GENERAL

# a level mathematics formula sheet

Published: September 3, 2026 | Index ID: #-

## Unlocking the Power of a Level Mathematics Formula Sheet

When you sit down to tackle A Level mathematics, the first thing that often comes to mind is the sheer volume of concepts you need to master. From algebraic manipulation to differential calculus, the exam covers a wide array of topics, each with its own set of crucial formulas. A well structured formula sheet is more than just a list of equations—it's a roadmap that guides you through complex problem solving and boosts your confidence on exam day.

In this comprehensive guide, we'll explore why a formula sheet is indispensable for A Level mathematics, how to design one that works for you, and what specific formulas you should include for every topic. Whether you're a seasoned student looking to refine your study tools or a newcomer who's just beginning to navigate the syllabus, this article will equip you with everything you need to create an effective, exam ready formula sheet.

## Why a Formula Sheet Matters for A Level Mathematics

Mathematics is a discipline built on patterns and relationships. The ability to recall and apply formulas quickly can make the difference between a solid answer and a missed opportunity. Here are the key reasons why a formula sheet is essential:

- Time Management: During timed exams, you don't have the luxury of searching for equations. A ready made sheet lets you retrieve formulas instantly, saving precious minutes.
- Memory Aid: Even the most diligent students can forget the exact wording of a theorem or the constants in a trigonometric identity. A sheet reduces cognitive load.
- Exam Strategy: Knowing where to find a formula instantly allows you to focus on solving the problem rather than searching for the right equation.
- Confidence Booster: A well organized sheet gives you peace of mind that you have all the tools you need at your fingertips.

Because A Level mathematics exams often test the application of multiple concepts in a single question, having a reliable reference that covers all topics is invaluable.

## Designing Your Own Formula Sheet

Creating a formula sheet that truly serves you involves more than just copying equations from textbooks. Below are practical steps to build a personalized, effective resource.

### 1. Start with the Syllabus

Each examination board publishes a detailed syllabus outlining the topics and sub topics covered. Use this as your master checklist. For example, the AQA and Edexcel syllabi both include sections on Algebra, Calculus, Statistics, Geometry, Trigonometry, and Vectors.

### 2. Organise by Theme

Group formulas by theme rather than by chapter. This mirrors the way exam questions often combine multiple areas. For instance, a question might require both a trigonometric identity and a calculus derivative. By placing related formulas together, you can quickly jump between concepts.

### 3. Use Clear, Concise Notation

Write formulas in the notation you will use on exam day. Avoid adding unnecessary symbols or comments that can clutter the sheet. For example, write the quadratic formula as **x = (-b ± " (b²-4ac))/(2a)** rather than a verbose description.

### 4. Include Quick Reference Guides

For formulas that involve multiple steps, consider adding a brief reminder of how to use them. For example, next to the derivative of a product, you could write “Use the product rule: (fg)’ = f''g + fg’.”

### 5. Keep It Compact

While you want completeness, a formula sheet that’s too bulky can be overwhelming. Aim for a single A4 sheet or two if you’re comfortable with a slightly larger format. Use a small font size (but still legible) and narrow columns to fit more content.

### 6. Test It Out

Practice with past exam questions while referring to your sheet. Note any missing formulas or sections that feel disorganised. Refine the sheet until it feels intuitive.

## Essential Formula Categories for A Level Mathematics

Below we break down the core areas of the A Level mathematics syllabus and list the most frequently used formulas. Each section includes a brief explanation and sample applications.

### 1. Algebra

Algebra forms the foundation of many A Level problems. Mastering algebraic manipulation is key to simplifying expressions and solving equations.

- Quadratic Formula: x = (-b ± " (b²-4ac))/(2a)
- Factorisation: (x + p)(x + q) = x² + (p+q)x + pq
- Completing the Square: ax² + bx + c = a(x + b/2a)² + (c - b²/4a)
- Logarithmic Laws: log_b(xy) = log_b x + log_b y; log_b(x/y) = log_b x - log_b y; log_b(x^k) = k log_b x
- Exponential Growth/Decay: N(t) = N € e^(kt)

### 2. Calculus

Calculus questions often involve differentiation, integration, and the application of limits. A concise list of rules and formulas is essential.

- Power Rule: (x •)'' = n x^(n-1)
- Product Rule: (fg)'' = f''g + fg''
- Quotient Rule: (f/g)'' = (f''g - fg'')/g²
- Chain Rule: (f(g(x)))'' = f''(g(x)) · g''(x)
- Derivative of Trigonometric Functions: (sin x)'' = cos x; (cos x)'' = -sin x; (tan x)'' = sec² x
- Integral of Basic Functions: ''+x • dx = x^(n+1)/(n+1) + C
- Definite Integral: ''+_a^b f(x) dx = F(b) - F(a)
- Fundamental Theorem of Calculus: F''(x) = f(x)
- Area Under a Curve: A = ''+_a^b f(x) dx
- Volume of Solids of Revolution (Disk Method): V = < ''µö æ'' ¶b‡,•Û'' G€
- Volume of Solids of Revolution (Shell Method): V = 2< ''µö æ'' , b‡,’ G€

### 3. Statistics

Statistical questions test your ability to summarise data, interpret distributions, and apply probability concepts.

- Mean: ;Â Ò £x / n
- Median: Middle value when data is sorted.
- Mode: Most frequently occurring value.
- Standard Deviation: <2 Ò !¢ƒ£(x - ;Â›" ò â•
- Variance: <;" Ò £(x - ;Â›" ò à
- Binomial Probability: P(k) = C(n, k) p^k (1-p)^(n-k)
- Normal Distribution (Z  score): Z = (x - ;Â’óÃ
- Confidence Interval (Mean): ;Â  ¢¢ƒÃ/" n)
- Correlation Coefficient (r): r = :5²‡,Ó¼x)(y-;Ç’•Ò ò !¢ƒ£(x-;Ç‚›" £(y-;Ç’›"•

### 4. Geometry

Geometry problems often require you to calculate lengths, angles, and areas of various shapes.

- Pythagorean Theorem: a² + b² = c²
- Area of a Triangle (Heron’s Formula): A = " [s(s-a)(s-b)(s-c)], where s = (a+b+c)/2
- Area of a Circle: A = < +
- Circumference of a Circle: C = 2<
- Area of a Parallelogram: A = bh
- Volume of a Cylinder: V = < +&€
- Volume of a Sphere: V = (4/3)< +0
- Surface Area of a Sphere: SA = 4< +

### 5. Trigonometry

Trigonometric identities are frequently used to simplify expressions or solve equations involving angles.

- Basic Identities: sin²;, ² 6÷;#¸ = 1
- Co  function Identities: sin(90°-;,’ Ò 6÷3¸; cos(90°-;,’ Ò 6–ã¸
- Double  Angle Formulas: sin2;, Ò '6–ã¸cos;ƒ° cos2;, Ò 6÷;#¸ - sin²;€
- Sum and Difference Formulas: sin(A±B) = sinA cosB ± cosA sinB; cos(A±B) = cosA cosB "  sinA sinB
- Law of Sines: sinA/a = sinB/b = sinC/c
- Law of Cosines: c² = a² + b² - 2ab cosC

### 6. Vectors

Vector problems often involve dot products, cross products, and vector projections.

- Dot Product: u · v = |u||v| cos;€
- Cross Product (Magnitude): |u × v| = |u||v| sin;€
- Vector Magnitude: |v| = " (v •² + v ‚² + v ƒ²)
- Unit Vector: u0" Ò R ò ÇWÀ
- Projection of u onto v: proj_v u = (u · v / |v|²) v

## Integrating the Formula Sheet into Your Study Routine

Having a formula sheet is only half the battle. Here are ways to make the most of it during your preparation.

### 1. Flashcard Review

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