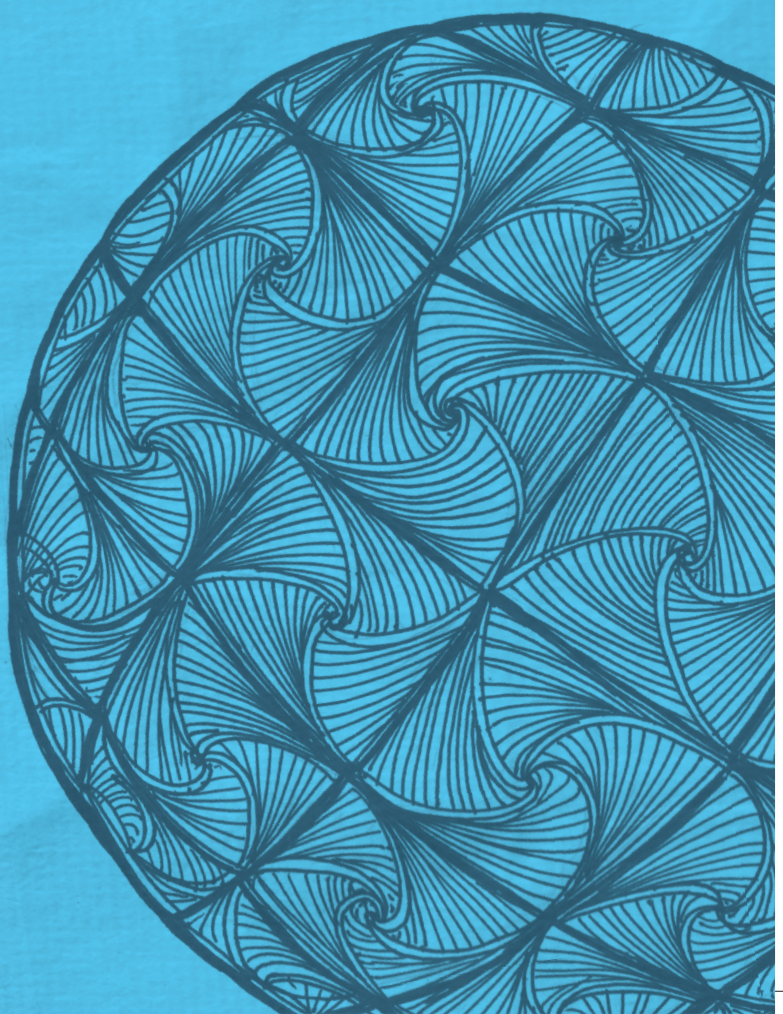
REVISE EDEXCEL GCSE (9–1)

Mathematics

PRACTICE PAPERS Plus+

Higher



For the (9–1) exams

Includes worked solution videos

Pearson

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REVISE EDEXCEL GCSE (9–1)

Mathematics

Higher

PRACTICE PAPERS Plus+

Authors: Jean Linsky, Navtej Marwaha and Harry Smith

Pearson

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Set B example papers

Using this book

This book has been created to help you prepare for your exam by familiarising yourself with the approach of the papers and the exam-style questions. Unlike the exam, however, each question has targeted hints, guidance and support in the margin to help you understand how to tackle them.

All questions also have fully worked solutions shown in the back of the book for you to refer to. In addition, some questions have videos explaining the working step-by-step. Look out for the QR codes in green boxes. To watch these videos, scan the QR codes with your mobile phone or tablet using a QR reader.

You may want to work through the papers at your own pace, to re-inforce your knowledge of the topics and practise the skills you have gained throughout your course. Alternatively, you might want to practise completing a paper as if in an exam. If you do this, bear these points in mind:

- Use black ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- In a real exam, **you must show all your working out**.
- For each paper, check whether you can use a calculator or not. This is stated at the start of each paper. You **cannot** use a calculator for Paper 1.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.
- Diagrams are **not** accurately drawn, unless otherwise indicated in the question.
- The total number of marks available for each paper is 80 marks.
- You have 1 hour 30 minutes to complete each paper.
- The marks for each question are shown in brackets. Use this as a guide as to how much time to spend on each question.

Paper 1: Non-calculator

Time allowed: 1 hour 30 minutes

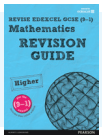
1 Work out 3.25×0.46

.....

(Total for Question 1 is 3 marks)

Turn to page 124 for complete worked solutions to the questions on this page.

NUMBER



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Hint

Estimate the answer before you start. You can use your answer to check that you have the right number of decimal places. To estimate, round both numbers to 1 significant figure then multiply:

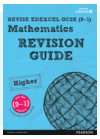
$3.25 \rightarrow 3$ and
$0.46 \rightarrow 0.5$ so your estimate will be
3×0.5

LEARN IT!

To multiply decimal numbers without a calculator:

- ignore the decimal points and just multiply the numbers
- count the number of decimal places in the calculation
- put this number of decimal places (including zeroes) in the answer.

PROBABILITY & STATISTICS



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Page 125

Hint

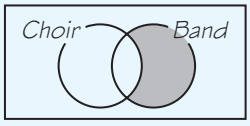
If you are working out values for a Venn diagram, always start at the centre and work out. You know that 6 children sing in the choir **and** play in the band so you can write '6' in the centre of your Venn diagram.

Hint

You can check a Venn diagram by adding up all the numbers. The total for this diagram should be 30

Hint

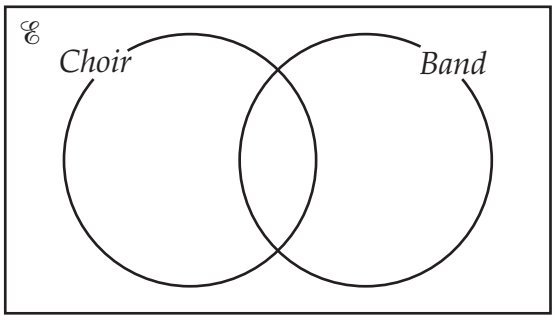
For part **(b)**, you are interested in this section of the Venn diagram:



2 There are 30 children in a class.

21 of the children sing in the choir.
10 of the children play in the band.
6 of the children sing in the choir **and** play in the band.

(a) Complete the Venn diagram to show this information.



(3)

One of the children from the class is chosen at random.

(b) Work out the probability that this child plays in the band, but does **not** sing in the choir.

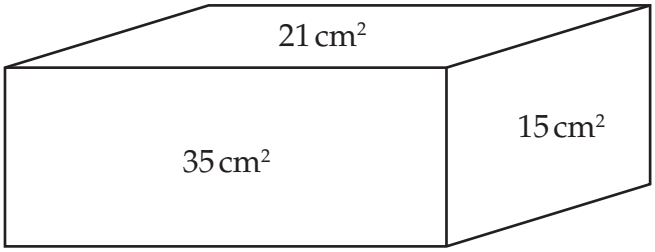
.....

(2)

(Total for Question 2 is 5 marks)

Turn to page 124 for complete worked solutions to the questions on this page.

3 The diagram shows the area of each of three faces of a cuboid.



The length of each edge of the cuboid is a whole number of centimetres.

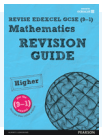
Work out the volume of the cuboid.

Scan this QR code for a video of this question being solved!

..... cm^3

(Total for Question 3 is 4 marks)

NUMBER



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Problem solved!

The dimensions of the front face are whole numbers with a product of 35. The only possibilities are 1 × 35 or 5 × 7. Find factor pairs of 21, 35 and 15 to work out the dimensions of the cuboid.

Watch out!

The diagram is not accurate, so you can't measure. Just because one side **looks** longer than another, it doesn't mean that it is.

Hint

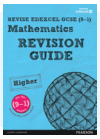
Once you have worked out the dimensions of the cuboid, write them on the diagram.

Explore

The length of each edge is the HCF of the areas of the faces that meet at that edge.

Turn to page 124 for complete worked solutions to the questions on this page.

PROBABILITY & STATISTICS



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Hint

For a cumulative frequency diagram, you plot the points at the **top** of each class interval. So the first two points you need to plot are (20, 0) and (40, 7).

Watch out!

Join your points with a smooth curve, not straight lines.

Hint

There are 74 data values. Read across from $\frac{74}{4} = 18.5$ for the lower quartile, $\frac{74}{2} = 37$ for the median and $\frac{3 \times 74}{4} = 55.5$ for the upper quartile.

4 When a person exercises, their pulse rate increases.

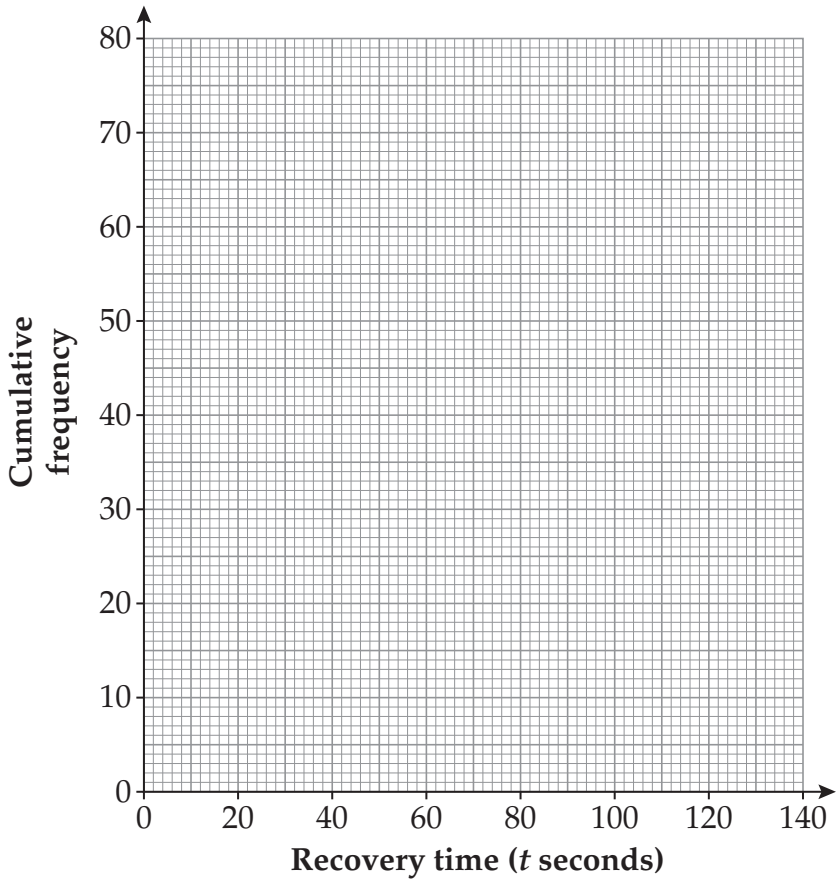
The time it takes for their pulse rate to return to normal after exercise is called the recovery time.

A group of people did some exercise.

The table below shows some information about their recovery times.

Recovery time (t seconds)	Cumulative frequency
$0 < t \leqslant 20$	0
$0 < t \leqslant 40$	7
$0 < t \leqslant 60$	16
$0 < t \leqslant 80$	34
$0 < t \leqslant 90$	47
$0 < t \leqslant 100$	59
$0 < t \leqslant 120$	68
$0 < t \leqslant 140$	74

(a) On the grid below, draw a cumulative frequency graph for this information. **(2)**



Turn to page 124 for complete worked solutions to the questions on this page.

A different group of people did the same exercise.

Their recovery times had a median of 61 seconds and an interquartile range of 22 seconds.

(b) Compare the recovery times of these two groups of people.

(5)

(Total for Question 4 is 7 marks)

Problem solved!

Always give **evidence** when you are comparing two distributions. For a cumulative frequency diagram, compare the **median** and the **interquartile range**. Make sure your statements refer to the **context** of the question. You need to talk about **recovery times**.

Watch out!

Don't waste time writing long-winded answers. Compare values for each distribution, then write a short conclusion.

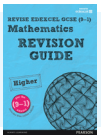
Explore

Many distributions follow a 'bell curve', with more data values in the middle. This is why cumulative frequency graphs are often steeper in the middle and shallower at each end.

Turn to page 125 for complete worked solutions to the questions on this page.

ALGEBRA

GEOMETRY AND MEASURES



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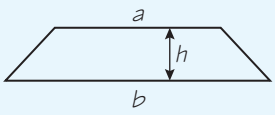
Watch out!

Unless it says so in the question, diagrams in your exam are **not accurate**. You can't measure any lengths for this question – you need to use algebra.

LEARN IT!

Area of trapezium $= \frac{1}{2}(a + b)h$



Problem solved!

Don't panic if lengths or angles are given as **expressions** rather than numbers. You can substitute an expression into a formula in exactly the same way as a number. Use the fact that the two areas are equal to write an equation, then solve it to find x.

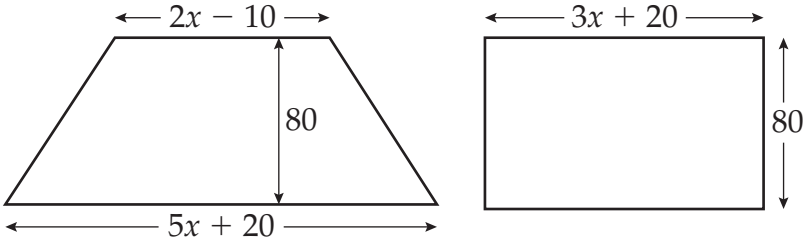
Watch out!

Make sure your final answer is the **length** of the **rectangular** desk.

5 A company makes two different desks.

The top of one desk is in the shape of a trapezium.
The top of the other desk is in the shape of a rectangle.

The diagram shows the tops of the two desks.



All measurements are in centimetres.

The tops of the two desks have the same area.

Work out the length, in centimetres, of the rectangular desk.
You must show all your working.

.....cm

(Total for Question 5 is 5 marks)

Turn to page 125 for complete worked solutions to the questions on this page.

6 Martin's house has a meter to measure the amount of water he uses. Martin pays on Tariff A for the number of water units he uses.

The graph on the following page can be used to find out how much he pays.

(a) (i) Find the gradient of this line.

.....

(2)

Martin reduces the amount of water he uses by 15 units.

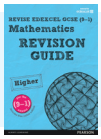
(ii) How much money does he save?

£.....

(1)

Turn to page 125 for complete worked solutions to the questions on this page.

ALGEBRA



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Hint

Draw a triangle to find the gradient of a graph:

$$\text{Gradient} = \frac{\text{Distance up}}{\text{Distance across}}$$

The larger your triangle, the more accurate your calculation will be.

Hint

The gradient tells you how much the cost increases or decreases for each unit of water. You can work out the answer to part **(a)(ii)** by multiplying your gradient by 15

Hint

To draw the graph for Tariff B, plot the points from the table and then join them up using a ruler. The point where the graphs cross represents the point where both tariffs cost the same. Read down from this point to the horizontal axis.

Watch out!

Always use the scale to work out the distance up and the distance across – don't just count grid squares on the graph.

Hint

Always read graphs accurate to the nearest small grid square. You need to use a sharp pencil to get accurate readings.

Instead of Tariff A, Martin could pay for his water on Tariff B.

The table shows how much Martin would pay for his water on Tariff B.

Number of water units used	0	20	40	60	80	100
Cost in £	12	18	24	30	36	42

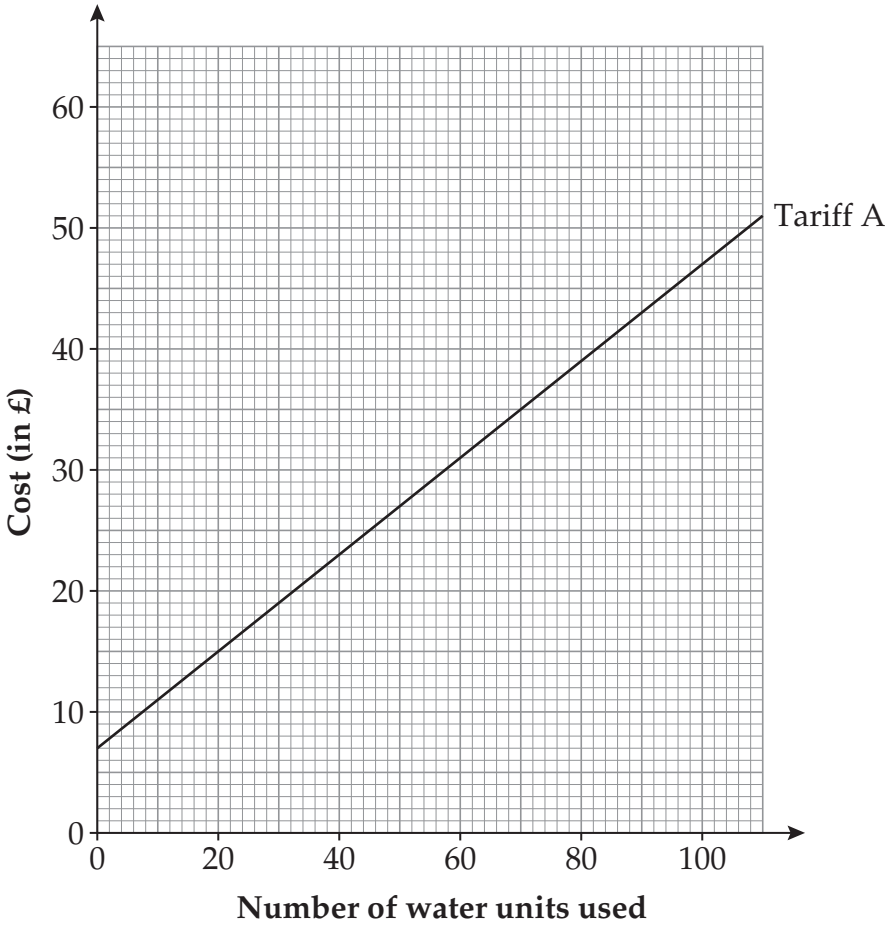
(b) (i) On the grid, draw a line for Tariff B.

(2)

(ii) Write down the number of water units used when the cost of Tariff A is the same as the cost of Tariff B.

.....units

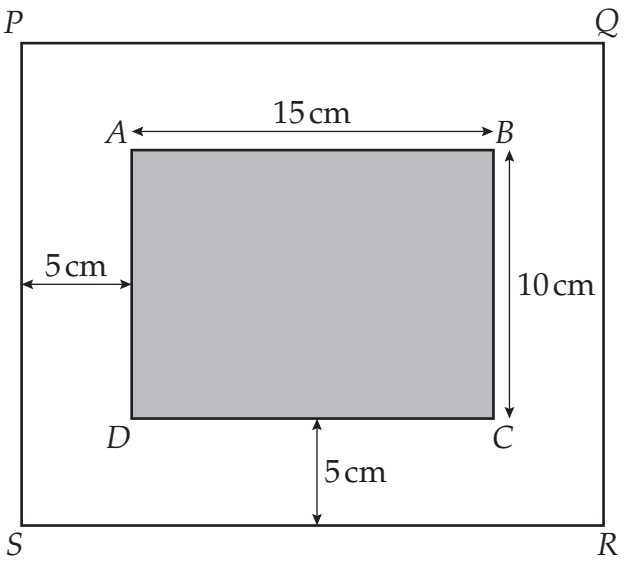
(1)



(Total for Question 6 is 6 marks)

Turn to page 125 for complete worked solutions to the questions on this page.

7 *ABCD* and *PQRS* are two rectangles.



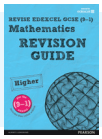
Rectangle *ABCD* is 15 cm by 10 cm.
There is a space 5 cm wide between rectangle *ABCD* and rectangle *PQRS*.

Are rectangle *ABCD* and rectangle *PQRS* mathematically similar?
You must show how you got your answer.

(Total for Question 7 is 3 marks)

Turn to page 126 for complete worked solutions to the questions on this page.

GEOMETRY AND MEASURES



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LEARN IT!

If two shapes are **similar** then corresponding sides will be in the same ratio.

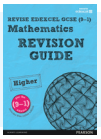
Problem solved!

You need to show enough working to explain your answer. Work out the dimensions of rectangle *PQRS*, then check for similarity. You could compare ratios between the shapes $\left(\text{e.g. } \frac{AB}{PQ} \text{ and } \frac{AD}{PS}\right)$ or ratios on each shape $\left(\text{e.g. } \frac{PS}{PQ} \text{ and } \frac{AD}{AB}\right)$

Hint

Similar shapes are enlargements of each other.

NUMBER



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Hint

Make sure you are confident manipulating powers without a calculator.

LEARN IT!

You need to know the squares up to 15^2 and the cubes of 1, 2, 3, 4, 5 and 10. You also need to know the corresponding square roots and cube roots.

Hint

$27^{\frac{2}{3}} = (\sqrt[3]{27})^2$

8 (a) Write down the value of $10^{-1} \times 5^0$

.....

(2)

(b) Find the value of $27^{\frac{2}{3}}$

.....

(2)

(Total for Question 8 is 4 marks)

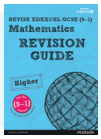
Turn to page 126 for complete worked solutions to the questions on this page.

9 Simplify fully $\dfrac{3x^2 - 6x}{x^2 + 2x - 8}$

.....

(Total for Question 9 is 3 marks)

ALGEBRA



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Hint

To simplify a single algebraic fraction you usually have to **factorise** the top, the bottom or both.

Explore

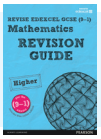
When you simplify an algebraic fraction by cancelling a linear factor, you should really ***exclude*** any values that make that factor equal to 0.

$\dfrac{3(x-5)}{x(x-5)} = \dfrac{3}{x}$, but only for $x \neq 5$. When $x = 5$ the left-hand side is not defined, because you can't divide by 0.

You don't have to worry about this in your GCSE exam.

Turn to page 126 for complete worked solutions to the questions on this page.

RATIO AND PROPORTION



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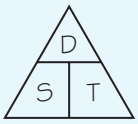
LEARN IT!

Sketch the formula triangle for speed on your working:



Watch out!

Be careful! Five hours is the time of the **whole journey**. You need to find the time for Appleton to Brockley before you can work out the distance of that part of the journey.

Problem solved!

Think about what information you need to answer the question. You need Harry's total distance travelled, and total time taken.

Watch out!

Check that your answer makes sense as an average driving speed.

10 Harry travels from Appleton to Brockley at an average speed of 50 mph. He then travels from Brockley to Cantham at an average speed of 70 mph.

Harry takes a total time of 5 hours to travel from Appleton to Cantham.
The distance from Brockley to Cantham is 210 miles.

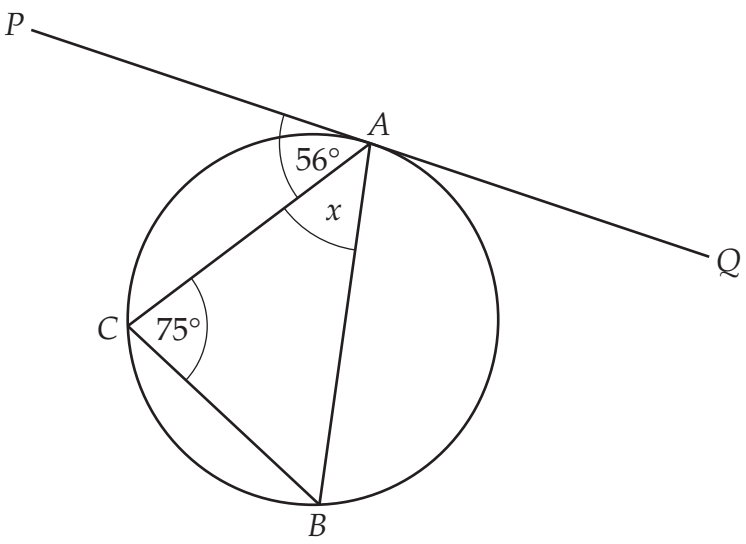
Calculate Harry's average speed for the total distance travelled from Appleton to Cantham.

.....mph

(Total for Question 10 is 4 marks)

Turn to page 126 for complete worked solutions to the questions on this page.

11



A, *B* and *C* are points on the circumference of a circle.
The straight line *PAQ* is a tangent to the circle.
Angle *PAC* = 56°
Angle *ACB* = 75°

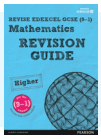
Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

Scan this QR code for a video of this question being solved!

.....°

(Total for Question 11 is 3 marks)

GEOMETRY AND MEASURES



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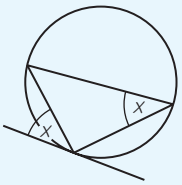
LEARN IT!

If you see a **tangent** and a **chord** in a circle question, you might be able to use the **alternate segment theorem**.

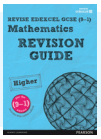


Hint

Write any angles you work out on your diagram as you go. Remember, you still need to write down reasons for each step of your working.

Turn to page 127 for complete worked solutions to the questions on this page.

NUMBER



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Page 8

Hint

You need to work out
$(2.4 \times 10^{10}) \div (6 \times 10^{-2})$

Hint

To divide standard form numbers **without a calculator**:

- divide the number parts
- divide the powers of 10
- rewrite in standard form if necessary.

Watch out!

Remember the third step in the hint above. A number is only in standard form if the number part is **greater than or equal to 1 and less than 10**

12 The number 2.4×10^{10} is bigger than the number 6×10^{-2}

How many times bigger?
Give your answer in standard form.

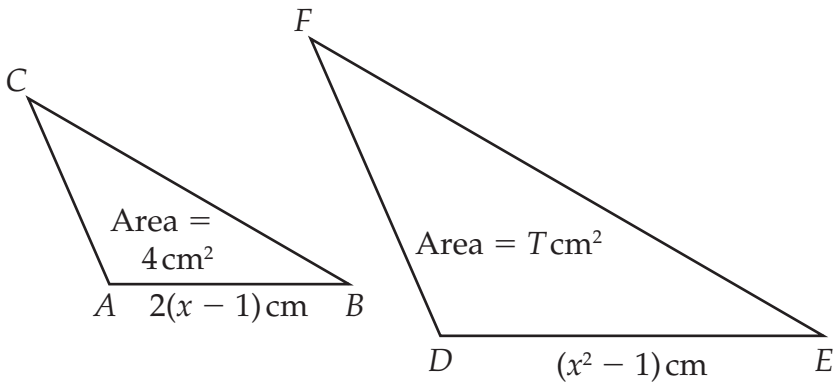
Scan this QR code for a video of this question being solved!

.....

(Total for Question 12 is 2 marks)

Turn to page 127 for complete worked solutions to the questions on this page.

13



Triangles ABC and DEF are mathematically similar.

The base, AB, of triangle ABC has length $2(x - 1)$ cm.
The base, DE, of triangle DEF has length $(x^2 - 1)$ cm.

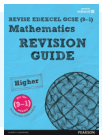
The area of triangle ABC is $4\,\text{cm}^2$.
The area of triangle DEF is $T\,\text{cm}^2$.

Prove that $T = x^2 + 2x + 1$

(Total for Question 13 is 4 marks)

ALGEBRA

GEOMETRY AND MEASURES



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LEARN IT!

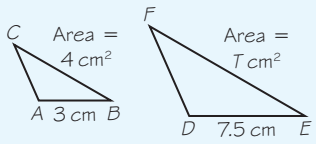
For similar shapes, if length is multiplied by k, then area is multiplied by k^2.

Hint

Work out an expression for the length multiplier, k. Then square it, and multiply by the area of the smaller triangle.

Problem solved!

If you can't see how to start with this question, try it with numbers instead. Can you show that $T = 25$ in this example:



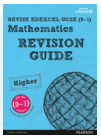
Now go back to the algebra.

Hint

It's always a good idea to write down what you have proved. The last line of your working could be, "So $T = x^2 + 2x + 1$".

Turn to page 127 for complete worked solutions to the questions on this page.

ALGEBRA



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Page 40

LEARN IT!

The graph of $y = f(x) + a$ is a translation of the graph $y = f(x)$ by the vector $\begin{pmatrix} 0 \\ a \end{pmatrix}$.

Watch out!

If a question says "Write down..." and is only worth one mark, you should be able to find the answer quickly. If you find yourself doing a lot of working you might have made a mistake.

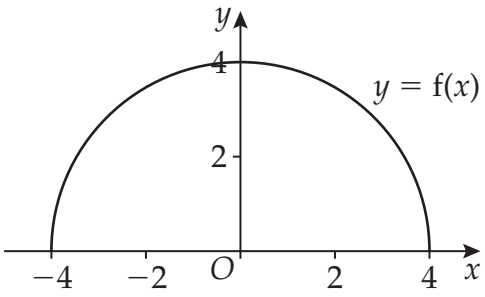
LEARN IT!

The graph of $y = f(x + a)$ is a translation of the graph $y = f(x)$ by the vector $\begin{pmatrix} -a \\ 0 \end{pmatrix}$.

Explore

This graph could be given by the function $f(x) = \sqrt{16 - x^2}$, $-4 \leqslant x \leqslant 4$

14 Here is the graph of $y = f(x)$.



(a) Write down the coordinates of the point P where the graph of $y = f(x) - 3$ meets the y-axis.

(.....,.....)
(1)

The graph of $f(x + 3)$ meets the negative x-axis at the point A.

(b) Work out the area of triangle AOP.

Scan this QR code for a video of this question being solved!

..... square units
(3)

(Total for Question 14 is 4 marks)

Turn to page 127 for complete worked solutions to the questions on this page.

15 $(2x^{\frac{3}{2}}y^{-1})^n = A\,x^6\,y^B$

Work out the value of n, the value of A and the value of B.

$n =$ .....

$A =$ .....

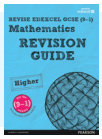
$B =$ .....

(Total for Question 15 is 3 marks)

Turn to page 128 for complete worked solutions to the questions on this page.

NUMBER

ALGEBRA



Revision Guide Pages 2, 16

LEARN IT!

Use $(ab)^n = a^n b^n$ to simplify the left-hand side.

Hint

The order of the variables in the answer line might give you a clue about the best order to work them out.

Problem solved!

You can **equate powers** of x and y in this question. Simplify the left-hand side, then set the power of x equal to 6. Solve the resulting equation to find n.

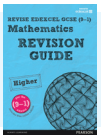
Hint

The question asks for the **values** of n, A and B, so all your answers will be numbers.

Watch out!

Don't leave your value of A as a power of 2. Work it out as an ordinary number.

RATIO AND PROPORTION



Revision Guide
Pages 69, 70

LEARN IT!

If R is inversely proportional to the square of r, the proportionality formula will look like:

$$R = \frac{k}{r^2}$$

Hint

Find the value of k to write a formula for R in terms of r. Use this to find R when $r = 5$ and when $r = 10$

Watch out!

You need to calculate two resistances, then show that the **difference** is 13.5 ohms.

Explore

The resistance of a wire is inversely proportional to its cross-sectional area. If the cross-section is a circle, then the resistance is inversely proportional to the **square** of the radius.

16 The resistance, R ohms, of a particular cable is inversely proportional to the square of its radius, r mm.

When the radius is 3 mm the resistance is 50 ohms.

Cable A has a radius of 5 mm.
Cable B has a radius of 10 mm.

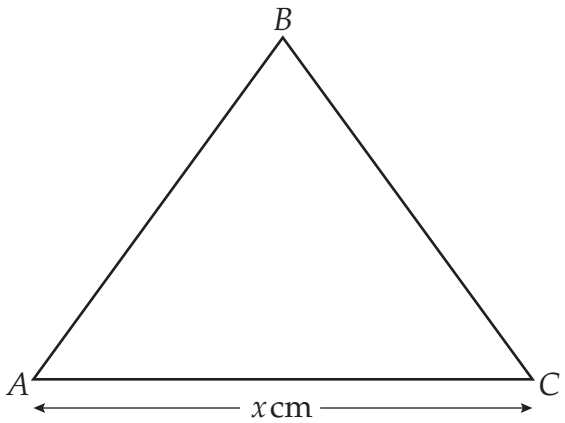
Show that the difference in the resistance of two cables is 13.5 ohms.

Scan this QR code for a video of this question being solved!

(Total for Question 16 is 3 marks)

Turn to page 128 for complete worked solutions to the questions on this page.

17 The diagram shows an equilateral triangle ABC.

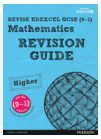


Show that the area of the triangle can be written as $\frac{x^2\sqrt{3}}{4}$

Scan this QR code for a video of this question being solved!

(Total for Question 17 is 2 marks)

GEOMETRY AND MEASURES



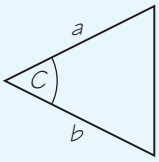
Revision Guide
Pages 79, 101

Hint

This is an equilateral triangle, so it has three equal angles.

LEARN IT!

Area $= \frac{1}{2}ab\sin C$

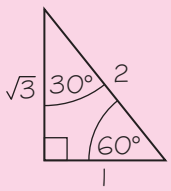


Watch out!

You need to know the exact values of sin, cos and tan of 30°, 45° and 60° **without a calculator**.

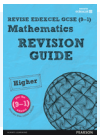
Explore

You can use this right-angled triangle to find sin, cos and tan of 30° and 60° without your calculator.



Turn to page 128 for complete worked solutions to the questions on this page.

GEOMETRY AND MEASURES



Revision Guide
Pages 106, 107

Hint

Write vectors between two points with an arrow. $\overrightarrow{OA}$ is the **vector** from O to A, whereas OA is the **line segment** between O and A.

Hint

For part **(a)**, trace a path from A to B. If you go **backwards** along a vector you have to **subtract** that vector.

Hint

Don't write **a** and **b** in bold in your answer! Just use normal neat letters.

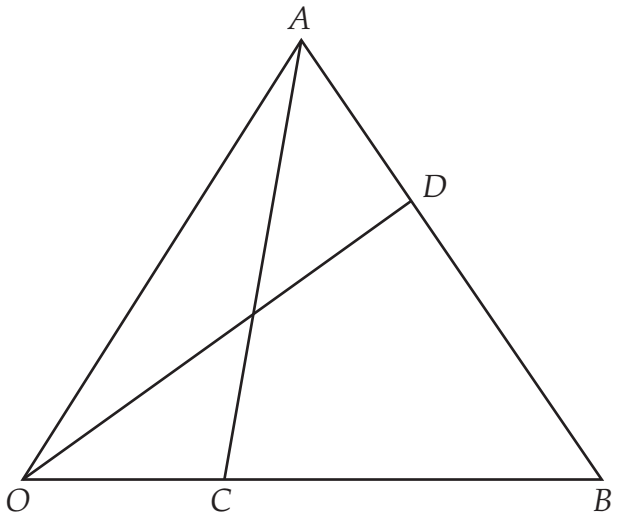
Problem solved!

For part **(b)**, find an expression for $\overrightarrow{CD}$ in terms of **a** and **b**.
If you can show that $\overrightarrow{CD} = k\overrightarrow{OA}$ then the lines CD and OA are **parallel**, and the length of CD is k times the length of OA.

Watch out!

The final line of your answer should be about **line segments**, not vectors.

18



OAB is a triangle.

The point D divides the line AB in the ratio 1 : 2
The point C divides the line OB in the ratio 1 : 2

$\overrightarrow{OA} = 6\mathbf{a}$
$\overrightarrow{OB} = 6\mathbf{b}$

(a) Write down $\overrightarrow{AB}$ in terms of **a** and **b**.

.....

(1)

(b) Show that:

CD is a parallel to OA **and** the length of CD is $\frac{2}{3}$ the length of OA.

(5)

(Total for Question 18 is 6 marks)

Turn to page 128 for complete worked solutions to the questions on this page.

19 A function is defined by $f(x) = \dfrac{x-1}{x+2}$, $x \in \mathbb{R}$, $x \neq -2$

(a) Find $f^{-1}(x)$.

$f^{-1}(x) =$ .....

(3)

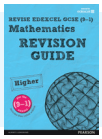
(b) Show that $f^{-1}(x) = -2$ has no solutions.

(2)

(Total for Question 19 is 5 marks)

Turn to page 129 for complete worked solutions to the questions on this page.

ALGEBRA



Revision Guide
Pages 46, 51

Hint

Write the function in the form $y = \ldots$ then rearrange to make x the subject.

Hint

x appears twice in the equation. You will need to group the x terms on one side then factorise to get x on its own.

Problem solved!

For part **(b)** you should attempt to solve the equation. Show all your working, and when you reach a point where you can't continue, write a short conclusion explaining why there are no solutions.

Explore

The equation $x = x + 1$ has no solutions. If you subtracted x from both sides you would have $0 = 1$ which is impossible.