknowns on both sides
- Setting up and solving word problems
- Graphs of linear equations

2 What is a Linear Equation?

Definition

A **linear equation** is an equation in which the highest power of the unknown variable is 1.

The general form of a linear equation in one variable is:

$$ax + b = c$$

where a , b , and c are constants and $a \neq 0$.

Examples of linear equations:

- $3x + 5 = 14$
- $2y - 7 = 11$
- $\frac{x}{4} = 6$

Not linear equations:

- $x^2 + 3 = 12$ (power of 2 — this is quadratic)

- $\frac{1}{x} = 5$ (x is in the denominator)
- $\sqrt{x} = 4$ (involves a square root of x)

Note**Key Vocabulary:**

- **Variable:** The unknown letter (usually x , y , or another letter)
- **Coefficient:** The number multiplied by the variable (e.g., in $3x$, the coefficient is 3)
- **Constant:** A number on its own (e.g., in $3x + 5$, the constant is 5)
- **Solution:** The value of the variable that makes the equation true

The Balance Principle

An equation is like a balanced set of scales. Whatever you do to one side, you must do exactly the same to the other side to keep it balanced.

If $a = b$, then:

- $a + c = b + c$ (add the same number to both sides)
- $a - c = b - c$ (subtract the same number from both sides)
- $a \times c = b \times c$ (multiply both sides by the same number)
- $\frac{a}{c} = \frac{b}{c}$ (divide both sides by the same number, $c \neq 0$)

3 Solving One-Step Equations

Definition

A **one-step equation** requires just a single operation (addition, subtraction, multiplication, or division) to isolate the variable.

Preview ends here

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