

# AS Mathematics PLC

## C1

<b>NUMBER AND ALGEBRA</b>			
Know and use the rules of indices to find a value eg $49^{-3/2}$			
Know and use the rules of indices to simplify expressions			
Factorise harder quadratics eg $3x^2 + 10x - 8$ and cubics with a common factor of x			
Simplify surds and rationalise denominators			
Solve quadratic equations by factorising			
Complete the square for quadratics and identify min/max value and corresponding x			
Solve quadratic equations by completing the square			
Know and use the Quadratic Discriminant			
Solve simultaneous equations where one is linear and one is non-linear			
Solve quadratic inequalities			
Solve a linear and a quadratic inequality simultaneously			
Identify where graphs cross the axes from their equations			
<b>GRAPHS</b>			
Sketch positive and negative quadratic graphs			
Sketch positive and negative cubic graphs			
Sketch positive and negative reciprocal graphs of the form $y = 12/x$ or $y = -20/x$			
Sketching two graphs on the same axes			
Form and (sometimes) solve an equation for points of intersection			
Know the transformations to graphs $f(x+a)$ and $f(x-a)$			
Know the transformations to graphs $f(x)+a$ and $f(x)-a$			
Know the transformations to graphs $kf(x)$ and $f(kx)$			
Know the transformations to graphs $-f(x)$ and $f(-x)$			
<b>CO-ORDINATE GEOMETRY</b>			
Able to calculate the gradient of a line through two given points			
Able to find the equation of a line using the gradient and a point			
Able to find the equation of a line parallel to a given line			
Able to find the equation of a line perpendicular to a given line			
Able to find the length of a line segment between two points			
<b>SEQUENCES AND SERIES</b>			
Use a formula to generate terms of a sequence eg $U_n = n^2 + 5n - 3$			
Use an iterative formula to generate terms of a sequence eg $U_{n+1} = 2U_n - 3, U_1 = 6$			
Know the formulas for $U_n$ and $S_n$ for an AP and use them with confidence			
Solve real life problems that consist of an AP			
Understand sigma notation for series and work out prescribed values			
<b>CALCULUS</b>			
Differentiate expressions containing powers and roots			
Differentiate products of brackets			
Differentiate quotients eg $(x^2 + 3x)/x^{1/2}$			
Find the gradient from an equation for a point with given x value			
Find the co-ordinates of a point with known gradient for a given equation			
Find the equation of a tangent to a curve at a given point			
Find the equation of a normal to a curve at a given point			
Find the second differential for a given equation			
Integrate expressions containing powers and roots			
Integrate products of brackets			
Integrate quotients eg $(x^2 + 3x)/x^{1/2}$			
Find the constant of integration when a point is given as well as an integral			

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## C2

<b><u>ALGEBRA AND FUNCTIONS</u></b>			
Use algebraic long division to divide $f(x)$ by a linear expression			
Use $f(a)$ to find the remainder when $f(x)$ is divided by $(x - a)$			
Use $f(a) = 0$ to show that $(x - a)$ is a factor of $f(x)$			
Use the remainder and factor theorems to calculate unknown coefficients in $f(x)$			
Factorise a cubic expression having been given given one linear factor			
Solve a cubic $f(x) = 0$ from the factorised format			
<b><u>EXPONENTIALS AND LOGARITHMS</u></b>			
Know the graphs of $y = a^x$ and $y = \log_a x$			
Know and use that if $y = a^x$ then $x = \log_a y$ and vice versa			
Know and use the rules of logs			
Use logs to solve equations such as $5^{2x-3} = 800$			
Use logs to solve equations such as $8^{x+3} = 3^{2x-1}$			
Solve equations such as $3^{2x} - 5(3^{x+1}) + 54 = 0$			
Solve equations such $\log_3(2x - 1) = \log_9(x^2 + 3x - 4)$ using the change of base formula			
Solve simple simultaneous equations involving logs and indices			
<b><u>CO-ORDINATE GEOMETRY</u></b>			
Know and use the coordinate geometry skills from C1			
Find the mid-point of a line between two points			
Know that the equation of a circle is $(x - a)^2 + (y - b)^2 = r^2$			
Find the equation of a circle from given information			
Use the equation of a circle to identify the centre and radius			
Calculate the equation of a tangent to a circle at a given point on the circle			
Understand how to analyse the intersection of a line and a circle - tangent or intersecting?			
<b><u>THE BINOMIAL EXPANSION</u></b>			
Understand the link to Pascal's triangle for the expansion $(a + b)^n$			
Use $(a + b)^n = a^n + {}^n C_1(a)^{n-1}(b) + {}^n C_2(a)^{n-2}(b)^2 + \dots$ to obtain an expansion			
Use the formula for $(1 + x)^n$ to obtain an expansion			
Use given information to find $p$ for $(1 + px)^n$ or $(a + px)^n$			
Identify and substitute a small value of $x$ into an expansion to approximate a value			
<b><u>GEOMETRIC SEQUENCES AND SERIES</u></b>			
Use the formulas for $U_n$ and $S_n$			
Understand the sum to infinity for a converging GP and how to obtain it			
Set up a GP identifying $a$ , $r$ and $n$ for a described practical situation			
Calculate $a$ and $r$ given two terms of a GP			
<b><u>TRIGONOMETRY</u></b>			
Use all trigonometry skills from GCSE			
Understand and convert between degrees and radians			
Know and use $r\theta$ and $1/2 r^2\theta$ for arc length and area of a sector			
Calculate the area of a segment between an arc and a chord			
Know the graphs of $y = \sin x$ , $y = \cos x$ and $y = \tan x$			
Apply transformations to the sin, cos and tan graphs eg $y = 2 \sin(x + 90)$			
Solve trig equations eg $\sin(2x + 30) = -0.5$ for $x$ from 0 to 360 or -180 to 180			
Use $\tan x = \sin x / \cos x$ to simplify a trig equation			

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Use $\sin^2x + \cos^2x = 1$ to enable quadratic trig equations to be solved			
Prove simple trig identities			
<b><u>DIFFERENTIATION</u></b>	Red	Yellow	Green
Know the differentiation techniques from C1			
Use $dy/dx$ to identify when a function is increasing or decreasing			
Use $dy/dx = 0$ to find the coordinates of stationary points			
Use $d^2y/dx^2$ to determine the nature of a stationary point			
Solve practical maximum/minimum problems by justifying and using a stated equation			
<b><u>INTEGRATION</u></b>	Red	Yellow	Green
Know the integration techniques from C1			
Use the trapezium rule to approximate a given integral/area			
Understand how to use limits in integration to find a numerical answer			
Calculate the area under a graph down to the x axis between two x values			
Calculate the area enclosed by two graphs between their points of intersection			

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## S1

<b>STATISTICAL GRAPHS</b>	Red	Yellow	Green
Use frequency density/area to construct a histogram			
Read information from a histogram and use it to calculate frequencies			
Construct and/or interpret a scatter diagram			
Construct and/or interpret a stem and leaf diagram (including back to back)			
Construct and/or interpret a box (and whisker)plot including showing outliers			
Construct and/or interpret a cumulative frequency graph			
<b>AVERAGES, MEASURES OF LOCATION and MEASURES OF SPREAD</b>	Red	Yellow	Green
Calculate the mean of discrete data (including grouped)			
Calculate an estimated mean for grouped continuous data			
Identify the median, quartiles and percentiles for discrete data			
Calculate the median, quartiles and percentiles for grouped continuous data			
Calculate and use range, IQR and semi-IQR			
Calculate the standard deviation of discrete data (including grouped)			
Calculate an estimate of standard deviation for grouped continuous data			
Know that variance is the square of standard deviation			
Know and apply the rules to calculate mean and standard deviation by coding			
Use a prescribed method to identify outliers			
<b>PROBABILITY</b>	Red	Yellow	Green
Use Number Venn diagrams to solve two category number problems			
Use Number Venn diagrams to solve three category number problems			
Use Number Venn Diagrams to read off probabilities			
Know the rule $P(A \cup B) = P(A) + P(B) - P(A \cap B)$			
Know $P(A^c) = 1 - P(A)$			
Use two category Probability Venn Diagrams to represent and to read probabilities			
Understand conditional probability			
Know the rule for calculating any specified conditional probability "and over second"			
Recognise when best to use a probability tree diagram			
Understand two way tables and possibility space diagrams			
Know that for independent events $P(A \cap B) = P(A) \times P(B)$			
Know that for mutually exclusive events $P(A \cap B) = 0$			
<b>CORRELATION and REGRESSION</b>	Red	Yellow	Green
Look up and use the formulas for $S_{xx}$ , $S_{yy}$ and $S_{xy}$			
Look up and use the formula for $r$ , the PMCC, substituting in $S_{xx}$ , $S_{yy}$ and $S_{xy}$			
Know that the PMCC of coded data is the same as for the original data			
Interpret the value of the PMCC as a measure of correlation			
Know the least squares regression line equation $y = a + bx$			
Look up and use the equations for $a$ and $b$ to find the least squares regression line			
Use coding and substitution to find the least squares regression line			
Substitute values into the least squares regression line			
Interpret the values of $a$ and $b$ in the least squares regression line			
<b>DISCRETE RANDOM VARIABLES</b>	Red	Yellow	Green
Know what is meant by a discrete random variable			
Understand and use the distributions $P(X=x)$ and $F(X)$			
Know and use the formula $E(X) = \sum xP(x)$			

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Know and use the formula $\text{VAR}(X) = \sum x^2P(x) - (E(X))^2$			
Know and use the formula $E(aX + b) = aE(X) + b$			
Know and use the formula $\text{VAR}(aX + b) = a^2\text{VAR}(X)$			
Know what is meant by a discrete uniform distribution			
Know and use the $E(X)$ and $\text{VAR}(X)$ formulas for a discrete uniform distribution			
<b>THE NORMAL DISTRIBUTION</b>			
Understand the bell shaped curve and its link to probability			
Know how to calculate the value of $z$ for any item of data in a normal distribution			
Use a positive $z$ value to read a probability from the normal distribution table			
Use a negative $z$ value to read a probability from the normal distribution table			
Use two $z$ values to find a probability within a specified range			
Know how to read the normal distribution table in reverse			
Know how and when to use the Percentage Points table			
Use a given piece of information to find the mean or the standard deviation			
Use two given pieces of information to find the mean and the standard deviation			

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## The structure of assessment

Over the course of this year you will be taught three AS modules: Core 1, Core 2 and Statistics 1. Your public examinations on these will take place in May/June.

These modules are broken down by topic, and each topic will take on average two weeks to cover. Once this has been taught you will be set an assessed homework. Use the hyperlinks in the tables on pages 7 to 9 of the handbook to access the assessed homework. This will be reviewed, and if further consolidation is needed, a follow up homework set. At the end of this cycle a short test on the topic is completed in class.

Every half term you will sit a larger timed assessment on all topics covered in that period. In January you will sit a mock C1 paper and mock C2 and S1 papers in April/May.

Throughout the year you will be asked to complete past papers and a schedule will be provided to map this out for you. This will commence towards the end of the teaching of C1.

## Guidance on how best to revise for mathematics

In the run up to your mocks and the formal exams in the summer you should follow these steps to maximise your revision:

- 1) Complete as many past papers as possible. Go back over the schedule and find any papers you missed or did not complete fully. Aim to complete at least one paper a day. Initially you could do this as an open book task; use your notes, assessments, textbooks and the mark schemes to help you answer questions you find difficult. As you become more confident you should start to sit these papers under timed conditions, without any support from these materials. If you finish all Edexcel papers to a satisfactory level attempt the Solomon Press range.
- 2) Mark the papers. Use the mark schemes to do this, making sure you pay particular attention to the distribution of marks and key methodology that you need to include in your answers. As you mark compile a list of topics and concepts that you found difficult, specifically those that you still feel insecure of after going through the mark scheme. Visit Exam Solutions (link below) for worked videos on specific questions that you still do not understand.
- 3) Revise. Use the list of topics you created when marking as a starting point. Consult your textbooks and notes to consolidate these areas. Try relevant questions from exercises and check solution banks on the MLE for worked solutions if needed. Use Mymaths lessons and Exam Solutions videos for further support on specific topics.

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- 4) Create a list of questions you need to ask your teacher. Be as detailed as possible, referencing specific exam questions that you still misunderstand. Do not come back with broad topics like 'Differentiation'. Instead, refer to an exam/textbook question with your own query such as 'How do I show a function is increasing?'. Bring this list with you to your lessons or Maths Workshop.

## Areas for support

There are a number of places you can find assistance if you have any difficulties in the course. Your teachers should be the first place you ask for help. Be proactive in talking to them and asking them any questions about something you have not misunderstood in class or at home.

Maths Workshop also runs on Mondays and Wednesdays after school in S32. There are two maths teachers there each session who can help you with homework and assessments. Feel free to drop in, even if it is only for ten minutes to ask a question. In addition to this you could also find support and additional materials at the following websites:

- MLE – use to find past papers, mark schemes and solution banks (for all textbook exercises). Login through the school website using your school details or 'studentguest' and 'fortismere'.  
Go to Departments/Maths/Key Stage 5
- Exam solutions: [www.examsolutions.net](http://www.examsolutions.net) Use for video solutions to past papers and instructive videos on most topics.
- <http://www.physicsandmathstutor.com/> Use to access past papers and mark schemes
- Mymaths: [www.mymaths.co.uk](http://www.mymaths.co.uk) Our school login is 'fort' and 'shape'. Use for lessons.

## Intervention

By the October half term you would have completed a few small topic assessments and two large summary assessments. Based on your results in these you may be asked to attend intervention sessions that will target topics requiring further consolidation.

## Textbooks

You will need three textbooks to cover the content this year, C1, C2 and S1. The maths department runs a refundable deposit system, through which you can be issued these books on a loan basis. Further information on this will be delivered separately.

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## Personal Learning Checklists

At the front of this pack is the personal learning checklist, split up by module, that covers all the content of AS Mathematics. Topics are broken down by learning objectives. Use these checklists as directed by your teacher to assess your understanding of particular objectives. Review it routinely to identify areas needing further consolidation and ask your teacher how best to approach this.