

Mathematics Study Guide

Algebra · Calculus · Statistics · Graphs

jasperspace.netlify.app ✦ Your learning journey starts here

Welcome to your Maths Study Guide

This guide covers the key topics you need to know. Work through each section at your own pace.

1. Algebra Basics

What is Algebra?

Algebra uses letters (called variables) to represent unknown numbers. The goal is usually to find what the variable equals.

Key Rules:

- Whatever you do to one side of an equation, do to the other side
- Collect like terms — only add/subtract terms with the same variable
- Use BODMAS/PEDMAS for order of operations

Example: Solve $2x + 5 = 13$

Step 1: Subtract 5 from both sides $\rightarrow 2x = 8$

Step 2: Divide both sides by 2 $\rightarrow x = 4$

2. Factorisation

Factorisation means breaking an expression into simpler parts (factors) that multiply together.

For $x^2 + bx + c$, find two numbers that multiply to c and add to b .

Example: Factorise $x^2 + 7x + 12$

- Numbers that multiply to 12: (1,12), (2,6), (3,4)

- Numbers that also add to 7: 3 and 4 ✓
 - Answer: $(x + 3)(x + 4)$
-

3. Linear Equations & Graphs

A linear equation makes a straight line when plotted. The general form is $y = mx + c$ where m is the gradient and c is the y-intercept.

- Gradient (m) = how steep the line is
 - y-intercept (c) = where the line crosses the y-axis
-

4. Quadratic Equations

A quadratic equation has the form $ax^2 + bx + c = 0$. You can solve it by factorising, completing the square, or using the quadratic formula.

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

5. Calculus Introduction

Differentiation — finding the gradient/rate of change:

- If $y = x^n$, then $dy/dx = nx^{n-1}$
- If $y = 3x^2$, then $dy/dx = 6x$

Integration — the reverse of differentiation:

- If $dy/dx = x^n$, then $y = x^{n+1}/(n+1) + C$
-

6. Statistics & Probability

- Mean = sum of all values / number of values
- Median = the middle value when arranged in order
- Mode = the most frequently occurring value
- Probability = number of favourable outcomes / total outcomes

Want to go deeper on any of these topics? Book a 1-on-1 session with Jasper Space and we will work through it together step by step!