Write your name here

Surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics IS Solutions

Paper 2 (Calculator)

Higher Tier

Thursday 7 June 2018 – Morning
Time: 1 hour 30 minutes

Paper Reference
1MA1/2H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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 ▶

6/7/7/7/8/7/

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Simplify $m^3 \times m^4$

m^7 B1

(1)

(b) Simplify $(5np^3)^3$

B1 B1

$125n^3p^9$

(2)

(c) Simplify $\dfrac{32q^9r^4}{4q^3r}$

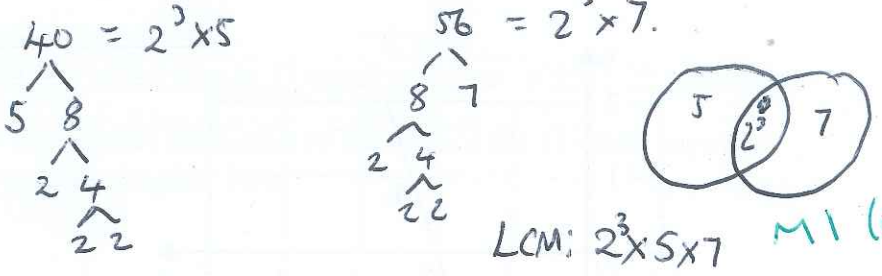
B1 B1

$8q^6r^3$

(2)

(Total for Question 1 is 5 marks)

2 (a) Find the lowest common multiple (LCM) of 40 and 56



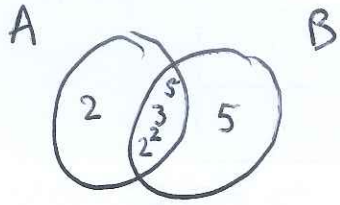
LCM: $2^3 \times 5 \times 7$ M1 (or lists)

280. A1

(2)

$A = 2^3 \times 3 \times 5$ $B = 2^2 \times 3 \times 5^2$

(b) Write down the highest common factor (HCF) of A and B.



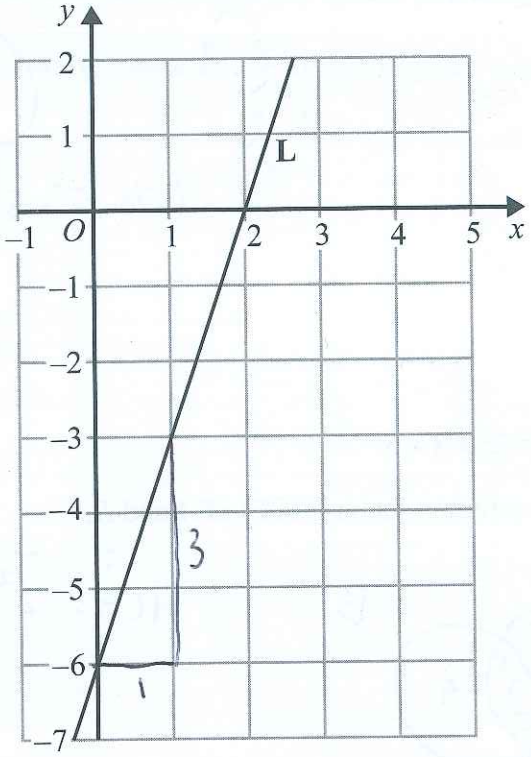
HCF: $2^2 \times 3 \times 5$

60 A1

(1)

(Total for Question 2 is 3 marks)

3 The line **L** is shown on the grid.



Find an equation for **L**.

gradient : 3 ✓B1

y-intercept : -6. B1

$y = 3x - 6$ A1

(Total for Question 3 is 3 marks)

4 Raya buys a van for £8500 plus VAT at 20%

Raya pays a deposit for the van.
She then pays the rest of the cost in 12 equal payments of £531.25 each month.

Find the ratio of the deposit Raya pays to the total of the 12 equal payments.
Give your answer in its simplest form.

$8500 \times 1.2 = £10200$ M1

$12 \times 531.25 = £6375$ M1

Deposit : $10200 - 6375 = £3825$ M1

$3825 : 6375$ M1

$3 : 5$

3 : 5 A1

(Total for Question 4 is 5 marks)

5 (a) Complete the table of values for $y = x^2 - x - 6$

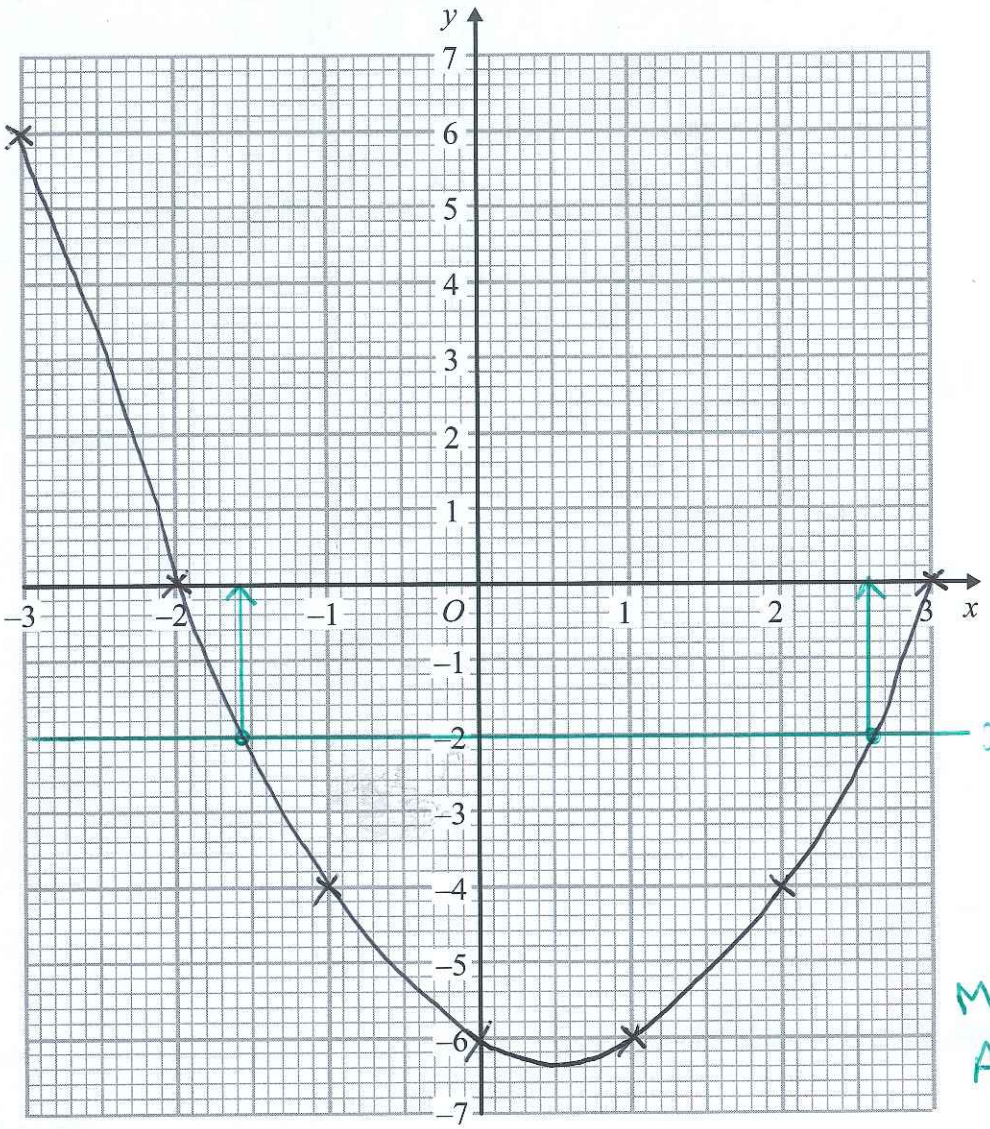
x	–3	–2	–1	0	1	2	3
y	6	0	–4	–6	–6	–4	0

B2 (-1 ee)

(2)

(b) On the grid, draw the graph of $y = x^2 - x - 6$ for values of x from –3 to 3

(2)



M1 ft
A1

(c) Use your graph to find estimates of the solutions to the equation $x^2 - x - 6 = -2$

(M1 for $y = -2$ on graph) (± 0.1)

$x = 2.6$ AND $x = -1.55$ A1

(2)

(Total for Question 5 is 6 marks)

6 A force of 70 newtons acts on an area of 20 cm^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The force is increased by 10 newtons.
The area is increased by 10 cm^2

Helen says,

"The pressure decreases by less than 20%"

Is Helen correct?
You must show how you get your answer.

$P = \frac{70}{20} = 3.5 \text{ N/cm}^2$ ✓M1

$P = \frac{80}{30} = 2.\dot{6} \text{ N/cm}^2$ ✓M1

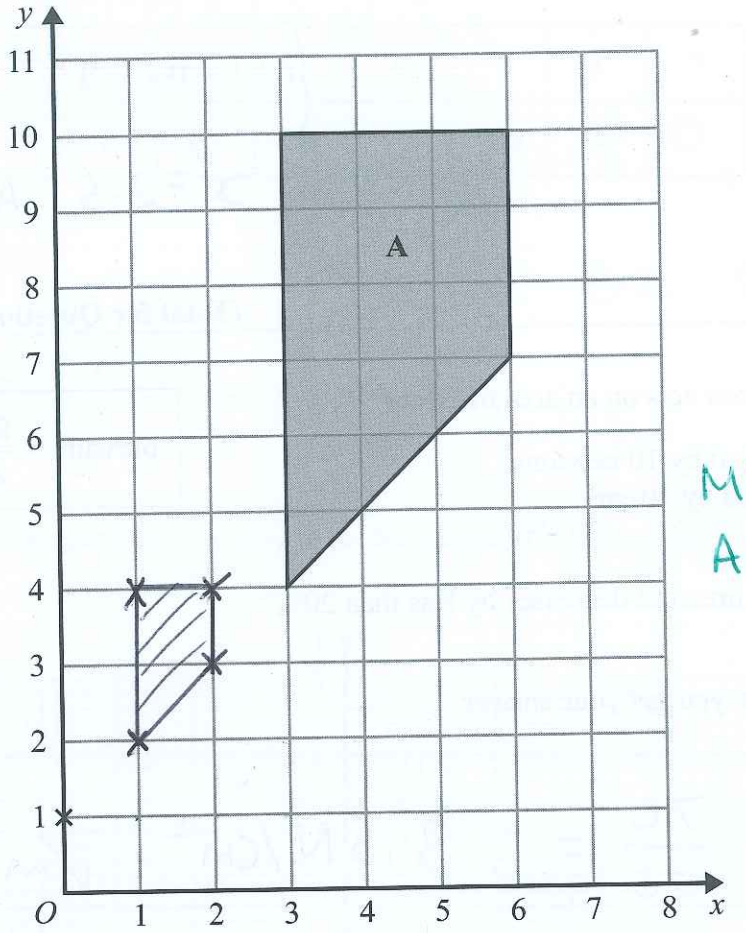
(20%↓) $3.5 \times 0.8 = 2.8$

C1 with evidence.

No the pressure decreases by more than 20%.

(Total for Question 6 is 3 marks)

7



M1 Size
A1

Enlarge shape **A** by scale factor $\frac{1}{3}$ centre (0, 1)

(Total for Question 7 is 2 marks)

8 60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

38 of the people were male.
11 of the 32 people who said Britain were female.
8 males said Italy.
12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

	Britain	Spain	Italy	total
Male	21 M1	9	8	38
Female	11	3 A1	8 OR M1	22 B1
Total	32	12	16	60

$\frac{3}{22}$ A1

(Total for Question 8 is 4 marks)

9 Jean invests £12 000 in an account paying compound interest for 2 years.

In the first year the rate of interest is $x\%$
At the end of the first year the value of Jean's investment is £12 336

In the second year the rate of interest is $\frac{x}{2}\%$

What is the value of Jean's investment at the end of 2 years?

$\frac{12336}{12000}$ M1 $= 1.028$.

↑ 2.8% first yr.

↑ 1.4% Second yr √M1

$12336 \times 1.014 = 12508.704$

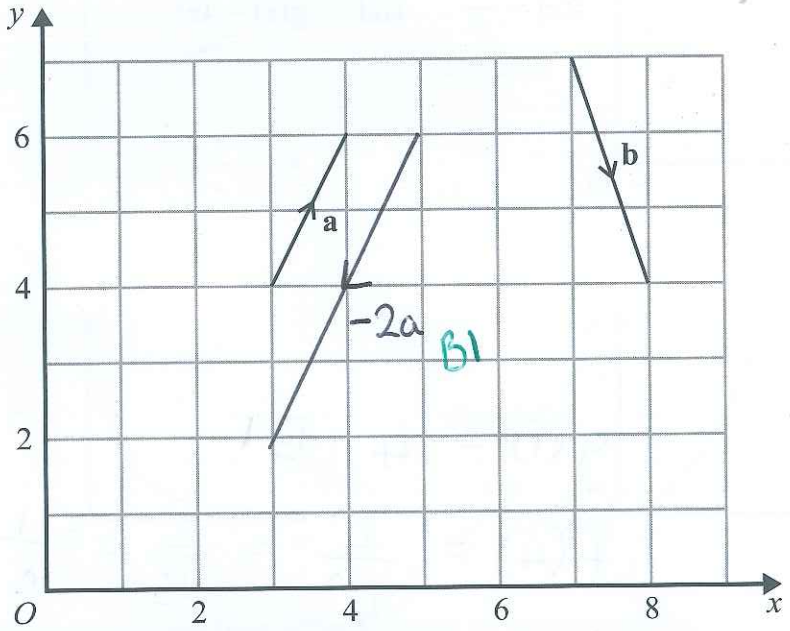
√M1

£12508.70

A1

(Total for Question 9 is 4 marks)

10 The vector **a** and the vector **b** are shown on the grid.



(a) On the grid, draw and label vector $-2\mathbf{a}$

(1)

(b) Work out $\mathbf{a} + 2\mathbf{b}$ as a column vector.

$$\begin{pmatrix} 1 \\ 2 \end{pmatrix} + 2\begin{pmatrix} 1 \\ -3 \end{pmatrix} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

M1

$\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ A1

(2)

(Total for Question 10 is 3 marks)

11 f and g are functions such that

$$f(x) = \frac{2}{x^2} \quad \text{and} \quad g(x) = 4x^3$$

(a) Find f(–5)

$\frac{2}{25}$ B1

(1)

(b) Find fg(1)

$g(1) = 4$ B1

$f(4) = \frac{2}{4^2} = \frac{2}{16} = \frac{1}{8}$

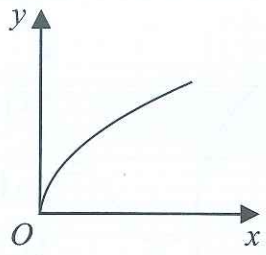
$\frac{1}{8}$ A1

(2)

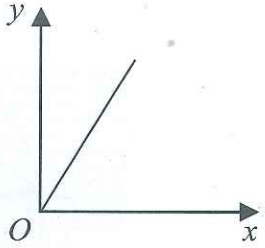
(Total for Question 11 is 3 marks)

12

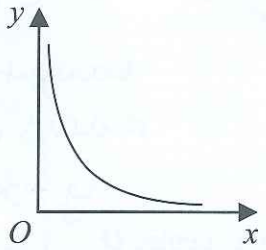
Graph A



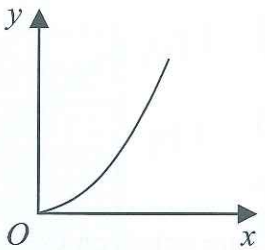
Graph B



Graph C



Graph D



The graphs of y against x represent four different types of proportionality.

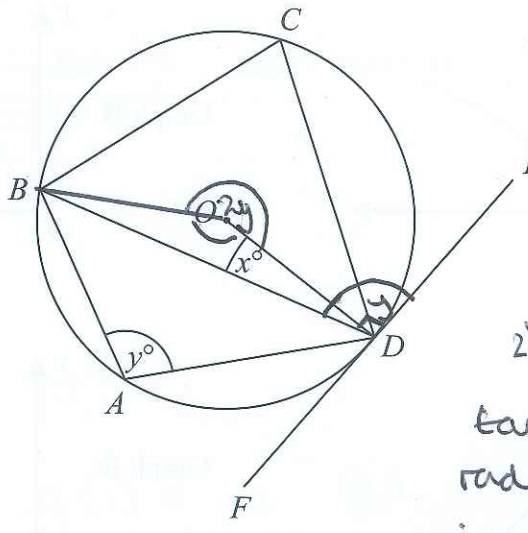
Match each type of proportionality in the table to the correct graph.

Type of proportionality	Graph letter
$y \propto x$	B
$y \propto x^2$	D
$y \propto \sqrt{x}$	A
$y \propto \frac{1}{x}$	C

B2 (-1 ee)

(Total for Question 12 is 2 marks)

13



* Lots of methods.

1) $\angle EDB = \angle DAB$ (alternate segment theorem)

2) $\angle ODE = 90°$ tangent meets the radius at a right angle

$\therefore y - x = 90.$

A, B, C and D are points on the circumference of a circle, centre O.
FDE is a tangent to the circle.

(a) Show that $y - x = 90$
You must give a reason for each stage of your working.

Alt

$\angle BOD = 2y$ (reflex) (angle at the centre is twice the angle at the circumference)

$\angle BOD = 360 - 2y$ (angles around a point sum to 360°)

$2x = 180 - (360 - 2y)$. (angles in a triangle sum to 180°)

$2x = -180 + 2y$

$x = -90 + y$ (base angles of an isosceles triangle are equal).

$\Rightarrow y - x = 90.$ (3)

Dylan was asked to give some possible values for x and y.

He said,

"y could be 200 and x could be 110, because $200 - 110 = 90$"

M1
A1
C1

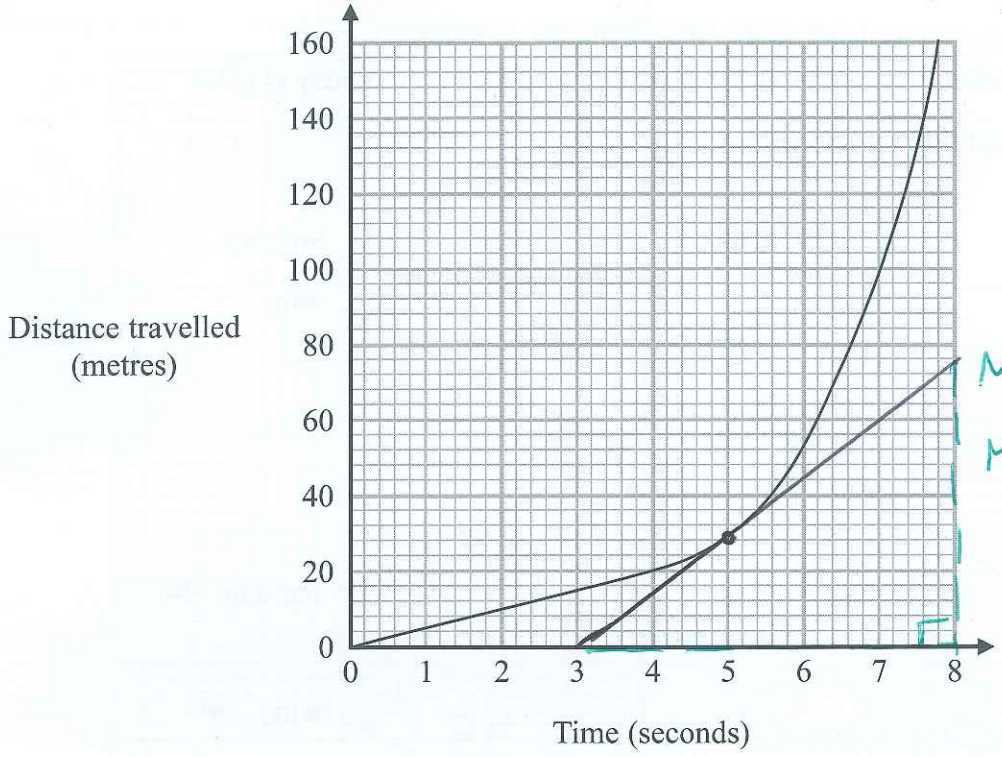
(b) Is Dylan correct?
You must give a reason for your answer.

• No x must be less than 90°

• x + y Must less than 180° C1 (1)

(Total for Question 13 is 4 marks)

14 The distance-time graph shows information about part of a car journey.



M1 tangent
M1 Find gradient

Use the graph to estimate the speed of the car at time 5 seconds.

$\frac{68}{5}$

(±0·1)
A1

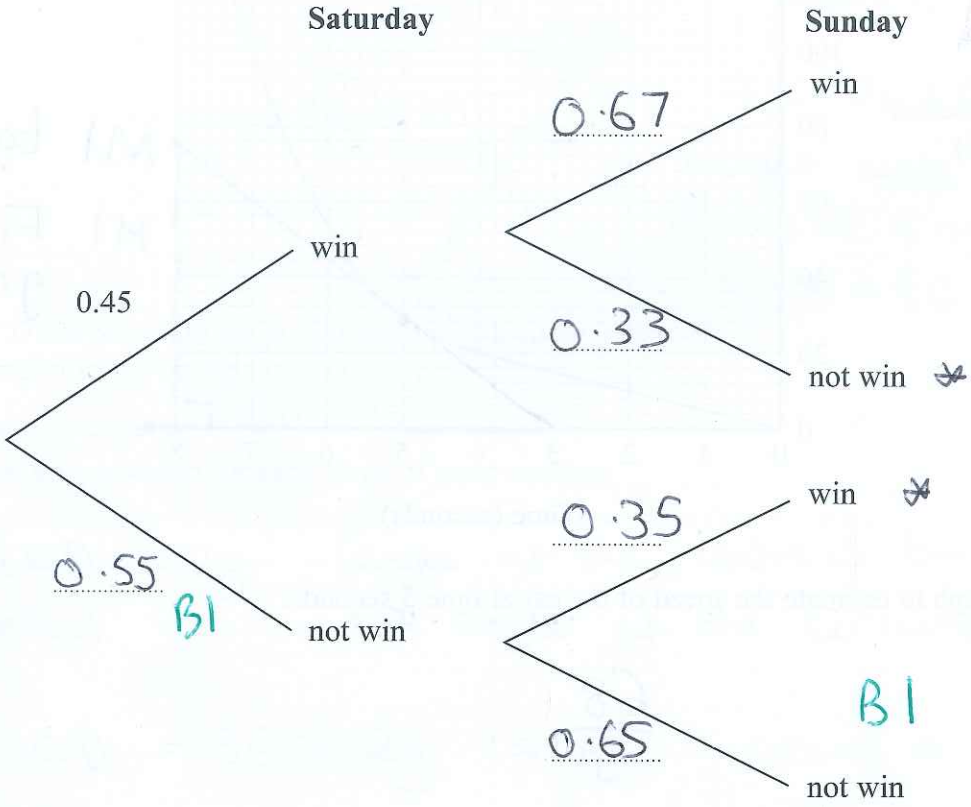
13.6 ..... m/s

(Total for Question 14 is 3 marks)

15 A darts team is going to play a match on Saturday and on Sunday.
The probability that the team will win on Saturday is 0.45

If they win on Saturday, the probability that they will win on Sunday is 0.67
If they do **not** win on Saturday, the probability that they will win on Sunday is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Find the probability that the team will win exactly one of the two matches.

$(0.45 \times 0.33) + (0.55 \times 0.35)$ M2

$= 0.341$

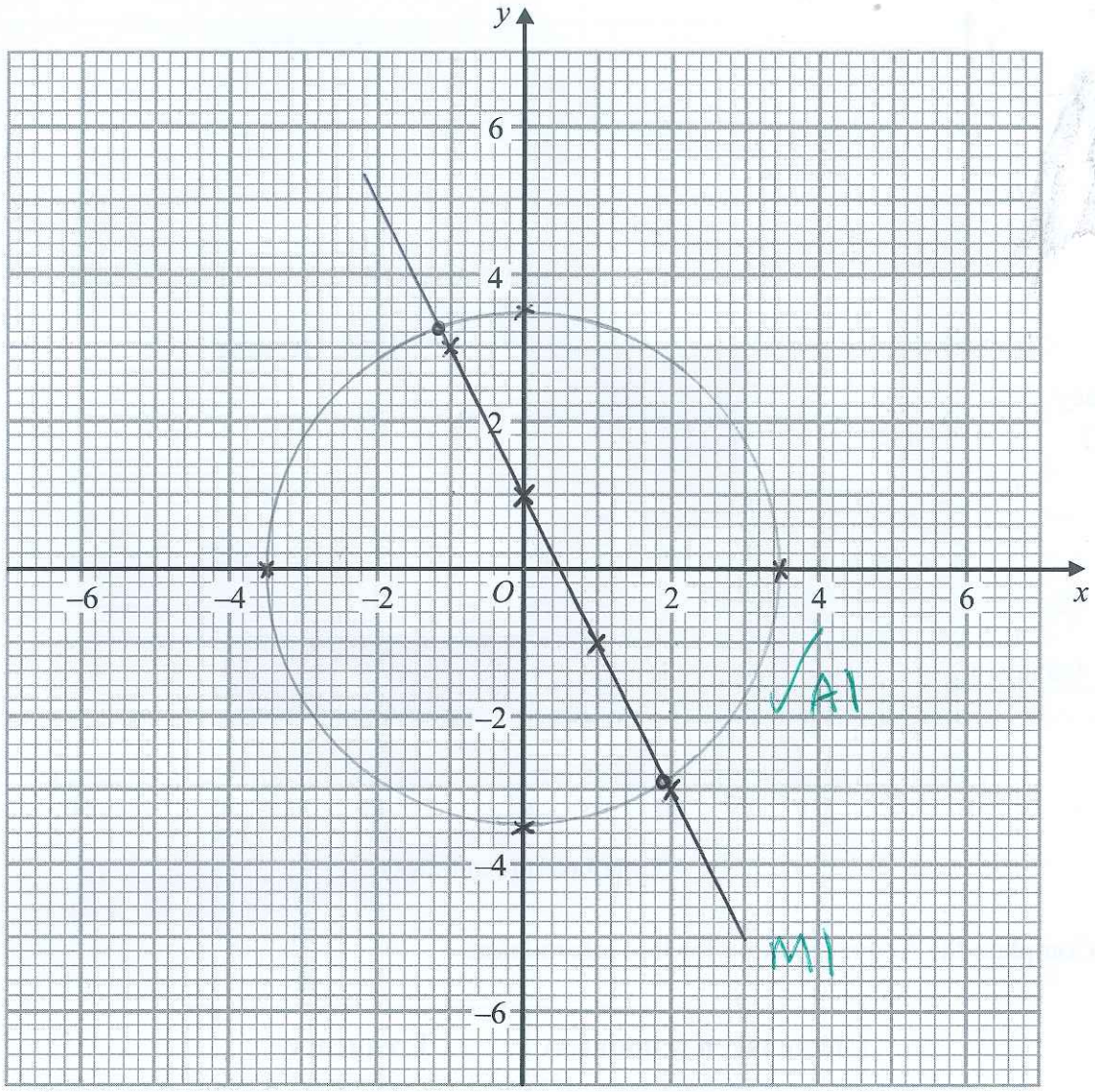
0.341 A1

(3)

(Total for Question 15 is 5 marks)

16 (a) On the grid, draw the graph of $x^2 + y^2 = 12.25$

$x^2+y^2=r^2$ $r=\sqrt{12.25}$ $r=3.5$ B1



√A1

M1

(2)

(b) Hence find estimates for the solutions of the simultaneous equations

$x^2 + y^2 = 12.25$
$2x + y = 1$

$y = -2x + 1$.

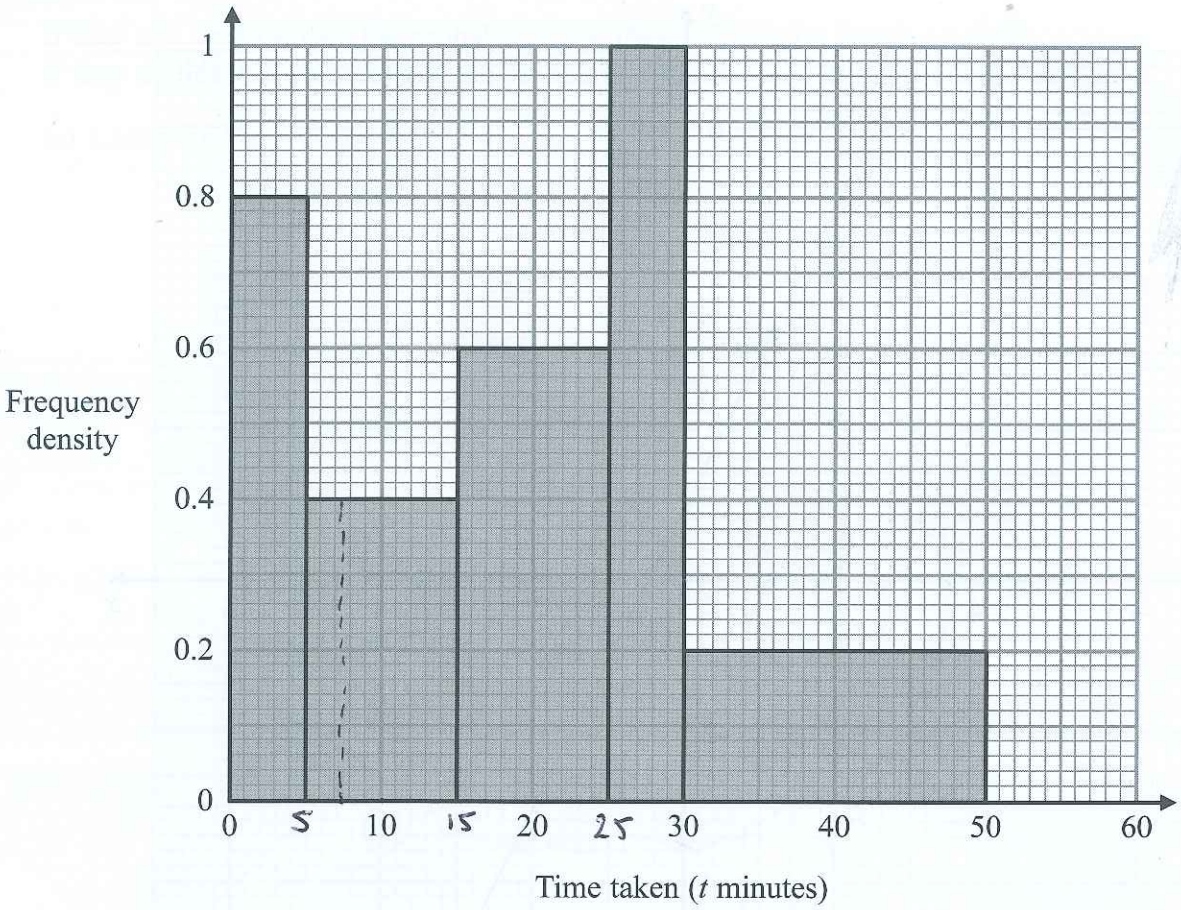
$x = -1.2, y = 3.2$ AND $x = 1.9, y = -2.9$

A1 A1

(3)

(Total for Question 16 is 5 marks)

17 The histogram shows information about the times taken by some students to finish a puzzle.



(a) Complete the frequency table for this information.

Time taken (t minutes)	Frequency
$0 < t \leqslant 5$	4
$5 < t \leqslant 15$	4
$15 < t \leqslant 25$	6
$25 < t \leqslant 30$	5
$30 < t \leqslant 50$	4

19.

B2 (1-ee)

(2)

(b) Find an estimate for the lower quartile of the times taken to finish the puzzle.

$\frac{19+1}{4} = 5$ H

$\frac{1}{4} \times 10 = 2.5$

$5 + 2.5 = 7.5$

M1

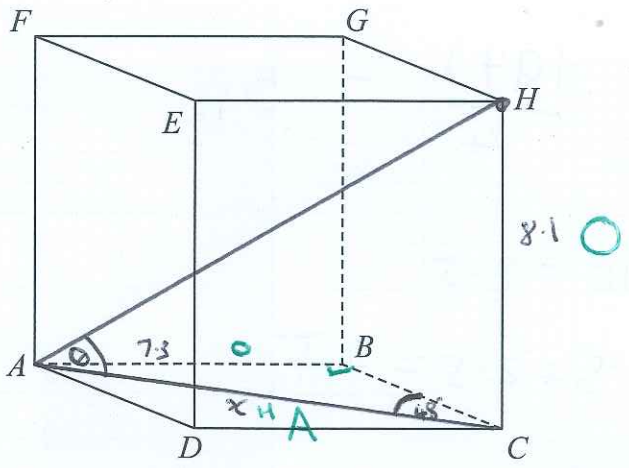
A1

7.5 ..... minutes

(2)

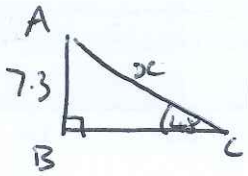
(Total for Question 17 is 4 marks)

18 *ABCDEFGH* is a cuboid.



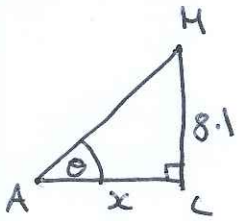
$AB = 7.3$ cm
$CH = 8.1$ cm
Angle $BCA = 48°$

Find the size of the angle between AH and the plane $ABCD$.
Give your answer correct to 1 decimal place.



$\sin 48 = \frac{7.3}{x}$ ✓M1

$x = \frac{7.3}{\sin 48} = 9.82...$ A1



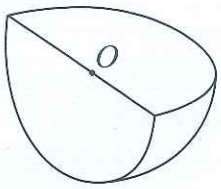
$\tan\theta = \frac{8.1}{x} = 0.8245...$ M1

$\theta = 39.5°$ A1

39.5 °

(Total for Question 18 is 4 marks)

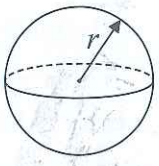
19 Shape **S** is one quarter of a solid sphere, centre O.



Shape **S**

Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



The volume of **S** is 576π cm^3

Find the surface area of **S**.
Give your answer correct to 3 significant figures.
You must show your working.

$\frac{1}{4} \times \frac{4}{3} \pi r^3 = 576\pi$ M1

$\pi r^3 = 1728\pi$

$r^3 = 1728$

$r = 12$ cm. A1

$\frac{1}{4} \times 4 \times \pi \times 12^2$ + $2 \times \frac{1}{2} \pi \times 12^2$ M1

(curve) M1 (flat sides)

$144\pi + 144\pi = 288\pi$

$= 904.778...$

905 A1 cm^2

(Total for Question 19 is 5 marks)

20 Martin did this question.

Rationalise the denominator of $\frac{14}{2+\sqrt{3}}$

Here is how he answered the question.

$$\frac{14}{2+\sqrt{3}} = \frac{14\times(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$$

(2) $$= \frac{28-14\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}+3}$$ Should be a negative sign here. C1

(3) $$= \frac{28-14\sqrt{3}}{7}$$

$$= 4-2\sqrt{3}$$

Martin's answer is wrong.

(a) Find Martin's mistake.

Denominator in step (2) is incorrect.

Step (3) should be 1 not 7.

(1)

Sian did this question.

Rationalise the denominator of $\frac{5}{\sqrt{12}}$

Here is how she answered the question.

$$\frac{5}{\sqrt{12}} = \frac{5\sqrt{12}}{\sqrt{12}\times\sqrt{12}}$$

$$= \frac{5\times 3\sqrt{2}}{12}$$

$$= \frac{5\sqrt{2}}{4}$$

Sian's answer is wrong.

(b) Find Sian's mistake. C1

$\sqrt{12} = \sqrt{4}\times\sqrt{3} = 2\sqrt{3}$ Not $3\sqrt{2}$.

(1)

(Total for Question 20 is 2 marks)

21 Jackson is trying to find the density, in g/cm^3, of a block of wood.
The block of wood is in the shape of a cuboid.

He measures
the length as 13.2 cm, correct to the nearest mm
the width as 16.0 cm, correct to the nearest mm
the height as 21.7 cm, correct to the nearest mm

He measures the mass as 1970 g, correct to the nearest 5 g.

13.25, 13.15
16.05, 15.95
21.75, 21.65
1972.5, 1967.5
B1 Any

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

$D = \frac{m}{V}$

Volume upper : $13.25 \times 16.05 \times 21.75$
$= 4625.409375$

Volume lower : $13.15 \times 15.95 \times 21.65$
$= 4540.925125$
√M1

$D_{upper} = \frac{1972.5}{4540.925125}$ √M1

$= 0.434382850\,6$ g/cm^3

$D_{lower} = \frac{1967.5}{4625.409375}$ √M1

$= 0.425367754\,6$ g/cm^3

Density = 0.43 to 2 decimal places as a suitable degree of accuracy.
√A1

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS