

**Revision Checklist for AS/A Level  
Mathematics 9709**  
A Guide for Students



# **Revision Checklist for GCE Advanced Subsidiary and GCE Advanced Level Mathematics 9709**

## **A guide for students**

### **How to use this guide**

This guide describes what you need to know about your AS/A Level Mathematics examination.

It will help you plan your revision programme and it will explain what the examiners are looking for in the answers that you write. It can also be used to help you revise by using the topic lists in Section 3, to check what you know and which topic areas you have covered.

The guide contains the following sections:

#### **Section 1: How will you be tested?**

This section will give you information about the different types of examination papers that are available.

#### **Section 2: What will be tested?**

This section describes the areas of knowledge, understanding and skills that the Examiners will test you on.

#### **Section 3: What you need to know**

This shows the syllabus content in a simple way so that you can check:

- what you need to know about each topic
- how much of the syllabus you have covered

#### **Section 4: Examination Information**

This section gives you some details about what you need to do in the exam.

Not all the information will be relevant to you. You will need to select what you need to know in Sections 1 and 3 by finding out from your teacher which examination papers you are taking.

## Section 1: How will you be tested?

### 1.1 The examination papers you will take

There are 7 examination papers for this syllabus, of which you need to take two for an AS qualification and 4 for an A Level qualification. Some units are compulsory and some optional, as specified in the table below.

You will need to check with your teacher which units you will be taking.

If you are taking the full A level qualification, you can take all 4 units at once, or alternatively you could take two (P1 and M1 **or** P1 and S1) at an earlier session for an AS qualification. Note that candidates taking P1 and P2 gain an AS in Pure Mathematics and will subsequently need to take the compulsory unit P3 to gain a full A Level. The subject content for P2 is a subset of the subject content for P3.

Certification Title	Compulsory Units	Optional Units
AS Mathematics	P1 (60%)	P2 (40%) <b>or</b> M1 (40%) <b>or</b> S1 (40%)
A Level Mathematics	P1 (30%) & P3 (30%)	M1 (20%) & S1 (20%) <b>or</b> M1 (20%) & M2 (20%) <b>or</b> S1 (20%) & S2 (20%)

The figures in brackets show the weighting of each unit towards the overall qualification.

#### Possible combinations of papers are:

##### AS Level

- P1 and P2
- P1 and M1
- P1 and S1

##### A Level

- P1,P3, M1 and S1
- P1,P3,M1 and M2
- P1,P3,S1 and S2

## 1.2 About the papers

Once you have checked with your teacher which units you are doing you can check on the table below for information about each paper. All units are assessed by a written examination, externally set and marked. You must answer all questions and all relevant working must be clearly shown. Each paper will contain both shorter and longer questions, with the questions being arranged in order of increasing mark allocation (i.e. questions with fewer marks will be at the beginning and higher marks at the end.) P1 and P3 will contain about 10 questions and the other units about 7 questions.

Component	Unit Name	Total Marks	Duration	Qualification Use
PAPER 1	P1 Pure Mathematics 1	75	1¼ hours	AS Mathematics A Level Mathematics
PAPER 2	P2 Pure Mathematics 2	50	1¼ hours	AS Mathematics
PAPER 3	P3 Pure Mathematics 3	75	1¼ hours	A Level Mathematics
PAPER 4	M1 Mechanics 1	50	1¼ hours	AS Mathematics A Level Mathematics
PAPER 5	M2 Mechanics 2	50	1¼ hours	A Level Mathematics
PAPER 6	S1 Probability and Statistics 1	50	1¼ hours	AS Mathematics A Level Mathematics
PAPER 7	S2 Probability and Statistics 2	50	1¼ hours	A Level Mathematics

## Section 2: What will be tested?

The full syllabus, which your teacher will have, lists the assessment objectives in detail. However, you should note that you must be able to:

- Understand relevant mathematical concepts, terminology and notation
- Recall and use appropriate manipulative techniques
- Recognise appropriate procedures
- Use skills and techniques in solving problems
- Present your work in a clear and logical way.

You should ask your teacher if you require more detailed information on this section.

### **Section 3: What you need to know**

This section is divided into units, and lists the things you may be tested on in the exam. It covers each of the papers P1, P3, M1 and S1. (Other units will be added at a later stage)

#### **How to use the table**

You can use the table throughout your Maths course to check the topic areas you have covered.

You can also use it as a revision aid. You can go through the list at various stages in the course.

- put a RED dot against a topic if you are really unsure,
- an ORANGE dot if you are fairly sure of the topic but need some further practice,
- and a GREEN dot if you are fully confident.

As you progress through the course and prepare for the examination you should be giving yourself more and more green dots!

**Remember** examiners are looking for you to **know** certain skills and facts **and** to be able to **apply** these in different situations. It is therefore important to learn the facts and practice the skills first, in isolation, then to find questions that use that skill, as this should help you to learn facts and formulae, practise skills in isolation, then apply your knowledge and skills in a more complex context. Working through past exam papers is invaluable here.

You will see that the syllabus has been divided into 'skills', 'knowledge', and 'application'. However, please be aware that each skill and knowledge item could be tested in questions requiring **use** of that particular skill or knowledge in a situation that may not be specifically mentioned here

**P1**

<b>Topic</b>	<b>Skill</b>	<b>Knowledge</b>	<b>Application</b>	√
<b>Quadratics</b>	Complete the square  Find discriminant  Solve quadratic equations  Solve linear inequalities. Solve quadratic inequalities  Solve by substitution a pair of simultaneous equations one linear and one quadratic		Locate vertex of quadratic Sketch graph of quadratic  Find number of real roots  Recognise and solve equations that can be reduced to quadratic form.	

Topic	Skill	Knowledge	Application	✓
<b>Functions</b>	Find range of given functions Find $fg(x)$ for given $f$ & $g$  Identify one-one functions Find inverse of one-one function	Understand terms: Function Domain Range One-one function Inverse function Composition of functions	Illustrate graphically $f$ and its inverse.	
<b>Coordinate Geometry</b>	Given end points: Find length of a line Find gradient of a line Find mid-point of a line Given 2 points or 1 point and gradient: Find equation of a line	Gradients of parallel & perpendicular lines Know the forms $y=mx+c$ and $y-y_1=m(x-x_1)$	Use this relationship	

Topic	Skill	Knowledge	Application	√
			Interpret & use linear equations Understand the relationship between a graph and its equation. Solutions. of equations graphically (inc. tangents to curve/repeated roots)	
<b>Circular measure</b>	Convert radians to and from degrees. Find arc length. Find sector area	Definition of a radian.  $s = r \theta$ $A = \frac{1}{2} r^2 \theta$	Solve connected problems	
<b>Trigonometry</b>	Solve trig equations giving all solutions in specified interval	Sketch and recognise graphs of Sine Cosine Tangent functions (degrees & radians)  Know exact values for sin, cos & tan of $30^\circ, 45^\circ, 60^\circ$  Understand notation $\sin^{-1}, \cos^{-1}, \tan^{-1}$  Identities $\frac{\sin \theta}{\cos \theta} = \tan \theta$ $\sin^2 \theta + \cos^2 \theta = 1$	Use these graphs  Apply exact values to related angles e.g. $\cos 150^\circ$  Principal values  Use these identities	

Topic	Skill	Knowledge	Application	✓
<b>Vectors</b>	Add and subtract vectors Multiply by a scalar       Find magnitude of a vector Find scalar product of two vectors	Know standard notations      Unit vectors Displacement vectors Position vectors	Geometrical interpretation of these operations      Use of these vectors    Use to find angles and show lines perpendicular.	
<b>Series</b>	Expand $(a + b)^n$ for n +ve integer      Find $n^{\text{th}}$ term AP Find sum of AP Find $n^{\text{th}}$ term GP Find sum of GP  Find sum to infinity of convergent GP	Notation n! Notation $\binom{n}{r}$ Know and recognise A.P.s and G.P.s    Know when a GP converges	Problems involving APs/ GPs	

Topic	Skill	Knowledge	Application	✓
<b>Differentiation</b>	<p>For any rational n: Differentiate <math>x^n</math> multiples of <math>x^n</math> sums and differences. Use chain rule.</p> <p>Find stationary points Identify max/min pt.</p>	<p>Gradient of a curve and notations (<math>dy/dx, f'(x)</math>)</p> <p>Second differential and notation (<math>d^2y/d^2x, f''(x)</math>)</p>	<p>Apply differentiation to: gradients tangents normals increasing/decreasing functions. rates of change</p> <p>Use to sketch graphs</p>	

Topic	Skill	Knowledge	Application	✓
<b>Integration</b>	<p>For any rational n (except -1 ) integrate <math>x^n</math>  multiples of <math>x^n</math>  sums and differences  <math>(ax + b)^n</math>  and constant multiples  sums and differences</p> <p>Find definite integral</p>	<p>As reverse of differentiation</p> <p>'improper' integrals</p>	<p>Solve related problems including finding 'C'</p> <p>Find area under curves or between 2 curves.  Find volumes of revolution about one axis</p>	

# P3

Topic	Skill	Knowledge	Application	√
<b>Algebra</b>	Solve equations and inequalities involving modulus Algebraic division           Partial fractions	Meaning of $ x $   Factor Theorem Remainder Theorem      Expansion of $(1+x)^n$	Use of (e.g. finding factors, solving equations finding unknown coefficients etc.)      Use of expansion and rearrangement to $(1+...)$	
<b>Logs, ln's and e's</b>	Solve equations of form $a^x = b$ and inequalities.	Relationship between logs and indices Laws of logs.  Definition and properties of $e^x$ and $\ln x$	Use of laws   Graphs of $e^x$ and $\ln x$   Transformation to linear form, gradient & intercept.	



Topic	Skill	Knowledge	Application	√
<b>Integration</b>	Integrate $e^{ax+b}$ , $1/(ax+b)$ , $\sin(ax+b)$ , $\cos(ax+b)$ and $\sec^2(ax+b)$  Integrate $kf'(x)/f(x)$ Integration by parts Integration by substitution  Trapezium rule	As reverse of differentiation	Use of this idea  Use trig relationships to integrate functions Use partial fractions to integrate rational functions    Over/under estimation	
<b>Numerical solutions</b>	Locate root graphically/sign change      Use of iterative formula	Notation for sequence of approximations which converge to a root	Use of sequence	

Topic	Skill	Knowledge	Application	√
<b>Vectors</b>	<p>Find angle between two lines. Find point of intersection of two lines when possible</p> <p>Find vector equation of a line Find vector equation of a plane</p> <p>Find point of intersection of line and plane when possible. Find line of intersection of two non-parallel planes. Find perpendicular distance from: Point to line Point to plane Find angle: Between 2 planes Between line &amp; plane</p>	<p>Straight line <math>r=a+tb</math> Understand structure</p> <p>Equation of plane <math>ax+by+cz=d</math> <math>(r-a).n=0</math></p>	<p>Use structure Find if lines are parallel, intersect or are skew.</p> <p>Solve problems concerning Distances Angles Intersections Lines lying in a plane or parallel to or intersecting a plane</p>	

Topic	Skill	Knowledge	Application	√
<b>Differential Equations</b>	Form differential equations from given statement. Solve first order differential equations by separating variables. General Solution. Particular Solution.		Use initial conditions Interpret solutions in context.	
<b>Complex Numbers</b>	Add, subtract, multiply and divide two complex numbers in Cartesian form.  Multiply and divide two complex numbers in polar form.  Find the two square roots of a complex number.	Terms: Real part Imaginary part Modulus Argument Conjugate  Argand diagram	Understand idea of complex number.  Equality of complex numbers.  Roots/Conjugate pairs.  Geometrical representation.  Geometrical interpretation of operations. Illustrate equations and inequalities on Argand diagram.	

# M1

Topic	Skill	Knowledge	Application	✓
<b>Trigonometry Knowledge required</b>		Trig results $\sin(90-\theta) = \cos \theta$ $\cos(90-\theta) = \sin \theta$ $\tan \theta = \sin \theta / \cos \theta$ $\sin^2 \theta + \cos^2 \theta = 1$		
<b>Forces and Equilibrium</b>	Identify forces  Find and use components and resultants. Equilibrium of forces. Contact force as Normal component and Frictional component. Use 'smooth' contact model.  Limiting friction.	$F = \mu R$ and $F \leq \mu R$  Newton's 3 <sup>rd</sup> Law	Forces as vectors.        Limitation of this model  Use this relationship  Use law.	

Topic	Skill	Knowledge	Application	√
<b>Kinematics of motion in a straight line</b>	<p>Sketch displacement-time velocity-time graphs.</p> <p>Differentiate &amp; integrate w.r.t time (as in unit P1)</p>	<p>Scalars and vectors. Distance &amp; speed/ Displacement, velocity and acceleration. (1 dimension)</p> <p>Formulae for motion with constant acceleration.</p>	<p>Interpret graphs: Area under v-t graph (displacement) Gradient of d-t graph (velocity) Gradient of v-t graph (acceleration)</p> <p>Solve problems with displacement/velocity/ time</p> <p>Use of formulae.</p>	<p>√</p>

Topic	Skill	Knowledge	Application	√
<p><b>Newton's laws of motion.</b></p>	<p>Solve simple problems: Motion under constant acceleration (vertically/inclined plane)</p> <p>Two particles connected by light inextensible string passing over smooth peg or light pulley.</p>	<p>Mass &amp; weight.</p>	<p>Apply laws to linear motion when particle moving under constant forces.</p> <p>Use of mass and weight</p>	<p>√</p>

Topic	Skill	Knowledge	Application	√
<b>Energy, work, power</b>	Calculate work done by constant force.	Work done.  Concept and formulae for: Gravitational P.E. & K.E.   Definition of Power (rate of working)	Use formulae. Change in energy of a system. Work done by external forces. Use principle of conservation of energy.  Use relationship power/force/velocity for a force acting in direction of motion. Solve problems.	✓

# S1

Topic	Skill	Knowledge	Application	√
<b>Representing data.</b>	<p>Select suitable ways of presenting raw data.</p> <p>Construct:            Stem and leaf            Box &amp; whisker            Histograms            Cumulative freq. graphs.</p> <p>Calculate:            Mean            Median            Mode            Range            Inter-quartile range            Standard deviation</p> <p>Estimate median and quartiles from cumulative frequency graph.</p> <p>Calculate mean and standard deviation from:            given data            given grouped data            given totals (<math>\sum x \dots</math>)</p>		<p>Discuss advantages/disadvantages</p> <p>Interpret these diagrams.</p> <p>Understand and use these measures (e.g. to compare and contrast data)</p>	

Topic	Skill	Knowledge	Application	√
<b>Permutations &amp; combinations.</b>	Solve simple problems involving selections. Solve problems about arrangements in a line with: repetition restriction	Terms permutation & combination		
<b>Probability</b>	Evaluate probabilities by: Consideration of sample space Calculation using permutations & combinations.  Use addition and multiplication of probabilities.  Calculate conditional probabilities. (tree digs.)	Exclusive events Independent events.		

Topic	Skill	Knowledge	Application	√
<b>Discrete random variables.</b>	Construct a probability distribution table. Calculate $E(X)$ Calculate $Var(X)$ .  Calculate probabilities for Binomial distribution.       Find $E(X)$ for $B(n,p)$ $Var(X)$ for $B(n,p)$	          Notation $B(n,p)$	          Recognise situations where the Binomial distribution is a suitable model.	
<b>The Normal Distribution</b>	          Use tables.          Use Normal as approx. to Binomial.	To model a continuous random variable.  Notation $N(\mu,\sigma^2)$          Conditions for. Continuity correction.	          Solve related problems: Finding $P(X > x_1)$ etc. Finding $\mu, \sigma$ Etc.   Solve related problems.	

## Section 4: Examination Information

In the examination

- You should take into the examination a calculator and any mathematical instruments that you need.
- A set of mathematical formulae and tables will be provided in the examination. Make sure you are familiar with these beforehand, so that you know where to find the tables you require and which formulae are given. You will need to learn any other formulae that you require.
- You may use an electronic calculator in the examination unless a particular question forbids it.
- Answers should be written in blue or black ink (except for graphs and diagrams, which may be done in pencil). Please write neatly and legibly.
- It is essential that you show as much working as possible in all questions and on all the papers, as marks are awarded for working. A correct answer without working **may** score full marks, but this is not always the case.
- Diagrams and angles should be drawn as accurately as possible and points in graphs should be plotted as accurately as possible.
- If a 'sketch' is required; a clear diagram, (not accurately drawn), but with relevant information shown will be sufficient (e.g. on a sketch graph it may be relevant to show intercepts, turning points and asymptotes, or it may be required to sketch a clear force diagram in Mechanics).
- Your teacher has a list of standard mathematical notation that may be used in the examination. Some are mentioned specifically in section 3.
- You must give final answers to the required level of accuracy (see general instructions on the front of the examination paper).

- Remember to work to a higher level of accuracy throughout the question and only round to the required level at the very end (and show your answer before you do the final rounding.)
- Common phrases ( e.g. 'show that', 'prove that', 'hence', etc.) are used in examination questions. It is important to be familiar with these.