


**AQA** 

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Qualifications update  
Maths spring hub network meeting

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This meeting will be recorded

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Exam boards have an Ofqual requirement to record event audio.

Recordings are kept for one year and not shared as an accompaniment to session resources.

The recording will begin now.

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Level 3 certificate in Mathematical studies  
(Core Maths)

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### Qualification overview

- Government initiative (Core Maths) to raise participation in post-16 maths
  - Not compulsory
  - In his last budget speech, the Chancellor announced that, from 2018-19, schools and colleges would be paid £600 for each additional pupil who takes a post-16 Mathematics qualification.
- For students with a grade C or above in GCSE
  - Approximately 250 000 eligible students per academic year
- Half the size of an A-level
  - 180 Guided Learning Hours
  - Designed to be a two-year course

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### Core maths: Summer 2017 results

Specification	Entry	% of entry	A	B	C	D	E
OCR H866	454	8.4	14.5	40.3	65.4	83.3	90.8
OCR H867	309	5.7	16.5	35.3	58.6	74.8	86.1
Edexcel	554	10.3	14.8	29.8	47.5	60.6	72.7
AQA	4044	75.2	11.3	26.9	48.2	68.0	84.0
All (incl. C&G) source MEI	5376	100	12.2	28.8	50.2	68.9	83.6
All 2016 source MEI	2930	100	10.5	26.2	47.1	66.3	82.0

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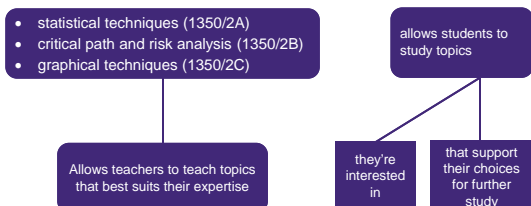
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### Specification structure

- All students must sit paper 1 (1350/1)
- Students must sit one paper 2 from a choice of three options



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### AQA entry by option

- Option A: statistical techniques – 2610 (65%)
- Option B: critical path and risk analysis – 964 (24%)
- Option C: graphical techniques – 466 (11%)

Grade boundaries (summer 2017)

boundary/ option	A	B	C	D	E
A/120	78	68	58	49	40
B/120	85	75	65	55	46
C/120	78	68	58	49	40

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### Resources

Located on the AQA website (w) or in AllAboutMaths (a)

- Specification (w)
- Specimen assessment materials (w)
- Additional sample questions and their mark schemes (w)
- Marked student answers (w)
- 1- and 2-year Route maps (scheme of work) – and all of its links to other resources (a)
- Companion guide (w)
- Guidance on assumed knowledge (w)

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### Resources

- Mapping document to maths in other subjects (a)
- Lesson plans (a)
- Complete sets of materials from Launch meetings and Prepare to Teach meetings (a)
- Additional set of practice papers (a)
- Contextualised examples of maths in other subjects (a)
- Case studies (a)
- Teachers' Guide (a)
- Textbooks (w)

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Level 2 Certificate in Further Mathematics

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Level 2 Certificate in Further Mathematics

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- Re-developed to reflect content and grading changes in reformed GCSE
- Some new content and some existing content treated in greater depth
- Likely to be graded 9–5 (with allowed grade 4)
- Reviewed by teachers prior to publication of specification and specimen papers
- First examination in 2020 (final legacy examination 2019)
- Updated Teaching Guidance, Route Map and Worksheets

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AQA

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Functional skills

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### Functional skills

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- Consultation on content complete
- Consultation on assessment structure complete
- Awaiting outcomes especially view on value of qualification



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### A-level Maths

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### A level Maths/Further Maths

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- General approach
- Structure
- Assessment
- Content
- Resources and support

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Approach

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Key changes

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- A-levels are no longer modular.
- AS is a stand-alone qualification.
- Large data set in AS/A-level Maths.
- Prescribed content from the DfE for maths and partly for further maths, confirmed in December 2014.
- The UCAS tariff has changed so that an AS is now worth approximately 40% of an A-level.

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Key features of the new maths A-level

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- The content has been defined for us by the DfE – this is common across all exam boards.
- The content for both AS and A-level splits approximately into two-thirds Pure content, one-sixth Mechanics content and one-sixth Statistics.
- There is no Decision featured in this defined content.
- The AS no longer contributes to the A-level, it is a separate qualification.
- First exam for AS and A-level Maths will be summer 2018.

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## Our philosophy

- Top priority: assessment that will encourage good teaching of mathematics.
- Applications with pure maths embedded.
- Holistic, non-modular approach to mathematics.
- Problem solving and modelling central.

### Targets

- Clarity for teachers/ease of delivery in classrooms.
- Confidence building for students.
- Further maths optionality - to suit needs of Higher Education, teacher preferences and sizes of centres - without loss of holistic approach.

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## Structure

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## Our A-level Maths structure (content 100% prescribed)

3 papers, 6 hours assessment time

<p><b>Paper 1: Pure</b> 2 hours 100 marks</p> <p>Assesses the following content <b>only</b></p> <p>(A) Proof (B) Algebra and functions (C) Coordinate Geometry (D) Sequences and series (E) Trigonometry (F) Exponentials and logarithms (G) Differentiation (H) Integration (I) Numerical Methods</p>	+	<p><b>Paper 2: Pure and Mechanics</b> 2 hours 100 marks (two sections of 50 marks)</p> <p><b>May</b> assess the following: Any content from Paper 1</p> <p><b>Will</b> assess the following:</p> <p>(J) Vectors (P) Quantities and units in mechanics (Q) Kinematics (R) Forces and Newton's laws (S) Moments</p>	+	<p><b>Paper 3: Pure and Statistics</b> 2 hours 100 marks (two sections of 50 marks)</p> <p><b>May</b> assess the following: Any content from Paper 1</p> <p><b>Will</b> assess the following:</p> <p>(K) Statistical sampling (L) Data presentation and interpretation (M) Probability (N) Statistical distributions (O) Statistical hypothesis testing</p>
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## Our AS Maths structure

2 papers, 3 hours assessment time

<p><b>Paper 1: Pure and Mechanics</b> 1 hour 30 minutes 80 marks (two unequal sections, Pure larger section)</p> <p>Assesses the following content only</p> <p>(A) Proof (B) Algebra and functions (C) Coordinate Geometry (D) Sequences and series (E) Trigonometry (F) Exponentials and logarithms (G) Differentiation (H) Integration</p> <p>(J) Vectors (P) Quantities and units in mechanics (Q) Kinematics (R) Forces and Newton's laws</p>	+	<p><b>Paper 2: Pure and Statistics</b> 1 hour 30 minutes 80 marks (two unequal sections, Pure larger section)</p> <p>Assesses the following content only</p> <p>(A) Proof (B) Algebra and functions (C) Coordinate Geometry (D) Sequences and series (E) Trigonometry (F) Exponentials and logarithms (G) Differentiation (H) Integration</p> <p>(K) Statistical sampling (L) Data presentation and interpretation (M) Probability (N) Statistical distributions (O) Statistical hypothesis testing</p>
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## Our A-level Further Maths structure

2 papers, 3 hours assessment time

<p><b>Paper 1: Compulsory content</b> 2 hours 100 marks</p>	+	<p><b>Paper 2: Compulsory content</b> 2 hours 100 marks</p>	+	<p><b>Paper 3: Discrete and Statistics</b> 2 hours 100 marks (two sections of 50 marks)</p> <p>or</p> <p><b>Paper 3: Statistics and Mechanics</b> 2 hours 100 marks (two sections of 50 marks)</p> <p>or</p> <p><b>Paper 3: Mechanics and Discrete</b> 2 hours 100 marks (two sections of 50 marks)</p>
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## Our AS Further Maths structure

2 papers, 3 hours assessment time

<p><b>Paper 1: Compulsory content</b> 2 hours 100 marks</p>	+	<p><b>Paper 2: Discrete and Statistics</b> 1 hour 30 minutes 80 marks (two sections of 40 marks)</p> <p>or</p> <p><b>Paper 2: Statistics and Mechanics</b> 1 hour 30 minutes 80 marks (two sections of 40 marks)</p> <p>or</p> <p><b>Paper 2: Mechanics and Discrete</b> 1 hour 30 minutes 80 marks (two sections of 40 marks)</p>
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Assessment

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Overarching themes from the DfE

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1. Mathematical argument, language and proof
2. Mathematical problem solving
3. Mathematical modelling

The whole assessment is set within the context of the overarching themes.

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New style mark schemes

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- AQA reformed AS and A-level Maths and Further Maths have mark schemes that look quite different.
- Rarely will any particular method be required in order to gain credit.
- A high proportion of marks are designated as Method marks.
- Where marks are awarded for accuracy, a high proportion of these marks allow 'Follow Through'.

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Current style mark schemes

Q	Solution	Mark	Total	Comment
5	(a)	$(-j)^2 + c(-j)^2 + d(-j) + 3$ $-27 = 9c - 3d + 3 = 0$ $= 9c - d = 8$	M1 A1 2	p(-) attempted  must use this line or equivalent, and must have = 0 on right or left before final result AG be convinced  p(2) attempted. & ... = 65 correct equation in any form simplifying powers of 2 eg $4c + 2d = 54$ correct elimination of c or d using both $3c - d = 8$ and their equation from (b)
	(b)	$2^2 + c + 2^2 + d + 2 + 3 = 65$ $8 + 4c + 2d + 3 = 65$	M1 A1 2	
	(c)	$5c = 35$ or $10d = 130$ OE $c = 7$ $d = 13$	M1 A1 A1 3	
<b>Total</b>			<b>7</b>	

(a) May use long division by  $x + 3$  but must reach remainder term for M1  
Condense missing brackets in p(-) expression if recovered later as  $-27 = 9c - d + 3$  to earn A1  
Treat parts (b) and (c) holistically  
(b) May use long division by  $x + 2$  as far as remainder and equate their remainder to 65 for M1  
(c) Example  $4c + 2d + 3 = 54$  is an attempt to use  $3c - d = 8$  and to eliminate d and earn M1

Slide 23

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New style mark scheme

Q	Marking Instructions	AO	Marks	Typical solution
4	Selects an appropriate method – either differentiates: $\frac{dy}{dx} = 2x \dots$ or completes the square: $\left(x - \frac{5}{2}\right)^2 + \dots$	AO1.1a	M1	$y = \left(x - \frac{5}{2}\right)^2 - \frac{25}{4} + a$ y minimised when squared bracket is 0 $\left(\frac{5}{2}, a - \frac{25}{4}\right)$ <b>ALT</b> $\frac{dy}{dx} = 2x - 5$ so $2x - 5 = 0$ for minimum $x = \frac{5}{2}$
	Fully differentiates and sets derivative equal to zero or fully completes square			
	Obtains both coordinates	AO1.1b	A1	$y = \left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right) + a = a - \frac{25}{4}$
<b>Total</b>				<b>3</b>

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The large data set

The large data set

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### Use of large data in statistics

- The use of one or more real 'large data' set.
- Chosen by each exam board.
- Used as a classroom tool including use of technology.
- Gets students familiar with working with and manipulating large sets of data.
- It is too large to be taken into the exam: suitable extracts may be used in a question.
- Exam boards are required to set questions that should be likely to give a **material advantage** to students who have studied, and are familiar with, the prescribed data set.

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### Large data set - what techniques might be used at AS?

- Sampling.
- Histograms.
- Scatter graphs and correlation (not causation).
- Measures of central tendency and spread (standard deviation).
- Select and critique different presentation techniques.
- Probability: exclusive and independent events.

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### Large data set - what techniques might be used?

- Short with brief interpretation.
- Deep interpretation of the data, using given graphs and summaries.
- Selection from given graphs and summary data.
- Modelling with trend lines for bivariate data.
- Modelling with distributions and hypothesis testing.
- Describing a situation where data needed to be collected and how it might be done.

Basic knowledge of spreadsheet packages such as Excel or free software such as Geogebra is essential.

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For all exams in 2018 and A level only in 2019

Purchased quantities of household food and drink by Government office region and country.



Department for Environment, Food & Rural Affairs



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For AS exams in 2019 and all exams from 2020

- An extract from the Department for Transport stock vehicle database.
- Now available on the AQA website.

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Why introduce a new large data set?

The LDS should support the effective teaching and learning of statistics and probability in AS and A-level Mathematics.

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### Why introduce a new large data set?

The LDS should ideally be a set of raw data, which allows data to be cleaned and outliers to be identified. The data should permit the calculation of statistical measures. There should predominantly be quantitative data, but also some categorical to facilitate meaningful comparisons. The data set should be large enough to allow students to take samples of data and thus make estimates of population parameters. The data should be such that it can be presented in a variety of graphical forms including histograms and scatter graphs.

Dan Rogan – Chair of examiners

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### Why introduce a new large data set?

The new LDS is a better fit to this definition and will allow the setting of less predictable questions offering a material advantage to students who have worked with the large data set.

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### Use of technology

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## Use of technology

The use of technology, in particular mathematical and statistical graphing tools and spreadsheets, must permeate the study of AS and A-level Mathematics.

Calculators used must include the following features:

- an iterative function
- the ability to compute summary statistics and access probabilities from standard statistical distributions.

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## Use of technology

Specifications should require students to explore the data set(s), and associated contexts, during their course of study to enable them to perform tasks that assume familiarity with the contexts, the main features of the data and the ways in which the technology can help explore the data.

Specifications should also require students to demonstrate the ability to analyse a subset of the features of the data using a calculator with standard statistical functions.

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## Example - technology

- Numerical measures – obtained directly from calculator.
- Binomial probabilities – obtained directly from calculator.
- Casio Graphical calculator model CG20 (similar Texas TI 83 or 84).
- Casio Classwiz (not graphical).

Other manufacturers may produce models designed to meet the new requirements.

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Use of calculators

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- Students taking the statistics option will be expected to use calculators to compute summary statistics and access probabilities from normal, binomial and Poisson distributions.
- Students will be expected to use calculators to solve equations, including equations that involve surds.
- Questions will be set in the expectation that students have become familiar with using calculators to perform matrix calculations.

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Use of calculators

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Use of calculators

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We will also expect calculators to be used for:

- definite integration
- calculating derivatives at a point
- summation of series
- logarithms to any base
- calculating with complex numbers
- calculating with vectors
- solving inequalities.

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## Support and resources

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## Resources and support from AQA

### Two sets of practice papers

- First set for AS/A-level Maths and AS Further Maths available now.
- Second set available later in 2018.
- A-level Further Maths – both sets available later in 2018.

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## Resources and support from AQA

### Teaching guidance

- AS and A-level Maths Teaching guidance available.
- AS and A-level Further Maths Teaching guidance available.
- A second version of the Teaching guidance is in production with more clarity available where teachers have contacted us requesting more detail.
- Maths: [allaboutmaths.aqa.org.uk/A-levelteachingguidance](http://allaboutmaths.aqa.org.uk/A-levelteachingguidance)
- Further Maths: [allaboutmaths.aqa.org.uk/furthermathsteachingguidance](http://allaboutmaths.aqa.org.uk/furthermathsteachingguidance)

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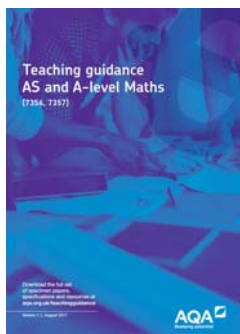
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## Teaching guidance



**B10** Decompose rational functions into partial fractions (denominators not more complicated than squared linear terms and with no more than three terms, numerators constant or linear).

Only assessed at A-level

Teaching guidance

Students should be able to:

- use the following form:
 
$$\frac{px+q}{(ax+b)(cx+d)} = \frac{A}{ax+b} + \frac{B}{cx+d}$$
- understand that the fractions may need to be simplified before partial fractions are found
- understand that partial fractions may be required for integration or as a binomial approximation

Examples:

- Express  $\frac{2x+3}{x^2+5x-6}$  in the form  $\frac{A}{x-1} + \frac{B}{x+6}$ , where  $A$  and  $B$  are integers.
- Express  $\frac{12x^2-7x+8}{x^2+1}$  in the form  $C + \frac{Dx+E}{x^2+1}$ , where  $C$  and  $D$  are integers.
- Express  $\frac{1}{x^2+1}$  as a sum of two partial fractions in the form  $\frac{p}{x+q} + \frac{r}{x+q}$ , where  $p$ ,  $q$  and  $r$  are rational numbers.

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## Resources and support from AQA

### Route maps

A number of route maps for different teaching combinations are available on: [allaboutmaths.aqa.org.uk/A-levelroutemaps](http://allaboutmaths.aqa.org.uk/A-levelroutemaps)

Version 1 of our route maps are available now. We'll update them with links to supporting resources as they become available.

- A-level Maths route map**
- A-level Maths in Year 1, A-level Maths in Year 2, for one teacher (updated October 2017)
  - A-level Maths in Year 1, A-level Maths in Year 2, for two teachers
- Parallel co-teaching route maps**
- A-level Maths and AS Further Maths in Year 1, A-level Maths and A-level Further Maths in Year 2 for one teacher
  - A-level Maths and AS Further Maths in Year 1, A-level Maths and A-level Further Maths in Year 2 for two teachers
- Consecutive co-teaching route maps**
- A-level Maths in Year 1, A-level Further Maths in Year 2 for one teacher
  - A-level Maths in Year 1, A-level Further Maths in Year 2 for two teachers

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## Route map (Year 12)

SEPTEMBER				OCTOBER				NOVEMBER			
WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8	WS9	WS10	WS11	WS12
Algebraic manipulation, rearranging formulae and simultaneous equations	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae	Graphs, factor and quadratic formulae
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## Resources and support from AQA

**Topic tests** are being released in phases. Many are available now.

[allaboutmaths.aqa.org.uk/1376](http://allaboutmaths.aqa.org.uk/1376)

### e-library (Maths only)

Our e-library contains links to interesting and useful maths resources found on the internet. It has been curated by experienced teacher, blogger and resource maker Jo Morgan.

[allaboutmaths.aqa.org.uk/alevelibrary](http://allaboutmaths.aqa.org.uk/alevelibrary)

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## Resources and support from AQA

**Approved textbooks** are now available from publishers, for details on who we are working with:

[aqa.org.uk/resources/mathematics/as-and-a-level/mathematics/teach/textbooks](http://aqa.org.uk/resources/mathematics/as-and-a-level/mathematics/teach/textbooks)

For more details, check the publishers' websites.

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## Resources and support from AQA

**Question commentaries and mark schemes** of our specimen papers written by Chair of Examiners, Dan Rogan.

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Thank you.

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Thank you

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