






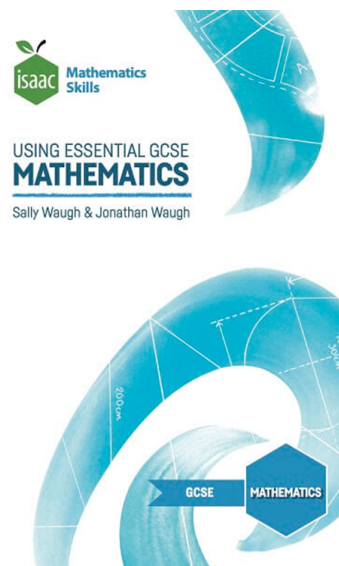
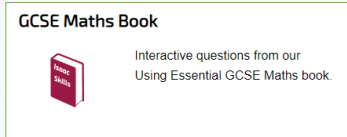
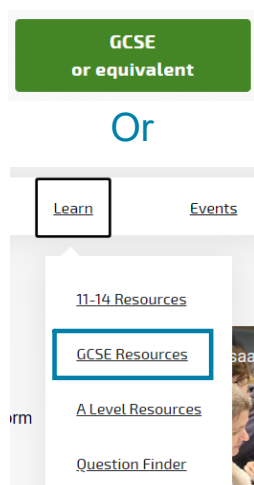


## Isaac Maths Resources

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">https://isaacphysics.org/books/pre_uni_maths</a> 
Practise Maths	<a href="https://isaacphysics.org/pages/maths_practice">https://isaacphysics.org/pages/maths_practice</a> 
Master Maths	<a href="https://isaacphysics.org/pages/master_maths">https://isaacphysics.org/pages/master_maths</a> 
Question finder	<a href="https://isaacphysics.org/gameboards">https://isaacphysics.org/gameboards</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_maths3">https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths3</a> 

## GCSE Book

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



Available for £1 in print, or online for free.

### Buy the book

Printed copies, cost price £1 (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

Notes

Real-World Graphs

>

Q

Essential GCSE Maths 36.3

Maths > Functions > Graph Sketching

GCSE

A Level

C

C

C

P

P

P

>

Q

Essential GCSE Maths 36.4

Maths > Functions > Graph Sketching

GCSE

A Level

C

C

C

P

P

P

>

Q

Essential GCSE Maths 36.5

Maths > Functions > Graph Sketching

GCSE

A Level

P

P

P

P

P

P

>

Q

Essential GCSE Maths 36.6

Maths > Functions > Graph Sketching

GCSE

A Level

P

P

P

P

P

P

>

Q

Essential GCSE Maths 36.8

Maths > Functions > Graph Sketching

GCSE

A Level

C

C

C

P

P

P

>

Q

Essential GCSE Maths 36.9

Maths > Functions > Graph Sketching

GCSE

A Level

P

P

P

P

P

P

>

Q

Essential GCSE Maths 36.10

GCSE

A Level

>

## A-level Book

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

A Level or equivalent

Or

Learn Events

11-14 Resources

GCSE Resources

A Level Resources

Question Finder

Maths for Sciences Book

Interactive questions from our pre-university Maths book.

isaac Mathematics Essentials

PRE-UNIVERSITY MATHEMATICS FOR SCIENCES

Julia Riley & Mark Warner

PRE-UNIVERSITY MATHEMATICS

Available for £1 in print, or online for free.

### Buy the book

Printed copies, cost price £1 (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

Level 1

2

Level 2

3

Level 3

4

Level 4

5

Level 5

6

Level 6

7

Level 7

Questions in gameboards for each chapter.

Level 4

4.1Trigonometry  
[View board](#) | [Assign](#)

4.2Functions  
[View board](#) | [Assign](#)
























































4.3Series  
[View board](#) | [Assign](#)

4.4Differentiation  
[View board](#) | [Assign](#)

4.5Integration  
[View board](#) | [Assign](#)

4.6Graph Sketching  
[View board](#) | [Assign](#)

### 4.4 Differentiation

 Differentiating Trig Functions 1 Maths > Calculus > Differentiation	A Level    	Further A   	>
 Differentiating Trig Functions 2 Maths > Calculus > Differentiation	A Level    	Further A   	>
 Differentiating Trig Functions 3 Maths > Calculus > Differentiation	A Level   	Further A   	>
 Differentiating Exponentials 1 Maths > Calculus > Differentiation	A Level    	Further A   	>
 Differentiating Exponentials 2 Maths > Calculus > Differentiation	A Level    	Further A   	>
 Powers Using Chain Rule 1 Maths > Calculus > Differentiation	A Level    	Further A   	>
 Powers Using Chain Rule 2	A Level    	Further A   	>

Practise Maths

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

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

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>

Master Maths

[https://isaacphysics.org/pages/master\\_maths](https://isaacphysics.org/pages/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	

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

1 2 3 4 5 6 7

1 2 3 4

1 2 3 4

Trigonometry:  
Identities and  
Equations Practice

1 2 3 4

Trigonometry: Identities and Equations 4ii

A Level

Share

Print

Flag

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/gameboards

Learn

11-14 Resources

GCSE Resources

A Level Resources

Question Finder

Concepts

GCSE or equivalent

Or

A Level or equivalent

Or

Question Finder

Practise your problem solving skills with our GCSE questions.

Search for questions by stage, topic or difficulty.

Select stage

Select difficulty

Select topic

Choose your Questions

Help

Topics: Maths Geometry Trigonometry

Scroll to questions...

Click these buttons to choose your question gameboard

I am interested in stage...  
A Level

I would like questions for...  
Practice  
P1 P2 P3  
Challenge  
C1 C2 C3

Topics:  
Physics Maths Chemistry  
Number Algebra Geometry Functions Calculus Statistics  
Shapes Trigonometry Vectors Planes

Go to Questions...

Shuffle Questions

Generate a new set of questions

Trigonometry

Save to My Gameboards

Q Addition of Forces 2  
Maths > Geometry > Trigonometry  
A Level  
C C C

Q Circles and Arcs 2  
Maths > Geometry > Trigonometry  
A Level  
P P P

Q Radians to Degrees 1  
Maths > Geometry > Trigonometry  
A Level  
P P P

Q Oscillating Mass  
Maths > Geometry > Trigonometry  
A Level  
P P P

Q Circles and Arcs 1  
Maths > Geometry > Trigonometry  
A Level  
P P P

Save board of questions



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

💡

Absolute Temperature

The Kelvin scale of absolute temperature.

>

💡

Activation Energy

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

>

💡

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.

>

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 denoted by a capital letter, and its size is given 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 × 2 matrix

3 × 1 matrix

2 × 3 matrix

Further A

Special types of matrix

Further A

Matrix addition and subtraction

Further A

Scalar multiplication

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	 <a href="https://isaacphysics.org/questions/gcse_maths_ch2_11_q1">https://isaacphysics.org/questions/gcse_maths_ch2_11_q1</a>
Symbolic	 <a href="https://isaacphysics.org/questions/algebra_level2_ineq_5">https://isaacphysics.org/questions/algebra_level2_ineq_5</a>
Graph sketcher	 <a href="https://isaacphysics.org/questions/sketch_reciprocal_trig">https://isaacphysics.org/questions/sketch_reciprocal_trig</a>
Cloze text	 <a href="https://isaacphysics.org/questions/proof_surface_areas">https://isaacphysics.org/questions/proof_surface_areas</a>
Reorder	 <a href="https://isaacphysics.org/questions/combined_transformations">https://isaacphysics.org/questions/combined_transformations</a>
Board link:	 <a href="https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths3">https://isaacphysics.org/gameboards#tcpd_newtoisaac_maths3</a>

## 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:  $a$ ,  $\cos()$ ,  $\operatorname{cosec}()$ ,  $\cot()$ ,  $\sec()$ ,  $\sin()$ ,  $\tan()$ ,  $\theta$

click here to drag and drop your answer

Check my answer

Algebraic symbols

$a$   $\theta$

Numbers

1 2 3 4 5 6  
7 8 9 0  $\pm$   $\times$   $-18$

Operators

$+$   $-$   $\pm$   $\frac{a}{b}$   $(x)$   $|x|$   $\sqrt{x}$   $=$   $<$   $>$   $\leq$   $\geq$

Functions

$\cos$   $\sin$   $\tan$   $\operatorname{cosec}$   $\sec$   $\cot$

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

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

Bin

Help ?

Re-centre  $\rightarrow| \leftarrow$

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

HIDE QUESTION

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

Question text

12

## Graph Sketcher Questions

Click on the **grid** to start:

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

Click and hold to sketch

Straight line Curve Colour

Bin Clear

Undo Redo

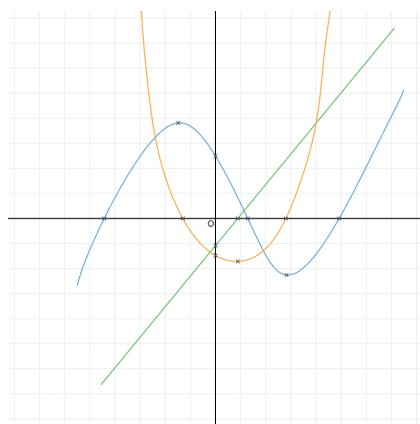
Sketch the graph of  $y = (x - 1)(x + 2)(x - 3)$ .

HIDE QUESTION

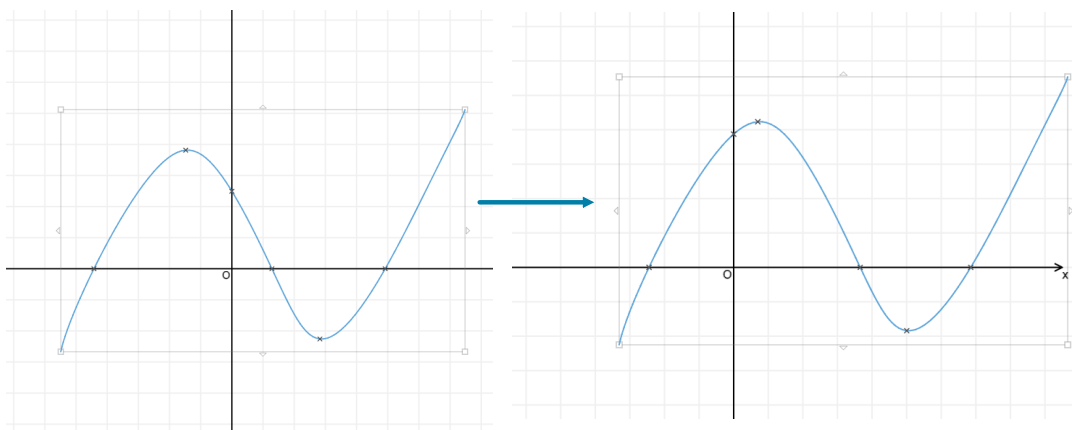
Help Finish

Question text

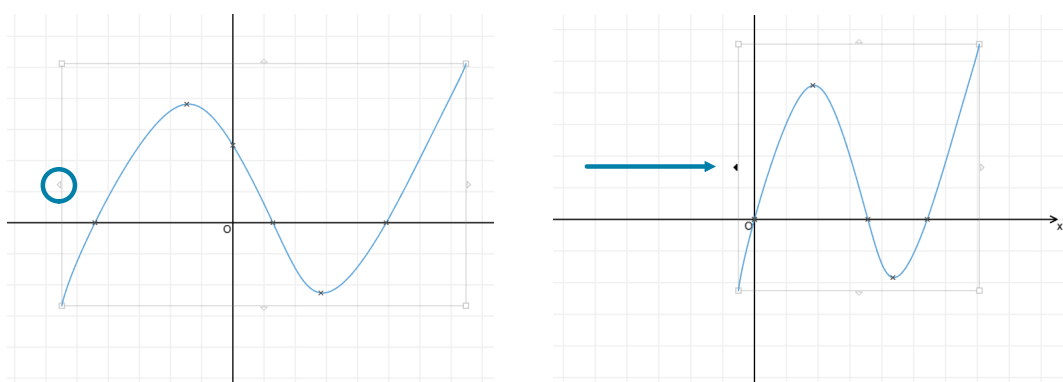
You can draw up to **3** strokes:



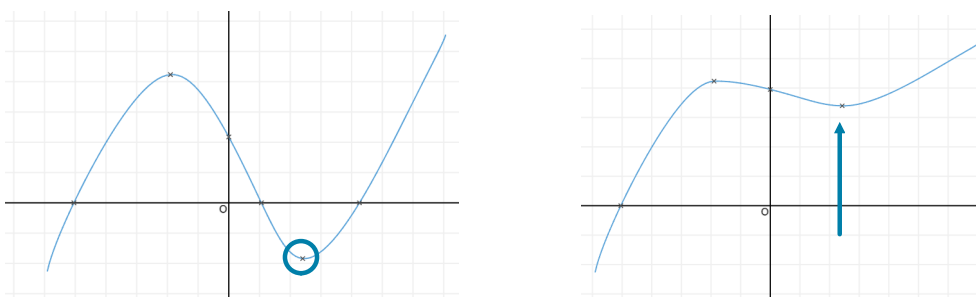
You can move a stroke by clicking and dragging.



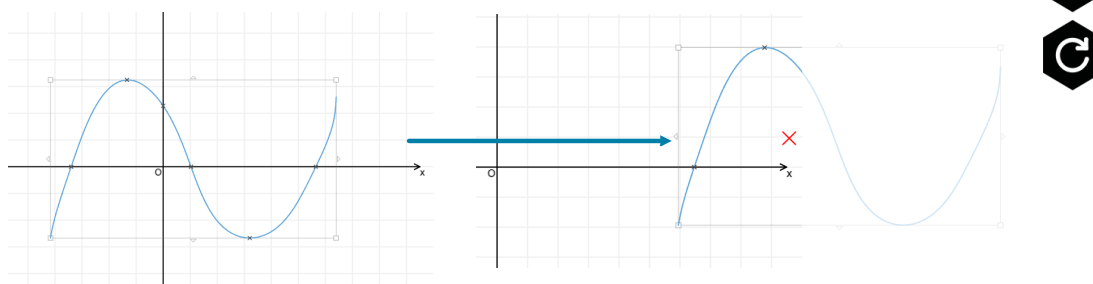
You can stretch it by dragging the edge of the selection box.



You can move a turning point 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 slopes?

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 4 units in the negative  $y$  direction.

Translate the curve 7 units in the positive  $x$  direction.

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  $\frac{1}{m}$ .

Your answer

Translate the curve 7 units in the negative  $x$  direction.

Stretch the curve in the  $x$  direction by a factor of  $\frac{1}{m}$ .

Check my answer



Cloze Text Questions

Drag items to fill in the boxes

Receive individual feedback on each item

Part A Expected frequencies ^

Calculate the expected frequencies. Fill in the gaps below.

		Hair colour		
		Dark	Fair	Red
Height	Less than 165 cm			
	165 cm to 180 cm			
	More than 180 cm			

Items:

2.52

2.84

4.08

4.23

7.6

7.76

8.64

11.28

13.77

16.15

21.62

29.16

31.11

34.2

38.07

43.54

44.65

45.26

Check my answer

Part A Expected frequencies x ^

Calculate the expected frequencies. Fill in the gaps below.

		Hair colour		
		Dark	Fair	Red
Height	Less than 165 cm	16.15 ✓	13.77 ✓	4.23 ✗
	165 cm to 180 cm	44.65 ✓	43.54 ✗	11.28 ✓
	More than 180 cm	34.2 ✓	29.16 ✓	7.76 ✗

Items:

2.52

2.84

4.08

7.6

8.64

21.62

31.11

38.07

45.26

Incorrect

Check my answer

## Have a go!

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