






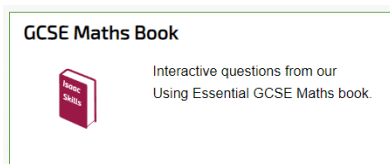
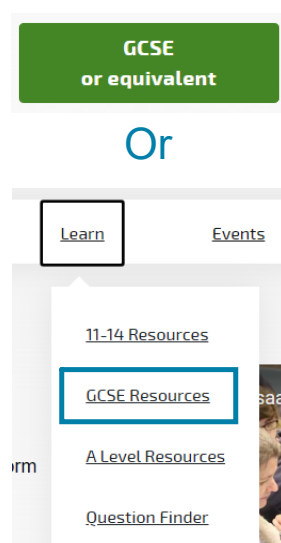


## Isaac Maths Resources

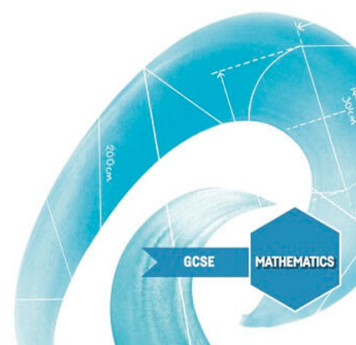
GCSE Book	 <a href="https://isaacphysics.org/books/maths_book_gcse">https://isaacphysics.org/books/maths_book_gcse</a>
A-level Book	 <a href="https://isaacphysics.org/books/pre_uni_maths_2e">https://isaacphysics.org/books/pre_uni_maths_2e</a>
Practise Maths	 <a href="https://isaacphysics.org/pages/maths_practice">https://isaacphysics.org/pages/maths_practice</a>
Revision Boards	 <a href="https://isaacphysics.org/pages/maths_practice#master_maths">https://isaacphysics.org/pages/maths_practice#master_maths</a>
Question finder	 <a href="https://isaacphysics.org/questions">https://isaacphysics.org/questions</a>
Concept Pages	 <a href="https://isaacphysics.org/concepts">https://isaacphysics.org/concepts</a>
Questions to try	 <a href="https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths4">https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths4</a>

## GCSE Book

[https://isaacphysics.org/books/maths\\_book\\_gcse](https://isaacphysics.org/books/maths_book_gcse)



USING ESSENTIAL GCSE  
**MATHEMATICS**  
Sally Waugh & Jonathan Waugh



Available for £1.50 in print, or online for free.

### Buy the book

Printed copies, cost price £1.50 (plus p+p)

**Buy Isaac Books**

## Teacher resources.

### For Teachers

**Specification Table** - maps the book to your exam board.

**Teacher's Manual** - authors' notes for teachers.

**Preparation for Sixth Form (pdf)** - by the authors.

**STEM Question Finder** - table of problems that relate to STEM subjects.

**Maths Skills for GCSE Science** - table of assumed skills for GCSE science courses.

Covers all of GCSE Maths, with sections for Foundation or Higher.

### Chapters:

**1 Solving Maths Problems**  
(Section 1)

**2 Skills**  
(Sections 2-11)

**3 Algebra**  
(Sections 12-22)

**4 Linear Functions**  
(Sections 23-25)

**5 Quadratic Functions**  
(Sections 26-30)

**6 Inequalities**  
(Sections 31-32)

**7 Graphs**  
(Sections 33-37)

**8 Geometry**  
(Sections 38-50)

**9 Probability and Statistics**  
(Sections 51-57)

Questions in gameboards for each chapter.

Graphs

33F

Standard Function Graphs Foundation

[View board](#) | [Assign](#)

33H

Standard Function Graphs Higher

[View board](#) | [Assign](#)

34F

Proportionality Foundation

[View board](#) | [Assign](#)

34H

Proportionality Higher

[View board](#) | [Assign](#)

35H

Transformations Higher

[View board](#) | [Assign](#)

36F

Real-World Graphs Foundation

[View board](#) | [Assign](#)

36H

Real-World Graphs Higher









[View board](#) | [Assign](#)

37H

Numerical Methods Higher

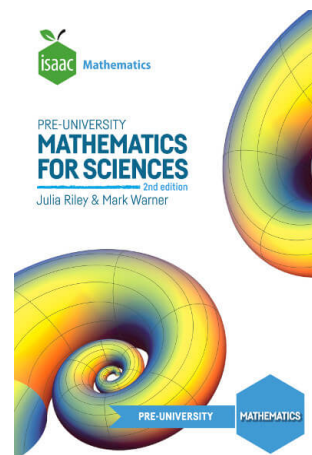
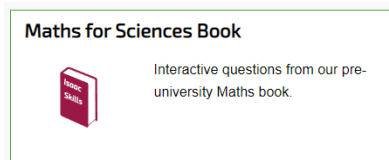
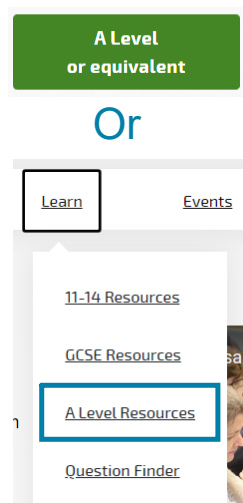
[View board](#) | [Assign](#)

36. Real-World Graphs Higher

	<b>Notes</b>	
	Real-World Graphs	>
	<b>Essential GCSE Maths 36.3</b>	GCSE A Level
	Maths > Functions > Graph Sketching	C C C P P P >
	<b>Essential GCSE Maths 36.4</b>	GCSE A Level
	Maths > Functions > Graph Sketching	C C C P P P >
	<b>Essential GCSE Maths 36.5</b>	GCSE A Level
	Maths > Functions > Graph Sketching	P P P P P P >
	<b>Essential GCSE Maths 36.6</b>	GCSE A Level
	Maths > Functions > Graph Sketching	P P P P P P >
	<b>Essential GCSE Maths 36.8</b>	GCSE A Level
	Maths > Functions > Graph Sketching	C C C P P P >
	<b>Essential GCSE Maths 36.9</b>	GCSE A Level
	Maths > Functions > Graph Sketching	P P P P P P >
	<b>Essential GCSE Maths 36.10</b>	GCSE A Level
		P P P P P P >

## A-level Book

[https://isaacphysics.org/books/pre\\_uni\\_maths\\_2e](https://isaacphysics.org/books/pre_uni_maths_2e)



2nd edition!

Available for £1.50 in print, or online for free.

### Buy the book

Printed copies of the book can be purchased at cost price for £1.50 (plus p+p).

**Buy Isaac Books**

## Specification table for teachers

### For Teachers

**Specification Table** - maps the book to your exam board.

Covers pure content for A-level Maths, and some of Further Maths.  
Focuses on mathematical methods used in the sciences.

### Chapters:

**1 Algebra & Number**  
(Sections A-D)

**2 Functions**  
(Sections E-F)

**3 Geometry**  
(Sections G-I)

**4 Calculus**  
(Sections J-L)

**5 Applications to Sciences**  
(Sections M-T)

Questions in gameboards for each chapter.

## Geometry

## G Shapes



[View board](#) | [Assign](#)

## H Trigonometry



[View board](#) | [Assign](#)



[View board](#) | [Assign](#)



[View board](#) | [Assign](#)



[View board](#) | [Assign](#)

## I Vectors




[View board](#) | [Assign](#)



Scalar Products


[View board](#) | [Assign](#)

### H3 Radians and Degrees



### Equation Editor: Text Entry

How to enter equations into the text entry box.




### Simplify Trig Expressions

Pre-Uni Maths for Sciences H3.1

Maths > Geometry > Trigonometry

A Level

P P P




### Angles and Projection

Pre-Uni Maths for Sciences H3.2

Maths > Geometry > Trigonometry

A Level

P P P




### Sec, Cosec and Cot

Pre-Uni Maths for Sciences H3.3

Maths > Functions > General Functions

A Level

P P P




### Trigonometric Manipulation

Pre-Uni Maths for Sciences H3.4

Maths > Functions > General Functions

A Level

P P P




### Circles and Arcs 1

Pre-Uni Maths for Sciences H3.5

Maths > Geometry > Trigonometry

A Level

P P P



### Circles and Arcs 2

Pre-Uni Maths for Sciences H3.6

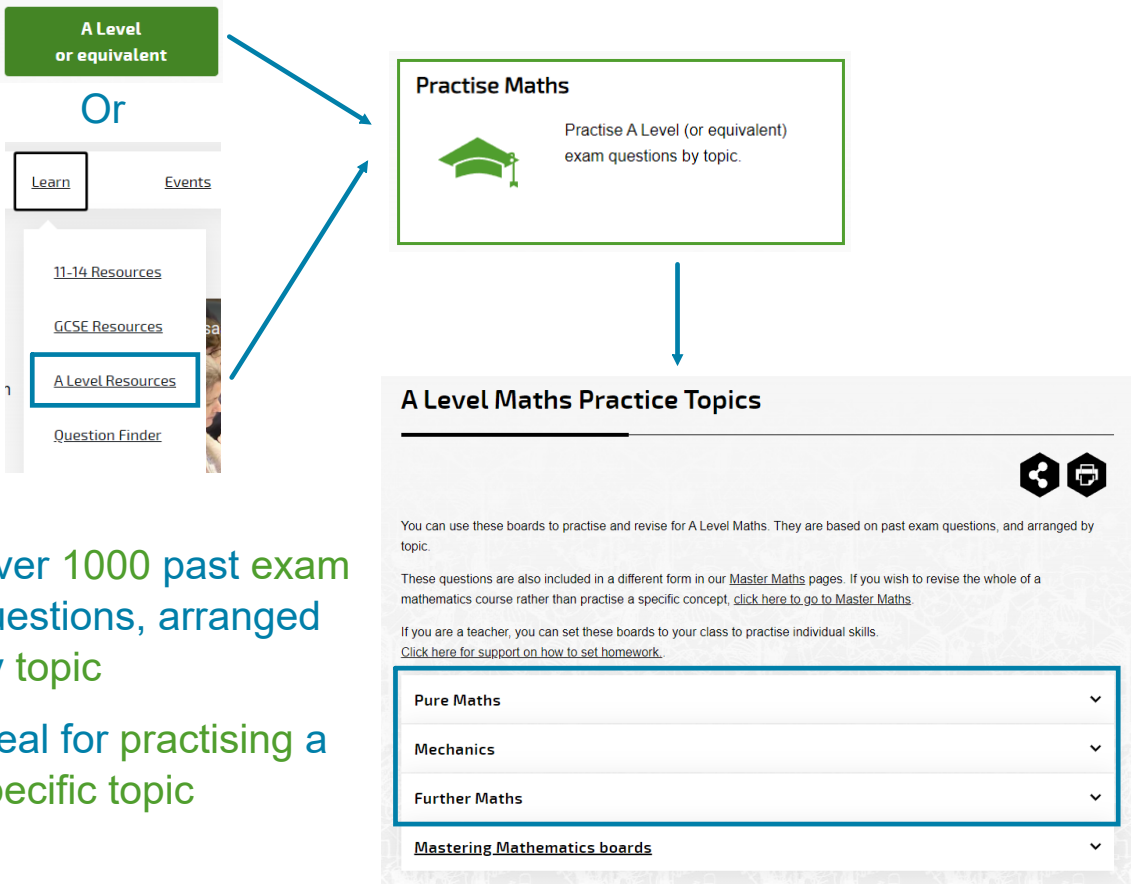
Maths > Geometry > Trigonometry

A Level

P P P

Practise Maths

https://isaacphysics.org/pages/maths\_practice



Over 1000 past exam questions, arranged by topic

Ideal for practising a specific topic

Stage 2 (Year 13)		
Field	Topic	Board
Algebra and functions	<a href="#">Algebraic Division</a>	<a href="#">Link</a>
	<a href="#">Curve Sketching and Combined Transformations</a>	<a href="#">Link</a>
	<a href="#">Functions and Algebra</a>	<a href="#">Link</a>
	<a href="#">Functions, Graphs and Inverse Functions</a>	<a href="#">Link</a>
	<a href="#">Modulus</a>	<a href="#">Link</a>
	<a href="#">Partial Fractions</a>	<a href="#">Link</a>
	<a href="#">Graphs and roots in context</a>	<a href="#">Link</a>
Coordinate geometry	<a href="#">Parametric equations</a>	<a href="#">Link</a>
Differentiation	<a href="#">Constructing Differential Equations</a>	<a href="#">Link</a>
	<a href="#">Differentiation and Gradients: Beyond Polynomials</a>	<a href="#">Link</a>
	<a href="#">Differentiation: Chain Rule</a>	<a href="#">Link</a>
	<a href="#">Differentiation: Implicit</a>	<a href="#">Link</a>
	<a href="#">Differentiation: Products</a>	<a href="#">Link</a>
	<a href="#">Differentiation: Quotients</a>	<a href="#">Link</a>
	<a href="#">Differentiation: Synoptic Problems</a>	<a href="#">Link</a>
Integration	<a href="#">Area Between Two Curves</a>	<a href="#">Link</a>
	<a href="#">Integration by Parts</a>	<a href="#">Link</a>
	<a href="#">Integration by Substitution</a>	<a href="#">Link</a>
	<a href="#">Integration by substitution (trig)</a>	<a href="#">Link</a>
	<a href="#">Integration: General</a>	<a href="#">Link</a>

Revision Boards

[https://isaacphysics.org/pages/maths\\_practice#master\\_maths](https://isaacphysics.org/pages/maths_practice#master_maths)

A Level  
or equivalent

Or

Learn

Events

11-14 Resources

GCSE Resources

A Level Resources

Question Finder

Practise Maths

Practise A Level (or equivalent)  
exam questions by topic.

A Level Maths Practice Topics

Pure Maths

Mechanics

Further Maths

Mastering Mathematics boards

Past exam questions  
that span A-level

Linked to easier  
questions

Ideal for revision

Each board spans the syllabus

	Stage 1 (Year 12)	Stage 2 (Year 13)
Core Pure Maths	C	C
Mechanics	M	M
Further Pure Maths	F	F

Maths Stage 1 - Revision & Practice

Significant Figures

Finding Roots

Circles and Geometry

Curves and Integration

Quadratics and Inequalities

Exponentials and Logs

Calculus

Trigonometry: Solving Equations

Each question part links to an easier question on the same topic

Easier question?

Check my answer

Maths Stage 1 -  
Revision & Practice

Trigonometry:  
Identities and  
Equations Practice

Trigonometry: Identities and Equations 4ii

Part A Solving  $2 \sin^2 x = 1 + \cos x$

Solve  $2 \sin^2 x = 1 + \cos x$  in the region  $-180^\circ \leq x \leq 180^\circ$ . Give the largest value within this range as your answer to 3 significant figures.

Hexagons  
will update  
to show  
progress

Question Finder

https://isaacphysics.org/questions

Learn

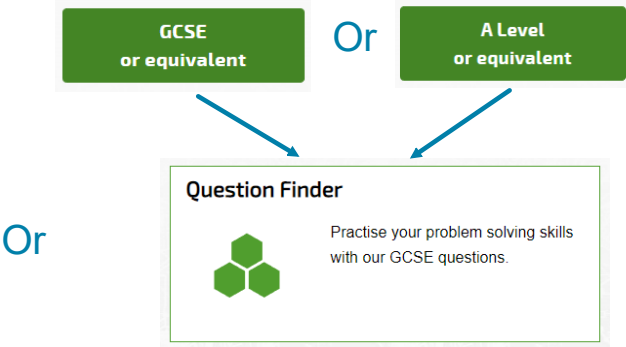
11-14 Resources

GCSE Resources

A Level Resources

Question Finder

Concepts



Search for questions by stage, topic or difficulty.

Question Finder

Help

Use our **new** question finder to find questions to try on topics in physics, maths, chemistry and biology. Use our practice questions to become fluent in topics and then take your understanding and problem solving skills to the next level with our challenge questions.

Use the search box or filters to find questions. You can then refine your search further with the filters. **Note that you will need to click on "Apply filters" for them to take effect.**

To save your progress on each question, please [login](#) or [sign up](#) for a free account.

Once you are happy with your search, click on a question in the list to have a go; clicking on the back button will return you to your search. **Please note that the search no longer creates a gameboard.**

If you prefer to use the previous question finder, you can find it [here](#). **Please note that this previous version will be retired on 31st December 2024.**

Search for a question

e.g. Man vs. Horse

Q

Search by name or text

Filter by

Clear all

Stage

1

>

Topics

1

>

Difficulty

2

>

Book

>

Status

>

Apply filters

Showing 15 of 15.

Q

Circles and Arcs 1

Pre-Uni Maths for Sciences 3.1.1

A Level

P

P

P

>

Q

Circles and Arcs 2

Pre-Uni Maths for Sciences 3.1.2

A Level

P

P

P

>

Q

Circles and Triangles 1

A Level

P

P

P

Further A

P

P

P

>

Q

Circles and Triangles 2

A Level

P

P

P

Further A

P

P

P

>

Q

Degrees to Radians 1

Pre-Uni Maths for Sciences 3.1.3

A Level

P

P

P

>

Q

Degrees to Radians 2

Pre-Uni Maths for Sciences 3.1.4

A Level

P

P

P

>

Q

Energy of Oscillating Mass

A Level

C

C

C

Further A

P

P

P

>

Filter by stage, topic, difficulty, book or status

8



Stage

Stage 1

☐ Year 7&8

☐ Year 9

☐ GCSE

☒ A Level

☐ Further A

☐ University

Difficulty

Difficulty 2

[Learn more about difficulty levels](#)

☐ Practice 1

☒ Practice 2

☐ Practice 3

☒ Challenge 1

☐ Challenge 2

☐ Challenge 3

Topic

Topics 1

Physics

Maths

Chemistry

Biology

Number

Shapes

Algebra

Trigonometry

Geometry

Vectors

Functions

Planes

Calculus

Coordinates

Statistics

Book

Book

☐ Exclude skills book questions

☐ Step Up to GCSE Physics

☐ GCSE Physics

☐ A Level Physics (3rd Edition)

☐ Linking Concepts in Pre-Uni Physics

☐ GCSE Maths

☐ Pre-Uni Maths (2nd edition)

☐ Pre-Uni Maths (1st edition)

☐ A-Level Physical Chemistry

Status

Status

☐ Not started

☒ Fully correct

☐ In progress

Concept Pages

https://isaacphysics.org/concepts

Learn

Events

11-14 Resources

GCSE Resources

A Level Resources

Question Finder

Concepts

Concepts

Search bar

Search concepts

Subject filter

Filter: ☒ Physics ☒ Maths ☒ Chemistry ☒ Biology

Search Results

Lightbulb icon

Absolute Temperature

The Kelvin scale of absolute temperature.

>

Lightbulb icon

Activation Energy

The energy required to break bonds in a chemical reaction, and its link to reaction rates.

>

Lightbulb icon

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.

>

Lightbulb icon

Algebraic Fractions & Partial Fractions

How to work with algebraic fractions, including splitting an expression into partial fractions.

>

Lightbulb icon

Algebraic Manipulation - Index Notation

An overview of the rules of combining integer, fractional and negative indices.

>

Concepts pages explain a concept in detail.

Matrices - Definition

All Stages

Further A

Matrix addition and subtraction

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 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. A matrix is identified by the number of rows and columns,  $m \times n$ .

$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$\begin{pmatrix} 4 \\ 1 \\ -2 \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & -3 \\ -2 & 2 & k^2 \end{pmatrix}$

$\begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_m \end{pmatrix}$

2 x 2 matrix

3 x 1 matrix

2 x 3 matrix

Quick Q1

Quick Q2

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

Hide answer

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

Feature worked examples

## Question Types

There are many different types of questions available on Isaac Physics. Here are some examples of different types.

### Numeric Questions

Part A Velocity at A

Find the velocity of  $P$  when it passes through  $A$ . Give your answer to 1 significant figure.

Value  ? Units  ← Choose a unit

Enter a number

Check my answer

These will check answers for appropriate use of significant figures.

Symbolic Questions

Type your answer

Or use the equation editor

Useful symbols and functions

Part A   Differentiate  $a \sin \theta$

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

Type your formula here

The following symbols may be useful:  $a$ ,  $\cos()$ ,  $\operatorname{cosec}()$ ,  $\cot()$ ,  $\sec()$ ,  $\sin()$ ,  $\tan()$ ,  $\theta$

or click here to drag and drop your answer

Check my answer

Algebraic symbols

Numbers

Operators

Functions

123  $Ab \Delta \gamma$   $+ - \sqrt{x}$   $\sin f$

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

Help ?

Re-centre  $\rightarrow \leftarrow$

Question text

Bin

Finish  $\cos(\theta)$   $>$

## Graph Sketcher Questions

[https://isaacphysics.org/questions/cubic\\_modulus](https://isaacphysics.org/questions/cubic_modulus)

Click on the grid to start:

Straight  
line



Curve



Colour



Click and  
hold to  
sketch



Bin



Clear



Undo



Redo

Sketch the graph of  $y = (x - 1)(x + 2)(x - 3)$ .

HIDE QUESTION

Question text

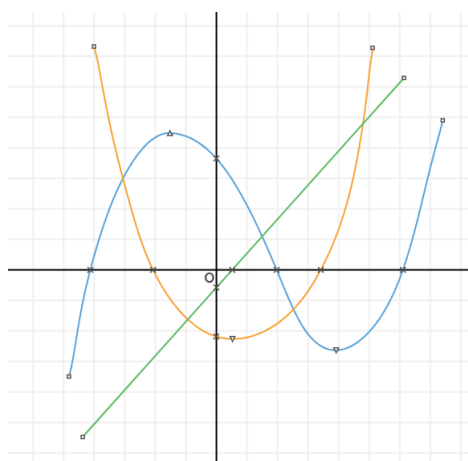


Help

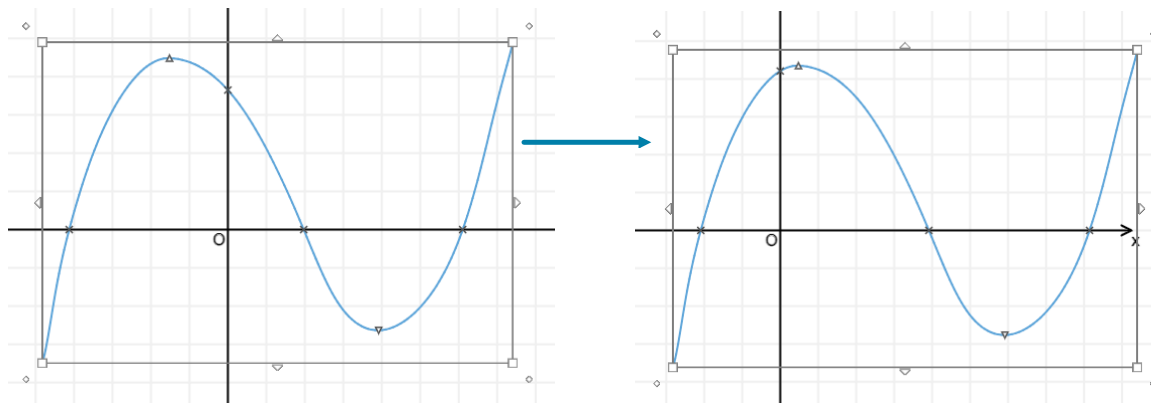


Finish

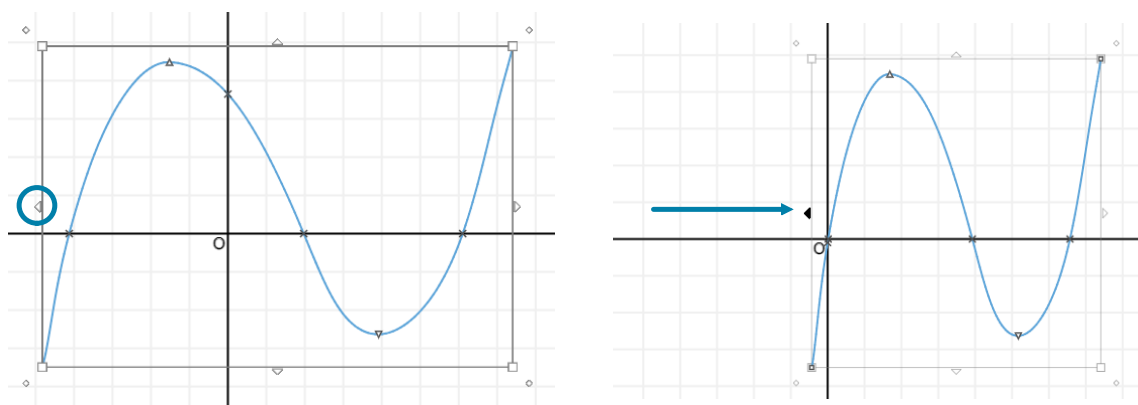
You can draw up to 3 strokes (usually):



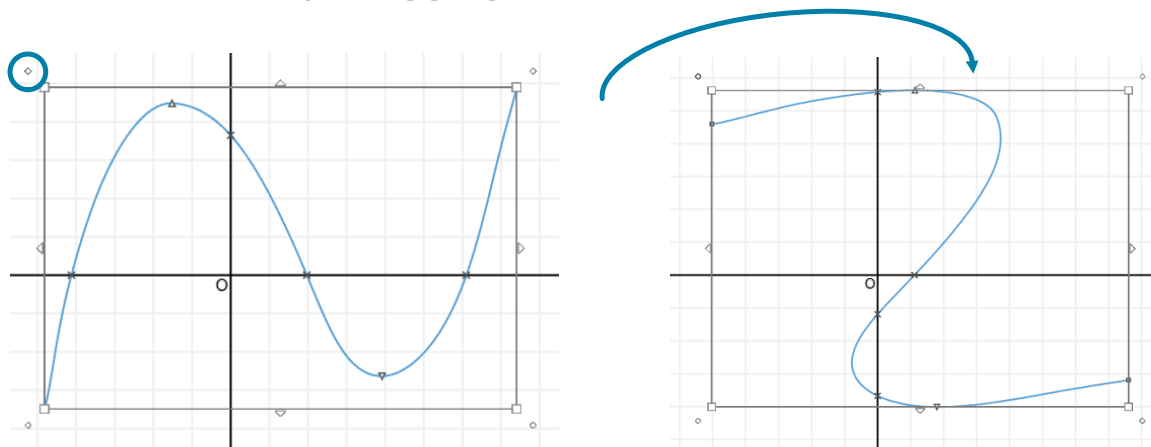
You can move a stroke by clicking and dragging.



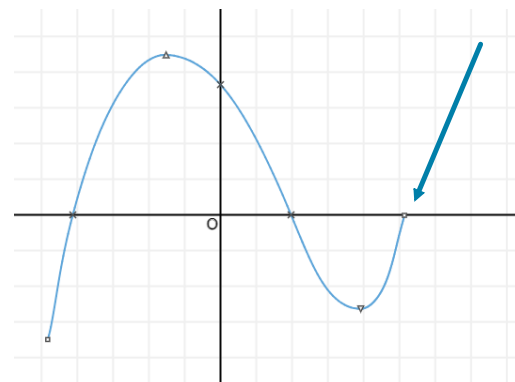
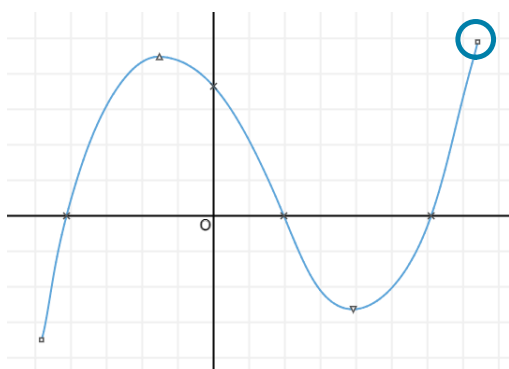
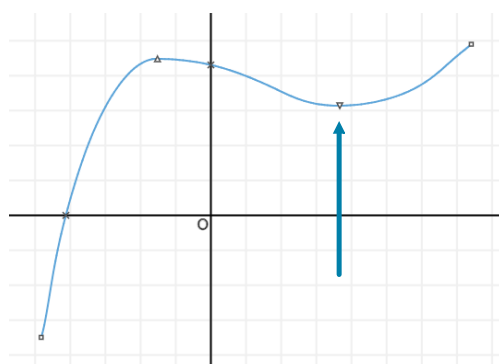
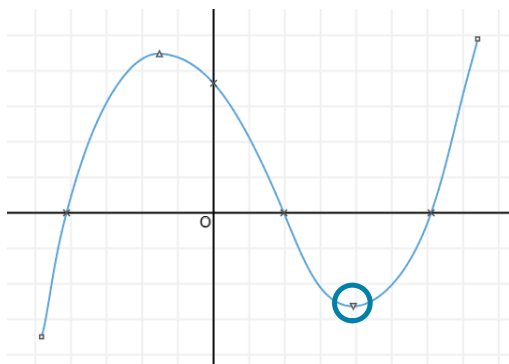
You can stretch it by dragging the edge of the selection box.



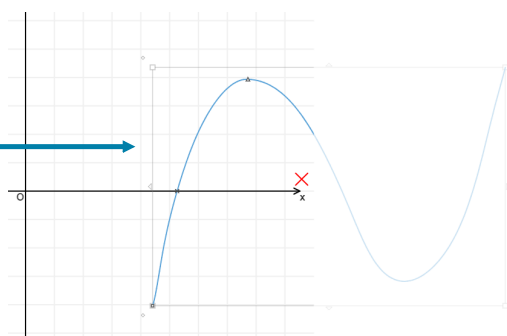
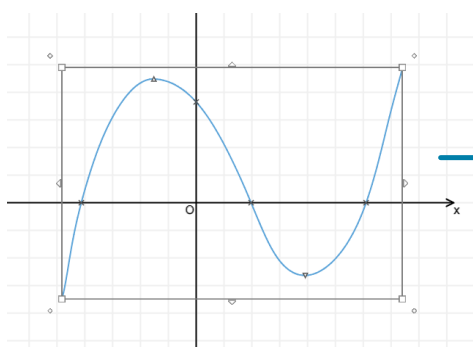
You can rotate it by dragging the outer handle near the corner.



You can move a turning point or end by dragging it.



You can delete a stroke by using the bin or dragging it off the grid. Clear will delete everything.



## How strict is it?

It uses rough positions:

- Which quadrants?
- Where does it cross the axes? (+/- or origin)
- Where are the turning points?
- What are the start and end gradients?



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

Check my answer

## Cloze Text Questions

Drag items to fill in the boxes

Receive individual feedback on each item

Small screens use a dropdown menu

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  is case we will combine r

less than 10

1 and 3

2 and 3

1 and 2

greater than or equal to 10

greater than or equal to 5

less than 5

Check my answer

Hint

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 .

Items:

less than 10

1 and 3

2 and 3

1 and 2

greater than or equal to 10

greater than or equal to 5

less than 5

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  ☒.

Items:

1 and 3

1 and 2

greater than or equal to 10

greater than or equal to 5

Incorrect

Check my answer

Inline Questions

Type numbers or text in the boxes

Receive individual feedback on each box

Some boxes may require units

Unit...

Part A

Expected frequencies

^

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

		Hair colour		
		Dark	Fair	Red
Height	Less than 165 cm	<input type="text" value="16.15"/>	<input type="text" value="4.4"/>	<input type="text" value="4"/>
	165 cm to 180 cm	<input type="text"/>	<input type="text"/>	<input type="text"/>
	More than 180 cm	<input type="text"/>	<input type="text"/>	<input type="text"/>

Check my answer

Part A

Expected frequencies

^

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

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.

(  ,  )

Add coordinate

Check my answer

### 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

## Have a go!

GCSE Book	 <a href="https://isaacphysics.org/books/maths_book_gcse">https://isaacphysics.org/books/maths_book_gcse</a>
A-level Book	 <a href="https://isaacphysics.org/books/pre_uni_maths_2e">https://isaacphysics.org/books/pre_uni_maths_2e</a>
Practise Maths	 <a href="https://isaacphysics.org/pages/maths_practice">https://isaacphysics.org/pages/maths_practice</a>
Revision Boards	 <a href="https://isaacphysics.org/pages/maths_practice#master_maths">https://isaacphysics.org/pages/maths_practice#master_maths</a>
Question finder	 <a href="https://isaacphysics.org/questions">https://isaacphysics.org/questions</a>
Concept Pages	 <a href="https://isaacphysics.org/concepts">https://isaacphysics.org/concepts</a>
Questions to try	 <a href="https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths4">https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths4</a>