



Maths and Further Maths

Matthew Rihan, Julia Riley, Jonathan Waugh

mcr48@cam.ac.uk

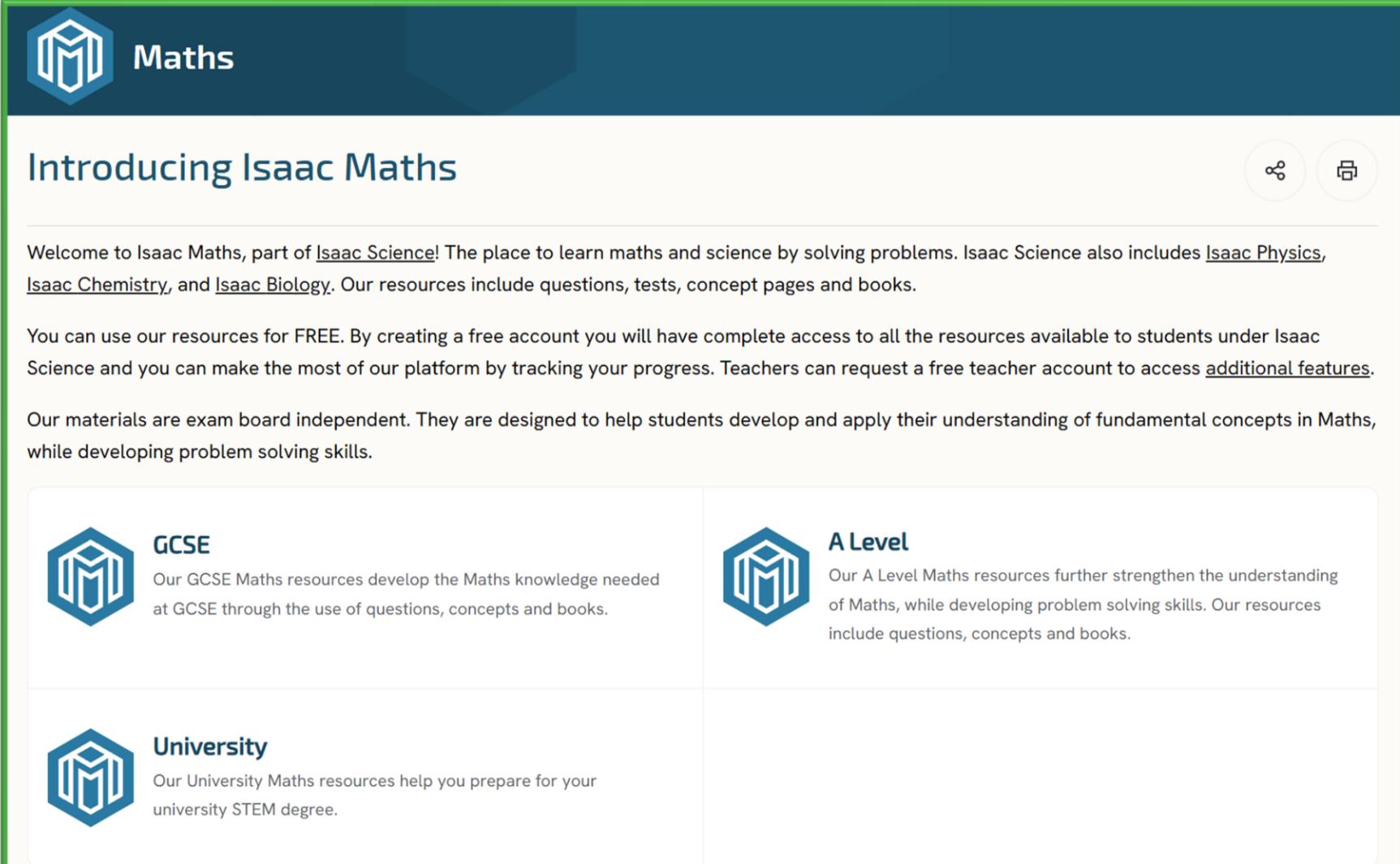
jmr2@cam.ac.uk

jnw34@cam.ac.uk

This symposium is
generously funded
by



Maths Homepage – isaacscience.org/math



The screenshot shows the homepage of Isaac Maths. At the top left is a blue hexagonal icon with a white 'M' and 'S' inside. To its right is the word 'Maths'. Below this is a large teal header with the title 'Introducing Isaac Maths'. Underneath the title are two circular icons: one with a person icon and another with a document icon. The main content area starts with a welcome message: 'Welcome to Isaac Maths, part of [Isaac Science](#)! The place to learn maths and science by solving problems. Isaac Science also includes [Isaac Physics](#), [Isaac Chemistry](#), and [Isaac Biology](#). Our resources include questions, tests, concept pages and books.' It then explains the free account benefits: 'You can use our resources for FREE. By creating a free account you will have complete access to all the resources available to students under Isaac Science and you can make the most of our platform by tracking your progress. Teachers can request a free teacher account to access [additional features](#).' It also states that materials are exam board independent and help develop problem-solving skills. The page is divided into three sections: 'GCSE' (with a blue hexagonal icon), 'A Level' (with a blue hexagonal icon), and 'University' (with a blue hexagonal icon). Each section describes the resources available for that level.

Maths

Introducing Isaac Maths

Welcome to Isaac Maths, part of [Isaac Science](#)! The place to learn maths and science by solving problems. Isaac Science also includes [Isaac Physics](#), [Isaac Chemistry](#), and [Isaac Biology](#). Our resources include questions, tests, concept pages and books.

You can use our resources for FREE. By creating a free account you will have complete access to all the resources available to students under Isaac Science and you can make the most of our platform by tracking your progress. Teachers can request a free teacher account to access [additional features](#).

Our materials are exam board independent. They are designed to help students develop and apply their understanding of fundamental concepts in Maths, while developing problem solving skills.

GCSE

Our GCSE Maths resources develop the Maths knowledge needed at GCSE through the use of questions, concepts and books.

A Level

Our A Level Maths resources further strengthen the understanding of Maths, while developing problem solving skills. Our resources include questions, concepts and books.

University

Our University Maths resources help you prepare for your university STEM degree.

Example Age Group – A Level



- Easy to find **resources** for an educational level.
- **Interactive online books.**

A Level Maths books

Pre-University Mathematics for Sciences (2nd edition)
Provides questions on mathematical topics that underpin all the sciences, as well as giving practice and fluency for Maths and Further Maths A-levels themselves.

Using Essential GCSE Mathematics
Develops the maths skills needed to succeed in science at GCSE level and beyond. Also useful for teaching GCSE maths.

A Level Maths

Try a random question! Get a different question ↻

Differentiating Natural Logs
Maths | Calculus | Differentiation

Question finder
Find A Level Maths questions to try by topic and difficulty level.
[Find questions](#)

Question decks by topic
Practise specific topics by using our ready-made question decks.
[View topic question decks](#)

Concepts
Review the key concepts for A Level Maths.
[Explore concepts](#)

Revision
Revise with our tailored revision decks on core pure, further pure, and mechanics.
[List of revision decks](#)

Tests
Use tests to practise a range of topics. These tests are available for you to freely attempt.
[Find a test](#)

Core skills practice Coming soon!
Practise those core skills, such as rearranging equations, vital for A Level Maths.
[Practise core skills](#)

New Resources for 2025



- Question decks by topic now includes resources for statistics
- New concept pages
- Practice tests for preparing for admissions tests
- Tools for practising mental arithmetic and solving simultaneous equations

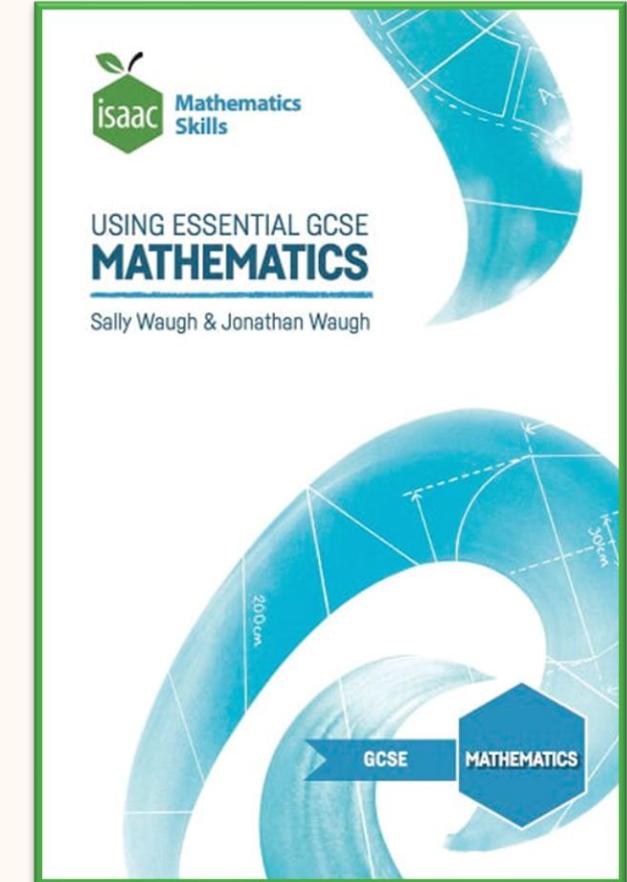
This symposium is
generously funded
by



GCSE Maths Book



- Print book
- All material is also available [online](#)
- Written for both [foundation](#) & higher
(shown with § symbol)
- Useful for [supporting maths skills](#) in STEM subjects at [A-level](#):
 - Sixth form induction programs
 - Ongoing [support](#) where GCSE-level maths is needed, e.g. proportionality



This symposium is
generously funded
by

GCSE Maths Book – Teachers’ Resources



- Additional online resources for **maths** and **user-of-maths** teachers.

Teacher notes ▾

Teacher notes

The following resources for teachers accompany this book:

Specification Table - This maps the content of the book to exam boards. Mapping is available for Edexcel, AQA, WJEC, OCR, IGCSE, CCEA and SQA.

Teacher's Manual - Notes by the author to accompany each chapter of the book, including hints for the harder questions. The manual includes suggestions for user-of-maths teachers on approaches to teaching a number of topics with which students often struggle.

Preparation for Sixth Form (pdf) - Suggestions on how to use the book to revisit key maths topics at the beginning of sixth form, catering for students starting a variety of different courses.

Useful Question for STEM - Tables listing problems within the book that may be useful for teaching STEM subjects.

Maths Skills for GCSE Science - Tables mapping the content of the book to mathematical skills for science requirements.

Pre-Uni Maths Book



- Print book, all material also online
- Second edition
- Chapters 1 – 4 cover pure maths underpinning A Level sciences
- Chapter 5 covers applications of maths to sciences
- Questions categorised according to stage and difficulty

The screenshot shows a digital book interface for 'Pre-University Mathematics for Sciences' by Julia Riley & Mark Warner, 2nd Edition. The left sidebar lists chapters: Overview, Chapter 1 (Algebra & Number), Chapter 2 (Functions), Chapter 3 (Geometry), Chapter 4 (Calculus), and Chapter 5 (Applications to Sciences). The main content area displays the book's title, authors, edition, and a brief description: 'Pre-University Mathematics for Sciences will help you to consolidate essential Mathematics at the core of Sixth Form Maths courses as well as the Maths needed for Physics, Chemistry and Biology.' To the right is a thumbnail image of the book cover, which features a colorful spiral design and the text 'PRE-UNIVERSITY MATHEMATICS FOR SCIENCES'.

This symposium is
generously funded
by

Question Finder



- Search for questions by **name** or **text**
- Filter by **topic**, **difficulty**, **book** or **status**
- Questions are sorted **alphabetically**, but you can **shuffle** them
- Use the **link** at the top to browse questions from **all subjects**

The screenshot shows the 'Question finder' interface. At the top, there's a search bar with placeholder text 'e.g. Crossing Paths' and a magnifying glass icon. Below it is a 'Filter questions by' section with a dropdown menu set to 'Learning Stage' (2). Under 'Learning Stage', 'A Level' and 'Further A' are checked. Other filter options include 'Topic' (Number, Algebra, Geometry, Functions, Calculus, Statistics), 'Difficulty', 'Book', and 'Status'. The main content area displays a list of 30 questions from 1186, filtered for A Level Maths. Each question card includes a thumbnail, the title, a brief description, and a difficulty rating represented by colored squares (orange for Challenge 3, green for Practice 3, blue for Practice 1, grey for University Practice 1). The first few questions listed are:

- Discharging a Capacitor (Pre-Uni Maths for Sciences 7.3.7, Maths | Calculus | Differential Equations)
- Parametric Equations 2 (Pre-Uni Maths for Sciences 35.2, Maths | Calculus | Differentiation)
- Falling Through Air I (Pre-Uni Maths for Sciences 7.4.3, Maths | Calculus | Differential Equations)
- Evaluate a Function 2 (Pre-Uni Maths for Sciences E1.2, Maths | Functions | General Functions)
- Integration Using Trig Identities 2 (Pre-Uni Maths for Sciences K3.8, Maths | Calculus | Integration)
- Solution by Substitution 2 (Pre-Uni Maths for Sciences L2.8, Maths | Calculus | Differential Equations)
- Common Factors 1 (Essential GCSE Maths 15.1, Maths | Algebra | Manipulation)
- Graphs of Quadratic Functions 9 (GCSE Practice 3)

This symposium is
generously funded
by



making
physics
matter

Question Decks by Topic



- These decks cover a specific topic
- Now includes statistics topics
- Also includes topic summaries

Question decks by topic

A level - Statistics ▾

A level - Topic summary questions ▾

Each of the questions in the table below summarises the key points of a particular topic.

Field	Topic	Board
Algebra and functions	Rules of Indices	Link
	The Discriminant	Link
Exponentials and logarithms	Logarithm Basics	Link
	Laws of Logarithms	Link
Differentiation	Introducing Differentiation	Link
	Derivatives of Standard Functions 1	Link
	Derivatives of Standard Functions 2	Link
Integration	Integrals of Standard Functions 1	Link

This symposium is
generously funded
by

Concepts



- Cover pure maths and statistics
- Mechanics is covered in physics
- Select GCSE or A Level as appropriate

The screenshot shows the 'Concepts' section of the isaac platform. At the top, there's a search bar with placeholder text 'e.g. Triangle' and a magnifying glass icon. Below it is a 'Filter by topic' section with a 'All' button (73 results) and categories: Number (7), Algebra (17), Geometry (13), Functions (9), Calculus (14), and Statistics (13). The main content area displays a message: 'The concepts shown on this page have been filtered to only show those that are relevant to A Level Maths.' It includes a 'Browse all concepts' button and icons for sharing and printing. Below this, a heading says 'Showing 73 results'. Five concept cards are listed:

- Algebraic Division and The Factor Theorem**: An explanation of algebraic division and how we can use it along with the factor theorem and remainder theorem to factorise polynomials.
- Algebraic Fractions & Partial Fractions**: How to work with algebraic fractions, including splitting an expression into partial fractions.
- Algebraic Manipulation - Index Notation**: An overview of the rules of combining integer, fractional and negative indices.
- Algebraic Manipulation - Inequalities**: An overview of inequality notation and how to manipulate inequalities, and how to solve linear, quadratic and rational inequalities.
- Algebraic Manipulation - Surds**

This symposium is
generously funded
by

Concepts



Concept

Matrices - Definition

Special types of matrix; addition, subtraction and scalar multiplication

A Level

Related concepts

- Vectors - Describing and Adding Vectors
- Vectors - Resolving Vectors
- Matrices - Matrix Multiplication

Related questions

There are no related questions for this concept.

See all questions for A Level Maths →

Further A

- Special types of matrix
- Matrix addition and subtraction
- Scalar multiplication

Matrices have many applications in Mathematics, Physics, Chemistry and Computer Science. They can be used to represent systems of simultaneous equations, stress and strain in materials, geometrical transformations of objects as well as having many uses in statistics, quantum mechanics, graph theory and artificial intelligence.

A matrix is an array of elements set out in a pair of brackets and arranged in rows and columns. We can describe the size of a matrix using the number of rows and columns, $m \times n$.

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \quad \begin{pmatrix} 4 \\ 1 \\ -2 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & -3 \\ -2 & 2 & k^2 \end{pmatrix} \quad \begin{pmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \dots & a_{mn} \end{pmatrix}$$

2 × 2 matrix 3 × 1 matrix 2 × 3 matrix $m \times n$ matrix

These **explain a concept** in detail

Further A

Matrix addition and subtraction ^

We can add or subtract two matrices (of the same size) by adding or subtracting the corresponding elements, just as we would for vectors. For example,

$$\begin{pmatrix} 2 & -1 & 0 \\ -3 & 1 & k \end{pmatrix} + \begin{pmatrix} 3 & k & -3 \\ 5 & 2 & 2k \end{pmatrix} = \begin{pmatrix} 5 & k-1 & -3 \\ 2 & 3 & 3k \end{pmatrix}$$

Quick Q1 Quick Q2

Given that $\mathbf{A} = \begin{pmatrix} 2 & -1 \\ 0 & -3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 4 & 3 \\ -2 & -5 \end{pmatrix}$, find $\mathbf{A} + \mathbf{B}$.

Hide answer

$$\begin{aligned} \mathbf{A} + \mathbf{B} &= \begin{pmatrix} 2 & -1 \\ 0 & -3 \end{pmatrix} + \begin{pmatrix} 4 & 3 \\ -2 & -5 \end{pmatrix} \\ &= \begin{pmatrix} 2+4 & -1+3 \\ 0+(-2) & -3+(-5) \end{pmatrix} \\ &= \begin{pmatrix} 6 & 2 \\ -2 & -8 \end{pmatrix} \end{aligned}$$

Feature worked examples

This symposium is
generously funded
by



making
physics
matter

Revision Decks



- Revision decks contain past exam questions that **span A Level**
- Each deck **spans** the syllabus
- Question parts are **linked** to easier questions
- **Hexagons update** to show progress

Question

Maths Stage 2 - Revision & Practice

Partial Fractions Practice

Question deck: Maths Stage 2 - Revision & Practice

- Integrating Exponentials & Logs A Level Challenge 3 ■■■
- Polynomials 1 A Level Challenge 2 ■■□
- Functions and Inverse Functions A Level Challenge 2 ■■□
- Parametrics & Implicit Differentiation A Level Challenge 2 ■■□
- Integration & Exponential Equations A Level Challenge 3 ■■■
- Trigonometric Identities A Level Challenge 2 ■■□
- Polynomials 2 A Level Challenge 2 ■■□

Part A Partial Fractions >

Part B Derivative >

Part C Deduction >

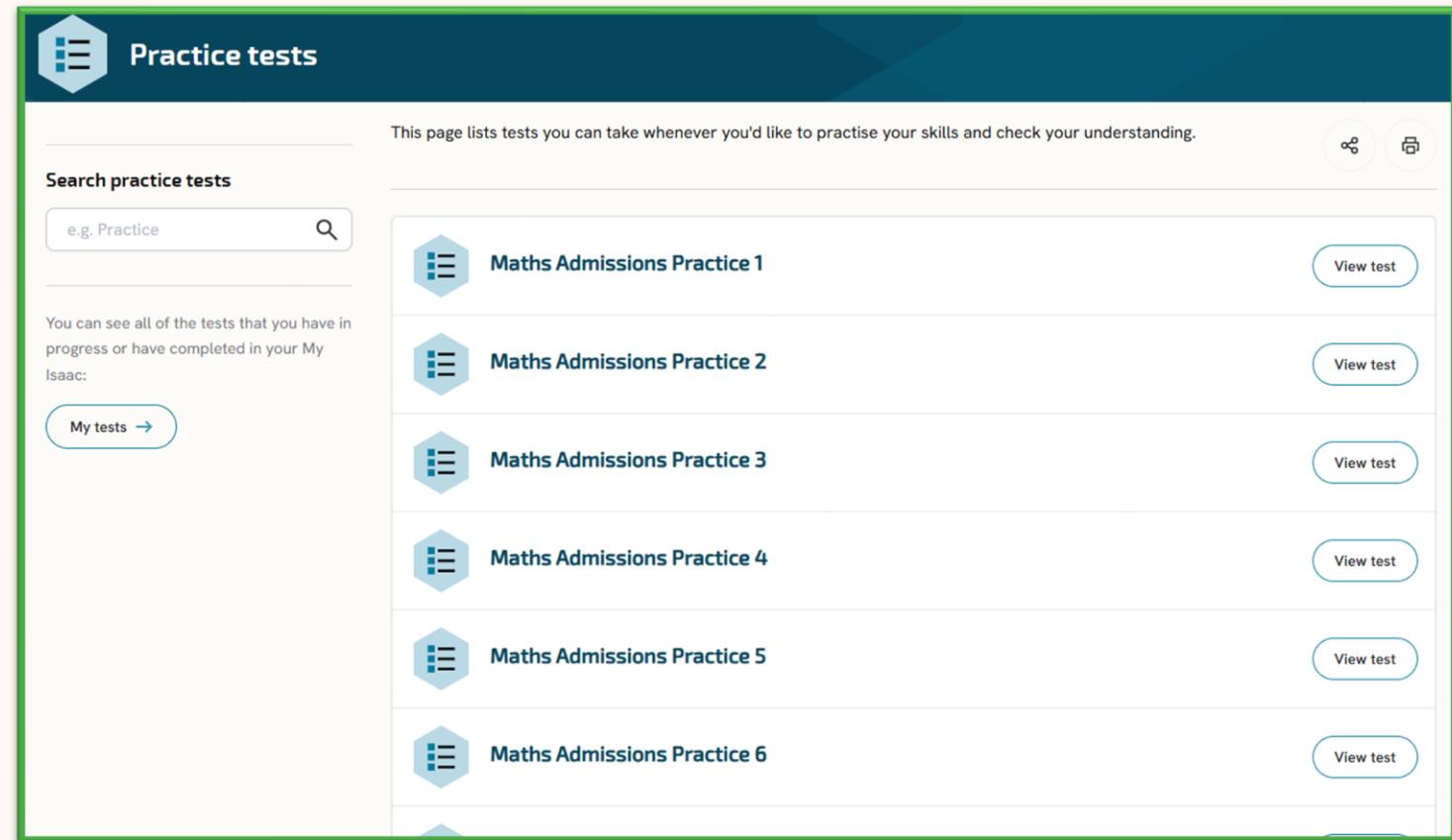
The equation of a curve is $y = f(x)$, where $f(x) = \frac{3x + 1}{(x + 2)(x - 3)}$.

Status: Not started | Stage & difficulty: A Level Practice 2

Used with permission from UCLES A-level Maths papers, 2003-2017.

Tests

- Admissions practice tests aim to help students prepare
- Aim to help students develop fluency and improve speed
- Build up to 7 questions in 10 minutes



The screenshot shows a user interface titled "Practice tests". At the top, there is a search bar with placeholder text "e.g. Practice" and a magnifying glass icon. Below the search bar, a message says: "You can see all of the tests that you have in progress or have completed in your My Isaac: [My tests →](#)". A list of six tests is displayed, each with a blue hexagonal icon containing three white vertical bars and the text "Maths Admissions Practice 1" through "Maths Admissions Practice 6". To the right of each test title is a blue rounded rectangular button with the text "View test".

This symposium is
generously funded
by

Core Skills Practice



- Help practise a specific skill
- Aimed at personal practice
- Questions are randomly generated

The screenshot shows the 'Core skills practice' website interface. At the top, there's a navigation bar with a logo and icons for search and print. Below it, a dark blue header bar has the title 'Core skills practice'. On the left, a sidebar titled 'Select stage' offers options for 'GCSE' and 'A Level', with 'A Level' being the active choice. The main content area contains a message about new tools under development. It then lists categories like 'Mental Maths' and 'Simultaneous Equations', each with sub-options such as 'Linear, 2-variable simultaneous equations' and 'Quadratic, 2-variable simultaneous equations'.

This symposium is
generously funded
by

Numeric Questions



Enter a
number

Part A

Volume of steel ▾

Find the volume of steel required.

Value

Units

ⓘ What can I type in this box?

Choose a
unit

These will check answers for appropriate use of significant figures.

This symposium is
generously funded
by

Symbolic Questions



Algebraic symbols



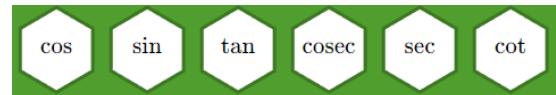
Numbers



Operators



Functions



1 2 3 $Ab \Delta\gamma$ $+ - \sqrt{x}$ $\sin \int$

$$a^\circ \cdot \cos(\theta)$$

Help



Re-centre

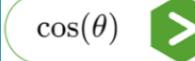
Differentiate $a \sin \theta$ with respect to θ (a is a constant).

HIDE QUESTION

Question text



Bin



Finish

This symposium is
generously funded
by



making
physics
matter

Graph Sketcher Questions



Part A
Sketch y ▾

Find the roots of the curve $y = x^2(3 - x)$ and sketch it.

Click on the grid

Click on the grid to start your sketch.

Check my answer

Straight line

Curve

Colour

Bin

Clear

Help

Finish

Undo

Redo

Question text

Click and hold to sketch

Find the roots of the curve $y = x^2(3 - x)$ and sketch it.

HIDE QUESTION

This symposium is
generously funded
by

Graph Sketcher Questions



You can

- Draw up to 3 strokes (usually)
- Move, stretch or rotate strokes
- Move turning points or ends
- Delete by dragging it off the grid or using the buttons

[Demo Link](#)

This symposium is
generously funded
by



Graph Sketcher Questions



How strict is it?

It uses **rough** positions:

- Which **quadrant**?
- Where does it **cross the axes**? (+/- or origin)
- Where are the **turning points**?
- What are the **start and end slopes**?
- Where do **curves intersect**?

This symposium is
generously funded
by



Reorder Questions



- Choose from available items
- Drag items into the answer
- Put items in the correct order

Part A
Translation of the curve $y = \sqrt{x}$ ✓

A sequence of transformations maps the curve $y = \sqrt{x}$ to the curve $y = f(x)$. Give details of these transformations.

Available items

- Translate the curve 7 units in the negative y direction.
- Translate the curve 4 units in the negative y direction.
- Stretch the curve in the xz direction by a factor of m .
- Translate the curve 7 units in the positive x direction.
- Stretch the curve in the xz direction by a factor of $\frac{1}{m}$.
- Translate the curve 4 units in the positive y direction.
- Translate the curve 4 units in the negative x direction.

Your answer

- Translate the curve 7 units in the negative x direction.
- Stretch the curve in the yz direction by a factor of $\frac{1}{m}$.

Check my answer

This symposium is
generously funded
by



Cloze Questions



- Drag items to fill in the boxes
- Receive individual feedback on each item
- Small screens use a dropdown menu

Part B
Combining cells Incorrect

Explain why some combining of rows or columns should be carried out. Fill in the gaps below.

Since one of the expected frequencies is less than 5, we should combine cells until they are less than 10. We could combine rows or columns to do so. In this case we will combine rows 2 and 3.

Items:

less than or equal to 10 greater than or equal to 5

Partly correct...

[Check my answer](#)

Part B
Combining cells

Explain why some combining of rows or columns should be carried out. Fill in the gaps below.

Since one of the expected frequencies is we should combine cells until they are We could combine rows or columns to do so. In this case we will combine rows we will combine rows

Need some help?

[Hint 1 >](#) [Hint 2 >](#)

This symposium is
generously funded
by

The Ogden Trust | making physics matter

Inline Questions



- Type numbers or text in the boxes
- Received individual feedback on each box
- Some boxes may require units

Unit...

Part A
Expected frequencies ▾

In progress

Calculate the expected frequencies. Fill in the gaps below. Give your answers to 2 dp.

Height		Hair colour		
		Dark	Fair	Red
Height	Less than 165 cm	16.15 ✓	4.4 ✗	4.08 ✓
	165 cm to 180 cm	44.65 ✓	18.33 ✗	11.28 ✓
	More than 180 cm	15.68 ✗	!	!

Partly correct...

You can view feedback for a specific box by either selecting it above, or by using the control panel below.

Previous Box 8 of 9 Next

You did not provide an answer.

Check my answer

Coordinate Questions



- Type **numbers** in the boxes
- You can **add/delete** coordinates
- **Coordinate points** can be submitted in **any order** (but not the abscissa and ordinate)

Part B
Intersection points ▾

Find the coordinates of the points of intersection of the line and the circle.

(,) Delete

(,) Delete

Add coordinate

Check my answer

This symposium is
generously funded
by

Have a go!



Maths homepage isaacscience.org/math

A Level page isaacscience.org/math/a_level

GCSE Book isaacscience.org/books/math_gcse

Pre-Uni Maths Book isaacscience.org/books/pre_uni_math_2e

Questions to try isaacscience.org/question_decks#ipts25_sat_2b

This symposium is
generously funded
by

