

Write your name here

Surname

Other names

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

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Mathematics

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 ►

P48528A

©2018 Pearson Education Ltd.

6/7/17/18/19

.CG Maths.
Worked Solutions



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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

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

$$a^x \times a^y = a^{x+y}$$

$$m^7$$

(1)

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

$$(a^x)^y = a^{xy}$$

Everything in the bracket is raised to the power of 3

$$125n^3p^9$$

(2)

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

r is basically r^1

$$a^x \div a^y = a^{x-y}$$

$$8q^6r^3$$

(2)

(Total for Question 1 is 5 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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

40, 80, 120, 160, 200, 240, 280
56, 112, 168, 224, 280

Use table mode (press Menu then 3) with $f(x) = 40x$ and $g(x) = 56x$. Start: 1. End: 30. Step: 1. This lists out the multiples of both numbers

280

(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.

$2^2 \times 3 \times 5$

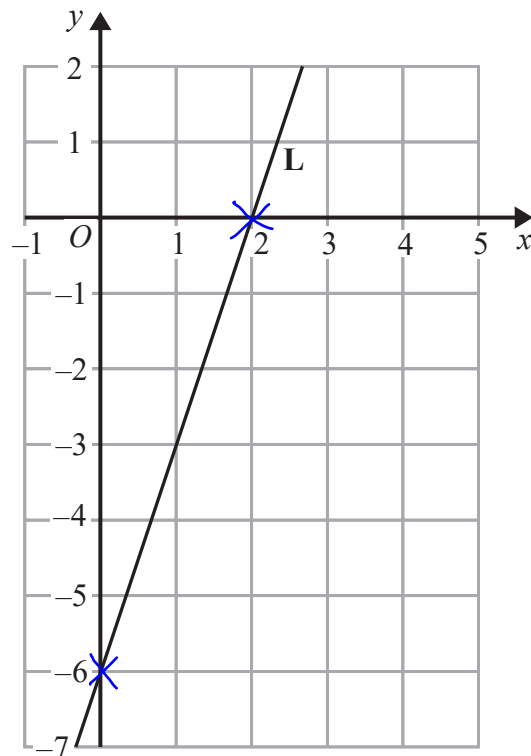
Multiply all the prime factors which are common to both A and B

60

(1)

(Total for Question 2 is 3 marks)

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



Find an equation for **L**.

$$m = \frac{6}{2} = 3$$

Gradient = change in y/change in x
Change in y from -6 to 0 is 6.
Change in x from 0 to 2 is 2

$y = mx + c$ is the general equation of a straight line, where m is the gradient and c is the y-intercept

$$y = 3x - 6$$

(Total for Question 3 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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.

$$8500 \times 1.2 = 10200$$

Increasing the £8500 by 20% to work out the total cost

$$531.25 \times 12 = 6375$$

Working out the total of the 12 equal payments

$$10200 - 6375 = 3825$$

Working out the deposit

$$3825 : 6375$$

The ratio of the deposit to the total of the 12 equal payments

Ratios simplify in a similar way to fractions. Putting $3825/6375$ into the calculator simplifies to $3/5$

3:5

(Total for Question 4 is 5 marks)

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

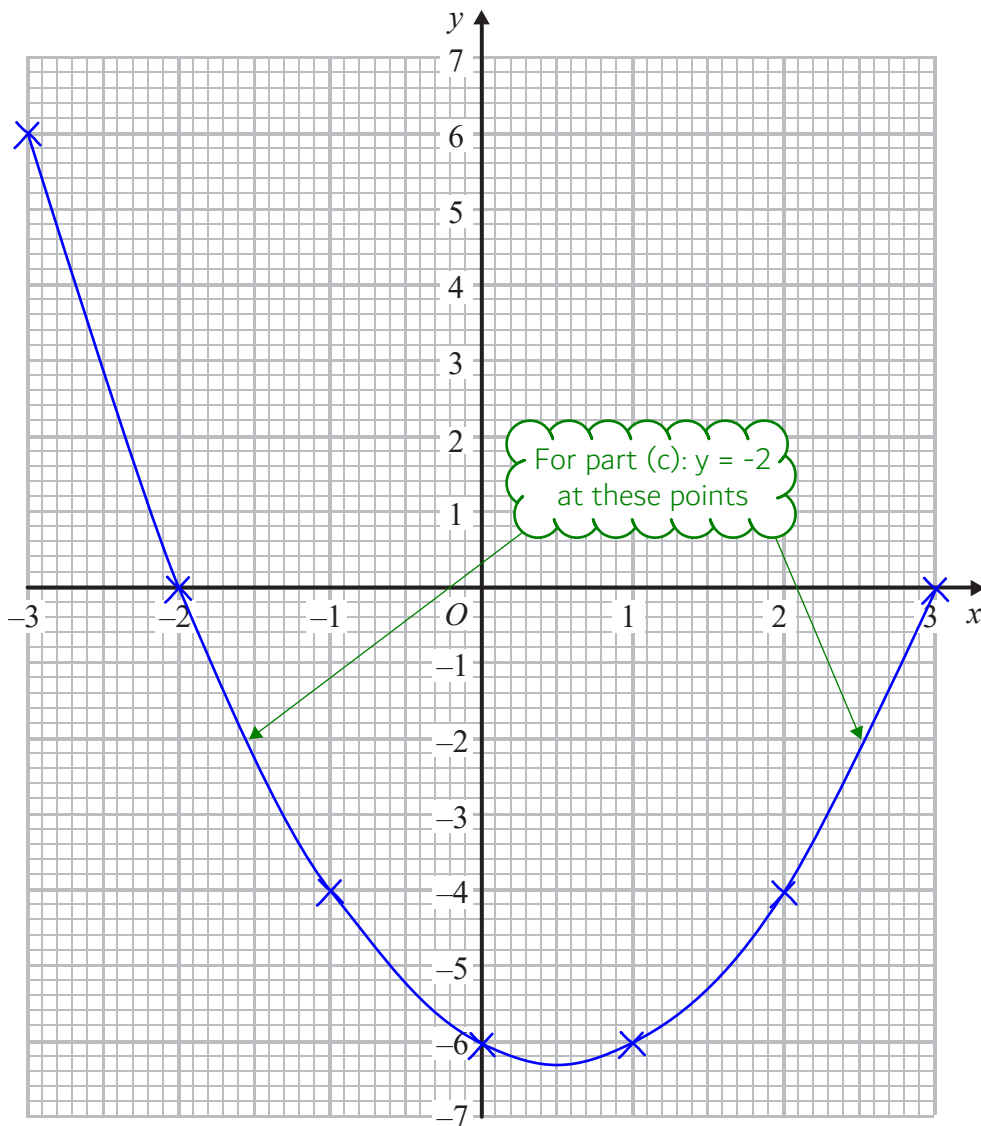
x	-3	-2	-1	0	1	2	3
y	6	0	-4	-6	-6	-4	0

Using table mode (press Menu then 3) with the $f(x) = x^2 - x - 6$. Start: -3. End: 3. Step: 1

(2)

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

(2)



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

2.55, -1.55

(2)

(Total for Question 5 is 6 marks)

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

The force is increased by 10 newtons.

The area is increased by 10 cm^2

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

Helen says,

“The pressure decreases by less than 20%”

Is Helen correct?

You must show how you get your answer.

$$\frac{70}{20} \times 0.8 = 2.8$$

Decreasing the original pressure by 20%

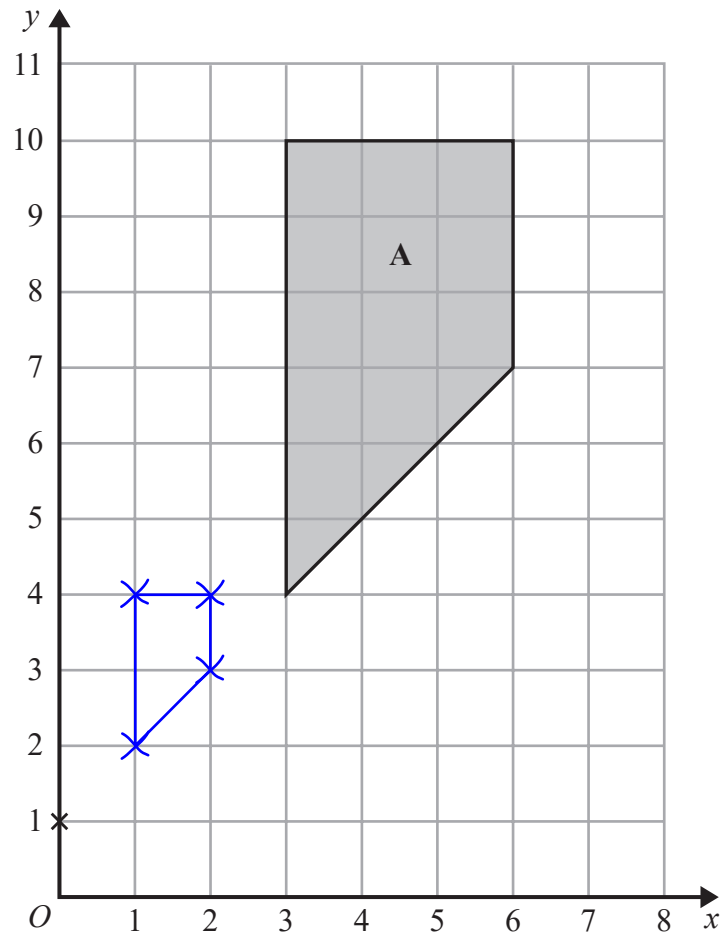
$$\frac{80}{30} = 2.6$$

Working out the new pressure

No

The new pressure is less than the original when decreased by 20% so the decrease must be more than 20%

(Total for Question 6 is 3 marks)



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

(Total for Question 7 is 2 marks)

First consider the point closest to the centre of enlargement. It is 3 jumps diagonally upward to the right. Multiplying this by $\frac{1}{3}$ gives 1 jump diagonally upward to the right. Once we work out where the first point goes, multiply the lengths of the other sides by $\frac{1}{3}$ to work out the new lengths and plot the corners. Then join up the corners with a ruler

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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?

	B	S	I	
M			8	38
F	11	3	8	22
	32	12	16	60

First fill in the information given then work out the missing numbers until we find the number of females who said Spain and the total number of females

3 out of the 22 females said Spain

$$\frac{3}{22}$$

(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?

$$12000 \times \frac{100+x}{100} = 12336$$

To express the percentage increase as a multiplier, add $x\%$ to 100% then divide by 100. Multiplying £12000 by the multiplier gives £12336

$$x = \frac{12336}{12000} \times 100 - 100 = 2.8$$

Rearrange to find x

$$12336 \times \frac{100+1.4}{100}$$

$2.8/2 = 1.4$. Expressing the percentage increase as a multiplier

Round the answer of 12508.704 to the nearest penny

£ 12508.70

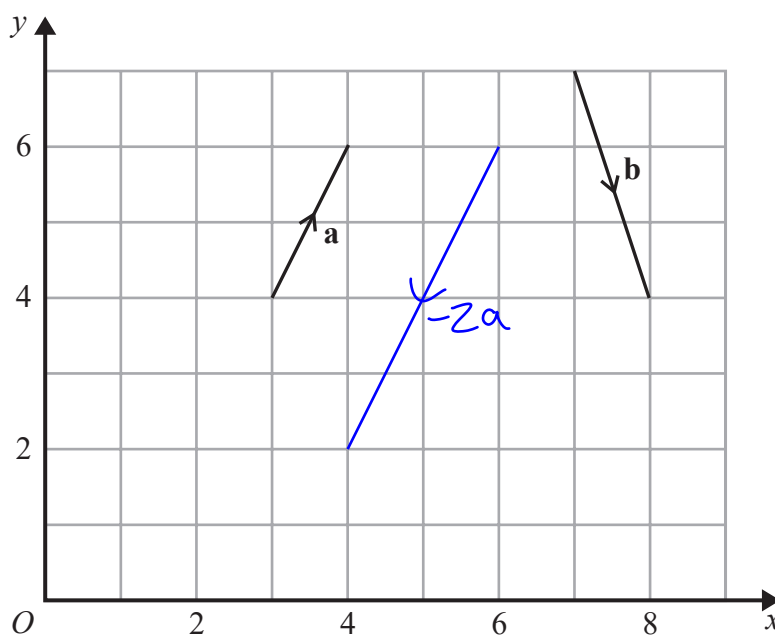
(Total for Question 9 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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



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

Twice as large and in the opposite direction

(1)

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

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

The top number is the x component and the bottom is the y component. **a** goes 1 in the x direction and 2 in the y direction. **b** goes 1 in the x direction and -3 in the y direction

$$\begin{aligned} x: & 1 + 2(1) = 3 \\ y: & 2 + 2(-3) = -4 \end{aligned}$$

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

(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 $f(-5)$

$$\frac{2}{(-5)^2}$$

Substitute x for -5 in $f(x)$

$$\frac{2}{25}$$

(1)

(b) Find $fg(1)$

$$\frac{2}{(4(1)^3)^2}$$

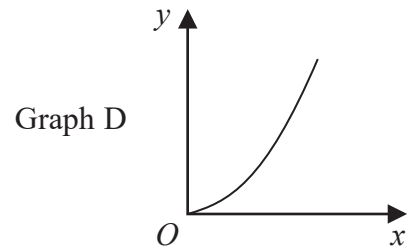
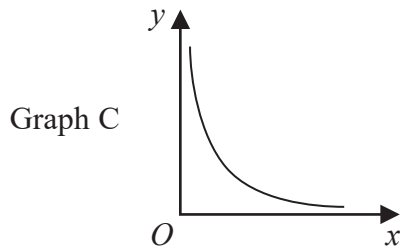
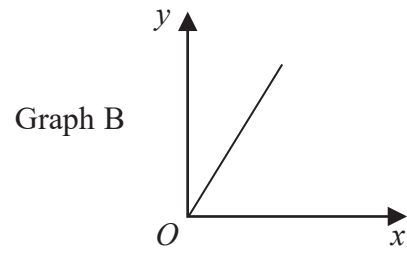
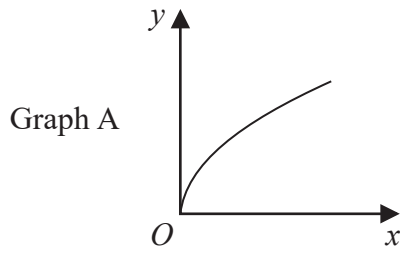
Substitute x for $4x^3$ in $f(x)$.
Then substitute x for 1

$$\frac{1}{8}$$

(2)

(Total for Question 11 is 3 marks)

12

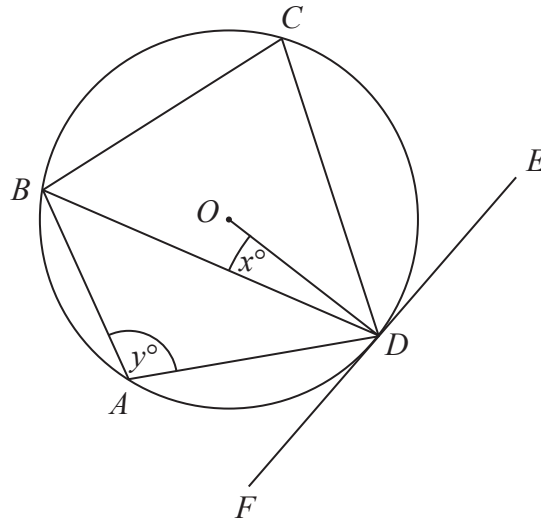


The graphs of y against x represent four different types of proportionality.
Match each type of proportionality in the table to the correct graph.

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

(Total for Question 12 is 2 marks)

Use table mode with $f(x) = x$, $f(x) = x^2$, $f(x) = \text{root } x$ and $f(x) = 1/x$ to visualise what they look like. Start: 0. End: 5. Step: 0.2



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.

Angle ODE is 90° as the angle between a radius and tangent is 90°

Angle BDE is $90 + x$

Angle BAD is $90 + x$ due to the alternate segment theorem

Therefore $y = 90 + x$

$y - x = 90$

(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 $200 - 110 = 90$ ”

- (b) Is Dylan correct?

You must give a reason for your answer.

No, y has to be less than 180° as it is in a triangle

(1)

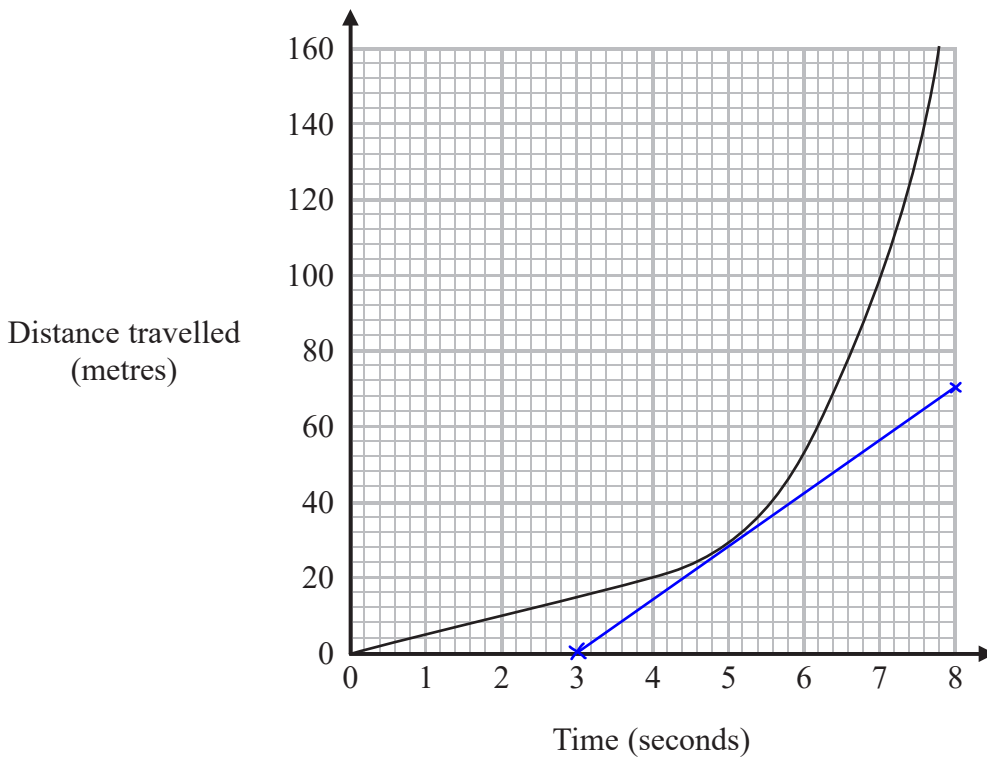
(Total for Question 13 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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



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

$$\frac{70}{5}$$

On a distance-time graph, the gradient is the speed. Gradient = change in y/change in x

..... 14 m/s

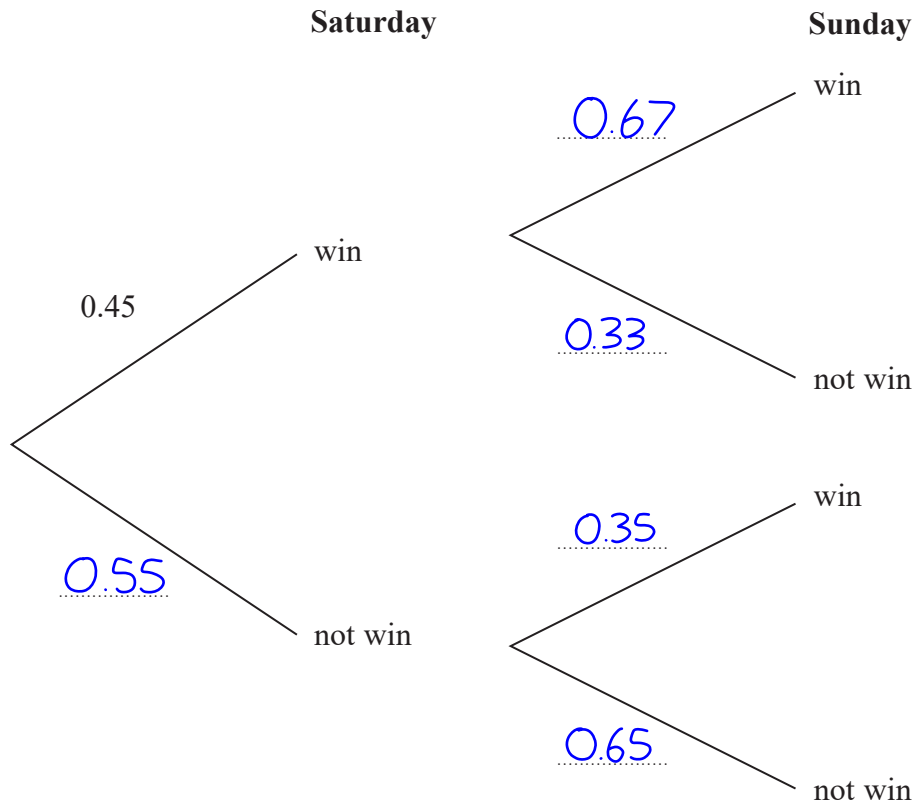
(Total for Question 14 is 3 marks)

- 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.



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

$$\underline{0.45 \times 0.33} + \underline{0.55 \times 0.35}$$

Win on Saturday and
not win on Sunday

Or

Not win on Saturday
and win on Sunday

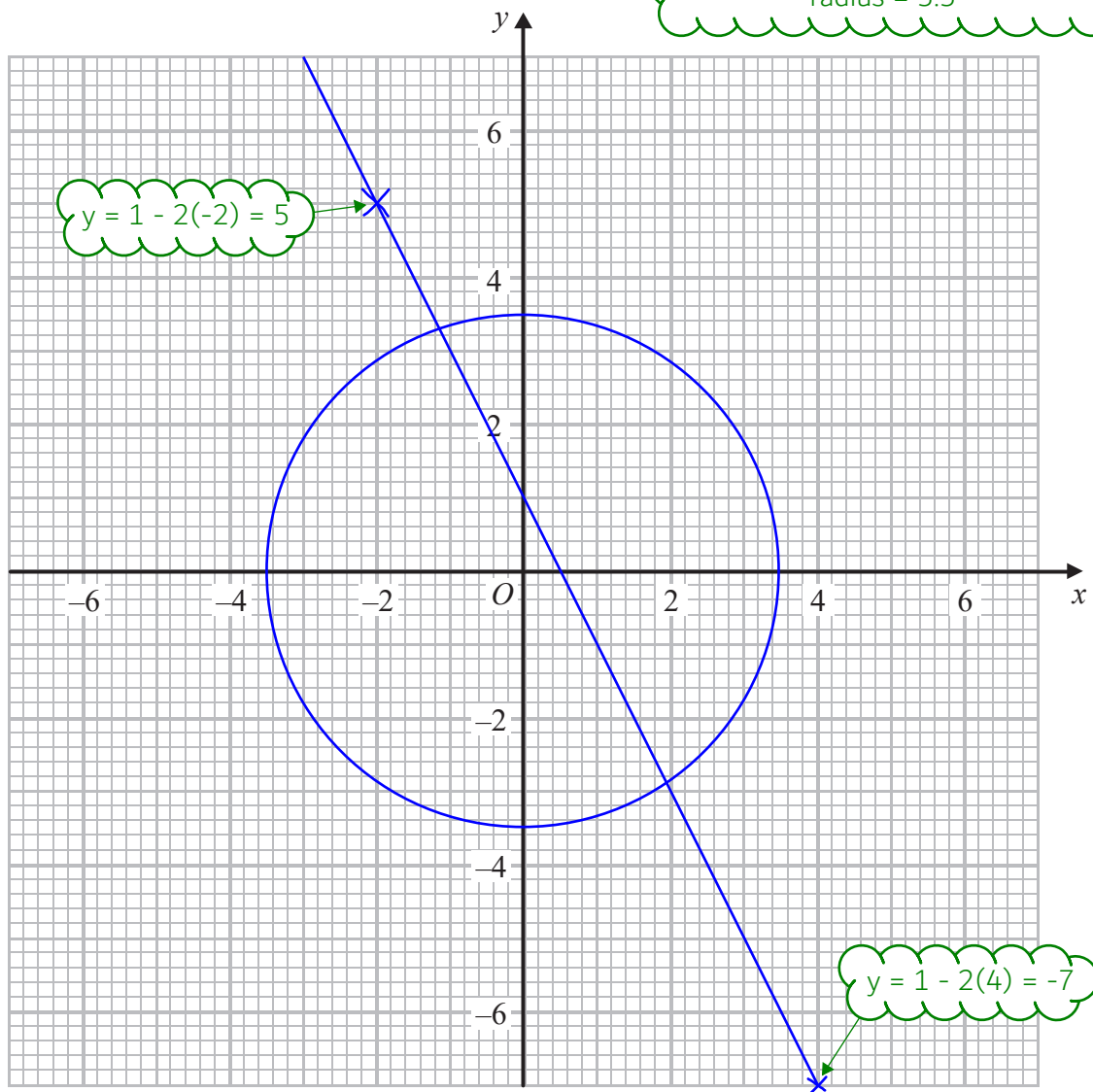
0.341

(3)

(Total for Question 15 is 5 marks)

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

It is a circle centred on the origin.
radius² = 12.25
radius = 3.5



(2)

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

Rearrange the second equation to make y the subject

$$\begin{aligned} x^2 + y^2 &= 12.25 \\ 2x + y &= 1 \end{aligned}$$

$$y = 1 - 2x$$

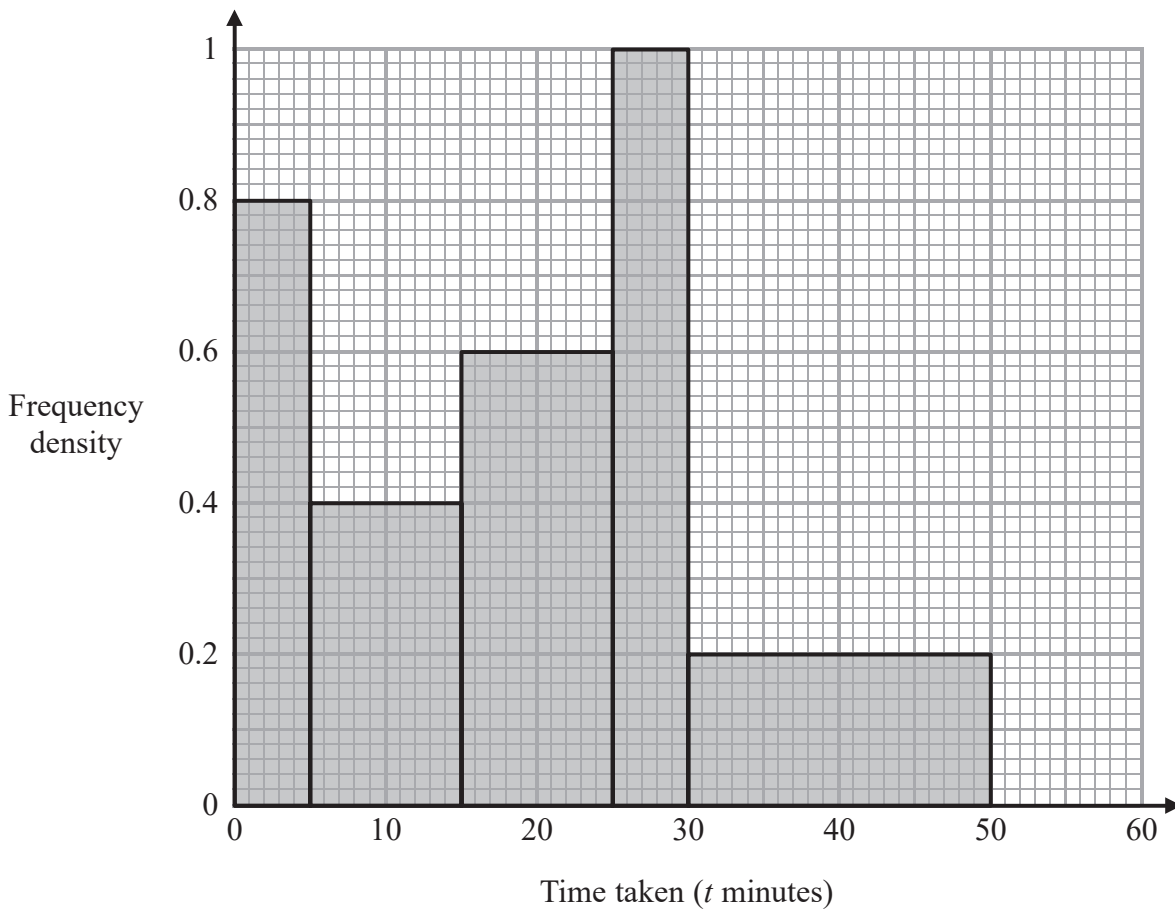
Plot two coordinates on the line $y = 1 - 2x$ then draw a straight line through both points. The solutions are where the line and the circle meet

$$x = 2, y = -2.9 \quad x = -1.2, y = 3.3$$

(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
$0 < t \leq 5$	4
$5 < t \leq 15$	4
$15 < t \leq 25$	6
$25 < t \leq 30$	5
$30 < t \leq 50$	4

(2)

Frequency = class width \times frequency density

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

$$4 + 4 + 6 + 5 + 4 = 23$$

← The total frequency

$$\frac{23 + 1}{4} = 6$$

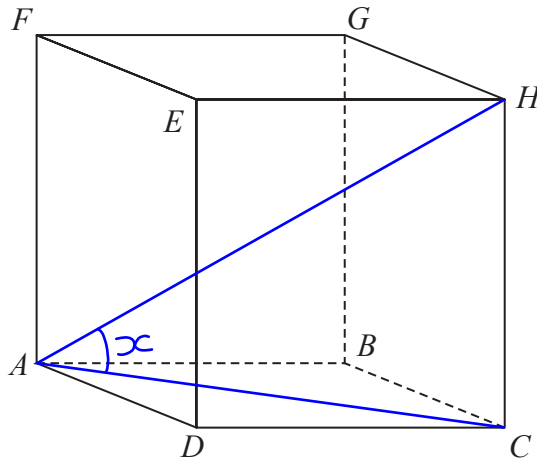
← The 6th value is the lower quartile

The 6th value is halfway through the 5 to 15 category. Halfway between 5 and 15 is 10

..... 10 minutes
(2)

(Total for Question 17 is 4 marks)

18 $ABCDEFGH$ is a cuboid.



$AB = 7.3$ cm
 $CH = 8.1$ cm
 Angle $BCA = 48^\circ$

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

SỐ H CÁCH TỐ Á $\frac{O}{S} \frac{T}{H}$

$$AC = \frac{7.3}{\sin 48} = 9.823118926$$

ABC is a right angled triangle so SOH CAH TOA can be used to find the missing side AC. AB is the opposite and AC is the hypotenuse. So SOH can be used. From the formula triangle, hypotenuse = opposite/sin of the angle

SỐ H CÁCH TỐ Á $\frac{O}{T} \frac{T}{A}$

$$\tan^{-1}\left(\frac{8.1}{AC}\right) = 39.50849231$$

ACH is a right angled triangle so SOH CAH TOA can be used to find the missing angle HAC. HC is the opposite and AC is the adjacent. So TOA can be used. From the formula triangle, tan of the angle = opposite/adjacent. Rearranging gives angle = $\tan^{-1}(\text{opp/adj})$

The answer is rounded to 1 decimal place

..... 39.5 °

(Total for Question 18 is 4 marks)

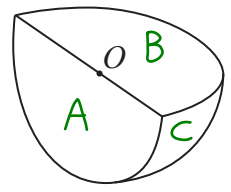
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

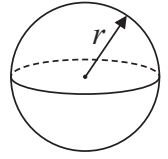
19 Shape S is one quarter of a solid sphere, centre O .



Shape S

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

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



The volume of S is $576\pi \text{ cm}^3$

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

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

Dividing the expression of the volume of a sphere by 4 as it is one quarter of a solid sphere

$$r = \sqrt[3]{\frac{576\pi \times 4}{\frac{4}{3}\pi}} = 12$$

Rearranging to find the radius, r

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

Part C of Shape S is a quarter of the surface area of a sphere

Part A and B of Shape S are semicircles.
Area of circle = πr^2
A semicircle is half of the area of a circle so multiplying it by $1/2$. There are 2 semicircles so multiplying it by 2

288 π rounds to 905 to 3 significant figures

..... 905 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.

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

$$= \frac{28 - 14\sqrt{3}}{4 + 2\sqrt{3} - 2\sqrt{3} + 3}$$

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

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

He has incorrectly expanded the brackets

Martin's answer is wrong.

(a) Find Martin's mistake.

$$\sqrt{3} \times -\sqrt{3} = -3$$

(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.

$$\sqrt{12} = 2\sqrt{3}$$

$$\begin{aligned} \sqrt{a} \times \sqrt{b} &= \sqrt{ab} \\ \sqrt{12} &= \sqrt{4 \times 3} \\ &= 2 \times \sqrt{3} \end{aligned}$$

(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.

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.

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

From the formula triangle, density = mass/volume

$$d_u = \frac{m_u}{V_L}$$

U is for upper bound and L is for lower bound

$$= \frac{1972.5}{13.15 \times 15.95 \times 21.65}$$

To work out the upper and lower bounds, add and subtract half of the resolution. e.g. 21.7 cm is to the nearest 1 mm so subtracting half of 1 mm (which is 0.5 mm) gives 21.65 cm.
Volume of cuboid = length x width x height

$$= 0.4343828506$$

$$d_L = \frac{m_L}{V_u}$$

$$= \frac{1967.5}{13.25 \times 16.05 \times 21.75}$$

$$= 0.4253677546$$

0.43 as both the upper and lower bound round to this to 2 decimal places

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS