edexcel

INTERNATIONAL GCSE

Mathematics (Specification A) (9-1)

GETTING STARTED

Pearson Edexcel International GCSE in Mathematics (Specification A) (4MA1)

For first teaching September 2016
First examination June 2018

ALWAYS LEARNING

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ISBN 978-4469-3248-3

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A Getting started for teachers

Introduction

This Getting Started guide provides an overview of the new International GCSE Mathematics A qualification, to help you get to grips with the changes to content and assessment, and to help you understand what these mean for you and your students.

Support for delivering the new specification

Our package of support to help you plan and implement the new specification includes:

Planning – In addition to the relevant section in this guide, we will provide a course planner and an editable Scheme of Work that you can adapt to suit your department.

Teaching and learning – To support you in delivering the new specification, we will provide suggested resource lists and suggested activities.

Understanding the standard –Sample assessment materials will be provided.

Tracking learner progress – Results Plus provides the most detailed analysis available of your students' exam performance. It can help you identify topics and skills where students could benefit from further learning. We will also offer examWizard, which is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports for a range of GCSE and GCE subjects.

Support – Our subject advisor service, and online community, will ensure you receive help and guidance from us as well as enabling you to share ideas and information with each other. You can sign up to receive e-newsletters to keep up to date with qualification updates, and product and service news. Email our subject advisor: TeachingMaths@pearson.com

Publishing – Print and online student resource, 100% matched to the new curriculum, featuring comprehensive coverage of all topics. Specifically developed for international students, it includes signposted skills and teacher guidance on the application of the Pearson Progression Scale, as well as online teacher support.

Key features of the qualification

We have consulted widely with teachers in the UK and across the world to understand how this popular qualification should evolve to meet International learner needs and remain comparable to the reformed GCSE in Mathematics (9-1). We have made changes to the specification to maintain comparability with the new GCSE and its increased level of demand, but kept these changes to a minimum.

We've retained the following key features:

- Comparable to GCSE
- Clear and straightforward question papers
- Tiered papers – 2 x 2 hour papers at each tier
- Two calculator papers
- Supports progression to A Level

What's new – at a glance

- A move from the current A*–G to the new 9–1 grading structure.
- Some minor additions to the content assessed at each tier to reflect the new 9–1 grading structure.
- A small increase in the Number and Algebra Assessment Objective weighting at the expense of Statistics.
- A few more questions on problem solving and mathematical reasoning.
- A revised formulae sheet at each tier.

Qualification overview

This section provides an overview of the course to help you see what you will need to teach. The overview gives a general summary of each of the examined papers.

Foundation Tier	
Externally assessed ■ Availability: January and June ■ First assessment: June 2018 ■ Two papers: 1F and 2F	Each paper is 50% of the total International GCSE raw marks
Content summary ■ Number ■ Algebra ■ Geometry ■ Statistics	
Assessment ■ Each paper is assessed through a 2-hour examination set and marked by Pearson. ■ The total number of marks for each paper is 100. ■ Each paper will assess the full range of targeted grades at Foundation Tier (5-1). ■ Each paper will have approximately equal marks available for each of the targeted grades. ■ There will be approximately 40% of questions targeted at grades 5 and 4, across Papers 1F and 3H, to aid standardisation and comparability of award between tiers. ■ A Foundation Tier formulae sheet will be included in the written examinations. ■ A calculator may be used in the examinations.	

Higher Tier	
Externally assessed Availability: January and June First assessment: June 2018 Two papers: 3H and 4H	Each paper is 50% of the total International GCSE raw marks
Content summary ■ Number ■ Algebra ■ Geometry ■ Statistics	
Assessment ■ Each paper is assessed through a 2-hour examination set and marked by Pearson. ■ The total number of marks for each paper is 100. ■ Questions will assume knowledge from the Foundation Tier subject content. ■ Each paper will assess the full range of targeted grades at Higher Tier (9-4) (an allowable grade 3). ■ Each paper will have approximately 40% of the marks distributed evenly over grades 4 and 5 and approximately 60% of the marks distributed evenly over grades 6, 7, 8 and 9. ■ There will be approximately 40% of questions targeted at grades 5 and 4, across papers 2F and 4H, to aid standardisation and comparability of award between tiers. ■ A Higher Tier formulae sheet will be included in the written examinations. ■ A calculator may be used in the examinations	

Assessment Objectives

		% in International GCSE
AO1	Demonstrate knowledge, understanding and skills in number and algebra: ■ numbers and the numbering system ■ calculations ■ solving numerical problems ■ equations, formulae and identities ■ sequences, functions and graphs.	57–63%
AO2	Demonstrate knowledge, understanding and skills in shape, space and measures: ■ geometry and trigonometry ■ vectors and transformation geometry.	22–28%
AO3	Demonstrate knowledge, understanding and skills in handling data: ■ statistics ■ probability.	12–18%
	TOTAL	**100%**

Relationship of Assessment Objectives to units

Unit number	**Assessment Objective**		
	AO1	**AO2**	**AO3**
Papers 1F and 2F	28.5–31.5%	11–14%	6–9%
Papers 3H and 4H	28.5–31.5%	11–14%	6–9%
Total for International GCSE	57–63%	22–28%	12–18%

Tier of entry guidance

Which tier of entry: Foundation or Higher?

There are a number of things you may wish to consider when deciding which tier is suitable for your students.

- The new Foundation tier goes up to a grade 5, which is of a higher level of demand than the current grade C, and the Higher tier starts at grade 4, which is of a higher level of demand than the current grade D.
- Consider how confident your students are with topics that were previously regarded as C grade.
- The common questions appear towards the end of the Foundation tier SAMs (Sample Assessment Materials) and form the first part of the Higher tier SAMs. How well your students perform on these questions will give you an indication if they are working below, at or above grades 4 and 5 (the target grades for these questions).

  Common questions on the Higher tier papers are:

  3H questions 1, 2, 3, 4, 5, 6, 7, 8, 9abc, 10

  4H questions 1, 2, 3, 4abce, 5, 6, 7, 8, 9, 10, 11

  Similar questions can be found in past International GCSE papers, past GCSE papers and on exam wizard.

- The Assessment Objectives indicate that the same percentage of marks will be awarded to AO1, AO2 and AO3 on the Foundation tier as on the Higher tier. However, the marks for AO1 will be allocated so that there is a greater emphasis on Number than on Algebra in the Foundation tier papers and a greater emphasis on Algebra than on Number in the Higher tier papers.
- The number of marks allocated to questions that require problem-solving skills and to questions that require mathematical reasoning will be slightly greater on the Higher tier papers than on the Foundation tier papers.
- At Higher tier each paper will have approximately 40% of the marks distributed evenly over grades 4 and 5 and approximately 60% of the marks distributed evenly over grades 6, 7, 8 and 9. At Foundation tier the marks will be evenly distributed over all five grades.

Understanding problem solving and mathematical reasoning

Students need to be able to demonstrate **problem-solving skills** by translating problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes.

Students need to be able to demonstrate **reasoning skills** by:

- making deductions and drawing conclusions from mathematical information
- constructing chains of reasoning
- presenting arguments and proofs
- interpreting and communicating information accurately.

Questions requiring the use of problem solving and mathematical reasoning are not new to the International GCSE specification. Papers from the previous specification (4MA0 & KMA0), along with papers from the GCSE specifications 1MA0 (linear) and 2MB0 (modular), will be a good source of both of these types of question.

Examples of questions requiring problem-solving skills from 4MA0/KMA0

KMA0 May 2014 Paper 1F Q11

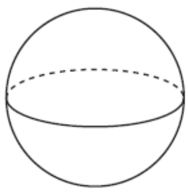
This question requires students to translate a problem in a non-mathematical context into a series of mathematical processes.

> The cost of an adult ticket to a zoo is \$13.50
>
> A teacher buys 4 adult tickets and 24 pupil tickets.
>
> The total cost of the tickets is \$270
>
> Work out the cost, in dollars (\$), of a ticket for one pupil.

KMA0 May 2014 Paper 4H Q21

This question requires students to translate a problem in a mathematical context into a series of mathematical processes.

> A sphere has a surface area of 81π cm^2.
>
> Work out the volume of the sphere.
>
> Give your answer correct to 3 significant figures.



Examples of questions requiring reasoning skills from 4MA0/KMA0

KMA0 May 2014 Paper 1F Q4

This question requires students to demonstrate their reasoning skills in parts (a), (b) and (c) by making a deduction, and in part (d) by presenting an argument.

Here are the first five terms of a number sequence.

10 14 18 22 26

(*a*) Write down the next two terms of the sequence.
(*b*) Explain how you worked out your answer.
(*c*) Find the 12th term of the sequence.
(*d*) Explain why 100 cannot be a term of the sequence.

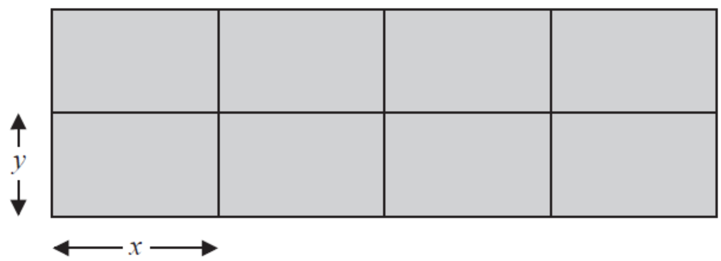
KMA0 May 2014 Paper 3H Q14

This question requires students to demonstrate their reasoning skills by constructing chains of reasoning.

A farmer has 180 metres of fencing.

With the 180 metres of fencing, he makes an enclosure divided into eight equal, rectangular pens.

The fencing is used for the perimeter of each pen.



The length of each pen is x metres and the width of each pen is y metres.

(*a*) (i) Show that $y = 18 - 1.2x$

The total area of the enclosure is A m^2.

(ii) Show that $A = 144x - 9.6x^2$

KMA0 May 2014 Paper 3H Q8

This question requires students to communicate information accurately by showing the required region on the grid.

Show, by shading on the grid, the region defined by all three inequalities

$x + 2y \leq 8$

$x \geq 2$

$y \geq 1$

Label your region **R**.

What is new in this specification is the weighting given to the number of marks from questions requiring problem-solving skills and mathematical reasoning skills to ensure consistency from one examination series to the next. As shown in the table below, there will be a greater emphasis on problem solving and mathematical reasoning in the Higher tier than in the Foundation tier.

	Problem solving	Mathematical reasoning
Foundation (1F and 2F)	25%	15%
Higher (3H and 4H)	30%	20%

Understanding problem solving

All questions that require problem-solving skills require students to translate the problem into a series of mathematical processes. It will not be clear from the question what these processes are; it will be up to the student to interpret the question and determine the most appropriate method of solution. In some cases there will be choice of different methods of solution.

As with any question, it is important that students do show workings to go with their final answer. It is particularly important in these types of question, which are likely to attract more marks then those testing standard techniques. The majority of problem-solving questions will have all method marks with the final mark allocated to accuracy.

Another area that requires consideration in problem-solving questions is the maintenance of accuracy throughout a solution. Some questions will require a series of processes in which case students should avoid rounding numbers prematurely, only rounding the final answer.

In order to develop problem-solving skills, students need as much practice as possible in solving different types of problem. A good source of problems will be past examination questions on International GCSE and GCSE papers.

Students should be encouraged to share their methods of solution, considering points such as whose method was the more efficient and why.

The following are all examples of questions where problem-solving skills, at varying levels, are required.

SAMs Paper 1F Q6

Rhianna has £25 to spend on plants.

Each plant costs £3.95

She buys as many plants as she can.

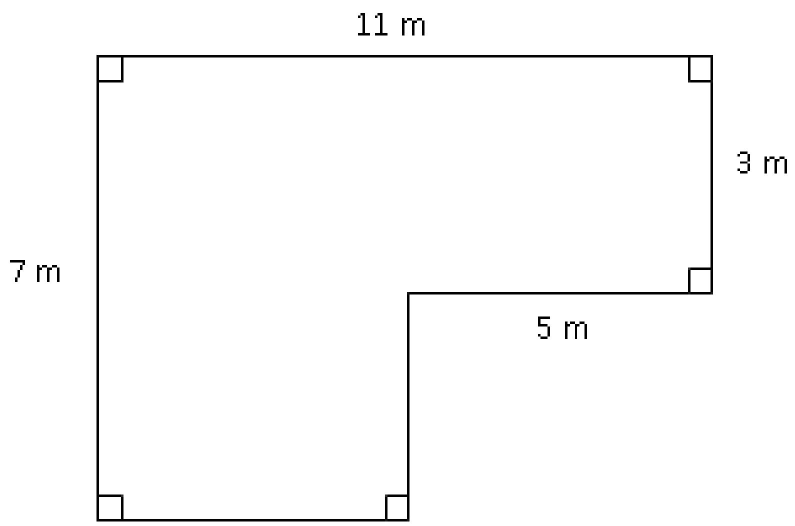
How much change should Rhianna receive from £25?

Mark	Working	Comments
M1	25 ÷ 3.95 (=6.32…)	The first process is to carry out a division; alternative methods such as repeated subtraction or addition would be acceptable but are not always done very accurately. Students should be encouraged to work efficiently and use a calculator when appropriate.
M1	25 – '6' × 3.95	The second process will be for the complete method to find the change. The student is also required to use a whole number of plants in this calculation (their answer to the previous process, rounded down).
A1	1.3(0)	The zero in brackets signifies that either 1.3 or 1.30 is an acceptable answer. (The £ sign is already on the answer line.)

SAMs Paper 2F Q12

The diagram shows the floor plan of a room in Kate's house.

Diagram NOT accurately drawn



Kate is going to cover the floor with tiles.

She is going to buy some packs of tiles.

The tiles in each pack of tiles cover 2 m^2 of floor.

Each pack of tiles costs £24.80

Work out how much it will cost Kate to buy the packs of tiles she needs.

Mark	Working	Comments
M1	5 × 3 (=15) **or** 7 × (11 – 5)(=42) **or** 11 × 7 (=77) **or** 5×(7-3)(=20) **or** 11×3(=33) **or** (11-5)×(7-3)(=24)	The first method mark is for a correct start to find the area of the floor.
M1	5 × 3 + 7 × (11 – 5)(=57) **or** 11 × 7 – 5×(7-3)(=57) **or** 11 × 3 + (11-5)×(7-3)(=57)	The second method mark is then awarded for a complete method to find area.
M1	'57' ÷ 2 (28.5)	The award of this mark depends on the award of at least one previous method mark. As the focus of the problem is on area, students need to be able to show that they understand this and the method to find the area of a rectangle. A common error in problems of this type is for students to use perimeter rather than area.
M1	'29' × 24.8	The final method mark is for both the appreciation that the number of packs of tiles needs to be rounded up to the nearest integer and then multiplied by the cost.
A1	719.20	At the pre-standardisation meeting with examiners, final decisions will be made as to what is acceptable for the answer. The draft mark scheme for this paper shows that, at present, the only acceptable answer is 719.20

SAMs Paper 2F Q22 / Paper 4H Q7

a, *b*, *c* and *d* are 4 integers written in order of size, starting with the smallest integer.

The mean of *a*, *b*, *c* and *d* is 15

The sum of *a*, *b* and *c* is 39

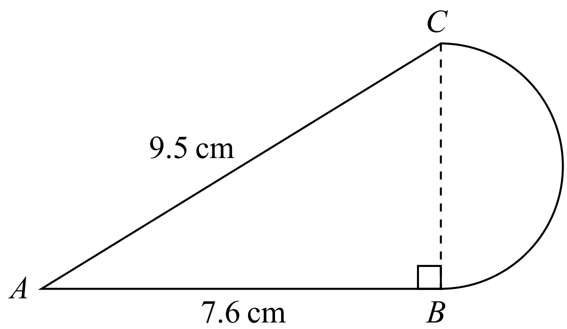
(a) Find the value of *d*.

Given also that the range of *a*, *b*, *c* and *d* is 10

(b) work out the median of *a*, *b*, *c* and *d*.

	Mark	Working	Comments
(a)	M1	4×15 (=60) **or** $\frac{a+b+c+d}{4} = 15$ **or** $4 \times 15 - 39$	The student needs to show some understanding of how a mean is found in order to gain this mark.
	A1	21	
(b)	M1	$d - a = 10$ **or** $a = 11$ **or** $a =$ "21" $- 10$ **or** $b + c = 39 - 11 = 28$	As this part of the question uses the answer from part (a), examiners would be instructed to look at the student's answer to part (a) and follow that through into this part of the question, awarding the first mark for showing an understanding of range.
	A1	14	

SAMs Paper 1F Q25 / Paper 3H Q10



The diagram shows a shape made from triangle *ABC* and a semicircle with diameter *BC*.

Triangle *ABC* is right-angled at *B*.

AB = 7.6 cm and *AC* = 9.5 cm.

Calculate the area of the shape.

Give your answer correct to 3 significant figures.

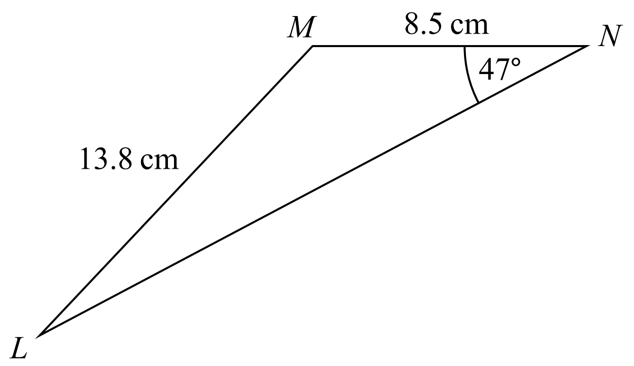
Mark	Working	Comments
M1	$\sqrt{9.5^2 - 7.6^2}$ **or** $\sqrt{90.25 - 57.76}$ **or** $\sqrt{32.49}$ **or** $\sqrt{32.5}$	The first mark here is for demonstrating the correct full process to use Pythagoras' theorem to find the length of the diameter.
A1	(*BC* =) 5.7	

M1	$\frac{1}{2} \times 7.6 \times$ '5.7' **or** 21.6(6) **or** 21.7	In order to access this problem, students need to be able to use Pythagoras' theorem correctly. The subsequent marks for finding the area of the semicircle are all dependent on this ability. This mark is for the correct process to find the area of the triangle.
M1	$\frac{1}{2} \times \pi \times \left(\frac{'5.7'}{2}\right)^2$ **or** 12.7(587...) **or** 12.8	The final method mark is for the correct process to find the area of the semicircle.
A1	34.4	At the standardisation meeting, a final decision will be taken as to what answers will be acceptable. A range is usually given on the mark scheme and any answer within this range is accepted. The instruction 'give your answer correct to 3 significant figures' is for guidance only. Students are advised to give the 'full' calculator answer in their working and then give the final rounded answer on the answer line.

SAMs Paper 4H Q21

Here is triangle *LMN*, where angle *LMN* is an obtuse angle.

Diagram **NOT** accurately drawn



Work out the area of triangle LMN.
Give your answer correct to 3 significant figures.

Mark	Working	Comments
M1	$\frac{\sin 47}{13.8} = 15\ \frac{\sin MLN}{8.5}$	In questions such as this there are frequently many different approaches that students can take. The most common methods will appear on the mark scheme but examiners will have been instructed on how to apply marks to other correct methods. In this question, the first step has to be to find one of the other angles in the triangle. The most direct method is shown here.
M1	$MLN = \sin^{-1}\left(\frac{\sin 47 \times 8.5}{13.8}\right)$	Students will frequently go from the initial statement of the sine rule (or a trigonometric ratio) to the answer without showing the working for this step. In the event that the wrong answer is given, two marks will be lost; students should be encouraged to show all steps in their working.
A1	$MLN = 26.7(73...)$	
M1	$LMN = 180 - 47 -$ '26.7...' or 106(.2260622…)	This mark is awarded for the complete method to find a useful angle.
M1	$\frac{1}{2} \times 8.5 \times 13.8 \times \sin(\text{"106"})$	The final method mark is for the complete method for finding the area of the triangle.
A1	56.3	

Understanding mathematical reasoning

Questions testing students' mathematical reasoning skills can take a number of different forms. These types of question include those testing the ability to:

- make deductions and draw conclusions
  E.g. extend a sequence, make an inference from given statistical information
- construct a chain of reasoning
  E.g. show all the steps when solving an equation
- present an argument or proof
  E.g. explain why a number is or is not in a sequence, give geometric reasons alongside a solution, give an algebraic proof
- interpret and communicate information accurately
  E.g. graph drawing, take a reading from a graph.

When answering questions with instructions such as 'Show that', 'Prove that', 'Show clear algebraic working', students must show all steps in their working; failure to do so could result in the loss of all marks even if the answer given is correct. When working with graphs students should take particular note of the scales given on the axes as these may be different. Errors often arise when readings from axes are taken; taking the simple step of drawing on vertical and horizontal lines on graphs to show where readings are obtained can help in this regard.

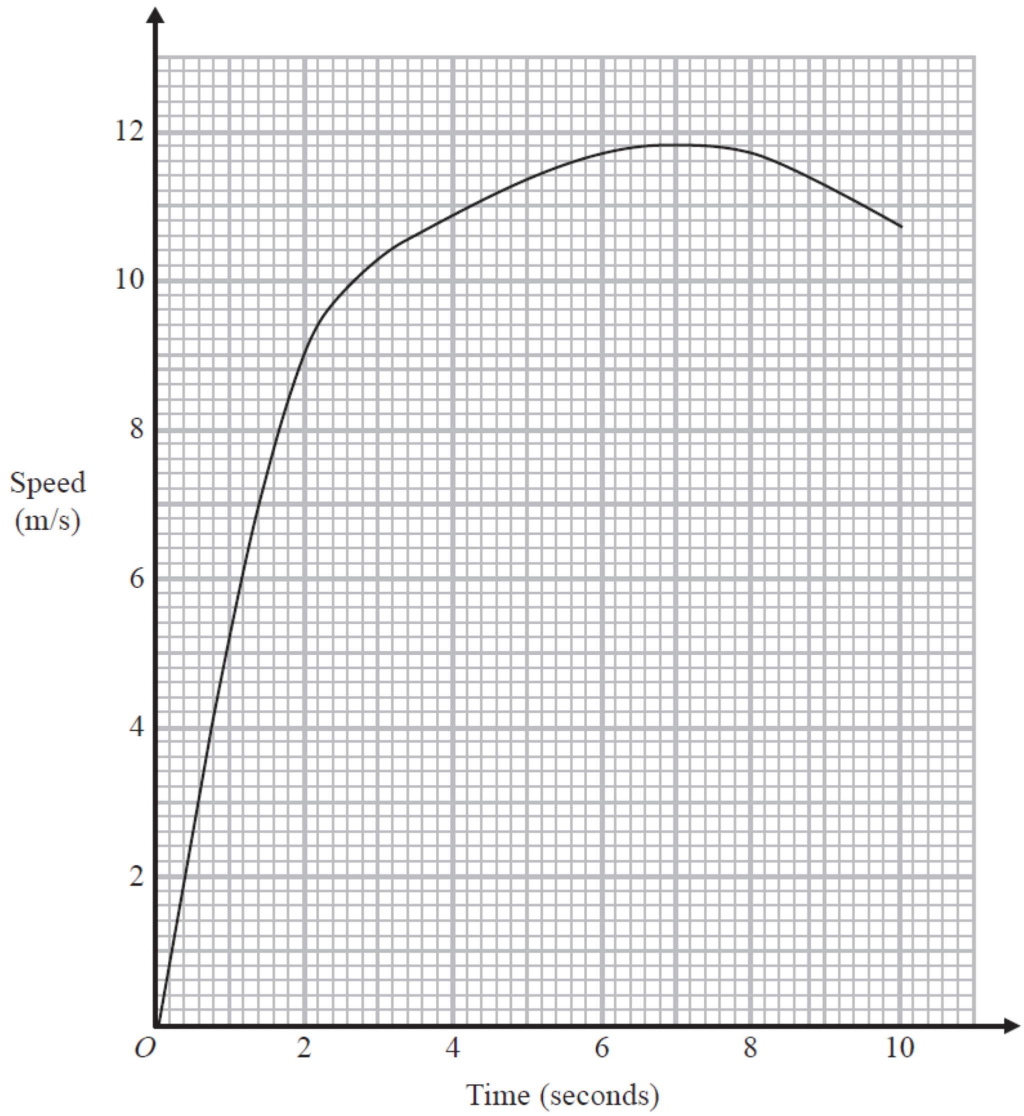
Having the correct equipment in the examination – protractor, ruler and pair of compasses – is also essential. Students should also practise using such equipment prior to the examination, particularly protractors where the wrong scale is frequently used.

The following are all examples of questions where reasoning skills, at varying levels, are required.

SAMs Paper 2F Q5

Jason runs in a race.

The graph shows his speed, in metres per second (m/s), during the first 10 seconds of the race.



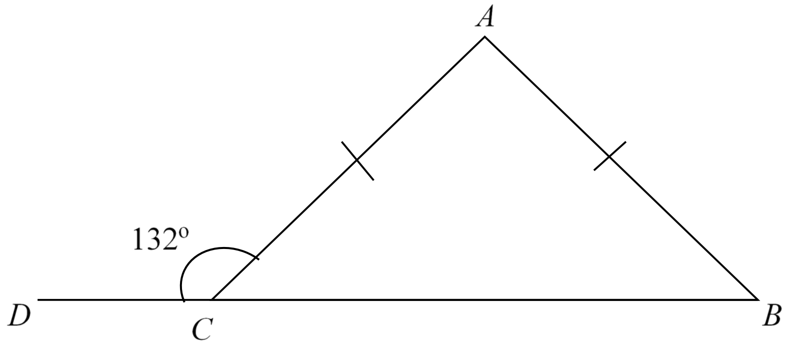
(a) Write down Jason's speed at 2 seconds.

(b) Write down Jason's greatest speed.

(c) Write down the time at which Jason's speed was 3 m/s.

	Mark	Working	Comments
(a)	B1	9	This is a low demand question that is testing the ability of students to read from graphs.
(b)	B1	11.8	This part of the question requires students to interpret the graph to find the greatest speed.
(c)	B1	0.6	The final part of the question again tests accuracy of reading from the graph and also the interpretation of the scale.

SAMs Paper 1F Q9



ABC is an isosceles triangle.

DCB is a straight line.

AC = *AB*.

Angle *DCA* = 132°

Work out the size of angle *CAB*.

Give a reason for each stage in your working.

Mark	Working	Comments
M1	180 – 132 (=48)	The first three marks are for finding the correct value for the angle. In order to do this the student is making deductions. The first mark is for a correct first step.
M1	180 – 2 ×'48'	The award of the second method mark is for a complete method to find the required angle.
A1	84	
B2	Angles in a triangle sum to 180°, base angles of an isosceles triangle are equal, angles on a straight line sum to 180° (B1 for any correct reason)	In questions of this type students would be well advised to write a reason alongside each stage in their working. Correct language should be used. Credit will be given for any correct method and the reasons that support it.

SAMs Paper 1F Q12

On the grid, draw the graph of $y = 3x - 4$ for values of x from –2 to 3

Mark	Working	Comments
B4	For a correct line between $x = -2$ and $x = 3$	Full marks are awarded for the correct graph.
B3	For a correct straight line segment through at least 3 of (–2, –10) (–1, –7) (0, –4) (1, –1) (2, 2) (3, 5) **OR** for all of (–2, –10) (–1, –7) (0, –4) (1, –1) (2, 2) (3, 5) plotted but not joined	A common error is for students to plot a number of points but then to forget to join these with a straight line. Another common error is to have the line correct for the positive values of x and then make errors when working with the negative values of x.
B2	For at least 2 correct points plotted **OR** for a line drawn with a positive gradient through (0, –4) and clear intention to use of a gradient of 3 eg. a line through (0, -4) and (0.5, –1)	Some students will attempt to use the gradient and y- axis intercept to draw their graph. This is a perfectly acceptable method. but when the scales on the two axes are different this can cause problems.
B1	For at least 2 correct points stated (may be in a table) **OR** for a line drawn with a positive gradient through (0, –4) **but not** a line joining (0, –4) and (3, 0) **OR** a line with gradient 3	An appropriate starting point for this type of question would be for students to draw up their own table of values; using the values of x as given in the question and working out the corresponding values of y.

SAMs Paper 2F Q19d / Paper 4H Q4e

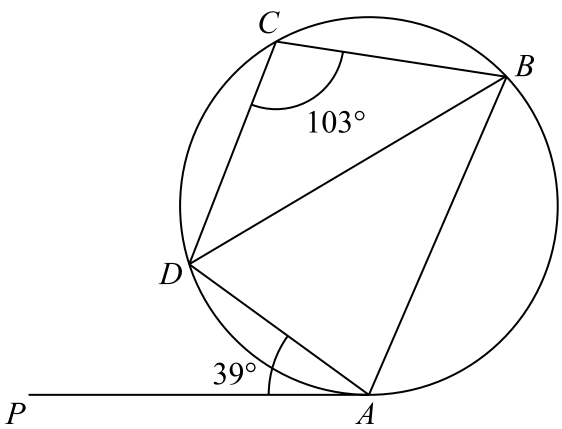
Solve $5(x + 7) = 2x - 10$

Show clear algebraic working.

Mark	Working	Comments
M1	$5x + 35 = 2x - 10$ or $= x + 7 = \frac{2x}{5} - \frac{10}{5}$	The first mark is for removing bracket or dividing all terms by 5
M1	eg. $5x - 2x = -10 - 35$ or $7 + = \frac{10}{5} - \frac{2x}{5} + x$	The second method mark is for isolating x terms in a correct equation. Although these are method marks, when the process is algebraic, accuracy is demanded as well.
A1	–15	When instructions such as ‘Show clear algebraic working’ appear in questions, students must do just that. In this question if an answer appears either without algebraic working or with a trial and improvement method, no marks will be awarded even if the answer given is correct.

SAMs Paper 3H Q16

Diagram **NOT** accurately drawn



A, *B*, *C* and *D* are points on a circle.

PA is a tangent to the circle.

Angle *PAD* = 39°

Angle *BCD* = 103°

Calculate the size of angle *ADB*.

Give a reason for each stage of your working.

Mark	Working	Comments
M1	180 – 77 – 39 **or** ∠ *BAD* = 77° **and** ∠ *ABD* = 39° **or** ∠ *BA* "*X*" = 64° where *X* is on *PA* produced **or** a fully correct method to find angle *ADB*	The first mark is awarded for a correct first step; the most common method will be shown in the mark scheme but other correct approaches will be accepted.
A1	64	
B1	Opposite angles in a cyclic quadrilateral add up to 180°	When a question involves circle theorems at least one of the marks for reasons will be for stating a correct circle theorem that has been used.
B1	Alternate segment theorem oe	

SAMs Paper 3H Q18

Show that $3 - (x - 1) \times \left(\frac{x^2 - 1}{3x + 2}\right)$ can be written as $\frac{a}{x + b}$ where a and b are integers.

Mark	Working	Comments
M1	$(x - 1) \times \left(\frac{3x + 2}{x^2 - 1}\right)$	Correct method for division. This may not be the first step seen. In many questions involving algebraic manipulation, marks can be awarded in a different order.
M1	$(x + 1)(x - 1)$	Correct factorisation of $x^2 - 1$
M1	eg $\frac{3(x + 1)\ (3x + 2)}{(x + 1)}$	Correct single fraction
A1	$\frac{1}{x + 1}$	This question includes the phrase 'Show that'; this is an indication that all stages in the process must be shown. As with all questions involving algebraic manipulation, accuracy is also a feature ; any loss of accuracy will be penalised with the loss of all subsequent marks.

Content guidance

Assessment

There are three Assessment Objectives (AOs) for this qualification.

Assessment Objective	Weighting
Number and algebra (AO1)	57 – 63%
Shape, space and measure (AO2)	22 – 28%
Handling data (A03)	12 – 18%

These AOs are further broken down into a total of six different sections in the specification as detailed below. For the Foundation tier, the number of marks for AO1 is split between number and algebra in the ratio 3 : 2 , this changes for the Higher tier to 1 : 2. There is therefore a greater emphasis on number than on algebra at Foundation tier, which is reversed at Higher tier.

On both Foundation and Higher tier, assessment will be through a number of different question types. These will include, for example, short numerical answers, questions covering standard techniques, longer numerical answer requiring problem-solving skills, graph drawing, accurate drawings, questions requiring reasoning. There will be a mix of different question types on each tier. Question types will be similar to those on the previous specification, although there will be a slight increase in the number of questions targeting problem solving as well as questions targeting reasoning, interpretation and communication.

On both tiers the papers will be ramped, i.e. the first questions on the papers will be the those targeted at the lowest grades on the paper with demand increasing through the paper, with the more demanding questions at the end. There will be a number of common questions targeted at the overlap grades of 4 and 5; these will typically be placed towards the end of the Foundation tier paper and towards the beginning of the Higher tier paper.

Content – what's changed?

The content of this specification is very similar to that of KMA0 and 4MA0. The main difference is that some topics have now moved so that they can be assessed on the Foundation tier papers as well as on the Higher tier papers. There is also some new content at Higher tier. Full details of the new content at each tier are given below.

Foundation Tier

The amount of content on the Foundation tier has increased in order to accommodate the award of grade 5. New content is identified below for each section of the specification. The majority of the new content was previously assessed on the Higher tier only. Past papers for the Higher tier for 4MA0 will be a good source of practice questions for these topics. The exception is the introduction of density and pressure (4.4 Measures), which is new to both tiers.

A formulae sheet will still be provided on page 2 of the examination paper. Please note that any reference to Pythagoras' theorem and the trigonometric ratios has been deleted from the formula sheet; students are expected to know these.

In all tables, wording that has been added into a section has been underlined; where a completely new section has been added no underlining has been used.

Numbers and the number system (AO1)

This section covers all the basic number skills needed in 'everyday' life from arithmetic through to ratio, proportion and percentages.

Content requirement

	Students should be taught to:	**Notes**
1.1 Integers	**A** understand and use integers (positive, negative and zero)	
	B understand place value	
	C use directed numbers in practical situations	e.g. temperatures
	D order integers	
	E use the four rules of addition, subtraction, multiplication and division	
	F use brackets and the hierarchy of operations	
	G use the terms 'odd', 'even', 'prime numbers', 'factors' and 'multiples'	
	H identify prime factors, common factors and common multiples	
1.2 Fractions	**A** understand and use equivalent fractions, simplifying a fraction by cancelling common factors	$\frac{8}{60} = \frac{2}{15}$ in its simplest form (lowest terms)
	B understand and use mixed numbers and vulgar fractions	
	C identify common denominators	
	D order fractions and calculate a given fraction of a given quantity	
	E express a given number as a fraction of another number	
	F use common denominators to add and subtract fractions and mixed numbers	$\frac{2}{3} + \frac{5}{7}$, $3\frac{1}{5} - 2\frac{2}{3}$
	G convert a fraction to a decimal or a percentage	$\frac{3}{5} = 0.6 = 60\%$ $\frac{4}{9} = 0.4444... = 44.4\%$

	Students should be taught to:	Notes
1.2 Fractions	**H** understand and use unit fractions as multiplicative inverses	$3 \div 5 = 3\frac{1}{5}$
	I and divide fractions and mixed numbers	$\frac{2}{3} + \frac{5}{7}$, $3\frac{1}{5} \div 2\frac{2}{3}$
1.3 Decimals	**A** use decimal notation	
	B understand place value	
	C order decimals	
	D convert a decimal to a fraction or a percentage	Terminating decimals only
	E recognise that a terminating decimal is a fraction	$0.65 = \frac{65}{100} = \frac{13}{20}$
1.4 Powers and roots	**A** identify square numbers and cube numbers	
	B calculate squares, square roots, cubes and cube roots	
	C use index notation and index laws for multiplication and division of positive and negative integer powers including zero	
	D express integers as a product of powers of prime factors	$720 = 2^4 \times 3^2 \times 5$
	E find highest common factors (HCF) and lowest common multiples (LCM)	
1.5 Set language and notation	**A** understand the definition of a set	
	B use the set notation $\cup$, $\cap$ and $\in$ and $\notin$	
	C understand the concept of the universal set and the empty set and the symbols for these sets	$\mathscr{E}$ = universal set $\varnothing$ = empty set
	D understand and use the complement of a set	Use the notation A'
	E use Venn diagrams to represent sets	
1.6 Percentages	**A** understand that 'percentage' means 'number of parts per 100'	
	B express a given number as a percentage of another number	
	C express a percentage as a fraction and as a decimal	
	D understand the multiplicative nature of percentages as operators	15% of $120 = \frac{15}{100} \times 120$
	E solve simple percentage problems, including percentage increase and decrease	
	F use reverse percentages	In a sale, prices were reduced by 30%. The sale price of an item was £17.50 Calculate the original price of the item.
	G use compound interest and depreciation	

	Students should be taught to:	Notes
1.7 Ratio and proportion	**A** use ratio notation, including reduction to its simplest form and its various links to fraction notation	Express in the form $1 : n$
	B divide a quantity in a given ratio or ratios	Share £416 in the ratio $5 : 3$ or $4 : 3 : 1$
	C use the process of proportionality to evaluate unknown quantities	
	D calculate an unknown quantity from quantities that vary in direct proportion	s varies directly as t Find the missing value in a table
	E solve word problems about ratio and proportion	Including maps and scale diagrams
1.8 Degree of accuracy	**A** round integers to a given power of 10	
	B round to a given number of significant figures or decimal places	
	C identify upper and lower bounds where values are given to a degree of accuracy	
	D use estimation to evaluate approximations to numerical calculations	By rounding values to 1 significant figure
1.9 Standard form	**A** calculate with and interpret numbers in the form $a \times 10^n$ where n is an integer and $1 \leqslant a < 10$	$150\,000\,000 = 1.5 \times 10^8$
1.10 Applying number	**A** use and apply number in everyday personal, domestic or community life	
	B carry out calculations using standard units of mass, length, area, volume and capacity	Metric units only
	C understand and carry out calculations using time, and carry out calculations using money, including converting between currencies	
1.11 Electronic calculators	**A** use a scientific electronic calculator to determine numerical results	

Content new to this section

1.2 Fractions	**F**	use common denominators to add and subtract fractions <u>**and mixed numbers**</u>
	I	multiply and divide fractions <u>**and mixed numbers**</u>

In this table, bold and underlined words indicate new content.

Arithmetic of fractions has always been assessed on the Foundation tier. The phrase 'and mixed numbers' has been included to aid clarity. In order to accommodate the fact that candidates have access to a calculator in both papers, there will always be a requirement to show full working in questions testing straightforward arithmetic as fractions. This has always been the case in the International GCSE. Where the arithmetic of fractions is needed in a more complex problem, unless otherwise stated, candidates will be permitted to use their calculators.

Example assessment of this topic from SAMs

SAMs Paper 2F Q25 / Paper 4H Q10 (part (b) only)

(a) Show that $\frac{5}{9}+\frac{1}{6}=\frac{13}{18}$	(2)
(b) Show that $4\frac{2}{3} \div 3\frac{5}{9} = 1\frac{5}{16}$	(3)

1.3 Decimals	**B**	**understand place value**

'Understand place value' has been added in as 1.3B to clarify that candidates are expected to be able to write down the value of, for example, the digit 3 in the number 24.536

1.4 Powers and roots	**C**	use index notation and index laws for multiplication and division of positive **and negative** integer powers **including zero**
	E	find highest common factors (HCF) and lowest common multiples (LCM)

The use of negative powers (including zero) is now a feature of the Foundation tier. Candidates may, for example, be asked to simplify $5^{-6} \times 5^{2}$ and give their answer as a power of 5

Candidates may be asked to find the LCM and/or HCF of either two of three numbers. As the use of Venn diagrams to represent sets is on the Foundation tier, centres may wish to combine these topics along with writing a number of the product of its prime factors.

Example assessment of this topic from SAMs

SAMs Paper 2F Q16 / Paper 4H Q1

Find the lowest common multiple (LCM) of 20, 30 and 45	(3)

1.5 Set language and notation	**D**	understand and use the complement of a set
	E	use Venn diagrams to represent sets

At Foundation tier, candidates are now expected to be able to use Venn diagrams to represent sets. The use of set language and notation has been extended to include, for example, the use of A' for the complement of set A.

1.6 Percentages	**F**	use reverse percentages
	G	use compound interest and depreciation

Work on percentages at Foundation tier has been extended to include compound interest and depreciation as well as reverse percentages.

Example assessment of this topic from SAMs

SAMs Paper 2F Q23 / Paper 4H Q8

Kwo invests HK$40 000 for 3 years at 2% per year compound interest.	
Work out the value of the investment at the end of 3 years.	(3)

The question below is of a type that has featured on Foundation tier papers in the past. More demanding questions can now be set on this topic. For example, in the question below the sale price rather than the price reduction could be given with the same demand.

Example assessment of this topic from SAMs

SAMs Paper 1F Q23 / Paper 3H Q8

In a sale, all normal prices are reduced by 15%	
The normal price of a mixer is reduced by 22.50 dollars.	
Work out the normal price of the mixer.	(3)

1.9 Standard form	**A** Solve Problems involving standard form	calculate with and interpret numbers in the form $a \times 10^n$ where n is an integer and $1 \times a < 10$

Standard form is a completely new topic on the Foundation tier. Candidates will be expected to able to convert between ordinary numbers and numbers in standard form. They will also need to be able to order numbers in standard form, this could be done by conversion to ordinary numbers. As candidates have access to a calculator in both examination papers, it would be appropriate to teach candidates how to use their calculator for calculations in standard form.

Example assessment of this topic from SAMs

SAMs Paper 1F Q24 / Paper 3H Q9

The table shows the diameters, in kilometres, of five planets.

Planet	**Diameter (km)**
Venus	1.2×10^4
Jupiter	1.4×10^5
Neptune	5.0×10^4
Mars	6.8×10^3
Saturn	1.2×10^5

(a) Write 1.4×10^5 as an ordinary number. (1)

(b) Which of these planets has the smallest diameter? (1)

(c) Calculate the difference, in kilometres, between the diameter of Saturn and the diameter of Neptune.

Give your answer in standard form. (2)

Equations, formulae and identities (AO1)

This section covers the basics of algebra. Some questions will cover straightforward algebraic processes and techniques whilst there may be scope for producing solutions to other questions by forming and solving linear equations.

Content requirement

	Students should be taught to:	Notes
2.1 Use of symbols	**A** understand that symbols may be used to represent numbers in equations or variables in expressions and formulae	
	B understand that algebraic expressions follow the generalised rules of arithmetic	
	C use index notation for positive and negative integer powers (including zero)	
	D use index laws in simple cases	
2.2 Algebraic manipulation	**A** evaluate expressions by substituting numerical values for letters	
	B collect like terms	
	C multiply a single term over a bracket	
	D take out common factors	
	E expand the product of two simple linear expressions	
	F understand the concept of a quadratic expression and be able to factorise such expressions (limited to $x^2 + bx + c$)	

2.3 Expressions and formulae	**A** understand that a letter may represent an unknown number or a variable	
	B use correct notational conventions for algebraic expressions and formulae	
	C substitute positive and negative integers, decimals and fractions for words and letters in expressions and formulae	Evaluate $2x - 3y$ when $x = 4$ and $y = -5$
	D use formulae from mathematics and other real-life contexts expressed initially in words or diagrammatic form and convert to letters and symbols	
	E derive a formula or expression	
	F change the subject of a formula where the subject appears once	Make r the subject of $A = \pi r^2$ Make t the subject of $v = u + at$
2.4 Linear equations	**A** solve linear equations, with integer or fractional coefficients, in one unknown in which the unknown appears on either side or both sides of the equation	$5x + 8 = 12$ $7(x + 3) = 5x - 8$ $\frac{4x + 5}{2} = 3$
	B set up simple linear equations from given data	The three angles of a triangle are $a°$, $(a + 10)°$, $(a + 20)°$. Find the value of a
2.5 Proportions	**Higher Tier Only**	
2.6 Simultaneous linear equations	**A** calculate the exact solution of two simultaneous equations in two unknowns	$x + y = 14$, $x - y = 2$ $2a + 5b = 12$, $3a + b = 5$
2.7 Quadratic equations	**A** solve quadratic equations by factorisation (limited to $x2 + bx + c = 0$)	Solve $x2 + x - 30 = 0$
2.8 Inequalities	**A** understand and use the symbols $>, <, \geqslant$ and $\leqslant$	To include double- ended inequalities, e.g. $1 < x \leqslant 5$
	B understand and use the convention for open and closed intervals on a number line	
	C solve simple linear inequalities in one variable and represent the solution set on a number line	$3x - 2 < 10$, so $x < 4$ $7 - x \leqslant 5$, so $x \geqslant 2$ $3 < x + 2 \leqslant 5$ so $1 < x \leqslant 3$
	D represent simple linear inequalities on rectangular Cartesian graphs	Shade the region defined by the inequalities $x \geqslant 0$, $y \geqslant 1$, $x + y \leqslant 5$
	E identify regions on rectangular Cartesian graphs defined by simple linear inequalities	Conventions for the inclusion of boundaries are not required

Content new to this section

2.1 Use of symbols	**C**	use index notation for positive <u>and negative</u> integer powers (<u>including zero</u>)

The testing of the index laws (see 1.4C) could be through using variables raised to a power as in the question below.

<u>Example assessment of this topic from SAMs</u>

SAMs Paper 2F Q19 / Paper 4H Q4

(a) Simplify $p^5 \times p^4$	(1)
(b) Simplify $(m^4)^{-3}$	(1)
(c) Write down the value of c^0	(1)

2.2 Algebraic manipulation	**D**	take out common factors
	F	understand the concept of a quadratic expression and be able to factorise such expressions (limited to $x^2 + bx + c$)

The previous specification limited taking out common factors to a single common factor, for example factorise $3x + 12$. This restriction has now been removed so candidates could be required to factorise an expression fully, as shown in the example below.

<u>Example assessment of this topic from SAMs</u>

SAMs Paper 1F Q21a / Paper 3H Q6a

Factorise fully $18e^3f + 45e^2f^4$	(2)

In the previous specification candidates were expected to be able to expand the product of two linear brackets. This has now been extended into the requirement to be able to factorise the resulting quadratic function. This also extends further into solving a quadratic equation by factorising.

For example, factorise $x^2 + {}^2x - 15$, factorise $x^2 - 25$

2.3 Expressions and formulae	**F**	change the subject of a formula where the subject appears once

Questions requiring a change of subject will be limited to those where the subject appears once only. For example, make r the subject of $t = 2r + 7$; make p the subject of $m = 3p^2$

2.6 Simultaneous linear equations	**A**	calculate the exact solution of two simultaneous equations in two unknowns

In 2.6, the word 'simple' has been deleted, as in the previous specification the requirement was to 'solve two simple simultaneous equations'. Therefore, questions such as the one shown below can now be asked. The requirement to show clear algebraic working will still be present. This means that candidates will have to use an algebraic approach in their solutions. Correct answers without any supporting algebraic working will not score any marks.

Example assessment of this topic from SAMs

SAMs Paper 2F Q24 / Paper 4H Q9

Solve the simultaneous equations

$$3x + y = 13$$

$$x - 2y = 9$$

Show clear algebraic working. (3)

2.7 Quadratic expressions	**A**	solve quadratic equations by factorisation (limited to $x^2 + bx + c = 0$)

In conjunction with the requirement in 2.2F to factorise quadratic expressions, candidates are expected to able to use this technique to solve quadratic equations.

Example assessment of this topic from SAMs

SAMs Paper 1F Q21b / Paper 3H Q6b

Solve $x^2 - 4x - 12 = 0$

Show clear algebraic working. (3)

Sequences, functions and graphs (AO1)

This section covers the basics of sequences. Some questions will cover straightforward algebraic processes and techniques whilst there may be scope for producing solutions to other questions by forming and solving linear equations.

Content requirement

	Students should be taught to:	Notes
3.1 Sequences	**A** generate terms of a sequence using term-to-term and position-to-term definitions of the sequence	Including odd, even, squares, multiples and powers
	B find subsequent terms of an integer sequence and the rule for generating it	5, 9, 13, 17, … (add 4) 1, 2, 4, 8, … (multiply by 2)
	C use linear expressions to describe the *n*th term of arithmetic sequences	1, 3, 5, 7, 9… *n*th term is $2n - 1$ *n*th term is $4n + 3$, write down the first 3 terms of the sequence
3.2 Function notation	**Higher tier only**	
3.3 Graphs	**A** interpret information presented in a range of linear and non-linear graphs	To include speed/time and distance/time graphs
	B understand and use conventions for rectangular Cartesian coordinates	
	C plot points (x, y) in any of the four quadrants or locate points with given coordinates	
	D determine the coordinates of points identified by geometrical information	
	E determine the coordinates of the midpoint of a line segment, given the coordinates of the two end points	
	F draw and interpret straight line conversion graphs	To include currency conversion graphs
	G find the gradient of a straight line	gradient = (increase in y) ÷ (increase in x)
	H recognise that equations of the form $y = mx + c$ are straight line graphs with gradient m and intercept on the y-axis at the point $(0, c)$	Write down the gradient and coordinates of the y intercept of $y = 3x + 5$; Write down the equation of the straight line with gradient 6 that passes through the point (0, 2)
	I recognise, generate points and plot graphs of linear and quadratic functions	To include $x = k$, $y = c$, $y = x$, $y - x = 0$ Including completion of values in tables and equations of the form $ax + by = c$
3.4 Calculus	**Higher Tier only**	

Content new to this section

3.1 Sequences	**C**	use linear expressions to describe the *n*th term of arithmetic sequences

Candidates entering the Foundation tier can now be asked to describe the *n*th term of arithmetic sequences. This has long been a requirement on the Higher tier where many example questions can be found.

Example assessment of this topic from SAMs

SAMs Paper 2F Q17 / Paper 4H Q2

The first four terms of an arithmetic sequence are

2 9 16 23

Write down an expression, in terms of n, for the nth term. (2)

3.3 Graphs	**H**	recognise that equations of the form $y = mx + c$ are straight line graphs with gradient m and intercept on the y-axis at the point $(0, c)$
	I	recognise, generate points and plot graphs of linear and quadratic functions

The requirement in 3.3H has been extended so that candidates could, for example, be asked to write down the gradient and the coordinates of the *y*-axis intercept of the graph of y = 3x + 4. The inclusion of the word ‘recognise’ in 3.3I means that candidates could, for example, be given the graphs of several linear functions and then be asked to identify which of these is the graph of $y = 2x + 1$

Geometry and trigonometry (AO2)

This section covers the basics of geometry and trigonometry. Some questions will cover straightforward processes and techniques whilst there may be more challenging problem-solving style questions or some involving mathematical reasoning.

Content requirement

	Students should be taught to:	Notes
4.1 Angles, lines and triangles	**A** distinguish between acute, obtuse, reflex and right angles	
	B use angle properties of intersecting lines, parallel lines and angles on a straight line	Angles at a point, vertically opposite angles, alternate angles, corresponding angles, allied angles
	C understand the exterior angle of a triangle property and the angle sum of a triangle property	
	D understand the terms 'isosceles', 'equilateral' and 'right-angled triangles' and the angle properties of these triangles	
4.2 Polygons	**A** recognise and give the names ofpolygons	To include parallelogram, rectangle, square, rhombus, trapezium, kite, pentagon, hexagon and octagon
	B understand and use the term 'quadrilateral' and the angle sum property of quadrilaterals	The four angles of a quadrilateral are 90°, $(x + 15)°$, $(x +25)°$ and $(x + 35)°$ Find the value of x
	C understand and use the properties of the parallelogram, rectangle, square, rhombus, trapezium and kite	
	D understand the term 'regular polygon' and calculate interior and exterior angles of regular polygons	
	E understand and use the angle sum of polygons	For a polygon with n sides, the sum of the interior angles is $(2n – 4)$ right angles
	F understand congruence as meaning the same shape and size	
	G understand that two or more polygons with the same shape and size are said to be congruent to each other	
4.3 Symmetry	**A** identify any lines of symmetry and the order of rotational symmetry of a given two-dimensional figure	Name a quadrilateral with no lines of symmetry and order of rotational symmetry of 2

	Students should be taught to:	Notes
4.4 Measures	**A** interpret scales on a range of measuring instruments	
	B calculate time intervals in terms of the 24-hour and the 12-hour clock	Use am and pm
	C make sensible estimates of a range of measures	
	D understand angle measure including three-figure bearings	
	E measure an angle to the nearest degree	
	F understand and use the relationship between average speed, distance and time	
	G use compound measure such as speed, density and pressure	Formula for pressure will be given
4.5 Construction	**A** measure and draw lines to the nearest millimetre	
	B construct triangles and other two-dimensional shapes using a combination of a ruler, a protractor and compasses	
	C solve problems using scale drawings	
	D use straight edge and compasses to: (i) construct the perpendicular bisector of a line segment (ii) construct the bisector of an angle	
4.6 Circle properties	**A** recognise the terms 'centre', 'radius', 'chord', 'diameter', 'circumference', 'tangent', 'arc', 'sector' and 'segment' of a circle	
	B understand chord and tangent properties of circles	Two tangents from a point to a circle are equal in length Tangents are perpendicular to the radius at the point of contact. The line from the centre of a circle which is perpendicular to a chord bisects the chord (and the converse)
4.7 Geometrical reasoning	**A** give informal reasons, where required, when arriving at numerical solutions to geometrical problems	Reasons will only be required for geometrical calculations based on lines (including chords and tangents), triangles or polygons

	Students should be taught to:	Notes
4.8 Trigonometry and Pythagoras' theorem	**A** know, understand and use Pythagoras' theorem in two dimensions	
	B know, understand and use sine, cosine and tangent of acute angles to determine lengths and angles of aright-angled triangle	
	C apply trigonometrical methods to solve problems in two dimensions	To include bearings
4.9 Mensuration of 2-D shapes	**A** convert measurements within the metric system to include linear and area units	e.g. cm^2 to m^2 and vice versa
	B find the perimeter of shapes made from triangles and rectangles	
	C find the area of simple shapes using the formulae for the areas of triangles and rectangles	
	D find the area of parallelograms and trapezia	
	E find circumferences and areas of circles using relevant formulae; find perimeters and areas of semicircles	
4.10 3-D shapes and volume	**A** recognise and give the names of solids	To include cube, cuboid, prism, pyramid, cylinder, sphere and cone
	B understand the terms 'face', 'edge' and 'vertex' in the context of 3-D solids	
	C find the surface area of simple shapes using the area formulae for triangles and rectangles	
	D find the surface area of a cylinder	
	E find the volume of prisms, including cuboids and cylinders, using an appropriate formula	
	F convert between units of volume within the metric system	e.g. cm^3 to m^3 and vice versa and 1 litre = 1000 cm^3
4.11 Similarity	**A** understand and use the geometrical properties that similar figures have corresponding lengths in the same ratio but corresponding angles remain unchanged	
	B use and interpret maps and scale drawings	

Content new to this section

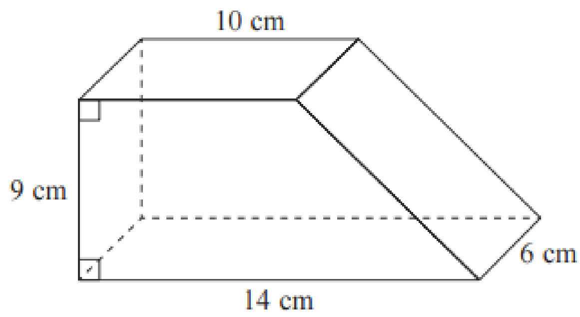
4.4 Measure	**G**	use compound measure such as speed, density and pressure

The use of density and pressure are new additions to the specification. The formula for pressure will be given in any question where this is needed; the formulae for speed and density will **not** be given. The question from the SAMs shown below is a more demanding question testing knowledge of density in a problem.

Example assessment of this topic from SAMs

SAMs Paper 2F Q18 / Paper 4H Q3

Diagram **NOT** accurately drawn



The diagram shows a solid prism.

The cross section of the prism is a trapezium.

The prism is made from wood with density 0.7 g/cm^3

Work out the mass of the prism. (4)

4.8 Trigonometry and Pythagoras' theorem	**A**	know, understand and use Pythagoras' theorem in two dimensions
	B	know, understand and use sine, cosine and tangent of acute angles to determine lengths and angles of a right-angled triangle

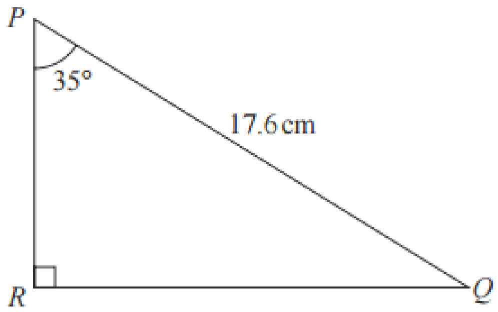
The inclusion of the word 'know' in both 4.8A and 4.8B is an indication that all reference to Pythagoras' theorem and the trigonometric ratios has been deleted from the formula sheet; candidates are now expected to know and be able to use the relevant formulae. The style of question shown below is consistent with that seen in the previous specification. Question 25 from Paper 1F, shown in the following section, shows how the use of Pythagoras' theorem can be incorporated into a problem solving type question.

Example assessment of this topic from SAMs

SAMs Paper 1F Q22 / Paper 3H Q7

Calculate the length of *PR*.

Diagram **NOT** accurately drawn



Give your answer correct to 3 significant figures. (3)

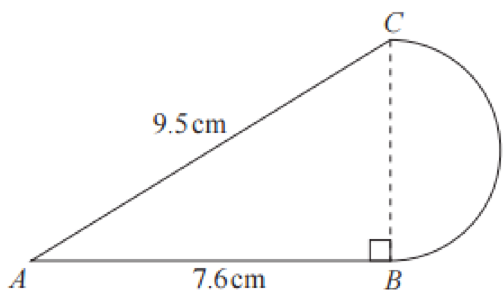
4.9 Mensuration of 2-D shapes	**E**	find circumferences and areas of circles using relevant formulae; find perimeters and areas of semicircles

The work on circles expected in the previous specification has been extended at Foundation tier to include semicircles. The example question below shows the need to find the area of a semicircle where the radius has first to be calculated.

Example assessment of this topic from SAMs

Paper 1F Q25 / Paper 3H Q10

Diagram **NOT** accurately drawn



The diagram shows a shape made from triangle *ABC* and a semicircle with diameter *BC*.

Triangle *ABC* is right-angled at *B*.

AB = 7.6 cm and *AC* = 9.5 cm.

Calculate the area of the shape.

Give your answer correct to 3 significant figures. (5)

Vectors and transformation geometry (AO2)

Content requirement

	Students should be taught to:	Notes
5.1 Vectors	Higher Tier only	
5.2 Transformation geometry	**A** understand that rotations are specified by a centre and an angle	
	B rotate a shape about a point through a given angle	
	C recognise that an anticlockwise rotation is a *positive* angle of rotation and a clockwise rotation is a *negative* angle of rotation	
	D understand that reflections are specified by a mirror line	Such as $x = 1$, $y = 2$, $y = x$, $y - x = 0$
	E construct a mirror line given an object and reflect a shape given a mirror line	e.g. reflect a triangle in the line $y = x$
	F understand that translations are specified by a distance and direction	
	G translate a shape	
	H understand and use column vectors in translations	
	I understand that rotations, reflections and translations preserve length and angle so that a transformed shape under any of these transformations remains congruent to the original shape	
	J understand that enlargements are specified by a centre and a scale factor	Positive scale factor only (including fractions)
	K understand that enlargements preserve angles and not lengths	
	L enlarge a shape given the scale factor	With or without a centre given
	M identify and give complete descriptions of transformations	

Content new to this section

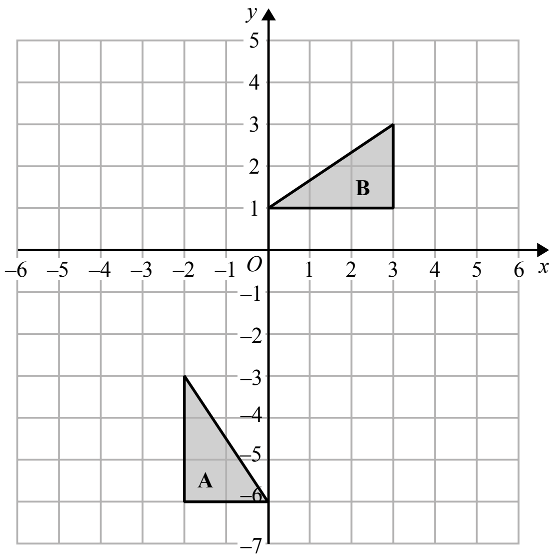
5.2 Transformation geometry	**H**	understand and use column vectors in translations

In the previous specification use of column vectors was not expected when describing or carrying out translations. In this specification, candidates are now expected to understand and use vectors in such circumstances.

Example assessment of this topic from SAMs

Paper 2F Q21 / Paper 4H Q6

21



a) On the grid, translate triangle **A** by the vector $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$ (1)

Statistics and probability (AO3)

Content requirement

	Students should be taught to:	Notes
6.1 Graphical representation of data	**A** use different methods of presenting data	Pictograms, bar charts and pie charts, and only two-way tables
	B use appropriate methods of tabulation to enable the construction of statistical diagrams	
	C interpret statistical diagrams	
6.2 Statistical measures	**A** understand the concept of average	Data could be in a list or tabulated form
	B calculate the mean, median, mode and range for a discrete data set	Includes simple problems using these measures
	C calculate an estimate for the mean for grouped data	
	D identify the modal class for grouped data	

6.3 Probability	**A** understand the language of probability	Outcomes, equal likelihood, events, random
	B understand and use the probability scale	P(certainty) = 1 P(impossibility) = 0
	C understand and use estimates or measures of probability from theoretical models	
	D find probabilities from a Venn diagram	
	E understand the concepts of a sample space and an event, and how the probability of an event happening can be determined from the sample space	For the tossing of two coins, the sample space can be listed as: Heads (H), Tails (T): (H, H), (H, T), (T, H), (T, T)
	F list all the outcomes for single events and for two successive events in a systematic way	
	G estimate probabilities from previously collected data	
	H calculate the probability of the complement of an event happening	$P(A')= 1- P(A)$
	I use the addition rule of probability for mutually exclusive events	P(Either A or B occurring) = P(A) + P(B) when A and B are mutually exclusive
	J understand and use the term 'expected frequency'	Determine an estimate of the number of times an event with a probability of 0.4 will happen over 300 tries

Higher tier

It is important to note that the Higher tier assumes knowledge of the Foundation tier and all content included in the Foundation tier could be assessed in the Higher tier papers, provided that the question is targeting at least grade 4.

A formulae sheet will still be provided on page 2 of the examination paper. Please note that any reference to Pythagoras' theorem and the trigonometric ratios has been deleted from the formula sheet; candidates are expected to know these. The formula for the sum to n terms of an arithmetic series has been added.

Numbers and the number system (AO1)

Content requirement

	Students should be taught to:	Notes
1.1 Integers	See Foundation Tier	
1.2 Fractions	See Foundation Tier	
1.3 Decimals	**A** convert recurring decimals into fractions	0.32 = 0.322... $\frac{29}{90}$
1.4 Powers and roots	**A** understand the meaning of surds	Simplify: $\sqrt{8} + 3\sqrt{32}$
	B manipulate surds, including rationalising a denominator	Express in the form $a + b\sqrt{2}$: $(3 + 5\sqrt{2})^2$ Rationalise: $\frac{2}{\sqrt{8}}$; $\frac{1}{2 - \sqrt{3}}$
	C use index laws to simplify and evaluate numerical expressions involving integer, fractional and negative powers	Evaluate: $\sqrt[3]{8^2}$, $625^{-\frac{1}{2}}$, $\left(\frac{1}{25}\right)^{\frac{3}{2}}$
1.5 Set language and notation	**A** understand sets defined in algebraic terms, and understand and use subsets	If A is a subset of B, then $A \subset B$
	B use Venn diagrams to represent sets and the number of elements in sets	
	C use the notation n(A) for the number of elements in the set A	
	D use sets in practical situations	
1.6 Percentages	**A** use repeated percentage change	Calculate the total percentage increase when an increase of 30% is followed by a decrease of 20%
	B solve compound interest problems	
1.7 Ratio and proportion	See Foundation tier	
1.8 Degree of accuracy	**A** solve problems using upper and lower bounds where values are given to a degree of accuracy	The dimensions of a rectangle are 12 cm and 8 cm to the nearest cm Calculate, to 3 significant figures, the smallest possible area as a percentage of the largest possible area
1.9 Standard form	**A** solve problems involving standard form	
1.10 Applying number	See Foundation Tier	
1.11 Electronic calculators	See Foundation Tier	

New content

1.4 Powers and roots	**B**	manipulate surds, including rationalising a denominator

In the previous specification, rationalising a denominator was restricted to the denominator being a pure surd; this is no longer the case as can be seen in the example question shown below. Candidates are expected to understand and be able to use the 'difference of two squares' to eliminate surds from the denominator. As calculators can be used on both papers, it is important that the instruction to 'show your working clearly' is followed and candidates show all steps, including the method used to simplify surds as required. For example, $\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$

Example assessment of this topic from SAMs

SAMs Paper 4H Q24

Show that $\dfrac{\sqrt{12} - 1}{2 - \sqrt{3}}$ can be written as $4 + 3\sqrt{3}$

Show your working clearly. (4)

Equations, formulae and identities (AO1)

Content requirement

	Students should be taught to:	Notes
2.1 Use of symbols	**A** use index notation involving fractional, negative and zero powers	
2.2 Algebraic manipulation	**A** expand the product of two or more linear expressions	Expand and simplify $(x + 2)(x + 3)(x - 1)$
	B understand the concept of a quadratic expression and be able to factorise such expressions	Factorise $6x^2 - 5x - 6$
	C manipulate algebraic fractions where the numerator and/or the denominator can be numeric, linear or quadratic	Express as a single fraction $\dfrac{3x + 1}{x + 2} - \dfrac{x - 2}{x + 1}$ Simplify $\dfrac{2x^2 + 3x}{4x^2 - 9}$
	D complete the square for a given quadratic expression	Write $2x^2 + 6x - 1$ in the form $a(x + b)^2 + c$
	E use algebra to support and construct proofs	

2.3 Expressions and formulae	**A** understand the process of manipulating formulae or equations to change the subject, to include cases where the subject may appear twice or a power of the subject occurs	Make r the subject of $V = \frac{4}{3}\pi r^3$ Make a the subject of $3a + 5 = \frac{4 - a}{r}$ Make l the subject of $T = 2\pi\sqrt{\frac{l}{g}}$
2.4 Linear equations	**See Foundation Tier**	**Notes** **For example** $\frac{2x-3}{6} + \frac{x+2}{3} = \frac{5}{2}$
2.5 Proportion	**A** set up problems involving direct or inverse proportion and relate algebraic solutions to graphical representation of the equations	To include only the following: $y \propto x$, $y \propto \frac{1}{x}$ $y \propto x^2$, $y \propto \frac{1}{x^2}$ $y \propto x^3$, $y \propto \frac{1}{x^3}$ $y \propto \sqrt{x}$, $y \propto \frac{1}{\sqrt{x}}$
2.6 Simultaneous linear equations	**A** calculate the exact solution of two simultaneous equations in two unknowns	$2x + 3y = 17$ $3x - 5y = 35$
	B interpret the equations as lines and the common solution as the point of intersection	
2.7 Quadratic equations	**A** solve quadratic equations by factorisation	$2x^2 - 3x + 1 = 0$, $x(3x - 2) = 5$
	B solve quadratic equations by using the quadratic formula or completing the square	
	C form and solve quadratic equations from data given in a context	
	D solve simultaneous equations in two unknowns, one equation being linear and the other being quadratic	$y = 2x - 11$ and $x^2 + y^2 = 25$ $y = 11x - 2$ and $y = 5x^2$

2.8 Inequalities	**A** solve quadratic inequalities in one unknown and represent the solution set on a number line	$x^2 \leqslant 25$, $4x^2 > 25$ $x^2 + 3x + 2 > 0$
	B identify harder examples of regions defined by linear inequalities	Shade the region defined by the inequalities $x \leqslant 4$, $y \leqslant 2x + 1$, $5x + 2y \leqslant 20$

Content changes

2.2 Algebraic manipulation	**A**	expand the product of two <u>or more</u> linear expressions
	D	complete the square for a given quadratic expression
	E	use algebra to support and construct proofs

The standard technique of expanding the product of linear expressions has been extended so that **more** than two linear expressions can be expanded. In practice, this is likely to be limited to three linear expressions as shown below.

<u>**Example assessment of this topic from SAMs**</u>

SAMs Paper 3H Q11

Expand and simplify $(x + 5)(x - 3)(x + 3)$ (3)

The inclusion of 2.2E explicitly states that the use of algebra to support and construct proofs will be assessed. In the previous specification, questions requiring this type of skill were set but using the word 'show' rather than 'prove'. Past papers from the GCSE Mathematics 1MA0 specification are a good source for questions of this type.

KMAO June 2015 Paper 4H Q20b

Show, using algebra, that the sum of any 4 consecutive odd numbers is always a multiple of 8.

1MA0 June 2014 Paper 2H Q14b

Prove algebraically that

$(2n + 1)^2 - (2n + 1)$ is an even number

for all positive integer values of n.

2.7 Quadratic equations	**B**	solve quadratic equations by using the quadratic formula <u>or completing the square</u>

The requirement to solve quadratic equations by completing the square is new to this specification. Candidates may also be asked, as shown below, to complete the square as a stand-alone process and possibly then use this to help them answer a subsequent question.

Example assessment of this topic from SAMs

SAMs Paper 4H Q22

(a) Write $2x^2 - 8x + 9$ in the form $a(x + b)^2 + c$ (3)

(b) Hence, or otherwise, explain why the graph of the curve with equation $y = 2x^2 - 8x + 9 = 0$ does not intersect the x-axis. (1)

Sequences, functions and graphs (AO1)

Content requirement

	Students should be taught to:	Notes
3.1 Sequences	**A** understand and use common difference (d) and first term (a) in an arithmetic sequence	e.g. given 2nd term is 7 and 5th term is 19, find a and d
	B know and use nth term $= a + (n - 1)d$	
	C find the sum of the first n terms of an arithmetic series (Sn)	e.g. given $4 + 7 + 10 + 13 + ..$ find sum of first 50 terms
3.2 Function notation	**A** understand the concept that a function is a mapping between elements of two sets	
	B use function notations of the form $f(x) = \dots$ and $f : x \mapsto \dots$	
	C understand the terms 'domain' and 'range' and which values may need to be excluded from a domain	$f(x) = \frac{1}{x - 2}$ exclude $x = 2$
	D understand and find the composite function fg and the inverse function f^{-1}	'fg' will mean 'do g first, then f'
3.3 Graphs	**A** recognise, plot and draw graphs with equation: $y = Ax^3 + Bx^2 + Cx + D$ in which: (i) the constants are integers and some could be zero (ii) the letters x and y can be replaced with any other two letters or: $y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x}$ in which: (i) the constants are numerical and at least three of them are zero (ii) the letters x and y can be replaced with any other two letters or: $y = \sin x$, $y = \cos x$, $y = \tan x$ for angles of any size (in degrees)	$y = x^3$ $y = 3x^3 - 2x^2 + 5x - 4$ $y = 2x^3 - 6x + 2$ $V = 60w(60 - w)$ $y = \frac{1}{x}, x \neq 0,$ $y = 2x^2 = 3x + \frac{1}{x},$ $x \neq 0,$ $y = \frac{1}{x}(3x^2 - 5),$ $x \neq 0,$ $w = \frac{5}{d^2}, d \neq 0$
	B apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ for linear, quadratic, sine and cosine functions	

	C interpret and analyse transformations of functions and write the functions algebraically	
	D find the gradients of non-linear graphs	By drawing a tangent
	E find the intersection points of two graphs, one linear (y_1) and one non-linear (y_2), and recognise that the solutions correspond to the solutions of $(y_1 - y_2) = 0$	The x values of the intersection of the two graphs: $y = 2x + 1$ $y = x^2 + 3x - 2$ are the solutions of: $x^2 + x - 3 = 0$ Similarly, the x values of the intersection of the two graphs: $y = 5$ $y = x^3 - 3x^2 + 7$ are the solutions of: $x^3 - 3x^2 + 2 = 0$
	F calculate the gradient of a straight line given the coordinates of two points	Find the equation of the straight line through (1, 7) and (2, 9)
	G find the equation of a straight line parallel to a given line; find the equation of a straight line perpendicular to a given line	Find the equation of the line perpendicular to $y = 2x + 5$ through the point (3, 7)
3.4 Calculus	**A** understand the concept of a variable rate of change	
	B differentiate integer powers of x	
	C determine gradients, rates of change, stationary points, turning points (maxima and minima) by differentiation and relate these to graphs	Find the coordinates of the maximum and minimum points
	D distinguish between maxima and minima by considering the general shape of the graph only	
	E apply calculus to linear kinematics and to other simple practical problems	The displacement, s metres, of a particle from a fixed point O after t seconds is given by: $s = 24t^2 - t^3$, $0 \leqslant t \leqslant 20$ Find expressions for the velocity and the acceleration

Changes to content

3.1 Sequences	**A**	understand and use common difference (d) and first term (a) in an arithmetic sequence
	B	know and use nth term = $a + (n - 1)d$
	C	find the sum of the first n terms of an arithmetic series (Sn)

The requirement to be able to write down an expression for the nth term of an arithmetic sequence was a feature of the previous specification and continues in this specification, although this will now be assessed on both tiers. Additional to the Higher tier only is understanding the various terminology and formulae needed to take this topic further. The formula for the sum of the first n terms of an arithmetic series will be given on the formulae sheet but the formula for the nth term will not.

Example assessment of this topic from SAMs

SAMs Paper 3H Q23

The 4th term of an arithmetic series is 17

The 10th term of the same arithmetic series is 35

Find the sum of the first 50 terms of this arithmetic series. (5)

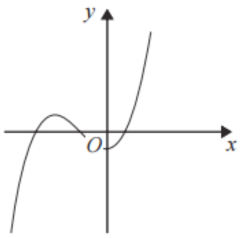
3.3 Graphs	**A**	recognise, plot and draw graphs with equation: $y = Ax^3 + Bx^2 + Cx + D$ in which: (i) the constants are integers and some could be zero (ii) the letters x and y can be replaced with any other two letters or: $y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x^2}$ in which: (i) the constants are numerical and at least three of them are zero (ii) the letters x and y can be replaced with any other two letters or: $y = \sin x$, $y = \cos x$, $y = \tan x$ for angles of any size (in degrees)
	B	apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ for linear, quadratic, sine and cosine functions
	C	interpret and analyse transformations of functions and write the functions algebraically
	G	find the equation of a straight line parallel to a given line; find the equation of a straight line perpendicular to a given line

The inclusion of the word 'recognise' in 3.3A enables questions like the one shown below to be set. Additionally, candidates are now required to be able to recognise, plot and draw the graphs of the three trigonometric functions.

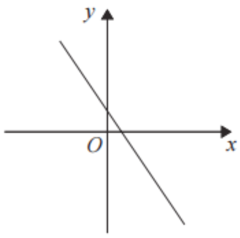
Example assessment of this topic from SAMs

SAMs Paper 4H Q19

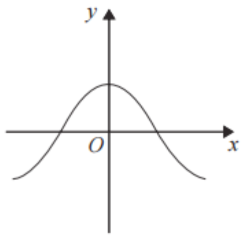
Here are nine graphs.



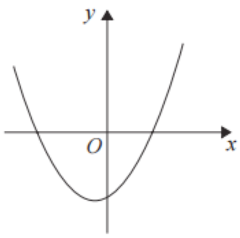
Graph A



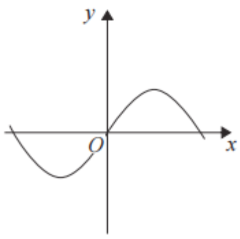
Graph B



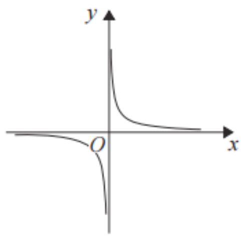
Graph C



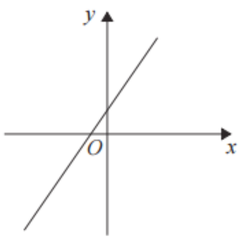
Graph D



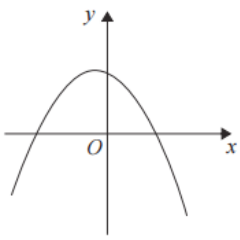
Graph E



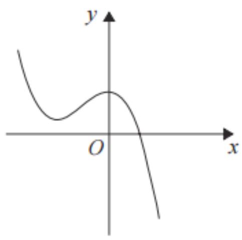
Graph F



Graph G



Graph H



Graph I

Complete the table below with the letter of the graph that could represent each given equation.

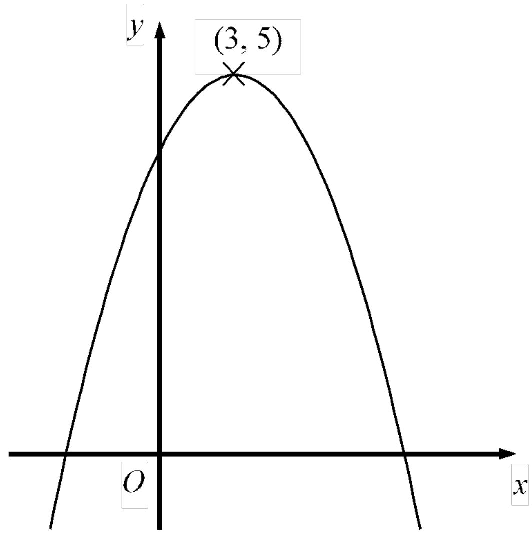
Equation	Graph
$y = \sin x$	
$y = 2 - 3x$	
$y = x^2 + x - 6$	
$y = x^3 + 3x^2 - 2$	

(3)

The introduction of 3.3B and 3.3C means that questions will now be set assessing knowledge of the transformation of functions. The question below shows one way of doing this. Instead of being asked to give specific coordinates, candidates could also be asked to sketch say $y = f(x + 3)$ given the graph of $y = f(x)$. Examples of this type of question can be found in past papers for GCSE Mathematics 1MA0.

Example assessment of this topic from SAMs

SAMs Paper 3H Q20



The diagram shows part of the curve with equation $y = f(x)$

The coordinates of the maximum point of the curve are (3, 5)

(a) Write down the coordinates of the maximum point of the curve with equation

(i) $y = f(x + 3)$ (1)

(ii) $y = 2f(x)$ (1)

(iii) $y = f(3x)$ (1)

The curve with equation $y = f(x)$ is transformed to give the curve with

equation $y = f(x) - 4$

(b) Describe the transformation. (1)

The work on coordinates geometry has been extended in 3.3G to perpendicular lines, in the previous specification work was restricted to parallel lines only. Candidates may be asked, for example, to write down the equation of a line parallel to or perpendicular to $y = 3x + 5$ that passes through the point (0,2). The example question shown below from the SAMs shows a variation on this theme.

Example assessment of this topic from SAMs

SAMs Paper 3H Q13b

Line L_1 has equation $y = 3x + 5$

Line L_2 has equation $6y + 2x = 1$

(b) Show that L_1 is perpendicular to L_2 (2)

Geometry and trigonometry (AO2)

Content requirement

	Students should be taught to:	Notes
4.1 Angles, lines and triangles	See Foundation Tier	
4.2 Polygons	See Foundation Tier	
4.3 Symmetry	See Foundation Tier	
4.4 Measures	See Foundation Tier	
4.5 Construction	See Foundation Tier	
4.6 Circle properties	**A** understand and use the internal and external intersecting chord properties	
	B recognise the term 'cyclic quadrilateral'	
	C understand and use angle properties of the circle including: (i) angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the remaining part of the circumference (ii) angle subtended at the circumference by a diameter is a right angle (iii) angles in the same segment are equal (iv) the sum of the opposite angles of a cyclic quadrilateral is 180° (v) the alternate segment theorem	Formal proof of these theorems is not required
4.7 Geometrical reasoning	**A** provide reasons, using standard geometrical statements, to support numerical values for angles obtained in any geometrical context involving lines, polygons and circles	

4.8 Trigonometry and Pythagoras' theorem	**A** understand and use sine, cosine and tangent of obtuse angles	
	B understand and use angles of elevation and depression	
	C understand and use the sine and cosine rules for any triangle	
	D use Pythagoras' theorem in three dimensions	
	E understand and use the formula $\frac{1}{2}ab \sin C$ for the area of a triangle	
	F apply trigonometrical methods to solve problems in three dimensions, including finding the angle between a line and a plane	The angle between two planes will not be required
4.9 Mensuration	**A** find perimeters and areas of sectors of circles	Radian measure is excluded
4.10 3-D shapes and volume	**A** find the surface area and volume of a sphere and a right circular cone using relevant formulae	
4.11 Similarity	**A** understand that areas of similar figures are in the ratio of the square of corresponding sides	
	B understand that volumes of similar figures are in the ratio of the cube of corresponding sides	
	C use areas and volumes of similar figures in solving problems	

No new content	

There is no additional content to this section but it should be noted that any reference to Pythagoras' theorem and the trigonometric ratios has been deleted from the formula sheet; candidates are expected to know these.

Vectors and transformation geometry (AO2)

This section covers the basics of vectors and transformation geometry. Some questions will cover straightforward processes and techniques whilst there may be scope for some questions to test mathematical reasoning by asking for a description of a transformation.

Content requirement

	Students should be taught to:	Notes
5.1 Vectors	**A** understand that a vector has both magnitude and direction	
	B understand and use vector notation including column vectors	The notations $\overrightarrow{OA}$ and **a** will be used
	C multiply vectors by scalar quantities	
	D add and subtract vectors	
	E calculate the modulus (magnitude) of a vector	Find the magnitude: of $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$
	F find the resultant of two or more vectors	$\overrightarrow{OA} = 3\mathbf{a}$, $\overrightarrow{AB} = 2\mathbf{b}$, $\overrightarrow{BC} = \mathrm{c}$ so: $\overrightarrow{OC} = 3\mathbf{a} + 2\mathbf{b} + \mathbf{c}$ $\overrightarrow{CA} = -3 -2\ \mathbf{b}$
	G apply vector methods for simple geometrical proofs	
5.2 Transformation geometry	See Foundation Tier	

5.1 Vectors	**C** understand and use vector notation including column vectors

The use of column vectors was assessed in the previous specification, the inclusion of the words 'including column vectors' adds clarity to this part of the specification.

Example assessment of this topic from SAMs

SAMs Paper 4H Q23

23 *ABCD* is a parallelogram.

$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \qquad \overrightarrow{AC} = \begin{pmatrix} 9 \\ 4 \end{pmatrix}$$

Find the magnitude of $\overrightarrow{BC}$

(3)

Statistics and probability (AO3)

Content requirement

	Students should be taught to:	Notes
6.1 Graphical representation of data	**A** construct and interpret histograms	For continuous variables with unequal class intervals
	B construct cumulative frequency diagrams from tabulated data	
	C use cumulative frequency diagrams	
6.2 Statistical measures	**A** estimate the median from a cumulative frequency diagram	
	B understand the concept of a measure of spread	
	C find the interquartile range from a discrete data set	The terms 'upper quartile' and 'lower quartile' may be used
	D estimate the interquartile range from a cumulative frequency diagram	
6.3 Probability	**A** draw and use tree diagrams	
	B determine the probability that two or more independent events will occur	
	C use simple conditional probability when combining events	Picking two balls out of a bag, one after the other, without replacement
	D apply probability to simple problems	

No new content	

Delivery of the qualification – transferable skills

Why transferable skills?

Ensuring students have opportunities to acquire transferable skills, as well as subject specific knowledge, understanding and skills to improve learners' progression outcomes is a central part of Pearson Edexcel's International GCSE qualifications.

In recent years, higher education institutions and employers have consistently flagged the need for students to develop a range of transferable skills to enable them to respond with confidence to the demands of undergraduate study and the world of work.

We have developed our teaching materials and support to:

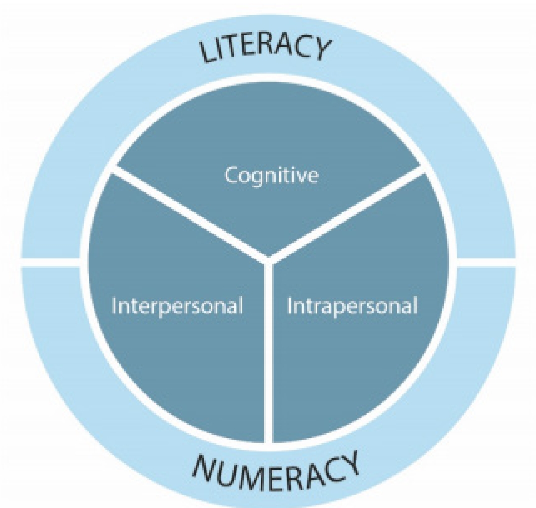
1) Increase awareness of transferable skills that are **already** being assessed (for both learners and teachers) and
2) Indicate where, for teachers, there are opportunities to teach additional skills that won't be formally assessed, but that would be of benefit to learners.

What are transferable skills?

The Organisation for Economic Co-operation and Development (OECD) defines skills, or competencies, as 'the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning.'[1]

To support the design of our qualifications, the Pearson Research Team selected and evaluated seven global 21st-century skills frameworks. Following on from this process, we identified the National Research Council's (NRC) framework [2] as the most evidence-based and robust skills framework, and have used this as a basis for our adapted skills framework.

The framework includes cognitive, intrapersonal skills and interpersonal skills.



[1] (OECD (2012), Better Skills, Better Jobs, Better Lives (2012):http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf)

[2] Koenig, J. A. (2011) Assessing 21st Century Skills: Summary of a Workshop, National Research Council)

What can I do if I want to see improved student outcomes through the development of transferable skills?

For each of our International GCSE subjects we will provide a subject-specific interpretation of each of the identified skills and a comprehensive mapping as to how these elements can be developed and where they link to assessment.

The skills have been interpreted for this qualification to ensure they are appropriate for the subject. All of the skills identified are evident or accessible in the teaching, learning and/or assessment of the qualification. Some skills are directly assessed. Pearson materials will support you in identifying these skills and developing them in your students.

Please refer to the 'Teaching and Learning Materials' section of the qualification webpage for more Pearson materials to support you in identifying and developing these skills in students.

Course planner

You will find a course planner at the front of each tier of entry in the Scheme of Work document, which gives suggested teaching times for each unit. This is broken down by Assessment Objective and is editable so that you can customise it to meet your own needs.

Suggested Resources

We recognise that new resources will become available throughout the lifetime of a qualification. We will therefore supply a version of this resource list on our website, which will be updated on an ongoing basis.

Name of resource	Link and info
Edexcel International GCSE (9-1) Maths A: Student Book	Print and online student resource, 100% matched to the new Edexcel International GCSE (9-1) Mathematics A curriculum, featuring comprehensive coverage of all topics. Specifically developed for international students, it includes signposted skills and teacher guidance on the application of the Pearson Progression Scale, as well as online teacher support.
Maths Emporium	This **free** website is intended for the use of teachers of mathematics in secondary schools http://www.edexcelmaths.com/
Sample assessment material and specimen papers	http://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/international-gcse-mathematics-a-2016.coursematerials.html#filterQuery=category:Pearson-UK:Category%2FSpecification-and-sample-assessments
Dedicated Maths Subject Advisor	Teachingmaths@pearson.com
examWizard	examWizard is a free online resource for teachers containing a huge bank of past paper questions and support materials to help you create your own mock exams and tests. http://qualifications.pearson.com/en/support/Services/examwizard.html
ResultsPlus	ResultsPlus is a free online results analysis tool for teachers that gives you a detailed breakdown of your students' performance in Edexcel exams. http://qualifications.pearson.com/en/support/Services/ResultsPlus.html

B Getting started for students

Student guide

Why study the Pearson Edexcel International GCSE in Mathematics A?

This course will enable you to:

- develop your problem-solving skills by translating problems in mathematical or non-mathematical contexts at both Higher and Foundation tiers
- develop reasoning skills through exercises such as presenting arguments and proofs, and making deductions and drawing conclusions from mathematical information.

What do I need to know, or be able to do, before taking this course?

We recommend that students are able to read and write in English at Level B2 of the Common European Framework of Reference for Languages, otherwise there are no prior learning requirements for this qualification.

Is this the right subject for me?

Have a look at our qualification overview to get an idea of what's included in this qualification. Then, why not get in touch with our student services, students@pearson.com, to discuss any outstanding questions you might have?

You could also have a look at http://qualifications.pearson.com/en/campaigns/pearson-qualifications-around-the- world.html#tab-Edexcel to find out what students and education experts around the world think about our qualifications.

We also offer a Mathematics specification B and you may feel that the approach used in this specification is more suitable for you.

How will I be assessed?

This qualification is 100% examination.

What can I do after I've completed the course?

You can progress from this qualification to:

- the Pearson Edexcel International GCSE in Further Pure Mathematics
- the GCE Advanced Subsidiary (AS) and Advanced Level in Mathematics, Further Mathematics or Pure Mathematics
- the International Advanced Subsidiary (AS) and Advanced Level in Mathematics, Further Mathematics or Pure Mathematics
- other equivalent Level 3 Mathematics qualifications
- further study in other areas where mathematics is required
- further training or employment where numeracy skills and knowledge are required.

What next?

Talk to your subject teacher at school or college for further guidance, or if you are a private candidate you should visit http://qualifications.pearson.com/en/support/support-for you/students.html

For information about Edexcel, BTEC or LCCI qualifications
visit qualifications.pearson.com

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Registered Office: 80 Strand, London WC2R 0RL
VAT Reg No GB 278 537121

Getty Images: Alex Belmonlinsky

ISBN 978-1-4469-3248-3