Edexcel AS and A level Mathematics and Further Mathematics

Your guide to our new resources for 2017

NEW

The UK's most trusted A level Mathematics resources

Welcome to our new resources for Edexcel AS and A level Maths 2017

We're excited to present our brand new series for 2017, specifically designed to support the new Edexcel AS and A level specifications for maths and further maths.

Our new resources for 2017 include:

- 14 brand new textbooks with e-books and free online content (pages 4-9)
- ActiveLearn Digital Service (pages 10-11)
- Revision Guides, Workbooks and Practice Papers Plus+ books (pages 12-13)

Textbooks

With over 1.3 million copies sold of the previous editions, we've taken care to retain the familiar style, layout and features you know and trust.

Our textbooks match the new Edexcel AS and A level exam structure, with separate Pure and Applied textbooks for AS and A level Maths, and a textbook per option for AS and A level Further Maths.

Our new textbooks for 2017:

- support flexible planning and delivery
- offer a more manageable approach to boost student confidence
- include FREE online student-facing content (pages 4-5).

NEW

AS and A level Mathematics

Year 1/AS — Pure Mathematics Year 1/AS

Year 2 — Pure Mathematics Year 2

Statistics and Mechanics Year 1/AS

Statistics and Mechanics Year 2

AS and A level Further Mathematics

Compulsory

Further Pure Mathematics Book 1/AS

Further Pure Mathematics Book 2

Options

Further Statistics 1 FS1

Further Mechanics 1 FM1

Decision Mathematics 1 D1

Further Pure Mathematics 3 FP3

Further Statistics 2 FS2

Further Mechanics 2 FM2

Decision Mathematics 2 D2

Further Pure Mathematics 4 FP4

ActiveLearn Digital Service

Our ActiveLearn Digital Service brings together front-of-class teaching resources, teacher planning resources and our Progression Services into one easy-to-use package.
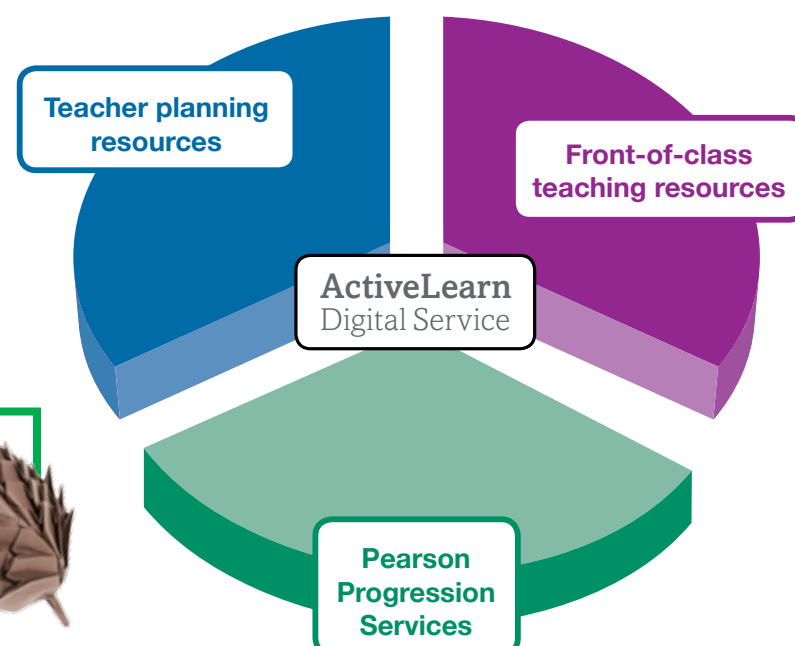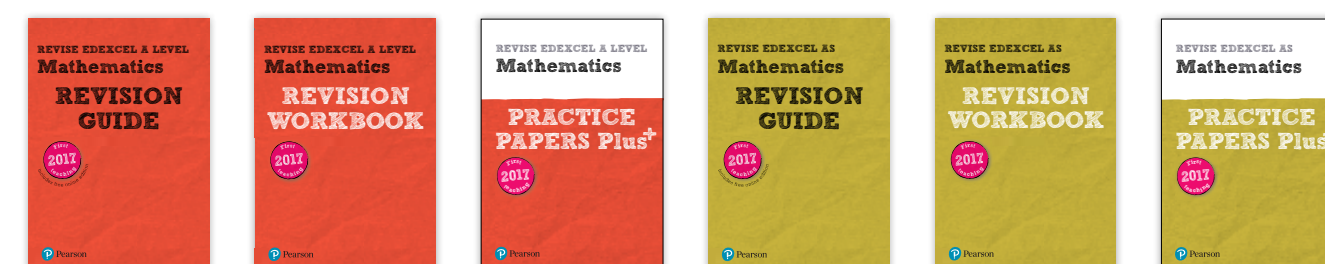
Fully integrated with the new Edexcel AS and A level Mathematics and Further Mathematics interactive Scheme of Work.

Teacher planning resources

Front-of-class teaching resources

ActiveLearn Digital Service

Pearson Progression Services

Revise Edexcel

Our new Revise Edexcel books for AS and A level Maths provide all the exam guidance, hints and tips students will need, as well as plenty of exam practice.

REVISE EDEXCEL A LEVEL Mathematics REVISION GUIDE 2017

REVISE EDEXCEL A LEVEL Mathematics REVISION WORKBOOK 2017

REVISE EDEXCEL A LEVEL Mathematics PRACTICE PAPERS Plus+ 2017

REVISE EDEXCEL AS Mathematics REVISION GUIDE 2017

REVISE EDEXCEL AS Mathematics REVISION WORKBOOK 2017

REVISE EDEXCEL AS Mathematics PRACTICE PAPERS Plus+ 2017

Buy our resources online at:
www.pearsonglobalschools.com/alevelmaths2017

Free online content with every textbook

You've told us that independent learning is an important part of A level study, so our new textbooks all come with links to free interactive online content to help students develop their knowledge and skills.

e-book with every textbook

Every textbook comes with an e-book, accessible online and valid for 3 years once activated.

GeoGebra interactives

Bespoke GeoGebra-powered content linked to the textbooks, allowing your students to explore topics in more detail, visualise problems and consolidate their learning. **Free unlimited access**.

Linked to worked examples in the textbook so students can make the most of their resources.

Casio calculator support

Video tutorials developed in collaboration with Casio, to help students make the most of the new calculators in the exams. **Free unlimited access**.

Students can annotate the pages and save their own notes.

See the actual keypresses and what appears on the calculator screen.

Available to download for offline access in an easy-to-print format.

© fotolia/BillionPhotos.com

SolutionBank

Our highly popular tool showing full worked solutions for every question in the textbooks. **Free unlimited access**.

Buy our resources online at:
www.pearsonglobalschools.com/alevelmaths2017

Textbooks: Fully updated versions of our best-selling course

We've kept the clear and accessible design and features that you and your students tell us you like, and have fully updated the content to match the new Edexcel AS and A level exams.

Integrated with the free Edexcel AS and A level qualification support

Our textbooks have been developed alongside the Edexcel AS and A level Schemes of Work, giving you the most coherent approach to teaching and learning.

Packed with exam-style questions to ensure that your students are ready for the new assessments.

Problem-solving questions are integrated throughout the main exercises.

Challenge boxes provide stretch for more able students.

Worked examples focus on the key types of questions students will need to tackle.

Problem-solving hints help students get to grips with the new style of question.

Exercise questions are carefully graded so they increase in difficulty and gradually bring students up to standard.

---

4 Use the binomial expansion to find the first four terms, in ascending powers of x, of:

a $(1 + x)^8$ **b** $(1 - 2x)^6$ **c** $\left(1 + \frac{x}{2}\right)^{10}$

d $(1 - 3x)^5$ **e** $(2 + x)^7$ **f** $(3 - 2x)^3$

g $(2 - 3x)^6$ **h** $(4 + x)^4$ **i** $(2 + 5x)^7$

Hint Your answers should be in the form $a + bx + cx^2 + dx^3$ where a, b, c and d are numbers.

(E) **5** Find the first 3 terms, in ascending powers of x, of the binomial expansion of $(2 - x)^6$ and simplify each term. **(4 marks)**

(E) **6** Find the first 3 terms, in ascending powers of x, of the binomial expansion of $(3 - 2x)^5$ giving each term in its simplest form. **(4 marks)**

(E/P) **7** Find the binomial expansion of $\left(x + \frac{1}{x}\right)^5$ giving each term in its simplest form. **(4 marks)**

Challenge

Show that $(a + b)^4 - (a - b)^4 = 8ab(a^2 + b^2)$.

Given that $82\,896 = 17^4 - 5^4$, write $82\,896$ as a product of its prime factors.

8.4 Solving binomial problems

You can use the general term of the binomial expansion to find individual coefficients in a binomial expansion.

■ In the expansion of $(a + b)^n$ the general term is given by $\binom{n}{r}a^{n-r}b^r$.

Example 6

a Find the coefficient of x^4 in the binomial expansion of $(2 + 3x)^{10}$.
b Find the coefficient of x^3 in the binomial expansion of $(2 + x)(3 - 2x)^7$.

a x^4 term $= \binom{10}{4}2^6(3x)^4$

$= 210 \times 64 \times 81x^4$

$= 1\,088\,640x^4$

The coefficient of x^4 in the binomial expansion of $(2 + 3x)^{10}$ is $1\,088\,640$.

b $(3 - 2x)^7$

$= 3^7 + \binom{7}{1}3^6(-2x) + \binom{7}{2}3^5(-2x)^2$

$+ \binom{7}{3}3^4(-2x)^3 + \dots$

$= 2187 - 10\,206x + 20\,412x^2$

$- 22\,680x^3 + \dots$

$(2 + x)(2187 - 10\,206x + 20\,412x^2$

$- 22\,680x^3 + \dots)$

Use the general term. The power is 10, so $n = 10$, and you need to find the x^4 term so $r = 4$.

There are $\binom{10}{4}$ ways of choosing 4 '$3x$' terms from 10 brackets.

First find the first four terms of the binomial expansion of $(3 - 2x)^7$.

Now expand the brackets $(2 + x)(3 - 2x)^7$.

x^3 term $= 2 \times -22\,680x^3 + x \times 20\,412x^2$

$= -24\,948x^3$

The coefficient of x^3 in the binomial expansion of $(2 + x)(3 - 2x)^7$ is $-24\,948$.

There are two ways of making the x^3 term: (constant term $\times$ x^3 term) and (x term $\times$ x^2 term).

The binomial expansion can be used to solve problems where there is an unknown in the original expression.

Example 7

$g(x) = (1 + kx)^{10}$, where k is a constant.

Given that the coefficient of x^3 in the binomial expansion of $g(x)$ is 15, find the value of k.

x^3 term $= \binom{10}{3}1^7(kx)^3 = 15x^3$

$120k^3x^3 = 15x^3$

$k = \frac{1}{2}$

$a = 1$, $b = kx$, $n = 10$ and $r = 3$.

$k^3x^3 = \frac{15}{120}x^3$

$k^3x^3 = \frac{1}{8}x^3$

$k^3 = \frac{1}{8}$, $k = \sqrt[3]{\frac{1}{8}}$

Example 8

a Write down the first three terms, in ascending powers of x, of the binomial expansion of $(1 + qx)^8$, where q is a non-zero constant.

b Given that, in the expansion of $(1 + qx)^8$, the coefficient of x is $-r$ and the coefficient of x^2 is $7r$, find the value of q and the value of r.

a $(1 + qx)^8$

$= 1^8 + \binom{8}{1}1^7(qx)^1 + \binom{8}{2}1^6(qx)^2$

$= 1 + 8qx + 28q^2x^2 + \dots$

b $8q = -r$ and $28q^2 = 7r$

$8q = -4q^2$

$4q^2 + 8q = 0$

$4q(q + 2) = 0$

$q = -2$, $r = 16$

Problem-solving

There are two unknowns in this expression. Your expansion will be in terms of p and q.

Using $28q^2 = 7r$, $r = 4q^2$, $-r = -4q^2$

q is non-zero so $q = -2$.

Exercise 8D

1 Find the coefficient of x^3 in the binomial expansion of:

a $(3 + x)^5$ **b** $(1 + 2x)^5$ **c** $(1 - x)^6$ **d** $(3x + 2)^5$

e $(1 + x)^{10}$ **f** $(3 - 2x)^6$ **g** $(1 + x)^{20}$ **h** $(4 - 3x)^7$

i $\left(1 - \frac{1}{2}x\right)^6$ **j** $\left(3 + \frac{1}{2}x\right)^7$ **k** $\left(2 - \frac{1}{2}x\right)^8$ **l** $\left(5 + \frac{1}{4}x\right)^5$

8

9

"

Here's what you said about our previous editions:

"Exceptional...makes everything so easy and simple to understand."

"Truly the best book for Edexcel Maths."

"How could anyone say this is not perfect! Everyone can study maths from such a book."
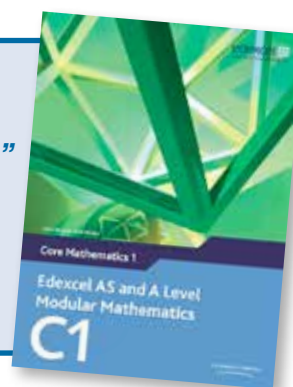
"

Buy our resources online at:
www.pearsonglobalschools.com/alevelmaths2017

Textbooks: Fully updated versions of our best-selling course

Mixed and review exercises

Each textbook provides mixed and review exercises packed with exam-style questions.

Review exercise 1

1 a Write down the value of $8^{\frac{1}{3}}$. **(1 mark)**
b Find the value of $8^{-\frac{1}{3}}$. **(2 marks)**
← Section 1.4

2 a Find the value of $125^{\frac{1}{3}}$. **(2 marks)**
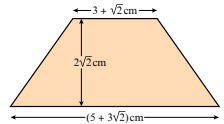**b** Simplify $24x^2 \div 18x^{\frac{1}{2}}$. **(2 marks)**
← Sections 1.1, 1.4

3 a Express $\sqrt{80}$ in the form $a\sqrt{5}$, where a is an integer. **(2 marks)**
b Express $(4 - \sqrt{5})^2$ in the form $b + c\sqrt{5}$, where b and c are integers. **(2 marks)**
← Section 1.5

4 a Expand and simplify $(4 + \sqrt{3})(4 - \sqrt{3})$. **(2 marks)**
b Express $\frac{26}{4 + \sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers. **(3 marks)**
← Sections 1.5, 1.6

5 Here are three numbers:
$1 - \sqrt{k}$, $2 + 5\sqrt{k}$ and $2\sqrt{k}$
Given that k is a positive integer, find:
a the mean of the three numbers. **(2 marks)**
b the range of the three numbers. **(1 mark)**
← Section 1.5

6 Given that $y = \frac{1}{25}x^4$, express each of the following in the form kx^n, where k and n are constants.
a y^{-1} **(1 mark)**
b $5y^{\frac{1}{2}}$ **(1 mark)**
← Section 1.4

7 Find the area of this trapezium in cm². Give your answer in the form $a + b\sqrt{2}$, where a and b are integers to be found. **(4 marks)**
← Section 1.5

8 Given that $p = 3 - 2\sqrt{2}$ and $q = 2 - \sqrt{2}$, find the value of $\frac{p + q}{p - q}$.
Give your answer in the form $m + n\sqrt{2}$, where m and n are rational numbers to be found. **(4 marks)**
← Sections 1.5, 1.6

9 a Factorise the expression $x^2 - 10x + 16$. **(1 mark)**
b Hence, or otherwise, solve the equation $8^{2y} - 10(8^y) + 16 = 0$. **(2 marks)**
← Sections 1.3, 1.4, 2.1, 2.3

10 $x^2 - 8x - 29 \equiv (x + a)^2 + b$, where a and b are constants.
a Find the value of a and the value of b. **(2 marks)**
b Hence, or otherwise, show that the roots of $x^2 - 8x - 29 = 0$ are $c \pm d\sqrt{5}$, where c and d are integers. **(3 marks)**
← Sections 2.2, 2.2

94

> *Exam-style questions have been specifically written to match the style of the new exams.*

> *Fully integrated exam practice in the textbooks, with around 500 exam-style questions in our Pure Year 1 book.*

> *Our course is aligned with the FREE Edexcel AS and A level topic tests so you can set them at specific points as you work through the textbooks.*

Problem-solving

Problem-solving questions are integrated throughout the textbooks, so that problem-solving is easy to deliver and directly related to relevant exam topics.

> *Problem-solving questions and exam-style questions that require problem-solving skills are clearly flagged.*

P 4 The point A with coordinates $(-1, 4)$ lies on the curve with equation $y = x^3 - 5x$.
The point B also lies on the curve and has x-coordinate $(-1 + h)$.
a Show that the gradient of the line segment AB is given by $h^2 - 3h - 2$.
b Deduce the gradient of the curve at point A.

> **Problem-solving**
> Draw a sketch showing points A and B and the chord between them.

E/P 5 Prove, from first principles, that the derivative of $6x$ is 6. **(3 marks)**

E/P 6 Prove, from first principles, that the derivative of $4x^2$ is $8x$. **(4 marks)**

E/P 7 $f(x) = ax^2$, where a is a constant. Prove, from first principles, that $f'(x) = 2ax$. **(4 marks)**

> *Hint boxes offer key problem-solving strategies.*

Practice papers

Full AS and A level practice papers are included at the back of each textbook. These have been written to reflect the new exams accurately.

Pearson Edexcel Level 3 GCE

Mathematics

Advanced Subsidiary
Paper 1: Pure Mathematics

Practice paper Time: 2 hours	You must have: Mathematical Formulae and Statistical Tables Calculator

1 a Write down the value of $64^{\frac{2}{3}}$. **(1)**
b Write $\sqrt{50}$ in the form $k\sqrt{2}$ where k is an integer to be determined. **(1)**

2 Find the equation of the line parallel to $2x - 3y + 4 = 0$ that passes through the point $(5, 6)$. Give your answer in the form $y = ax + b$ where a and b are rational numbers. **(3)**

3 Evaluate $\int_1^2 \left(x^4 - \frac{3}{\sqrt{x}} + 2 \right) dx$
Give your answer correct to 3 significant figures. **(4)**

4 Find all the solutions in the interval $0 \leqslant x \leqslant 180°$ of
$2\sin^2(2x) - \cos(2x) - 1 = 0$
giving each solution in degrees. **(7)**

5 A rectangular box has sides measuring x cm, $x + 3$ cm and $2x$ cm.
Figure 1:
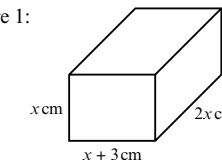
a Write down an expression for the volume of the box. **(1)**
Given that the volume of the box is 980 cm³,
b Show that $x^3 + 3x^2 - 490 = 0$. **(2)**
c Show that $x = 7$ is a solution to this equation. **(1)**
d Prove that the equation has no other real solutions. **(4)**

6 $f(x) = x^3 - 5x^2 - 2 + \frac{1}{x^2}$
The point P with x-coordinate -1 lies on the curve $y = f(x)$. Find the equation of the normal to the curve at P, giving your answer in the form $ay - bx = c$ where a, b and c are positive integers. **(7)**

342

> *Questions worded just like they'd appear in the exams.*

> Buy our resources online at:
> **www.pearsonglobalschools.com/alevelmaths2017**

ActiveLearn Digital Service : Everything you need to teach, all in one place

Our ActiveLearn Digital Service brings together front-of-class teaching resources, teacher planning resources and resources from Pearson Progression Services into one easy-to-use package.

1. Front-of-class teaching resources

- Present interactive versions of all our maths and further maths textbooks on your whiteboard – zoom in on questions and click to reveal answers.

- Explore hundreds of digital resources, including lesson presentations, GeoGebra interactives and additional worksheets.

GeoGebra interactives.
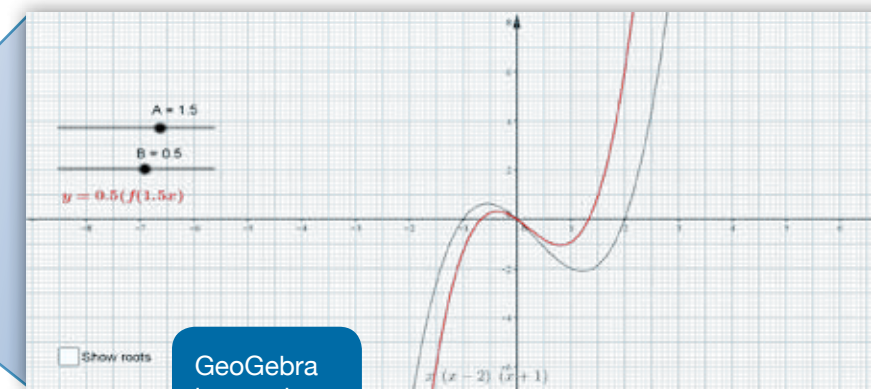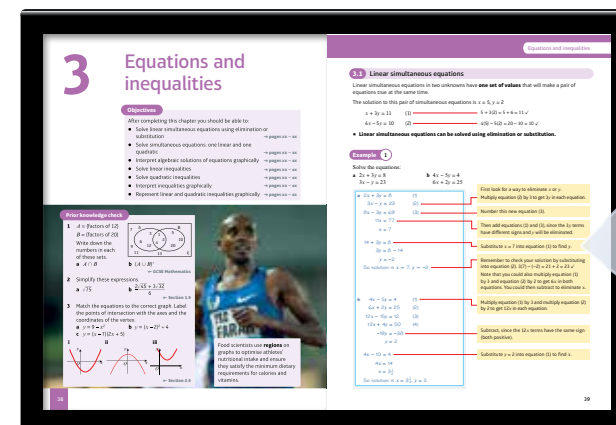
Covers all 14 textbooks across AS and A level Maths and Further Maths.

2. Teacher planning resources

- Teaching guidance for all areas of maths and further maths, including opportunities for reasoning/problem-solving, common misconceptions, examiner report quotes and prerequisite knowledge.

- Specific support on teaching Mechanics and Statistics as well as new areas such as the large data set.
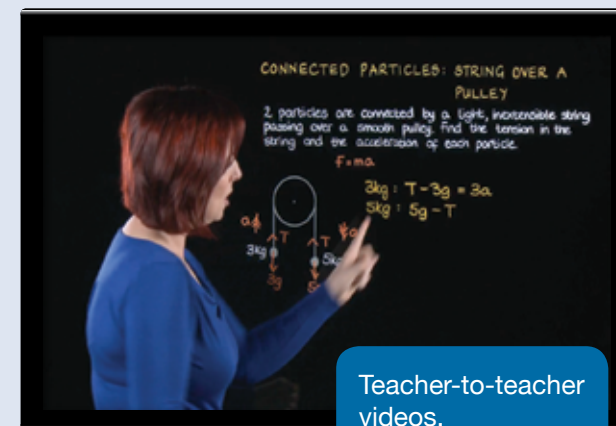
Teacher-to-teacher videos.
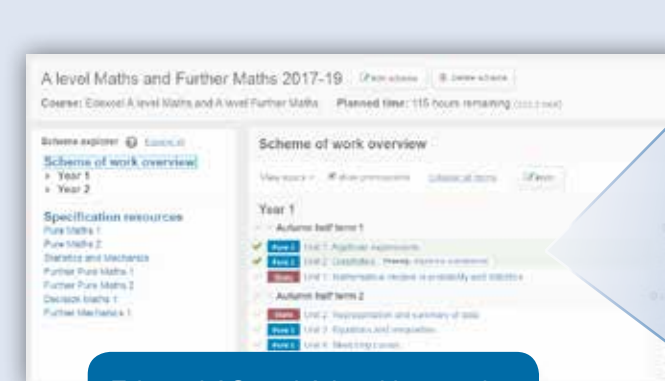
Edexcel AS and A level interactive Scheme of Work.
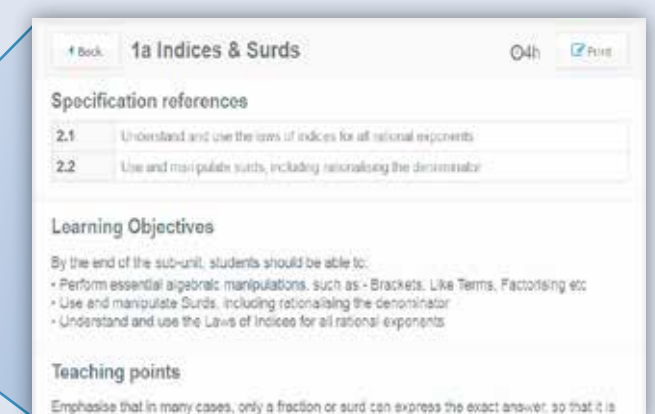
3. Pearson Progression Services

- Baseline, end-of-unit and end-of-year assessments all mapped to indicative grades.

- Tools and resources for tracking and reporting progress, including strengths and weaknesses reports and reports by individual student, class and year group.

End-of-unit test.

Linked to indicative grades for A level helping you to formulate grade predictions and put in place appropriate interventions.

Student progress reports.

Fully integrated with the Edexcel AS and A level interactive Scheme of Work

ActiveLearn Digital Service is fully flexible to the way you teach A level: move units around in the interactive Scheme of Work and all your ActiveLearn Digital Service resources move with them.

Buy our resources online at:
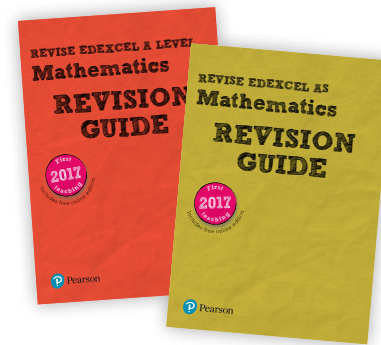**www.pearsonglobalschools.com/alevelmaths2017**

Revise Edexcel: All your exam preparation covered

Revision Guides

Our Revision Guides provide all the exam guidance, hints and tips students will need, as well as plenty of exam practice.

The Revision Guides for AS and A level Maths help students:

- **organise** their revision with the one-topic-per-page format
- **speed up** their revision with summary notes in short, memorable chunks
- **check** their understanding with worked examples
- **develop** their exam technique with exam-style practice questions and answers.

> "
>
> **Here's what you said about our previous editions:**
>
> *"AMAZING, absolutely amazing book... It's incredibly useful and it explains everything so well."*
>
> *"Very thorough and clear with great exam-style questions to do."*
>
> *"Summarises whole chapters in a page and has questions that cement your understanding."*
>
> "

Buy our resources online at:
www.pearsonglobalschools.com/alevelmaths2017

Revision Workbooks

Our Revision Workbooks are focussed on exam practice and are suitable for classroom and independent study.

The Revision Workbooks for AS and A level Maths help students:

- **prepare** for their exams with a book full of exam-style practice questions and a full length practice paper
- **simplify** their revision by writing straight into the book just as they would in an exam
- **track** their revision progress with at-a-glance check boxes
- **build confidence** and improve their understanding and exam technique with guided questions and hints to support key revision points.
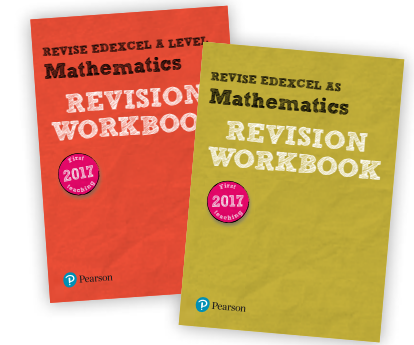
Keep an eye out for our Revise Edexcel AS and A level Further Maths titles - coming soon!

Practice Papers Plus⁺ books

Our Practice Papers Plus⁺ books contain additional full length practice papers, to help familiarise you and your students with the new style of assessments.

The Practice Papers Plus⁺ books for AS and A level Maths help students:

- **prepare** for their exams by familiarising them with the approach of the new papers and the exam-style questions
- **practise** answering questions by writing straight into the book just as you would in an exam
- **perfect** their responses with targeted hints, guidance and support for every question, including fully worked solutions.
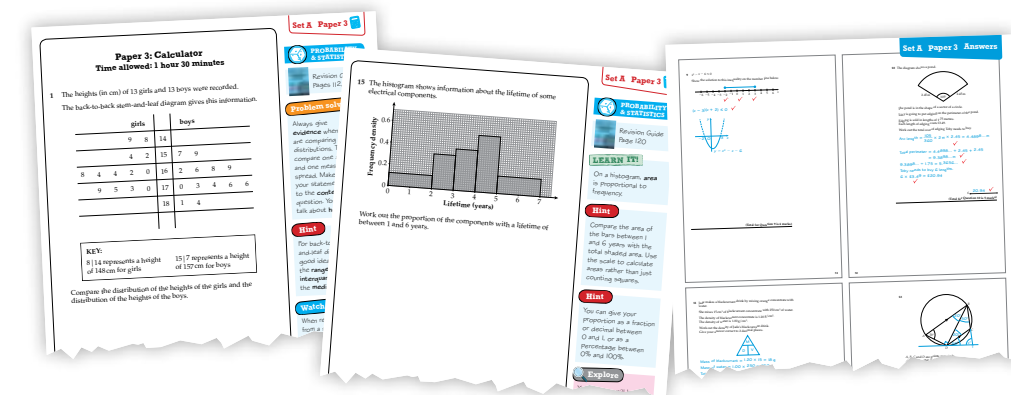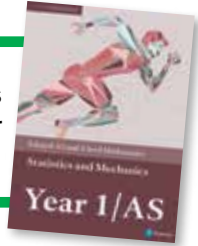
Sample pages from our *GCSE Higher Practice Papers Plus⁺* book
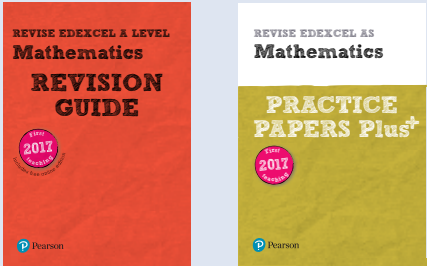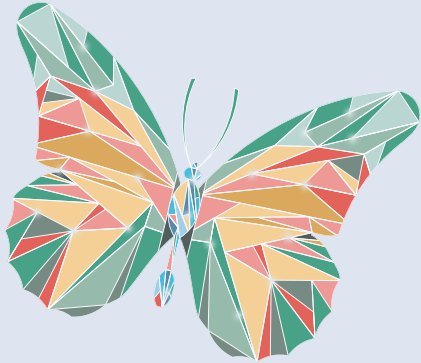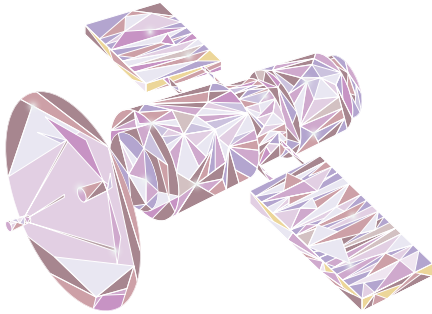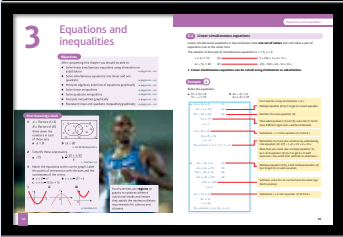
Supporting you through the changes

Four key ways our new resources will support you through the 2017 specification changes:

We will provide free online access to the Statistics and Mechanics Year 1/AS textbook until Autumn 2017, so that you can be familiar with the content before first teaching.

	Preparing students for the new exams	Helping with the move to linear exams	Teaching new and unfamiliar topics	Focusing on problem-solving
Textbooks	✔ Exam-style questions integrated throughout the exercises ✔ Mixed and review exercises dedicated to exam preparation ✔ Full AS and A level practice papers at the back of each textbook	✔ Mixed and review exercises that test holistically ✔ A summary of key points at the end of each chapter	✔ Separate, focussed textbooks for the applied content ✔ Exam-style questions using the large data set ✔ Large data set investigations enabling exploration using ICT	✔ Problem-solving questions integrated throughout the exercises ✔ Exam-style questions reflecting the new focus on problem-solving ✔ Problem-solving hints help embed key strategies
Revise Edexcel	✔ Exam guidance, hints, tips and plenty of exam-style practice ✔ A dedicated book full of additional practice papers	✔ Revision Guides for key teaching and Workbooks for exam preparation ✔ Additional practice papers that match the linear exams		✔ Specific revision tips and hints for problem-solving
FREE online content	✔ Worked solutions show how to clearly lay out answers ✔ Casio calculator tutorials demonstrate best exam use		✔ GeoGebra interactives help students visualise topics ✔ Casio calculator tutorials for using the statistics functions	✔ GeoGebra interactives allow further exploration of topics
ActiveLearn Digital Service	✔ Additional worksheets provide extra practice	✔ Assessments and reporting with indicative grades ✔ Progression maps and scales with flightpaths	✔ Planning materials for Statistics and Mechanics ✔ Teacher-to-teacher videos for teaching ideas	

Your next steps

1. **Browse our free resources**

   Take a look at the free textbook and other samples at:
   www.pearsonglobalschools.com/alevelmaths2017

2. **Buy online**

   Visit our website to order your resources. Go to:
   www.pearsonglobalschools.com/alevelmaths2017

3. **Find your Local Consultant**

   Visit www.pearsonglobalschools.com and select find
   your local contact.