Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Centre Number | Candidate Number

Mathematics

Paper 1 (Non-Calculator)

Higher Tier

Thursday 2 November 2017 – Morning
Time: 1 hour 30 minutes

Paper Reference
1MA1/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may not be used.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

Pearson

Please note that these worked solutions have neither been provided nor approved by Pearson Education and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Write 36 as a product of its prime factors.

Do a factor tree of 36 and circle the primes. Multiplying the primes together gives the product of its prime factors

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(Total for Question 1 is 2 marks)

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2 Kiaria is 7 years older than Jay.
Martha is twice as old as Kiaria.
The sum of their three ages is 77

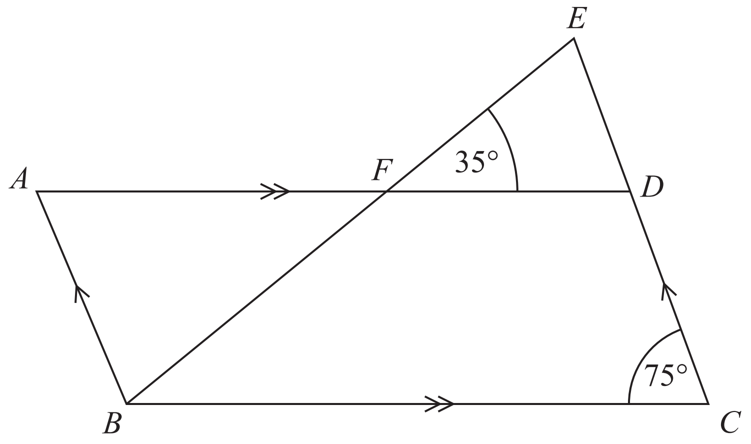
Find the ratio of Jay's age to Kiaria's age to Martha's age.

Let J be Jay's age. Express each of their ages in terms of J then add them together to give the sum of their ages. An equation can be created which can be simplified, rearranged and solved to find J. Now we have Jay's age, we can find the other ages and write them as a ratio

....

(Total for Question 2 is 4 marks)

3



ABCD is a parallelogram.
EDC is a straight line.
F is the point on *AD* so that *BFE* is a straight line.

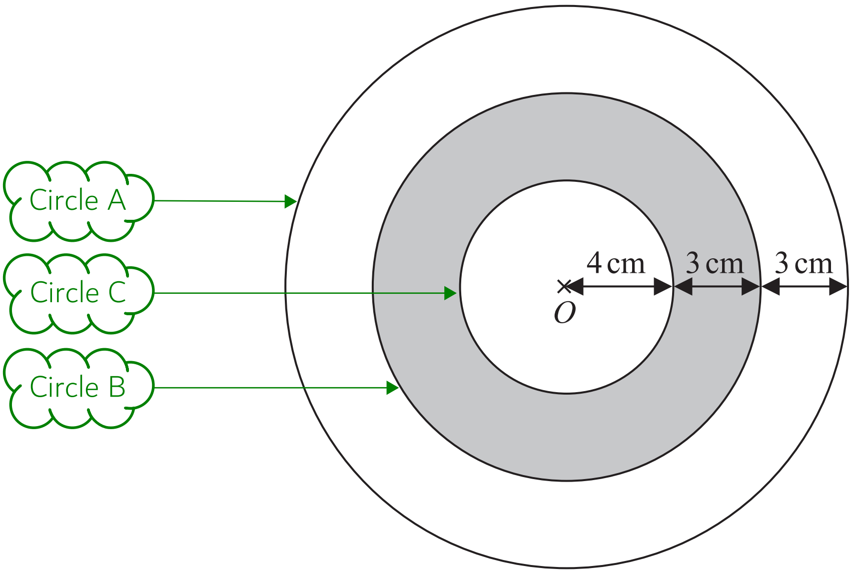
Angle *EFD* = 35°
Angle *DCB* = 75°

Show that angle *ABF* = 70°
Give a reason for each stage of your working.

Angle ABF can be shown using the following reasons: opposite angles in a parallelogram are equal, vertically opposite angles are equal and there are 180° in a triangle.

(Total for Question 3 is 4 marks)

4 The diagram shows a logo made from three circles.



Each circle has centre O.

Daisy says that exactly $\frac{1}{3}$ of the logo is shaded.

Is Daisy correct?
You must show all your working.

Express the shaded area as a fraction of the total area and simplify it. Then compare it to 1/3.
Area of circle = π x radius^2
Shaded area = circle B - circle C
Total area = circle A

(Total for Question 4 is 4 marks)

5 The table shows information about the weekly earnings of 20 people who work in a shop.

Weekly earnings (£x)	**Frequency**	Mid	Fx
$150 < x \leqslant 250$	1	200	200
$250 < x \leqslant 350$	11	300	3300
$350 < x \leqslant 450$	5		
$450 < x \leqslant 550$	0		
$550 < x \leqslant 650$	3		

(a) Work out an estimate for the mean of the weekly earnings.

Work out the midpoint of each category then multiply the midpoint by the frequency to get an estimated total for each category. Then add up the totals to get an overall total

Mean = total/number

£.......................................

(3)

Nadiya says,

"The mean may **not** be the best average to use to represent this information."

(b) Do you agree with Nadiya?
You must justify your answer.

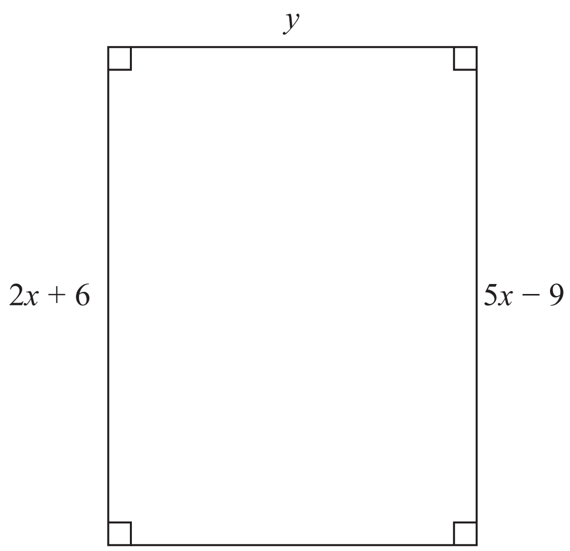
Median is usually used for average earnings

....

(1)

(Total for Question 5 is 4 marks)

6 Here is a rectangle.



All measurements are in centimetres.

The area of the rectangle is 48 cm^2.

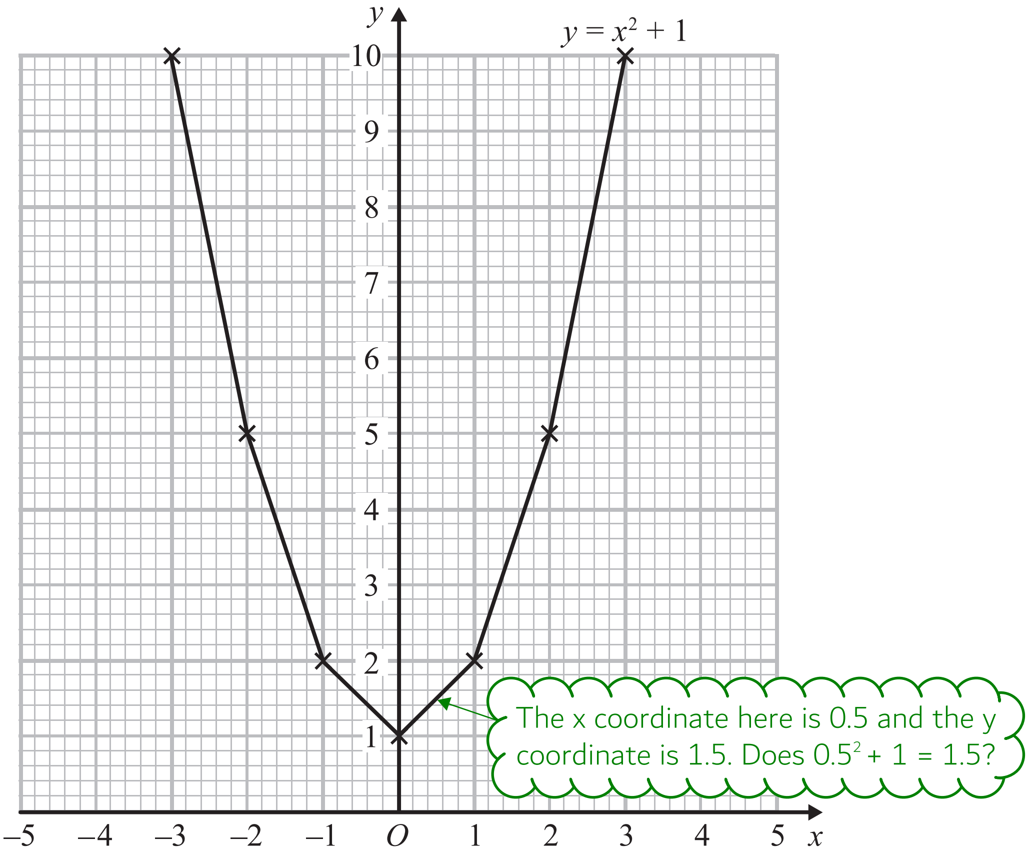
Show that $y = 3$

Opposite sides on a rectangle are equal. Using this fact, an equation in terms of x can be formed, rearranged and solved to find x. Substitute in the value of x into one of the expressions for the length. Then express the area in terms of y, rearrange and solve. Area of rectangle = length x width

(Total for Question 6 is 4 marks)

7 Brogan needs to draw the graph of $y = x^2 + 1$

Here is her graph.



Write down one thing that is wrong with Brogan's graph.

....

....

(Total for Question 7 is 1 mark)

8 Write these numbers in order of size.
Start with the smallest number.

The dots above the numbers mean that they recur (go on forever). For example, this number is 0.246246246...

$0.2\dot{4}\dot{6}$ $\qquad$ $0.24\dot{6}$ $\qquad$ $0.\dot{2}4\dot{6}$ $\qquad$ 0.246

0.246...
0.246...
0.246...
0.246

Writing the numbers in a column to compare them. They all have 2 tenths, 4 hundredths and 6 thousandths but the ten-thousandths are all different. The number with the smallest number of ten-thousandths is the smallest

....

(Total for Question 8 is 2 marks)

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9 James and Peter cycled along the same 50 km route.

James took $2\frac{1}{2}$ hours to cycle the 50 km.

Peter started to cycle 5 minutes after James started to cycle.
Peter caught up with James when they had both cycled 15 km.

James and Peter both cycled at constant speeds.

Work out Peter's speed.

$\frac{D}{S \mid T}$

$S_P = \frac{15}{T_P}$ ← Peter's speed = 15km/(the time it takes Peter to do 15km)

The time it takes Peter to do 15km can be found by calculating the time it takes James to do the 15km and subtracting 5 minutes, which can be found by using James' speed, which can be found using the time it takes him to do 50km

.... km/h

(Total for Question 9 is 5 marks)

10 (a) Write down the value of $100^{\frac{1}{2}}$

Power of 1/2 means positive square root

....
(1)

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

Power of 2/3 means cube root then square

....
(2)

(Total for Question 10 is 3 marks)

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11 3 teas and 2 coffees have a total cost of £7.80
5 teas and 4 coffees have a total cost of £14.20

Work out the cost of one tea and the cost of one coffee.

$3t + 2c = 7.80$ ← First equation. 3 teas and 2 coffees have a total cost of £7.80

$5t + 4c = 14.20$ ← Second equation. 5 teas and 4 coffees have a total cost of £14.20

Make the number of c the same in both equations by multiplying one of the equations to make another equation. Then eliminate one of the variables by subtracting two of the equations from each other. Once we have one of the values, substitute it back into the original equations to find the other

tea £...

coffee £...

(Total for Question 11 is 4 marks)

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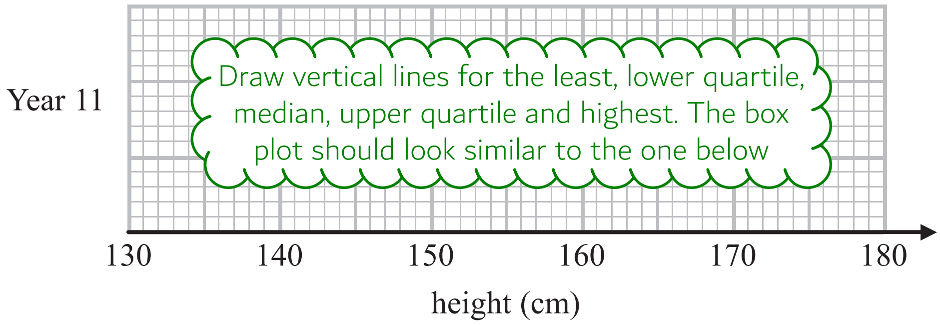
12 The table shows information about the heights, in cm, of a group of Year 11 girls.

	height (cm)
least height	154
median	165
lower quartile	161
interquartile range	7
range	20

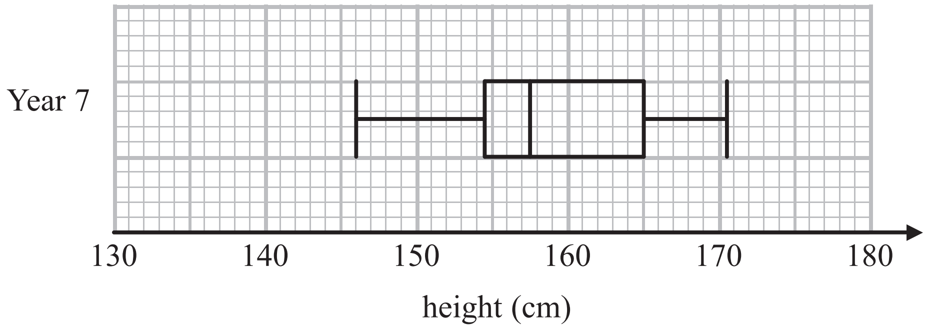
The upper quartile and highest height can be calculated using these values

(a) Draw a box plot for this information.



(3)

The box plot below shows information about the heights, in cm, of a group of Year 7 girls.



(b) Compare the distribution of heights of the Year 7 girls with the distribution of heights of the Year 11 girls.

Compare the medians and the interquartile ranges. The interquartile range is upper quartile subtract lower quartile

....

....

....

....

(2)

(Total for Question 12 is 5 marks)

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13 A factory makes 450 pies every day.
The pies are chicken pies or steak pies.

Each day Milo takes a sample of 15 pies to check.

The proportion of the pies in his sample that are chicken is the same as the proportion of the pies made that day that are chicken.

On Monday Milo calculated that he needed exactly 4 chicken pies in his sample.

(a) Work out the total number of chicken pies that were made on Monday.

4 out the 15 pies in the sample are chicken so 4/15 of the pies made that day are chicken

....
(2)

On Tuesday, the number of steak pies Milo needs in his sample is 6 correct to the nearest whole number.

Milo takes at random a pie from the 450 pies made on Tuesday.

(b) Work out the lower bound of the probability that the pie is a steak pie.

Find the lowest possible number which would round to 6 to the nearest whole number. This is the lower bound of the number of steak pies in his sample. Express this as a fraction of the number of pies in the sample then simplify the fraction to eliminate any decimals

....
(2)

(Total for Question 13 is 4 marks)

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14 The ratio $(y + x):(y - x)$ is equivalent to $k:1$

Show that $y = \dfrac{x(k+1)}{k-1}$

To get 1 on the right side of the ratio, (y - x) needs to be divided by (y - x). To keep the ratio equivalent, the left side needs to be divided by the same amount. Both of the left sides of the ratios are equal to each other so these can be set equal to each other once both the right sides are 1.

Rearrange the equation to make y the subject

(Total for Question 14 is 3 marks)

---

15 $x = 0.4\dot{3}\dot{6}$

Prove algebraically that x can be written as $\dfrac{24}{55}$

Keep multiplying x by ten until the recurring part of the decimal is in the same decimal places as x. Then subtract x from this to get a terminating decimal. Now we can rearrange to express x as a fraction which should simplify to 24/55

(Total for Question 15 is 3 marks)

---

16 y is directly proportional to $\sqrt[3]{x}$

$y = 1\frac{1}{6}$ when $x = 8$

Find the value of y when $x = 64$

$y = k \times \sqrt[3]{x}$

The cube root of x can be multiplied by anything and still be directly proportional to y. Using this fact, we can make this equation

Make k the subject then substitute in the first values of x and y to find k. Then substitute k and the second value of x back into the original equation to find y when x = 64

....

(Total for Question 16 is 3 marks)

---

17 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n + 1)$ and $\frac{1}{2}(n + 1)(n + 2)$ is always a square number.

Express the sum of both expressions, expand the brackets, collect like terms then factorise to express it as something squared

(Total for Question 17 is 2 marks)

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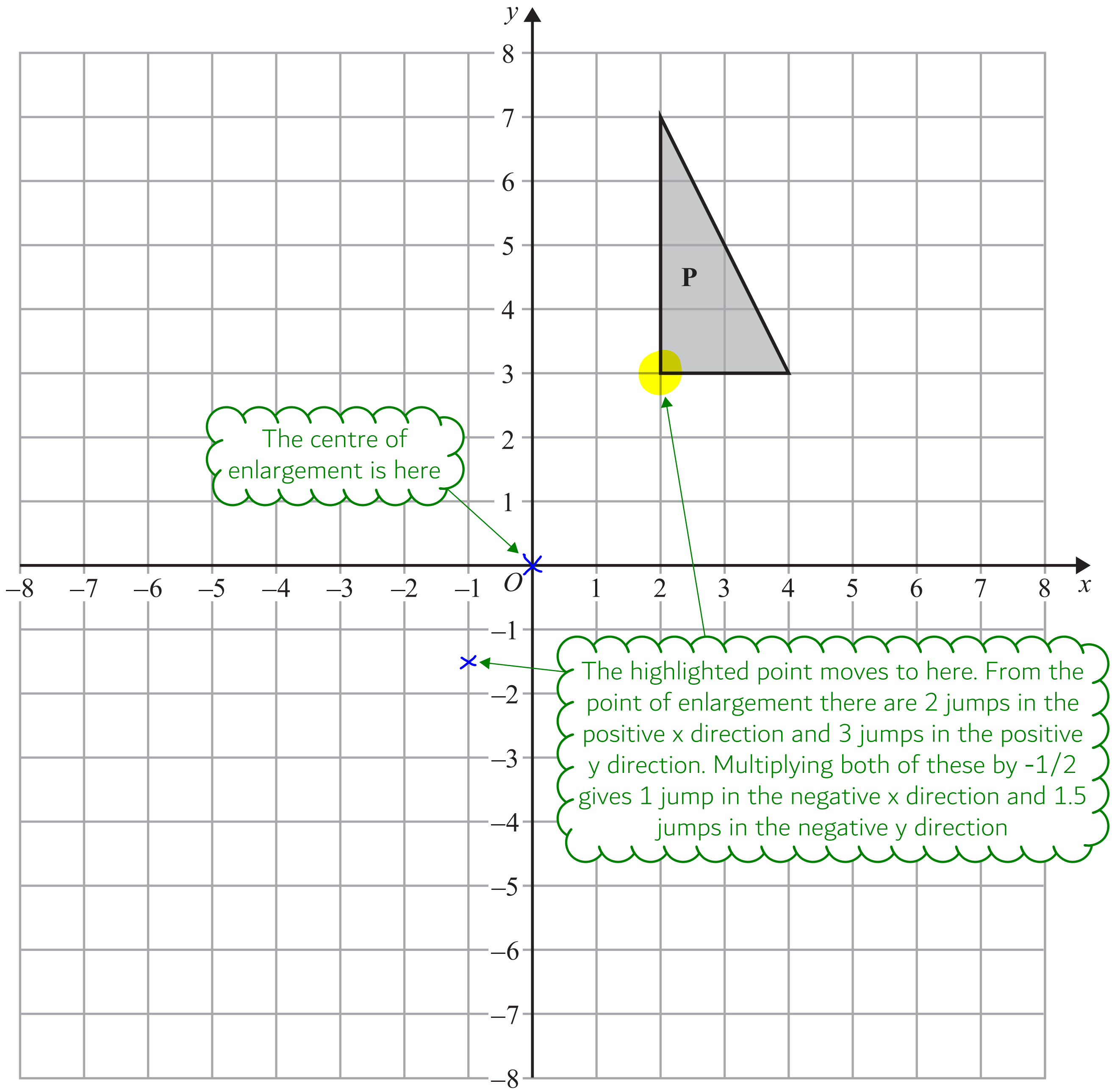
18

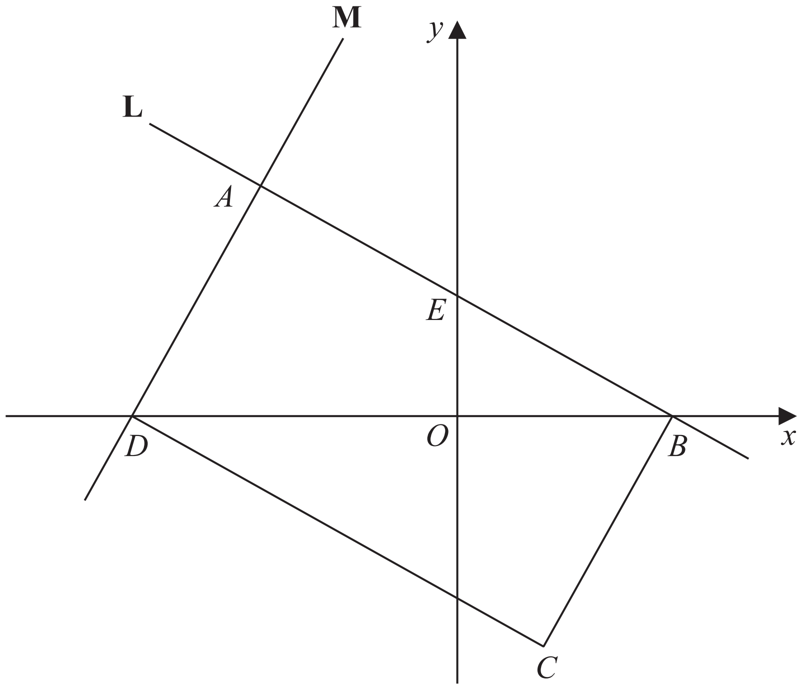


Enlarge shape **P** by scale factor $-\frac{1}{2}$ with centre of enlargement (0, 0).

Label your image **Q**.

(Total for Question 18 is 2 marks)

19



ABCD is a rectangle.

A, *E* and *B* are points on the straight line **L** with equation $x + 2y = 12$
A and *D* are points on the straight line **M**.

$AE = EB$

Find an equation for **M**.

The general equation of a straight line is y = mx + c, where m is the gradient and c is the y-intercept. The gradient of M is the negative reciprocal of the gradient of L as they are perpendicular.

Gradient of L = change in y/change in x
But first we need to find the coordinates of two points on the line L.

At point B, y = 0. By substituting this into the equation for L we can find x and therefore the coordinates of B. A similar method can be used to find the coordinates of E.

The y-intercept of line M, c, can be found by rearranging the equation to make it the subject then substituting in the coordinates of A, which can be found using the diagram once E and B are found as AE = EB and AEB is a straight line, meaning there is the same distance in the y and x directions between A and E, E and B

....

(Total for Question 19 is 4 marks)

20 The table shows some values of x and y that satisfy the equation $y = a\cos x° + b$

x	0	30	60	90	120	150	180
y	3	$1 + \sqrt{3}$	2	1	0	$1 - \sqrt{3}$	-1

Find the value of y when $x = 45$

$1 = a\cos 90 + b$

First substituting x for 90 as cos90 = 0 and this will eliminate the a so we can work out b

a can then be found by substituting x for 0 and b for the value found. Next substitute x for 45 and the values of a and b into the original equation

....

(Total for Question 20 is 4 marks)

21 Show that $\dfrac{6 - \sqrt{8}}{\sqrt{2} - 1}$ can be written in the form $a + b\sqrt{2}$ where a and b are integers.

$$\frac{6-\sqrt{8}}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1}$$

Rationalising the denominator to eliminate the surds from the denominator

Simplify the expression. At some point one of the surds needs to be simplified to express it in terms of root 2. To do this, express it as the root of a square number multiplied by a surd. The square root of a square number is a whole number

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$

(Total for Question 21 is 3 marks)

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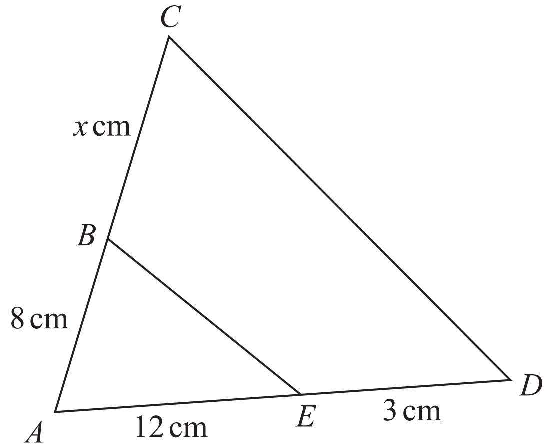
22 The two triangles in the diagram are similar.



There are two possible values of x.

Work out each of these values.
State any assumptions you make in your working.

Assuming AE is scaled to get AD and AB is scaled to get AC

$12 \times r = 15$ ← r is the scale factor

Work out the scale factor. Side AC can be expressed as side AB + BC or as AB x scale factor and both of these expressions are equal

Assuming AB is scaled to get AD and AE is scaled to get AC

$8 \times q = 15$ ← q is the scale factor

(Total for Question 22 is 5 marks)

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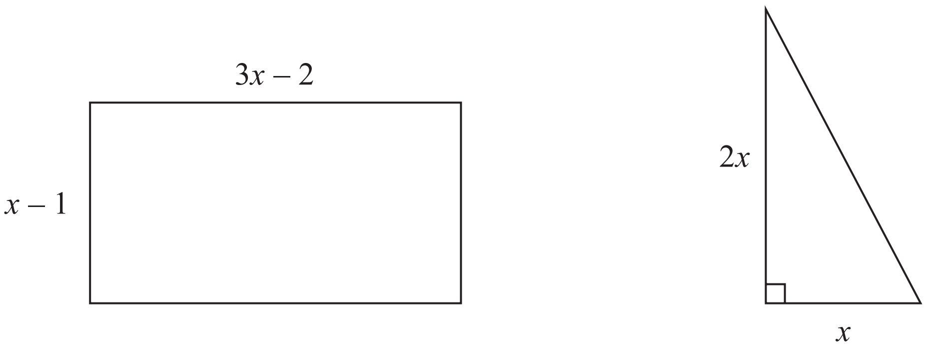
23 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.
The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x.

$$(3x-2)(x-1) > \frac{1}{2} \times x \times 2x$$

Area of rectangle = length x width
Area of triangle = 1/2 x base x height

Expand the brackets and simplify. Bring all the terms to one side so it is in the quadratic form and can be solved with factorisation. Remember that length can't be negative

....

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS