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Mathematics

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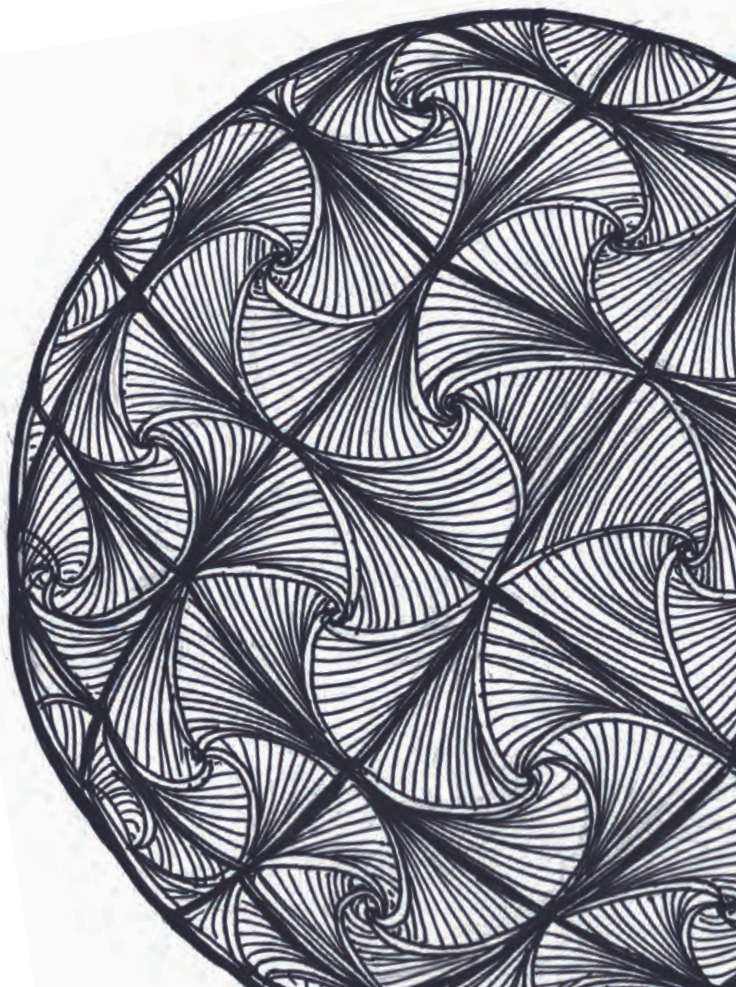

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REVISE EDEXCEL GCSE (9–1)

Mathematics

HIGHER

PAST PAPERS Plus+

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Pearson

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118 Answers

150 Notes

A small bit of small print

Pearson publishes Sample Assessment Material and the Specification on its website. This is the official content and this book should be used in conjunction with it. All the questions in this book were on the 2017 exam papers. The papers you will sit will be different, and these papers are provided for practice purposes only.

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 it.

All questions also have fully worked solutions shown in the back of the book for you to refer to.

You may want to work through the papers at your own pace, to reinforce 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:

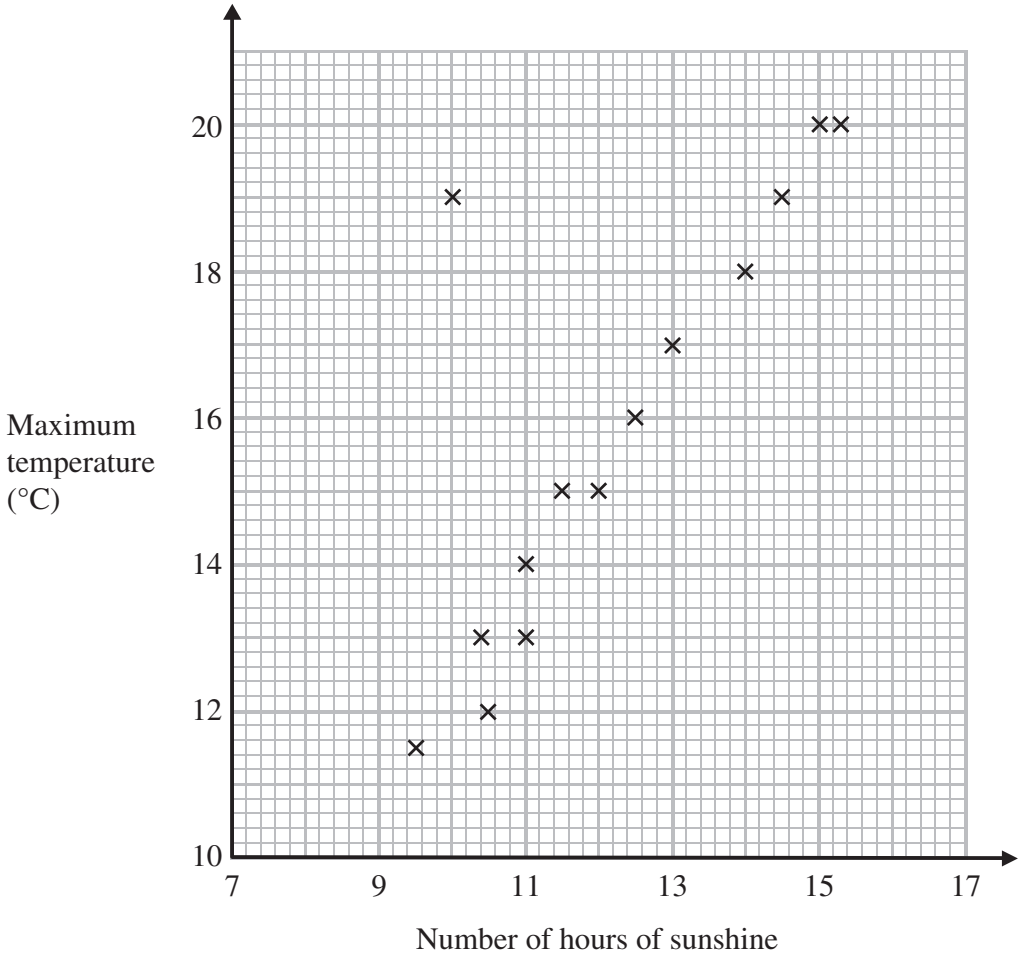
- Use black ink or ball point pen.
- Answer all questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- In a real exam, **you must show all your working out**.
- For each paper, check whether you can use a calculator or not. This is stated at the start of each 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.
- When checking your answer against the Answers at the back of the book, take note of how the marks for the question are awarded for working out, so you can see what you need to include in your answers.

Paper 1: Non-calculator
Time allowed: 1 hour 30 minutes

PROBABILITY AND STATISTICS

Revision Guide Page 114

1 The scatter graph shows the maximum temperature and the number of hours of sunshine in fourteen British towns on one day.



One of the points is an outlier.

(a) Write down the coordinates of this point.

(....., ...)

(1)

(b) For all the other points write down the type of correlation.

.....

(1)

Hint

Start by reading the question carefully. Each point on the graph represents one town.

LEARN IT!

An **outlier** is a point which does not fit with the rest of the data. It lies away from the line of best fit.

Watch out!

You need to state if there is 'positive', 'negative' or 'no' correlation. Only the right choice from these three will score the mark, so do not give extra detail!

Turn to page 118 for complete worked solutions to the questions on this page.

On the same day, in another British town, the maximum temperature was 16.4°C.

(c) Estimate the number of hours of sunshine in this town on this day.

.....hours
(2)

A weatherman says,

"Temperatures are higher on days when there is more sunshine."

(d) Does the scatter graph support what the weatherman says?

Give a reason for your answer.

.....

.....

.....

(1)

(Total for Question 1 is 5 marks)

---

2 Express 56 as the product of its prime factors.

.....

(Total for Question 2 is 2 marks)

Hint

Add a **line of best fit** to the scatter graph. Make sure there are roughly the same number of points on either side of it.

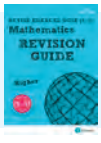
Watch out!

Your line should pass through the middle of the points. It does not need to pass through the point where the axes meet.

Explore

Take care if you use a scatter diagram to estimate values that are beyond the scope of the data (extrapolation). You cannot accurately estimate the daytime temperature of a British town with 7 hours of sunshine or a Spanish town with 12 hours of sunshine.

NUMBER



Revision Guide Page 1

Hint

Check that:

- your answer only consists of primes
- the primes multiply to give the target number.

Turn to page 118 for complete worked solutions to the questions on this page.

3 Work out 54.6×4.3

.....

(Total for Question 3 is 3 marks)

NUMBER

Problem solved!

To multiply decimals:

1. Ignore the decimal point and multiply the numbers.

2. Count the total number of digits after the decimal point in the question.

The answer has this number of decimal places (including zeros).

Hint

Check your answer by estimating 55×4.

Turn to page 118 for complete worked solutions to the questions on this page.

ALGEBRA

Revision Guide Pages 17, 31, 52

Watch out!

This is a 'show that' question, so you must show every step in your working.

Problem solved!

1. Start by writing an expression for the area of the whole square.

2. Put your expression equal to 10.

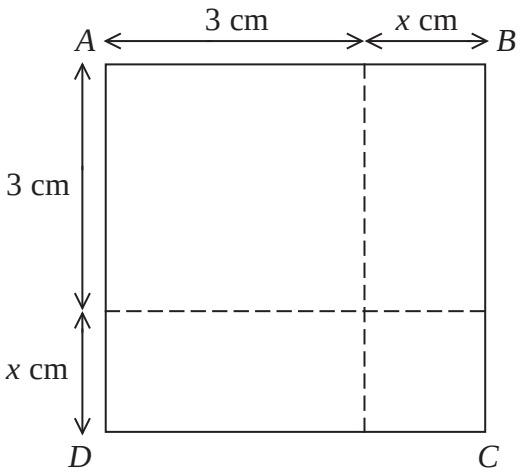
3. Expand the brackets.

4. Gather all the number terms on the right-hand side.

Watch out!

The last line of your working should be $x^2 + 6x = 1$. Make sure you complete the question fully to avoid losing a mark.

4



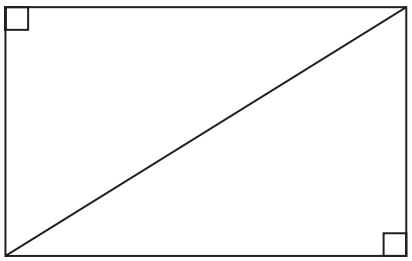
The area of square $ABCD$ is 10 cm^2.

Show that $x^2 + 6x = 1$

(Total for Question 4 is 3 marks)

Turn to page 118 for complete worked solutions to the questions on this page.

5 This rectangular frame is made from 5 straight pieces of metal.



The weight of the metal is 1.5 kg per metre.

Work out the total weight of the metal in the frame.

..... kg

(Total for Question 5 is 5 marks)

Turn to page 119 for complete worked solutions to the questions on this page.

RATIO AND PROPORTION

Revision Guide
Pages 67, 76

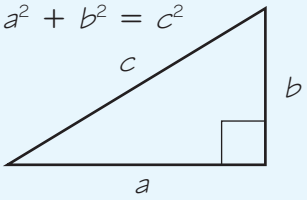
Hint

You need to work out the length of the diagonal and the **perimeter** of the frame first.

LEARN IT!

Pythagoras' theorem for right-angled triangles is

$a^2 + b^2 = c^2$



Watch out!

Make sure you answer the question. Once you have the total length you must work out the **weight** of the frame.

Explore

Pythagoras' theorem is named after the Greek philosopher and mathematician Pythagoras who lived in the 6th century BCE. His teachings influenced later Greek thinkers such as Plato and Aristotle.

ALGEBRA

Revision Guide
Pages 25, 27

Hint

First you need to rearrange L_2 to find its gradient.

Then you need to show that L_1 and L_2 have the same gradient.

LEARN IT!

When the **equation of a line** is in the form $y = mx + c$, the gradient is m and the y-intercept is at $(0, c)$.

LEARN IT!

Parallel lines have the same gradient.

6 The equation of the line L_1 is $y = 3x - 2$
The equation of the line L_2 is $3y - 9x + 5 = 0$

Show that these two lines are parallel.

(Total for Question 6 is 2 marks)

Turn to page 119 for complete worked solutions to the questions on this page.

7 There are 10 boys and 20 girls in a class.
The class has a test.

The mean mark for all the class is 60
The mean mark for the girls is 54

Work out the mean mark for the boys.

.....

(Total for Question 7 is 3 marks)

---

8 (a) Write 7.97×10^{-6} as an ordinary number.

.....

(1)

(b) Work out the value of $(2.52 \times 10^{5}) \div (4 \times 10^{-3})$

Give your answer in standard form.

.....

(2)

(Total for Question 8 is 3 marks)

Turn to page 119 for complete worked solutions to the questions on this page.

PROBABILITY AND STATISTICS

Revision Guide
Page 110

Hint

The total mark of the whole class is

mean mark × total number of students in the class.

Problem solved!

1. Work out the total mark of the whole class.

2. Find the total mark of all the girls.

3. The total mark of all the boys is the difference between these totals.

4. Divide by 10 to find the mean boy's mark.

NUMBER

Revision Guide
Page 8

Problem solved!

To divide numbers in standard form:

- divide the 'number' parts
- divide the powers of 10
- rewrite your answer in standard form (if necessary).

RATIO AND PROPORTION

Revision Guide Page 63

Watch out!

The **original** price of the washing machine is 100%. When VAT is added, you pay 120% of the original price. So £600 is equal to 120%.

Hint

Start by finding 10%.

9 Jules buys a washing machine.

20% VAT is added to the price of the washing machine.
Jules then has to pay a total of £600

What is the price of the washing machine with **no** VAT added?

£ .....

(Total for Question 9 is 2 marks)

ALGEBRA

Revision Guide Page 17

Hint

Expand $(x + 1)(x + 2)$.

Then multiply the resulting expression by $(x + 3)$.

Watch out!

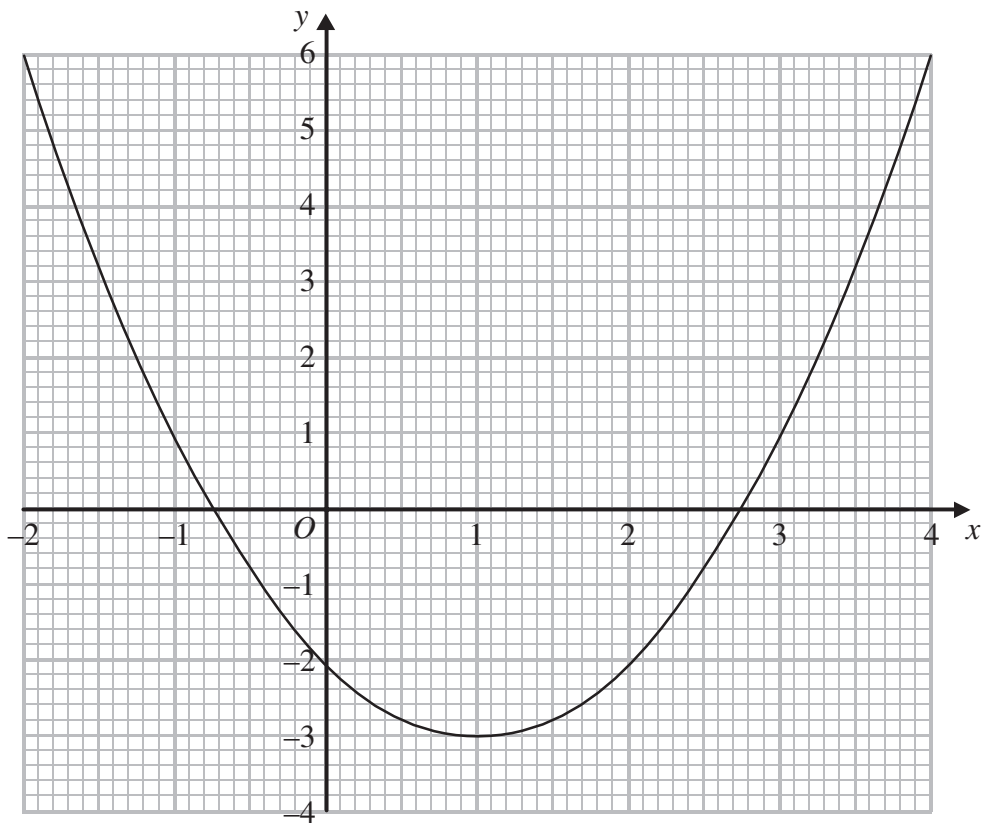
Take care when expanding brackets – don't try to expand all three brackets at once.

10 Show that $(x + 1)(x + 2)(x + 3)$ can be written in the form
$ax^3 + bx^2 + cx + d$
where a, b, c and d are positive integers.

(Total for Question 10 is 3 marks)

Turn to page 119 for complete worked solutions to the questions on this page.

11 The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(....., ...)

(1)

(b) Write down estimates for the roots of $f(x) = 0$

.....

(1)

(c) Use the graph to find an estimate for $f(1.5)$

.....

(1)

(Total for Question 11 is 3 marks)

Turn to page 120 for complete worked solutions to the questions on this page.

ALGEBRA

Revision Guide Pages 28, 42

Watch out!

Take care to read off values as accurately as you can in graph questions. Always check the scales on both axes carefully – they may be different.

Explore

The curve is a **parabola**. When you throw a ball, the trajectory (path) of the ball can be modelled by a parabola. The equation of a parabola is a quadratic.

Hint

Look for the points where the curve crosses the *x*-axis.

Watch out!

Take care, there are two different roots!

Problem solved!

To estimate f(1.5) you need to read off the value of *y* when $x = 1.5$.

123 NUMBER

Revision Guide
Pages 2, 3

Hint

Leave your answer as a fraction.

LEARN IT!

Remember the **laws of indices:**

- $x^{-n} = \frac{1}{x^n}$
- $x^{\frac{1}{m}} = \sqrt[m]{x}$
- $x^{\frac{n}{m}} = \sqrt[m]{x^n}$

% RATIO AND PROPORTION

Revision Guide
Pages 69, 70

LEARN IT!

y is inversely proportional to the square of x means

$y \propto \frac{1}{x^n}$.

So $y = \frac{k}{x^2}$.

Hint

You can use any pair of values from the table to work out k.

Watch out!

Take care when you solve $16 = \frac{9}{x^2}$.

Multiply **both sides** by x^2 and then divide **both sides** by 16.

12 (a) Find the value of $81^{-\frac{1}{2}}$

.....

(2)

(b) Find the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

.....

(2)

(Total for Question 12 is 4 marks)

---

13 The table shows a set of values for x and y.

x	1	2	3	4
y	9	$2\frac{1}{4}$	1	$\frac{9}{16}$

y is inversely proportional to the square of x.

(a) Find an equation for y in terms of x.

.....

(2)

(b) Find the positive value of x when $y = 16$

.....

(2)

(Total for Question 13 is 4 marks)

Turn to page 120 for complete worked solutions to the questions on this page.

14 White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3 : 7

The ratio of the number of white circles to the number of white squares is 4 : 5

The ratio of the number of black circles to the number of black squares is 2 : 5

Work out what fraction of all the shapes are circles.

.....

(Total for Question 14 is 4 marks)

Turn to page 120 for complete worked solutions to the questions on this page.

RATIO AND PROPORTION

Revision Guide
Pages 5, 60

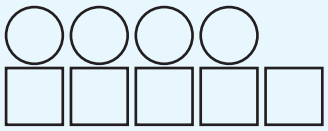
Problem solved!

1. Find the fractions of the shapes that are
   - white
   - circles.
2. Multiply these two fractions to find the fraction that are white circles.
3. Find the fraction that are black circles.
4. Add the fractions for white circles and black circles.

Watch out!

Take care when converting ratios to fractions.

Here is the ratio 4 : 5



$\frac{4}{9}$ of the white shapes are circles.

NUMBER

GEOMETRY AND MEASURES

Revision Guide
Pages 7, 85

Hint

You need to find an **estimate**. You should round the values so you can easily work out the answer without using a calculator.

Hint

You need to work out how h has been affected by the rounding.

Think about whether each number has been rounded up or rounded down. How will this affect the calculation?

ALGEBRA

Revision Guide
Pages 17, 52

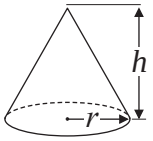
Hint

- Expand the brackets and then simplify.
- To prove that a number is **even** you need to show that 2 is a factor of that number.

15 A cone has a volume of 98 cm^3.
The radius of the cone is 5.13 cm.

(a) Work out an estimate for the height of the cone.

Volume of cone = $\frac{1}{3}\pi r^2 h$



..... cm
(3)

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?

Give reasons for your answer.

.....

.....

.....

.....

.....

.....

(1)

(Total for Question 15 is 4 marks)

16 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n-2)^2$ is always an even number.

(Total for Question 16 is 4 marks)

Turn to page 120 for complete worked solutions to the questions on this page.

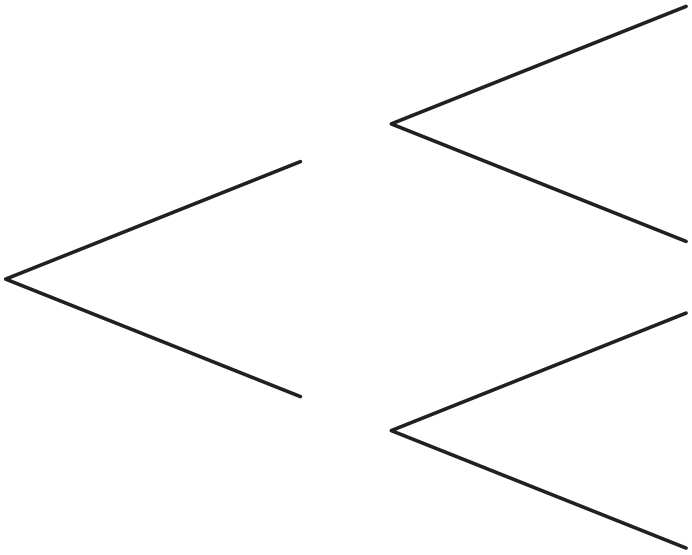
17 There are 9 counters in a bag.

7 of the counters are green.
2 of the counters are blue.

Ria takes at random two counters from the bag.

Work out the probability that Ria takes one counter of each colour.

You must show your working.



.....

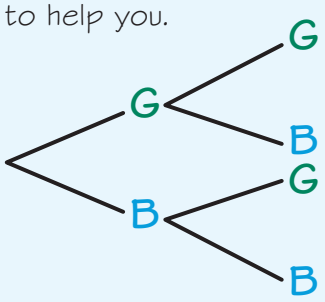
(Total for Question 17 is 4 marks)

PROBABILITY AND STATISTICS

Revision Guide
Page 128

Hint

Draw a **tree diagram** to help you.



Watch out!

The counters are **not** replaced, so after Ria takes the first counter there are only 8 left in the bag.

Turn to page 121 for complete worked solutions to the questions on this page.

ALGEBRA

Revision Guide
Pages 25, 26 and 27

LEARN IT!

The diagonals of a **rhombus** are perpendicular.

Hint

Start by adding the information you have been given to the diagram.

Problem solved!

1. Find the gradient of DB and use it to give the gradient of AC.

2. Substitute the gradient of AC and the coordinates of A into $y = mx + c$ to find the value of c.

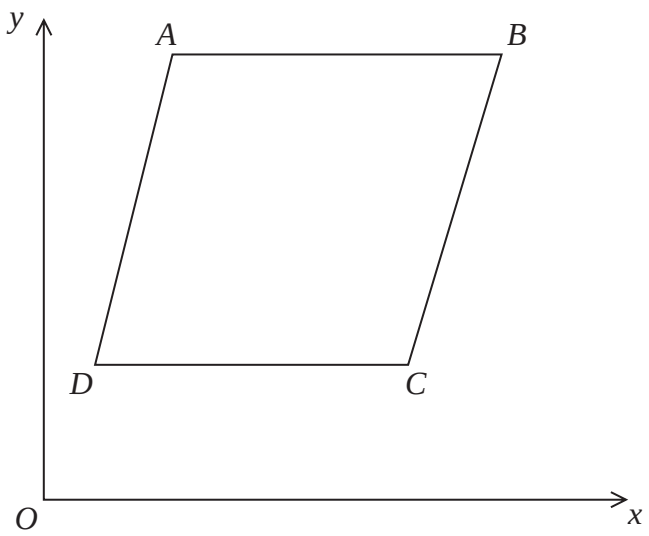
3. Make sure you finish by stating the equation of AC.

LEARN IT!

When two lines are **perpendicular**, the product of their gradients is -1.

So the perpendicular gradient $= -\frac{1}{m}$.

18



$ABCD$ is a rhombus.
The coordinates of A are (5, 11)

The equation of the diagonal DB is $y = \frac{1}{2}x + 6$

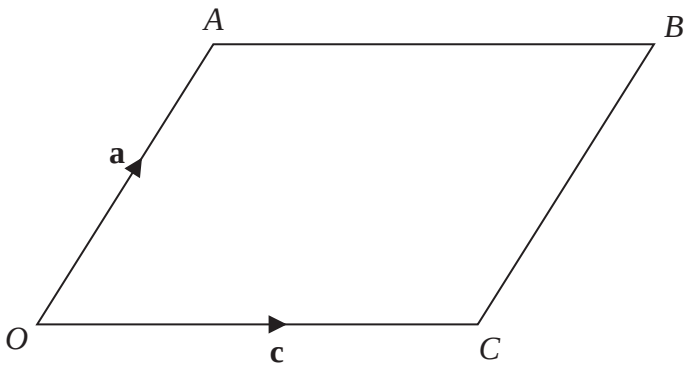
Find an equation of the diagonal AC.

.....

(Total for Question 18 is 4 marks)

Turn to page 121 for complete worked solutions to the questions on this page.

19



$OABC$ is a parallelogram.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$

X is the midpoint of the line AC.
OCD is a straight line so that $OC : CD = k : 1$

Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$

find the value of k.

$k =$ .....

(Total for Question 19 is 4 marks)

GEOMETRY AND MEASURES

Revision Guide Pages 106 and 107

Hint

Start by adding the point D to the diagram.

You are told that OCD is a straight line, so D is to the right of C.

Problem solved!

1. You are given $\overrightarrow{OC}$, so find $\overrightarrow{CD}$ and compare their lengths.

2. From your diagram, $\overrightarrow{CD} = \overrightarrow{CX} + \overrightarrow{XD}$

3. Find $\overrightarrow{CX}$ in terms of a and c.

4. Use $\overrightarrow{CX}$ and $\overrightarrow{XD}$ to find $\overrightarrow{CD}$ in terms of c.

5. Compare $\overrightarrow{CD}$ and $\overrightarrow{OC}$ to find the ratio.

Turn to page 121 for complete worked solutions to the questions on this page.

ALGEBRA

Revision Guide
Page 35

Problem solved!

1. Rearrange the linear equation to make y the subject.
2. Substitute your expression for y into the quadratic equation.
3. Expand the brackets.
4. Solve the resulting quadratic equation to find x.
5. Use the linear equation to find the corresponding values of y.

Hint

To factorise the quadratic, look for:

- two x terms that multiply to give the x^2 term
- two numbers that multiply give the constant.

Test out different combinations until you find the right factors.

Watch out!

Always substitute your values of x into the linear equation to find the values of y.

20 Solve algebraically the simultaneous equations

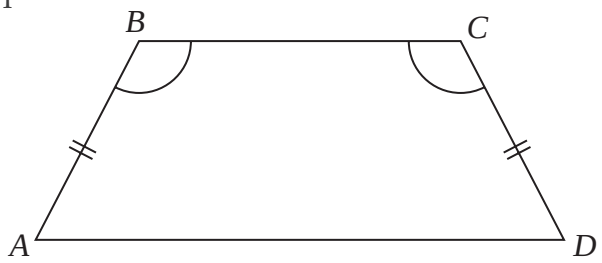
$$x^2 + y^2 = 25$$
$$y - 3x = 13$$

.....

(Total for Question 20 is 5 marks)

Turn to page 121 for complete worked solutions to the questions on this page.

21 $ABCD$ is a quadrilateral.



$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

(Total for Question 21 is 4 marks)

GEOMETRY AND MEASURES

Revision Guide Page 96

Hint

Start by dividing the quadrilateral into two triangles: ABC and BCD.

Show that the two triangles are **congruent**.

LEARN IT!

Congruent triangles are exactly the same shape and size.

Two triangles are congruent if they have:

- three sides the same (SSS)
- two sides and the included angle the same (SAS)
- two angles and the included side the same (ASA)
- a right-angle, the same hypotenuse and one side the same (RHS).

Watch out!

This question is worth 4 marks so make sure you make 4 statements in your proof.

Turn to page 122 for complete worked solutions to the questions on this page.

GEOMETRY AND MEASURES

Revision Guide
Pages 79, 100

Problem solved!

1. Use the cosine rule to find cos *PBQ*.

2. Use the cosine rule again to find *PQ* in terms of *x*.

3. Substitute your expression for *PQ* into your expression for cos *PBQ*.

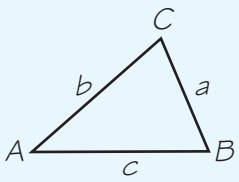
4. Simplify your expression.

Hint

Use the cosine rule when you know:

- two sides and the angle between them and you want to find a third side
- three sides and you want any angle.

LEARN IT!



The cosine rule is

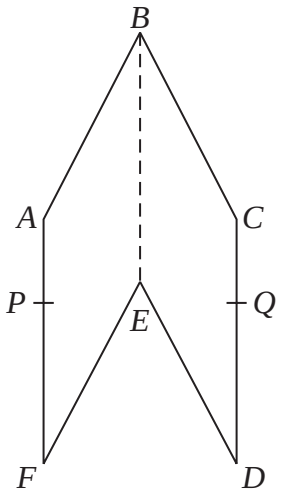
$a^2 = b^2 + c^2 - 2bc\cos A$

LEARN IT!

You need to know that

$\cos 30° = \frac{\sqrt{3}}{2}$

22 The diagram shows a hexagon *ABCDEF*.



ABEF and *CBED* are congruent parallelograms where $AB = BC = x$ cm.
P is the point on *AF* and *Q* is the point on *CD* such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30°$,

prove that $\cos PBQ = 1 - \frac{(2-\sqrt{3})}{200}x^2$

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER 1H IS 80 MARKS

Turn to page 122 for complete worked solutions to the questions on this page.