LJH WS

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 ▶

P49308A

6/6/6/7/2/

P 4 9 3 0 8 A 0 1 2 0

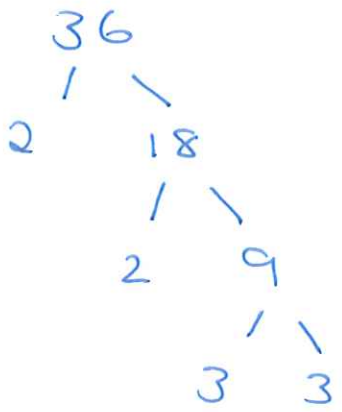
Pearson

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.



$36 = 2 \times 2 \times 3 \times 3$

or $2^2 \times 3^2$

.....

(Total for Question 1 is 2 marks)

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.

Jay + Kiaria + Martha = 77

$x + x+7 + 2(x+7) = 77$

$x + x + 7 + 2x + 14 = 77$

$4x + 21 = 77$ [−21

$4x = 56$ [÷4

$x = 14$

77
−21
56

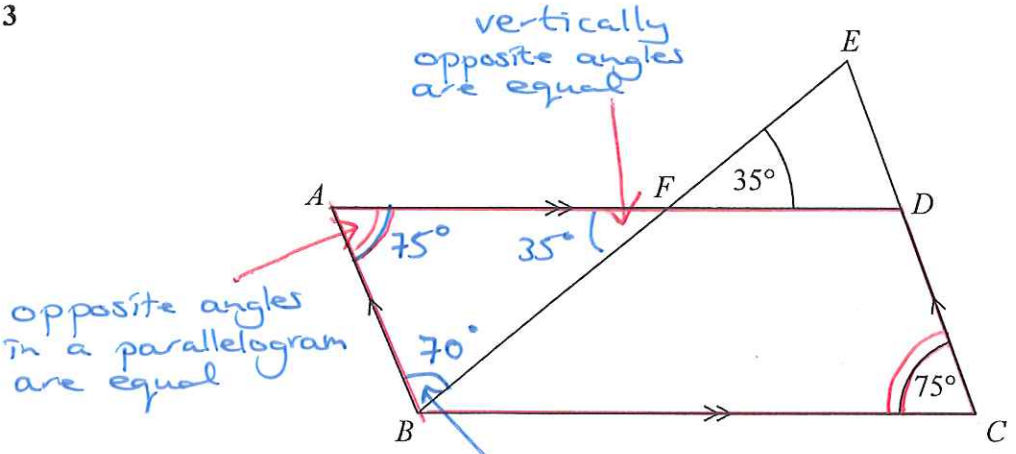
$$4\overline{)56} = 14$$

Jay : Kiaria : Martha
14 : 14+7 : 2(14+7)
14 : 21 : 42
÷7 ÷7 ÷7
2 : 3 : 6

2 : 3 : 6

(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.

we cannot use ABF = 70 within our working

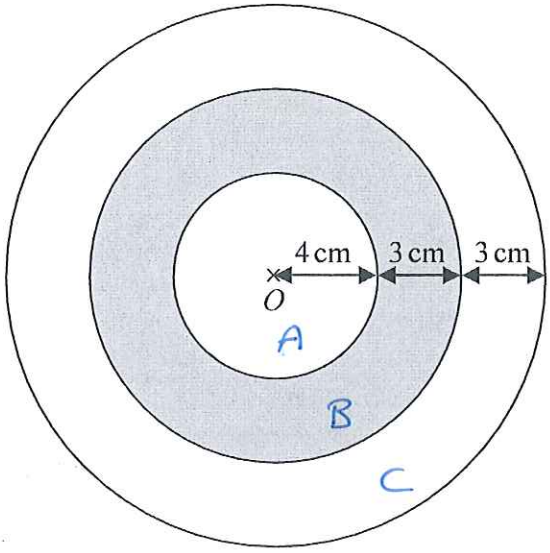
$75° + 35° = 110°$

$180° - 110° = 70°$

Angle ABF = 70°

(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.

Area circle A centre O $= \pi \times 4^2 = 16\pi$

Area Circle B centre O $= \pi \times 7^2 = 49\pi$

Area Circle C centre O $= \pi \times 10^2 = 100\pi$

Shaded Section $= \text{Area B} - \text{Area A}$
$= 49\pi - 16\pi$
$= 33\pi$

Fraction of Logo Shaded $= \frac{33\pi}{100\pi}$

$= \frac{33}{100}$

$\neq \frac{1}{3}$

Daisy is not correct

(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)	mid point x	Frequency f	
$150 < x \leqslant 250$	200	1	= 200
$250 < x \leqslant 350$	300	11	= 3300
$350 < x \leqslant 450$	400	5	= 2000
$450 < x \leqslant 550$	500	0	= 0
$550 < x \leqslant 650$	600	3	= 1800
		20	7300

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

$$\text{mean} \approx \frac{200\times1 + 300\times11 + 400\times5 + 500\times0 + 600\times3}{1 + 11 + 5 + 0 + 3}$$

$$= \frac{7300}{20}$$

$$= \frac{730}{2}$$

$$= 365$$

£ 365

(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.

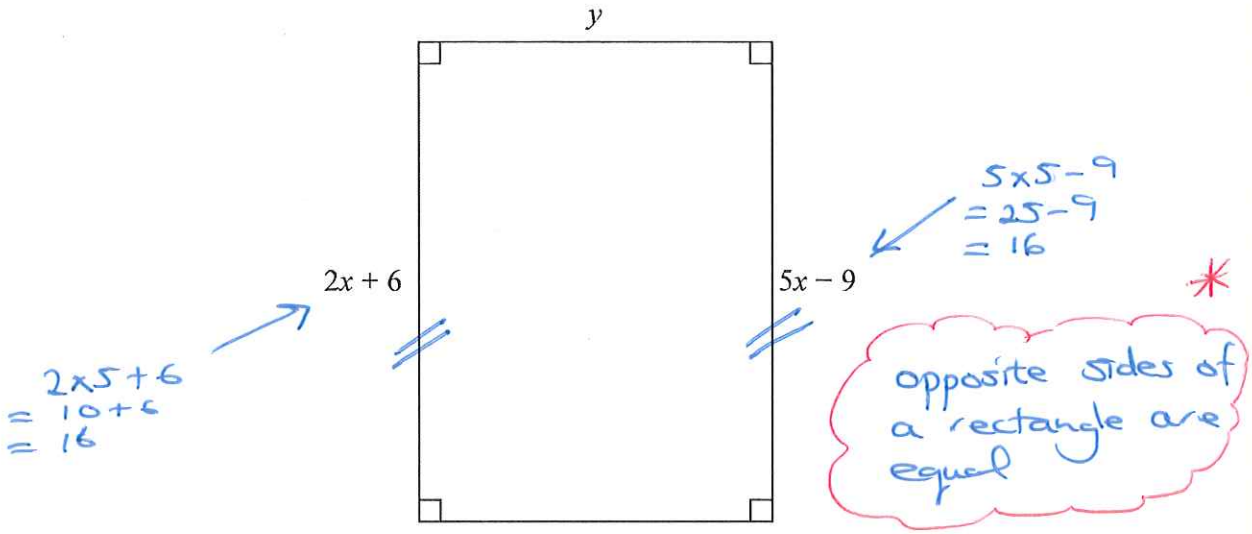
The median may be better as the data is not evenly spread out.

(1)

(Total for Question 5 is 4 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

6 Here is a rectangle.



$2\times5+6$
$= 10+6$
$= 16$

$5\times5-9$
$= 25-9$
$= 16$

* opposite sides of a rectangle are equal

All measurements are in centimetres.

The area of the rectangle is 48 cm^2.

Show that $y = 3$

remember we cannot use $y=3$ in our working.

first find x

* $2x+6 = 5x-9$ [−2x
$6 = 3x-9$ [+9
$15 = 3x$ [÷3
$5 = x$

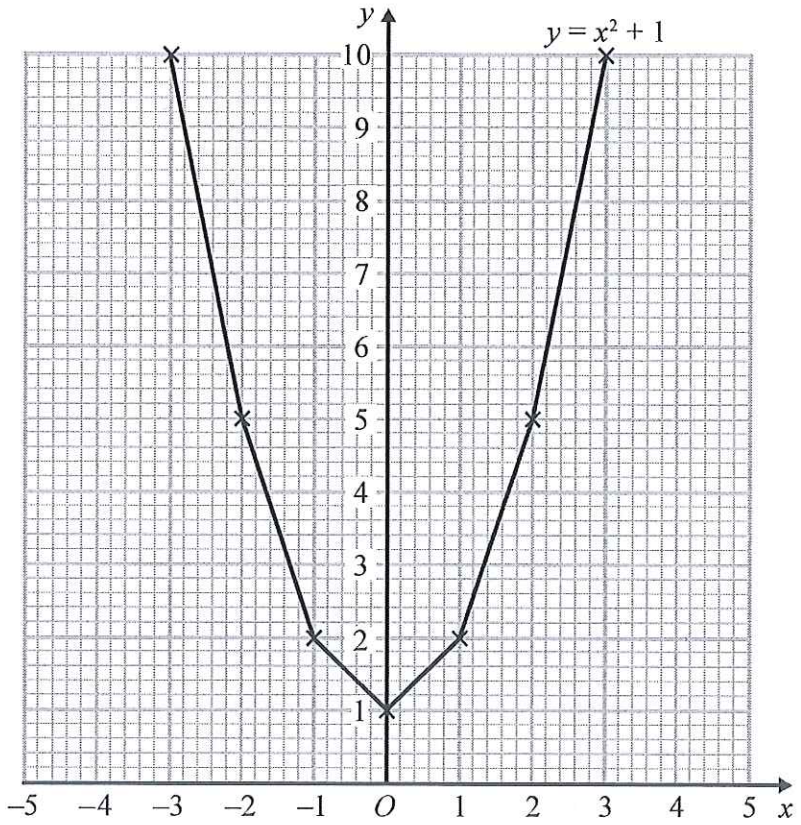
Area rectangle $= y \times 16$
Area rectangle $= 48\text{ cm}^2$

$y \times 16 = 48$
$16y = 48$ [÷16
$y = 3$

(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.

The points should be joined with a smooth curve

(Total for Question 7 is 1 mark)

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

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

0·24646…. 0·24666… 0·246246…

0·246 $0.\dot{2}4\dot{6}$ $0.2\dot{4}\dot{6}$ $0.24\dot{6}$

(Total for Question 8 is 2 marks)

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.

James

S = 20 km/h
D = 50 km
T = 2.5 hours

Speed = $\frac{D}{T} = \frac{50}{2.5} \overset{\times 10}{\underset{\times 10}{}}$

$= \frac{500}{25}$

= 20 km/h

S = 20 km/h
D = 15 km
T = $\frac{D}{S} = \frac{15}{20} \overset{\div 5}{\underset{\div 5}{}} = \frac{3}{4}$

James reached 15 km after $\frac{3}{4}$ hour or 45 mins

Peter

S
D = 50 km
T

S
D = 15 km
T = 40 mins = $\frac{2}{3}$ hour

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

$= \frac{15}{2/3}$

$15 \times \frac{3}{2}$

22.5

22.5 km/h

(Total for Question 9 is 5 marks)

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

$\sqrt{100}$

10

(1)

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

$\left(\sqrt[3]{125}\right)^2 = 5^2$

25

(2)

(Total for Question 10 is 3 marks)

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.

$3t + 2c = 780$ ①
$5t + 4c = 1420$ ②

① × 2: $6t + 4c = 1560$ ③
② × 1: $5t + 4c = 1420$ ④

DASS

③ − ④: $t = 140$ tea £1.40

Subs t in ①: $3 \times 140 + 2c = 780$
$420 + 2c = 780$ [−420
$2c = 360$ [÷2
$c = 180$
coffee £1.80

780 × 2 = 1560

140 × 3 = 420

780 − 420 = 360

180
2⟌360

tea £ 1.40

coffee £ 1.80

(Total for Question 11 is 4 marks)

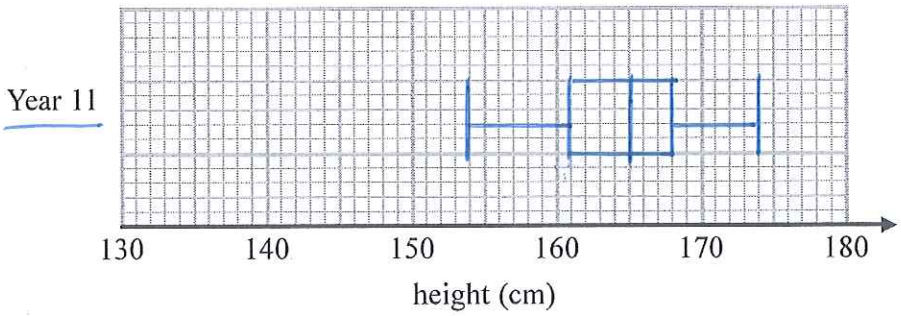
12 The table shows information about the heights, in cm, of a group of Year 11 girls.

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

upper quartile = 161 + 7 = 168

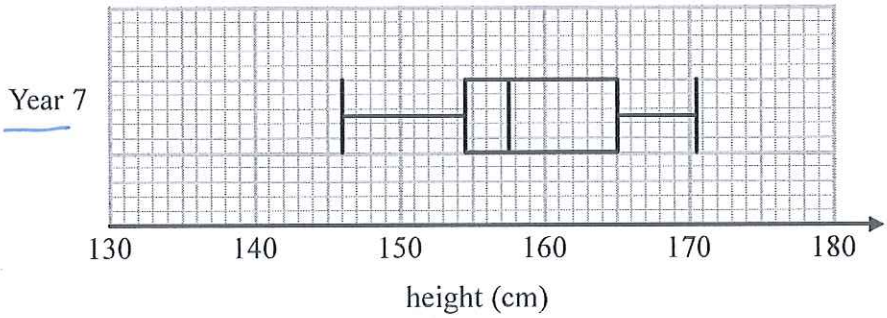
greatest height = 154 + 20 = 174

(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.

- The median height of Y11 girls (165 cm) is greater than the median height of Y7 girls (152.5 cm) showing that Y11 girls are taller than Y7 girls
- The IQR of Y7 heights (10.5 cm) is greater than the IQR of Y11 heights (7 cm) showing that Y11 heights are more consistent than Y7 heights (less variation) (2)

(Total for Question 12 is 5 marks)

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.

$\frac{x}{450} = \frac{4}{15}$

$x = \frac{4}{\cancel{15}_{1}} \times \frac{\overset{30}{\cancel{450}}}{1}$

120

(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.

$\frac{x}{450} = \frac{6}{15}$

$\frac{x}{450} = \frac{5.5}{15}$

$x = \frac{5.5}{15} \times 450$

$= 5.5 \times 30$

$= 165$

Lower

$\frac{x}{450} = \frac{6.5}{15}$

$x = \frac{6.5}{15} \times 450$

$= 6.5 \times 30$

$= 195$

Upper

$\frac{165}{450}$

(2)

(Total for Question 13 is 4 marks)

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

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

$y+x : y-x$

$k : 1$

$y+x = k(y-x)$

$y+x = ky - kx$

$x+kx = ky - y$

$x(1+k) = y(k-1)$

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

(Total for Question 14 is 3 marks)

15 $x = 0.4\dot{3}\dot{6}$ 2 digits recur $\times 100$

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

let $100x = 43.63636\ldots$

$x = 0.43636\ldots$

$99x = 43.2$

$x = \dfrac{43.2}{99}$ $\times 10$ $\times 10$

$= \dfrac{432}{990}$ $\div 3$ $\div 3$

$= \dfrac{144}{330}$ $\div 3$ $\div 3$

$= \dfrac{48}{110}$ $\div 2$ $\div 2$

$\dfrac{24}{55}$

$3\overline{)432}$ 144

$3\overline{)990}$ 330

$3\overline{)144}$ 48

$3\overline{)330}$ 110

(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 $x = 64$

$y \propto \sqrt[3]{x}$

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

$\frac{7}{6} = k\sqrt[3]{8}$

$\frac{7}{6} = 2k$ ÷2

$\frac{7}{12} = k$

$y = \frac{7}{12}\sqrt[3]{x}$

when $x = 64$

$y = \frac{7}{12}\sqrt[3]{64}$

$= \frac{7}{12} \times \frac{4}{1}$

$= \frac{28}{12}$ $2\frac{4}{12}$ or $2\frac{1}{3}$

(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.

$\frac{1}{2}n(n+1) + \frac{1}{2}(n+1)(n+2)$

$= \frac{1}{2}[n^2 + n + n^2 + 3n + 2]$

$= \frac{1}{2}[2n^2 + 4n + 2]$

$= n^2 + 2n + 1$

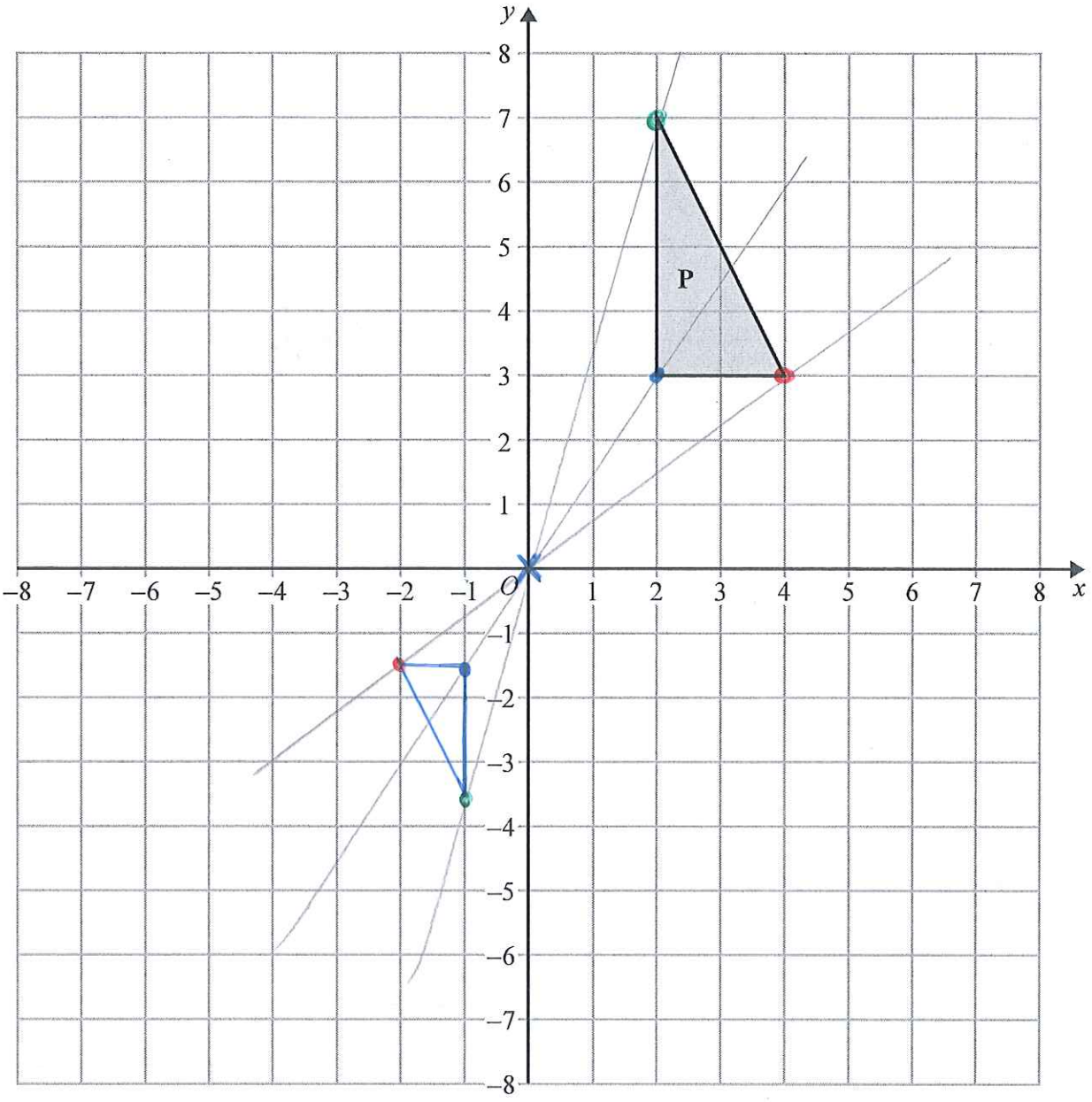
$= (n+1)(n+1)$

$= (n+1)^2$

perfect square ∴ always a square number

(Total for Question 17 is 2 marks)

18

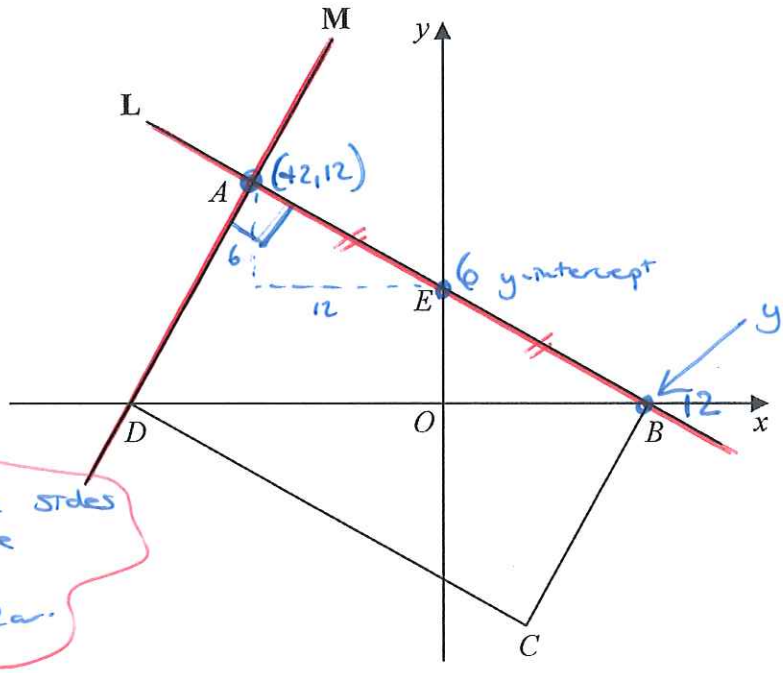


Enlarge shape **P** by scale factor $-\frac{1}{2}$ with centre of enlargement (0, 0).

Label your image **Q**.

(Total for Question 18 is 2 marks)

19



L and M are sides of a rectangle and so are perpendicular.

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**.

L: $x + 2y = 12$

$2y = -x + 12$

$y = -\frac{1}{2}x + 6$

gradient L $= -\frac{1}{2}$

$\therefore$ gradient M $= 2$

Equation of M

grad 2

point (-12, 12)

$y = mx + c$

$12 = 2 \times 12 + c$

$12 = -24 + c$

$36 = c$

$\therefore y = 2x + 36$

.....

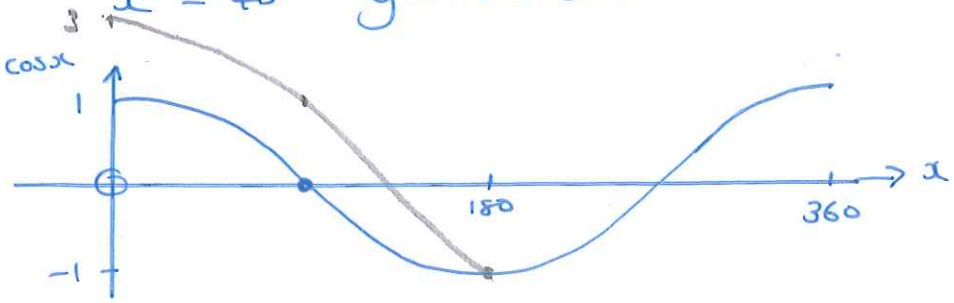
(Total for Question 19 is 4 marks)

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 $x = 45$

$x = 45 \quad y = a\cos 45 + b$



$1 + \sqrt{2}$

(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.

rationalise the denominator

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

$$= \frac{(6 - \sqrt{8})(\sqrt{2} + 1)}{(\sqrt{2} - 1)(\sqrt{2} + 1)}$$

$$= \frac{6\sqrt{2} + 6 - \sqrt{16} - \sqrt{8}}{2 - 1}$$

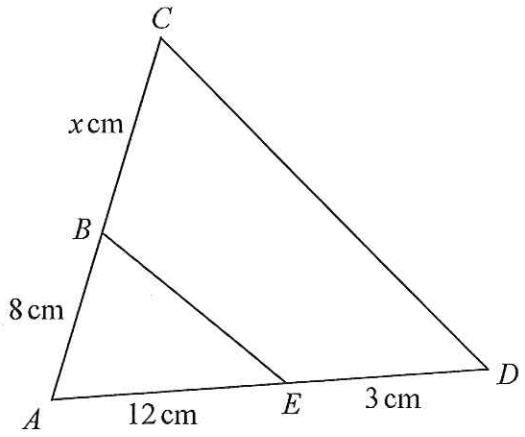
$$= 6\sqrt{2} + 6 - 4 - 2\sqrt{2}$$

$$= 4\sqrt{2} + 2$$

$$= 2 + 4\sqrt{2}$$

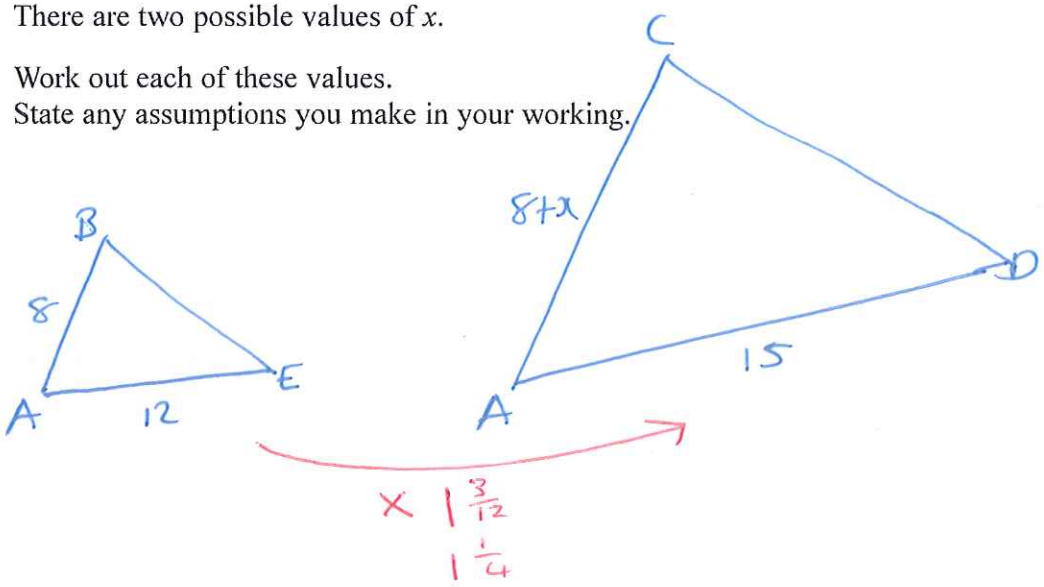
(Total for Question 21 is 3 marks)

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.



$AB \times 1\frac{1}{4} = AC$

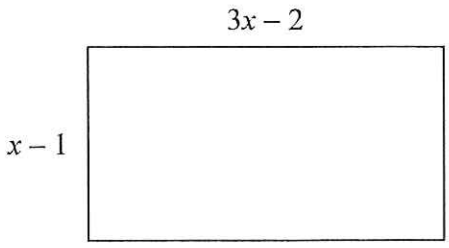
$8 \times 1\frac{1}{4} = 8 + x$

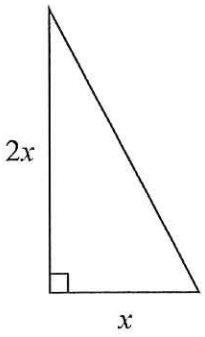
$10 = 8 + x$

$x = 2$

(Total for Question 22 is 5 marks)

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.

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

$3x^2 - 2x - 3x + 2 > x^2$

$3x^2 - 5x + 2 > x^2$

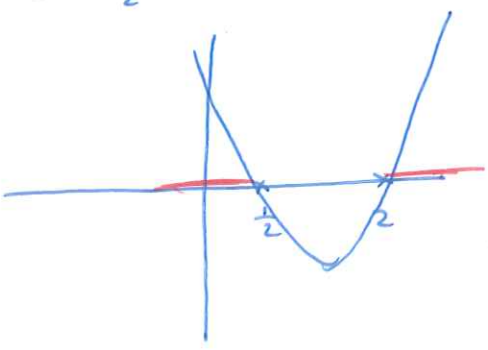
$2x^2 - 5x + 2 > 0$

$(2x - 1)(x - 2) > 0$

$\begin{pmatrix} 2x & -1 \\ x & -2 \end{pmatrix} -4x - x = -5x$

key values

$x = \frac{1}{2}$ or $x = 2$



$x < \frac{1}{2}$ would give negative lengths on rectangle

$x < \frac{1}{2}$ or $x > 2$

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

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