Elite Mathematics
Pearson Edexcel International GCSE

IGCSE LINEAR · 4MA1

4WM1/01 May 2025 Worked Solutions

May 2025 paper rebuilt with the worked solution after each question.

25	2020–2026	Single-paper solutions
paper questions	52 past papers	checked by Dr Eslam



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PAST PAPER

4WM1/01 May 2025

May 2025

25	100	2 h
questions	marks	exam time

Each question is followed by its worked solution and final answer.

4WM1/01 MAY 2025

Question 1

3 marks | Fractions

1 Without using a calculator, work out

$$3\frac{2}{3} \times 2\frac{4}{7}$$

Show each stage of your working.
Give your answer as a mixed number in its simplest form.

(Total for Question 1 is 3 marks)

WORKED SOLUTION

Question 1 · 4WM1/01 May 2025

1 **Simplify fraction**

Convert the mixed numbers to improper fractions.

$$3\frac{2}{3} = \frac{11}{3}, \qquad 2\frac{4}{7} = \frac{18}{7}$$

2 **Simplify fraction**

Then multiply.

$$\frac{11}{3} \times \frac{18}{7} = \frac{198}{21} = \frac{66}{7}$$

3 **Convert to a mixed number**

Convert to a mixed number.

$$\frac{66}{7} = 9\frac{3}{7}$$

✓ **FINAL ANSWER**

$9\frac{3}{7}$

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Question 2

4 marks | Rounding, Estimation & Bounds

2 The height of a tree is 17.8 metres correct to one decimal place.

(a) Write down the lower bound for the height of the tree.

..... metres

(1)

The weight of an apple is 145 grams correct to the nearest 5 grams.

(b) Write down the upper bound for the weight of the apple.

..... grams

(1)

$$A = \frac{4.766 \times 815}{0.399}$$

(c) By rounding each number to one significant figure, work out an estimate for the value of A
Show your working clearly.

.....

(2)

(Total for Question 2 is 4 marks)

WORKED SOLUTION

Question 2 · 4WM1/01 May 2025

1 **Find lower bound**

For 17.8 correct to 1 decimal place, the lower bound is

$$17.8 - 0.05 = 17.75$$

2 **Find upper bound**

For 145 correct to the nearest 5 grams, the upper bound is

$$145 + 2.5 = 147.5$$

3 **Estimate the value**

For the estimate,

$$A = \frac{4.766 \times 815}{0.399}$$

4 **Round to 1 significant figure**

Round to 1 significant figure.

$$4.766 \approx 5, \quad 815 \approx 800, \quad 0.399 \approx 0.4$$

$$A \approx \frac{5 \times 800}{0.4} = 10000$$

✓ **FINAL ANSWER**

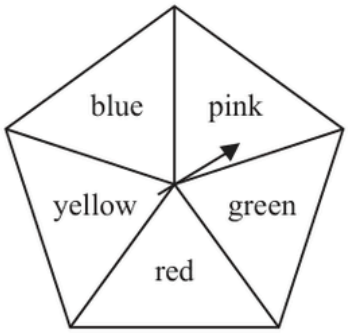
17.75 m, 147.5 g, and 10000.

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Question 3

4 marks | Probability Toolkit

3 Here is a biased spinner.
The spinner can land on pink or on green or on red or on yellow or on blue.



The table gives information about the probability that, when the spinner is spun, it will land on each colour.

Colour	pink	green	red	yellow	blue
Probability	0.14	0.23	$2x$	0.18	$7x$

Jim is going to spin the spinner 500 times.

Work out the expected number of times the spinner will land on blue.

(Total for Question 3 is 4 marks)

WORKED SOLUTION

Question 3 · 4WM1/01 May 2025

1 Calculate probability

The probabilities add to 1.

$$0.14 + 0.23 + 2x + 0.18 + 7x = 1$$

$$0.55 + 9x = 1$$

$$x = 0.05$$

2 The probability of blue is

The probability of blue is

$$7x = 7(0.05) = 0.35$$

3 Expected number of blue results

Expected number of blue results:

$$500 \times 0.35 = 175$$

FINAL ANSWER

175

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Question 4

3 marks | Perimeter & Area

4 The diagram shows triangle ABC and a semicircle.

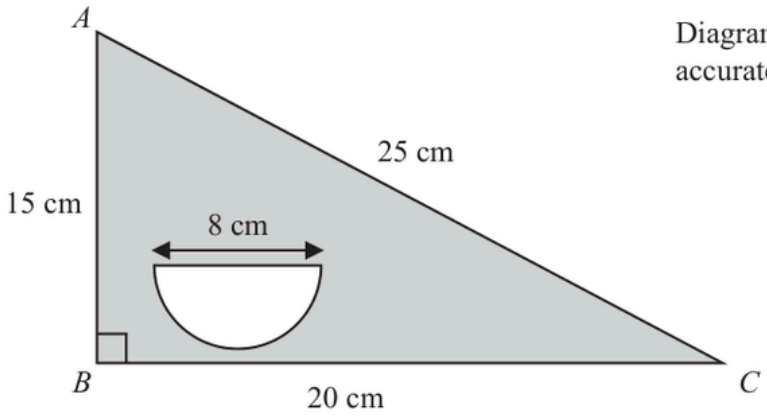


Diagram **NOT** accurately drawn

$AB = 15$ cm $\quad BC = 20$ cm $\quad AC = 25$ cm $\quad$ angle $ABC = 90°$

The diameter of the semicircle is 8 cm

Work out the area of the region shown shaded in the diagram.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 4 is 3 marks)

WORKED SOLUTION

Question 4 · 4WM1/01 May 2025

1 **The shaded area is the**

The shaded area is the triangle area minus the semicircle area.

$$\text{triangle area} = \frac{1}{2} \times 15 \times 20 = 150$$

2 **Calculate area**

The semicircle has diameter 8, so radius 4.

$$\text{semicircle area} = \frac{1}{2}\pi(4)^2 = 8\pi$$

$$\text{shaded area} = 150 - 8\pi = 124.867\ldots$$

3 **Calculate area**

To 3 significant figures,

$$125$$

FINAL ANSWER

$125\ \text{cm}^2$

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Question 5

4 marks | Algebraic Roots & Indices

5 $x^5 \times x^7 = x^m$

(a) Find the value of m

$m =$ .....

(1)

$y^8 \div y^3 = y^n$

(b) Find the value of n

$n =$ .....

(1)

(c) Simplify fully $(5a^4r^2)^3$

.....

(2)

(Total for Question 5 is 4 marks)

WORKED SOLUTION

Question 5 · 4WM1/01 May 2025

1 **Use index laws**

$$x^5 \times x^7 = x^{5+7} = x^{12}$$

2 **Use index laws**

So $m = 12$.

$$y^8 \div y^3 = y^{8-3} = y^5$$

3 **Use index laws**

So $n = 5$.

$$(5a^4r^2)^3 = 5^3(a^4)^3(r^2)^3 = 125a^{12}r^6$$

✓ **FINAL ANSWER**

$m = 12$, $n = 5$, and $125a^{12}r^6$.

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Question 6

3 marks | Standard & Compound Units

6 The diagram shows a block in the shape of a cuboid.

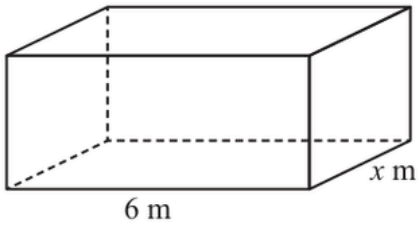


Diagram **NOT** accurately drawn

The block has a horizontal base with length 6 m and width x m

The block is placed on a table so that the whole of its horizontal base is in contact with the table.

The block exerts a force of 702 newtons on the table.
The pressure on the table due to the block is 65 newtons/m²

Work out the value of x

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

$x =$ .....

(Total for Question 6 is 3 marks)

WORKED SOLUTION

Question 6 · 4WM1/01 May 2025

1 Calculate area

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

$$65 = \frac{702}{\text{area}}$$

$$\text{area} = \frac{702}{65} = 10.8$$

2 **Calculate area**

The base area is $6x$, so

$$6x = 10.8$$

$$x = 1.8$$

✓ **FINAL ANSWER**

$x = 1.8$

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Question 7

6 marks | Factorising

7 (a) Solve $x - 4 = \dfrac{3 + 2x}{6}$

Show clear algebraic working.

$x =$ .....

(3)

(b) (i) Factorise $y^2 - 11y + 30$

.....

(2)

(ii) Hence solve $y^2 - 11y + 30 = 0$

.....

(1)

(Total for Question 7 is 6 marks)

WORKED SOLUTION

Question 7 · 4WM1/01 May 2025

1 Factorise expression

For part (a),

$$x - 4 = \frac{3 + 2x}{6}$$

2 Multiply by

Multiply by 6.

$$6x - 24 = 3 + 2x$$

$$4x = 27$$

$$x = \frac{27}{4} = 6.75$$

3 Factorise expression

For part (b),

$$y^2 - 11y + 30 = (y - 5)(y - 6)$$

4 **Factorise expression**

Hence,

$$(y-5)(y-6)=0$$

$$y=5 \quad \text{or} \quad y=6$$

✓ **FINAL ANSWER**

$x=6.75$, $(y-5)(y-6)$, and $y=5$ or 6.

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Question 8

5 marks | Set Notation & Venn Diagrams

8 $\mathscr{E} = \{18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$

$A = \{\text{even numbers}\}$

$B = \{\text{multiples of 3}\}$

$C = \{\text{multiples of 5}\}$

(a) List the members of the set $(A \cup B)'$

.....

(2)

Sophie writes down the statement $B \cap C = \emptyset$

(b) Explain why Sophie's statement is wrong.

.....

(1)

D is a set such that $A \cap D = \{18, 26\}$
The set D has exactly 5 members.

(c) List the members of one possible set D

.....

(2)

(Total for Question 8 is 5 marks)

WORKED SOLUTION

Question 8 · 4WM1/01 May 2025

1 **Calculate value**

$$A = \{18, 20, 22, 24, 26, 28, 30\}$$

$$B = \{18, 21, 24, 27, 30\}$$

$$A \cup B = \{18, 20, 21, 22, 24, 26, 27, 28, 30\}$$

2 **Calculate value**

So

$$(A \cup B)' = \{19, 23, 25, 29\}$$

3 **Sophie is wrong because is**

Sophie is wrong because 30 is both a multiple of 3 and a multiple of 5, so $30 \in B \cap C$.

4 **Set is**

For D, include 18 and 26, but no other even numbers. One possible set is

$$D = \{18, 19, 23, 25, 26\}$$

✓ **FINAL ANSWER**

$\{19, 23, 25, 29\}$; Sophie is wrong because $30 \in B \cap C$; one possible D is $\{18, 19, 23, 25, 26\}$.

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Question 9

3 marks | Algebraic Roots & Indices

9 $7^x = 1$

(a) Write down the value of x

$x =$ .....

(1)

$$\frac{8^{-4} \times 8^{11}}{8^{12}} = 8^n$$

(b) Work out the value of n

$n =$ .....

(2)

(Total for Question 9 is 3 marks)

WORKED SOLUTION

Question 9 · 4WM1/01 May 2025

1 Use index laws

$$7^x = 1$$

2 Use index laws

Since $7^0 = 1$,

$$x = 0$$

3 Use index laws

For part (b),

$$\frac{8^{-4} \times 8^{11}}{8^{12}} = 8^n$$

$$8^{-4} \times 8^{11} = 8^7$$

$$\frac{8^7}{8^{12}} = 8^{7-12} = 8^{-5}$$

4 Use index laws

So $n = -5$.

FINAL ANSWER

$x = 0, n = -5.$

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Question 10

5 marks | Perimeter & Area

10

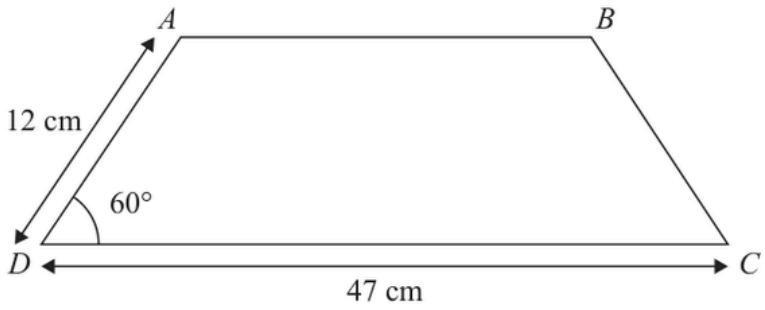


Diagram **NOT** accurately drawn

ABCD is a trapezium with one line of symmetry.

angle $ADC = 60°$ $AD = 12\,\text{cm}$ $DC = 47\,\text{cm}$

Work out the area of the trapezium.
Give your answer correct to 3 significant figures.
Show your working clearly.

..... cm^2

(Total for Question 10 is 5 marks)

WORKED SOLUTION

Question 10 · 4WM1/01 May 2025

1 The trapezium is symmetrical. The

The trapezium is symmetrical. The horizontal shift from each sloping side is

$$12\cos 60° = 6$$

2 Find the gradient

So the top parallel side is

$$47 - 6 - 6 = 35$$

3 The height is

The height is

$$12\sin 60° = 10.392\ldots$$

4 **Area of the trapezium**

Area of the trapezium:

$$\frac{1}{2}(47+35)(12\sin 60°) = 426.084\ldots$$

5 **Calculate area**

To 3 significant figures,

$$426$$

✓ **FINAL ANSWER**

$426\ \text{cm}^2$

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Question 11

6 marks | Expanding Brackets

11 (a) Expand and simplify $5x(5x + 4)(2x - 3)$

.....

(3)

(b) Express $\frac{9}{4} + \frac{y - 7}{5y}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 11 is 6 marks)

WORKED SOLUTION

Question 11 · 4WM1/01 May 2025

1 **Expand brackets**

$$5x(5x + 4)(2x - 3)$$

2 **Expand brackets**

First,

$$(5x + 4)(2x - 3) = 10x^2 - 15x + 8x - 12 = 10x^2 - 7x - 12$$

3 **Expand brackets**

Then multiply by $5x$.

$$5x(10x^2 - 7x - 12) = 50x^3 - 35x^2 - 60x$$

4 **Expand brackets**

For part (b), use denominator $20y$.

$$\frac{9}{4} + \frac{y - 7}{5y} = \frac{45y}{20y} + \frac{4(y - 7)}{20y}$$

$$= \frac{49y - 28}{20y}$$

FINAL ANSWER

$50x^3 - 35x^2 - 60x$ and $\frac{49y - 28}{20y}$.

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Question 12

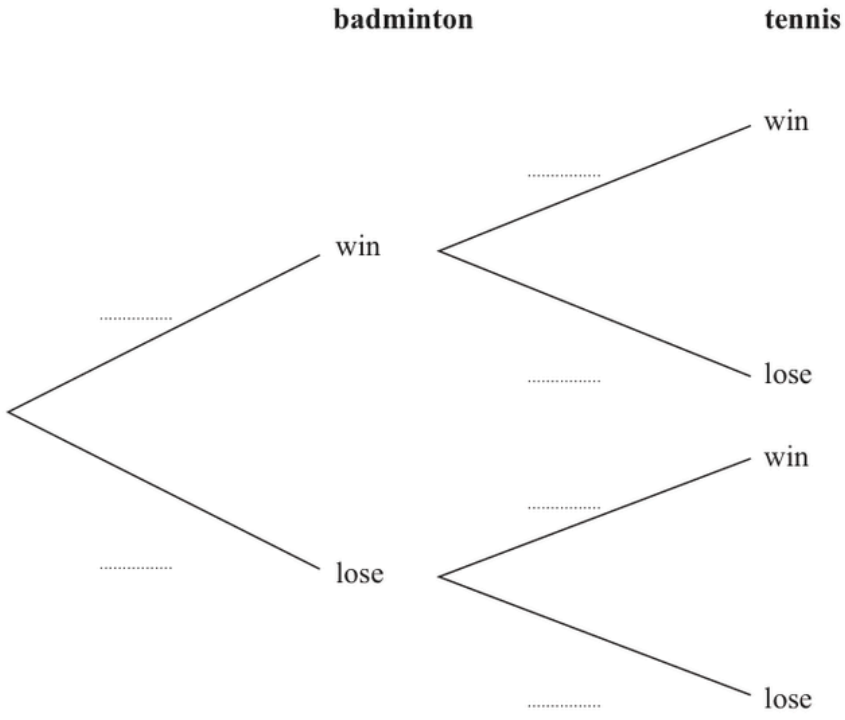
4 marks | Tree Diagrams & Conditional Probability

12 Ricardo is going to play one game of badminton and one game of tennis.

He can either win or lose each game.

The probability that he will win the game of badminton is 0.7
The probability that he will win the game of tennis is 0.4

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Ricardo loses both games.

.....

(2)

(Total for Question 12 is 4 marks)

WORKED SOLUTION

Question 12 · 4WM1/01 May 2025

1 **Calculate probability**

For badminton,

$$P(\text{win}) = 0.7, \qquad P(\text{lose}) = 0.3$$

2 **Calculate probability**

For tennis,

$$P(\text{win}) = 0.4, \qquad P(\text{lose}) = 0.6$$

3 **The probability of losing both**

The probability of losing both games is

$$0.3 \times 0.6 = 0.18$$

✓ **FINAL ANSWER**

Tennis branches are 0.4 and 0.6 on each branch; probability of losing both is 0.18.

Question 13

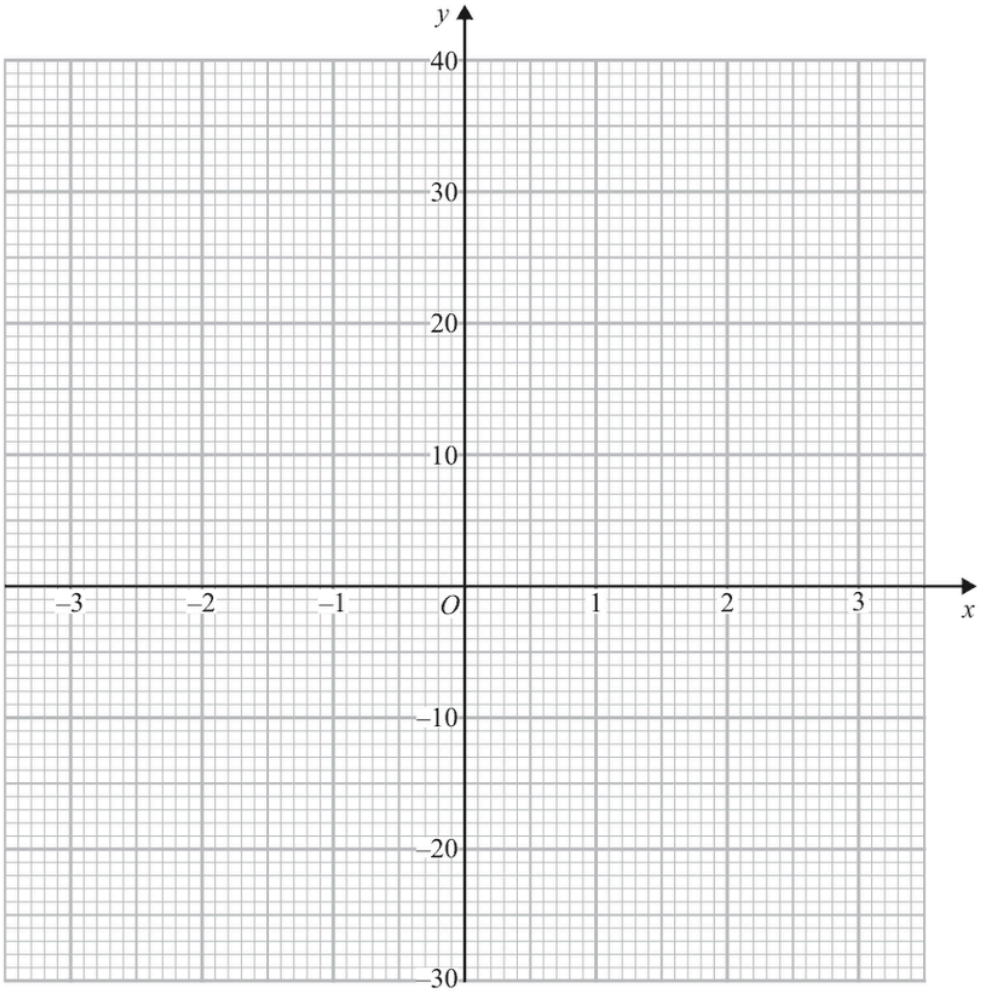
3 marks | Graphs of Functions

13 (a) Complete the table of values for $y = x^3 + 2x + 3$

x	–3	–2	–1	0	1	2	3
y		–9	0	3	6		36

(1)

(b) On the grid, draw the graph of $y = x^3 + 2x + 3$ for $-3 \leqslant x \leqslant 3$



(2)

(Total for Question 13 is 3 marks)

1 **Use**

Use $y = x^3 + 2x + 3$.

2 **Read the graph**

For $x = -3$,

$$y = (-3)^3 + 2(-3) + 3 = -30$$

3 **Read the graph**

For $x = 2$,

$$y = 2^3 + 2(2) + 3 = 15$$

4 **Read the graph**

So the table is

x	-3	-2	-1	0	1	2	3
y	-30	-9	0	3	6	15	36

5 **Plot these points and draw**

Plot these points and draw a smooth cubic curve through them.



FINAL ANSWER

Missing values -30 and 15; draw the smooth curve through the table points.

Question 14

4 marks | Circles, Arcs & Sectors

14 The diagram shows sector OAB of a circle, centre O

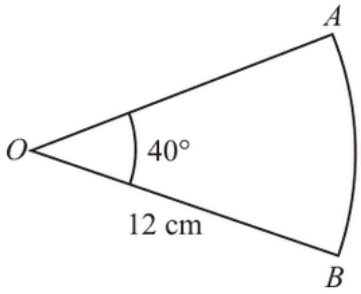


Diagram **NOT** accurately drawn

$OA = OB = 12$ cm angle $AOB = 40°$

(a) Work out the area of the sector.
Give your answer correct to 3 significant figures.

..... cm^2

(2)

The diagram shows triangle XYZ

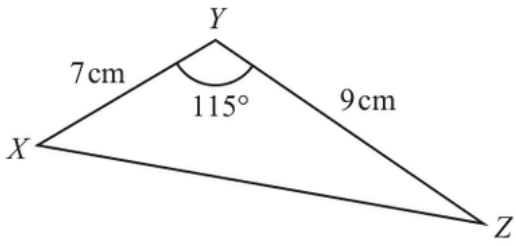


Diagram **NOT** accurately drawn

$XY = 7$ cm $YZ = 9$ cm angle $XYZ = 115°$

(b) Work out the area of the triangle.
Give your answer correct to 3 significant figures.

..... cm^2

(2)

(Total for Question 14 is 4 marks)

1 **Sector area**

Sector area:

$$\frac{40}{360}\pi(12)^2 = 16\pi = 50.265\ldots$$

2 **To 3 significant figures**

To 3 significant figures,

$$50.3\ \text{cm}^2$$

3 **Triangle area**

Triangle area:

$$\frac{1}{2}(7)(9)\sin 115^\circ = 28.548\ldots$$

4 **To 3 significant figures**

To 3 significant figures,

$$28.5\ \text{cm}^2$$

✓ **FINAL ANSWER**

$50.3\ \text{cm}^2$ and $28.5\ \text{cm}^2$.

4WM1/01 MAY 2025

Question 15

3 marks | Quadratic Equations

15 Solve the equation $5x^2 + 9x - 17 = 0$
Show your working clearly.
Give your solutions correct to 3 significant figures.

(Total for Question 15 is 3 marks)

WORKED SOLUTION

Question 15 · 4WM1/01 May 2025

1 **Solve quadratic equation**

$$5x^2 + 9x - 17 = 0$$

2 **Use quadratic formula**

Use the quadratic formula with $a = 5$, $b = 9$, $c = -17$.

$$x = \frac{-9 \pm \sqrt{9^2 - 4(5)(-17)}}{2(5)}$$

$$x = \frac{-9 \pm \sqrt{421}}{10}$$

$$x = 1.152\ldots \quad \text{or} \quad x = -2.952\ldots$$

3 **Solve quadratic equation**

To 3 significant figures,

$$x = 1.15 \quad \text{or} \quad x = -2.95$$

✓ **FINAL ANSWER**

$x = 1.15$ or $x = -2.95$.

4WM1/01 MAY 2025

Question 16

3 marks | Algebraic Roots & Indices

16 Solve the equation $8^{3y+4} \times 4^{3y} = 2^{5y}$
Show your working clearly.

$y =$ .....

(Total for Question 16 is 3 marks)

WORKED SOLUTION

Question 16 · 4WM1/01 May 2025

1 Solve equation

$$8^{3y+4} \times 4^{3y} = 2^{5y}$$

2 Solve equation

Write 8 and 4 as powers of 2.

$$(2^3)^{3y+4}(2^2)^{3y} = 2^{5y}$$

$$2^{9y+12} \times 2^{6y} = 2^{5y}$$

$$2^{15y+12} = 2^{5y}$$

3 Solve equation

So

$$15y + 12 = 5y$$

$$y = -\frac{6}{5}$$

✓ **FINAL ANSWER**

$y = -\frac{6}{5}$

4WM1/01 MAY 2025

Question 17

4 marks | Surds

17 $(\sqrt{3})^5 = k\sqrt{3}$ where k is an integer.

(a) Find the value of k

$k =$ .....

(1)

(b) Show that $\dfrac{21}{3-\sqrt{2}}$ can be written in the form $c + \sqrt{d}$

where c and d are integers.
Show each stage of your working clearly.

(3)

(Total for Question 17 is 4 marks)

WORKED SOLUTION

Question 17 · 4WM1/01 May 2025

1 **Simplify surd**

$$(\sqrt{3})^5 = (\sqrt{3})^4\sqrt{3} = 3^2\sqrt{3} = 9\sqrt{3}$$

2 **Simplify surd**

So $k = 9$.

3 **Split the ratio**

For part (b), rationalise the denominator.

$$\frac{21}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{21(3+\sqrt{2})}{9-2}$$

$$= 3(3+\sqrt{2}) = 9+3\sqrt{2}$$

4 **Simplify surd**

Since $3\sqrt{2} = \sqrt{18}$,

$$9+3\sqrt{2} = 9+\sqrt{18}$$

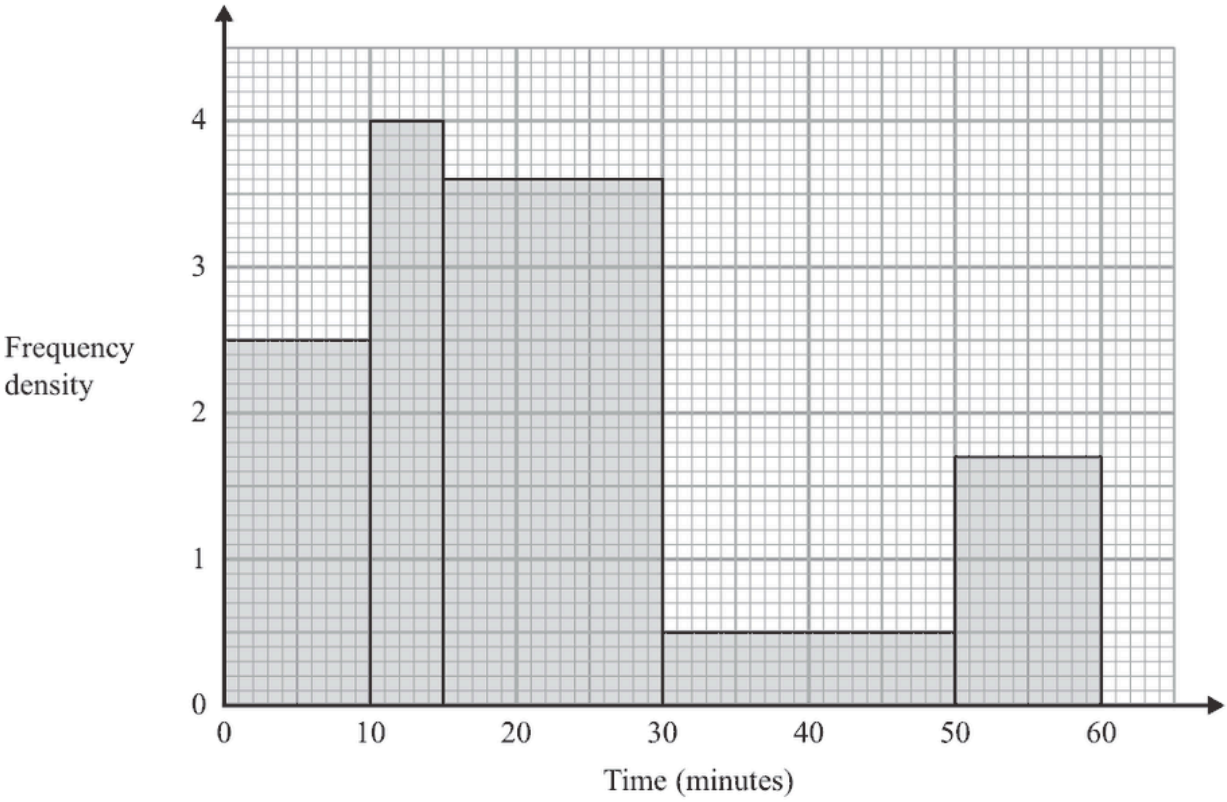
FINAL ANSWER

$k = 9$, and $9 + \sqrt{18}$.

Question 18

3 marks | Histograms

18 The histogram shows information about the times, in minutes, that some people were in a shop.



Work out an estimate for the proportion of these people who were in the shop for more than 40 minutes.

(Total for Question 18 is 3 marks)

1 **Frequency is class width multiplied**

Frequency is class width multiplied by frequency density.

$$0\text{--}10 : 10 \times 2.5 = 25$$

$$10\text{--}15 : 5 \times 4 = 20$$

$$15\text{--}30 : 15 \times 3.6 = 54$$

$$30\text{--}50 : 20 \times 0.5 = 10$$

$$50\text{--}60 : 10 \times 1.7 = 17$$

2 **Total**

Total:

$$25 + 20 + 54 + 10 + 17 = 126$$

3 **More than minutes is the**

More than 40 minutes is the part from 40 to 50, plus 50 to 60.

$$10 \times 0.5 + 17 = 22$$

4 **Use histogram**

So the proportion is

$$\frac{22}{126} = \frac{11}{63}$$

FINAL ANSWER

$\frac{11}{63}$

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Question 19

3 marks | Algebraic Fractions

19 Simplify fully $\dfrac{3x^2 - 3y^2}{5x + 5y} \div \dfrac{xy^2 - x^2y}{10xy}$

Show clear algebraic working.

(Total for Question 19 is 3 marks)

WORKED SOLUTION

Question 19 · 4WM1/01 May 2025

1 Simplify fraction

$$\frac{3x^2 - 3y^2}{5x + 5y} \div \frac{xy^2 - x^2y}{10xy}$$

2 Factorise

Factorise.

$$= \frac{3(x - y)(x + y)}{5(x + y)} \div \frac{xy(y - x)}{10xy}$$

$$= \frac{3(x - y)}{5} \div \frac{y - x}{10}$$

$$= \frac{3(x - y)}{5} \times \frac{10}{y - x}$$

3 Simplify fraction

Since $y - x = -(x - y)$, the expression is

$$-6$$

FINAL ANSWER

-6

4WM1/01 MAY 2025

Question 20

3 marks | Algebraic Fractions

20 Given that $k = m + n$ and $m = \dfrac{3}{4n}$

express $\dfrac{7k}{5-m}$ in the form $\dfrac{a+bn^2}{cn-d}$ where a, b and c are integers and d is prime.

(Total for Question 20 is 3 marks)

WORKED SOLUTION

Question 20 · 4WM1/01 May 2025

1 Simplify fraction

$$k = m + n, \qquad m = \frac{3}{4n}$$

2 Simplify fraction

So

$$k = \frac{3}{4n} + n = \frac{3 + 4n^2}{4n}$$

3 Simplify fraction

Then

$$7k = \frac{21 + 28n^2}{4n}$$

4 Simplify fraction

and

$$5 - m = 5 - \frac{3}{4n} = \frac{20n - 3}{4n}$$

5 Simplify fraction

Therefore

$$\frac{7k}{5-m} = \frac{\frac{21+28n^2}{4n}}{\frac{20n-3}{4n}}$$

$$= \frac{21 + 28n^2}{20n - 3}$$

FINAL ANSWER

$$\frac{21+28n^2}{20n-3}$$

4WM1/01 MAY 2025

Question 21

5 marks | Sine & Cosine Rules

21

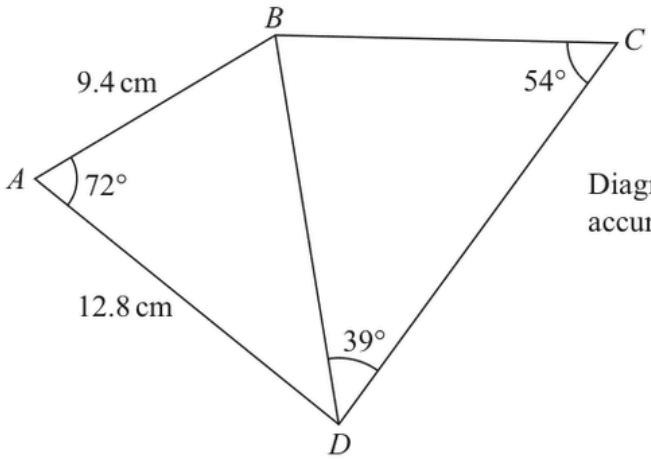


Diagram **NOT** accurately drawn

Work out the length of BC
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 21 is 5 marks)

WORKED SOLUTION

Question 21 · 4WM1/01 May 2025

1 **Use trigonometry**

First find BD in triangle ABD using the cosine rule.

$$BD^2 = 9.4^2 + 12.8^2 - 2(9.4)(12.8)\cos 72°$$

$$BD = 13.3356\ldots$$

2 **Use trigonometry**

In triangle BCD, use the sine rule.

$$\frac{BC}{\sin 39°} = \frac{BD}{\sin 54°}$$

$$BC = 13.3356\ldots \times \frac{\sin 39°}{\sin 54°}$$

$$BC = 10.3735\ldots$$

3 **Use trigonometry**

To 3 significant figures,

$$BC = 10.4$$

✓ **FINAL ANSWER**

$10.4\ \text{cm}$

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Question 22

3 marks | Probability Toolkit

22 A box contains 20 counters.

9 of the counters are red
7 of the counters are yellow
4 of the counters are green

Alex takes at random three counters from the box.

Work out the probability that exactly two of the three counters are the same colour.

(Total for Question 22 is 3 marks)

WORKED SOLUTION

Question 22 · 4WM1/01 May 2025

1 Total ways to choose counters

Total ways to choose 3 counters:

$$\binom{20}{3} = 1140$$

2 Exactly two red

Exactly two red:

$$\binom{9}{2}\binom{11}{1} = 396$$

3 Exactly two yellow

Exactly two yellow:

$$\binom{7}{2}\binom{13}{1} = 273$$

4 Exactly two green

Exactly two green:

$$\binom{4}{2}\binom{16}{1} = 96$$

5 Favourable outcomes

Favourable outcomes:

$$396 + 273 + 96 = 765$$

$$P = \frac{765}{1140} = \frac{51}{76}$$

FINAL ANSWER

$\frac{51}{76}$

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Question 23

6 marks | 3D Pythagoras & Trigonometry

23 The diagram shows cuboid $ABCDEFGH$

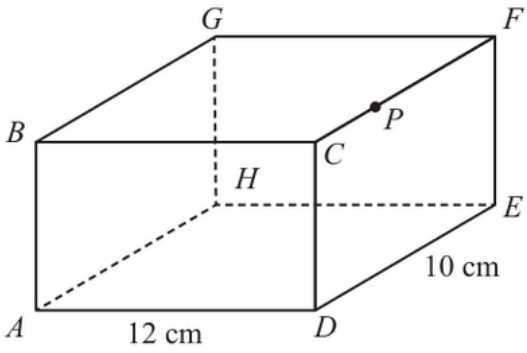


Diagram **NOT** accurately drawn

The point P lies on CF

$AD = 12$ cm $\quad DE = 10$ cm $\quad CP = 3$ cm

The angle of elevation of P from A is $24°$

Calculate the size of angle APG
Give your answer correct to the nearest degree.
Show your working clearly.

.....°

(Total for Question 23 is 6 marks)

WORKED SOLUTION

Question 23 · 4WM1/01 May 2025

1 **Point is cm from along**

Point P is 3 cm from C along CF. The horizontal distance from A to the point directly below P is

$$\sqrt{12^2 + 3^2} = \sqrt{153}$$

2 **Use trigonometry**

Using the angle of elevation,

$$h = \sqrt{153}\tan 24° = 5.507\ldots$$

3 **Use trigonometry**

So

$$AP = \frac{\sqrt{153}}{\cos 24^\circ} = 13.5399\ldots$$

4 **Use trigonometry**

On the top face,

$$PG = \sqrt{12^2 + 7^2} = \sqrt{193} = 13.8924\ldots$$

5 **Use trigonometry**

Also,

$$AG = \sqrt{12^2 + 10^2 + h^2} = 16.561\ldots$$

6 **Use cosine rule**

Use the cosine rule in triangle APG.

$$\cos \angle APG = \frac{AP^2 + PG^2 - AG^2}{2(AP)(PG)}$$

$$\angle APG = 49.163\ldots^\circ$$

7 **Use trigonometry**

To the nearest degree,

$$49^\circ$$

✓ **FINAL ANSWER**

49°

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Question 24

5 marks | Linear Graphs

24 $PQRS$ is a square.

PR is a diagonal of the square.

P is the point with coordinates $(4, 7)$
R is the point with coordinates $(8, -5)$

Find an equation of the straight line that passes through the points Q and S
Give your answer in the form $ay = bx + c$ where a, b and c are integers.

(Total for Question 24 is 5 marks)

WORKED SOLUTION

Question 24 · 4WM1/01 May 2025

1 The diagonals of a square

The diagonals of a square bisect each other and are perpendicular.

2 Find the midpoint

Midpoint of $P(4, 7)$ and $R(8, -5)$:

$$\left(\frac{4+8}{2}, \frac{7-5}{2}\right) = (6, 1)$$

3 Find the gradient

Gradient of PR:

$$\frac{-5-7}{8-4} = -3$$

4 Find the gradient

So the perpendicular gradient is $\frac{1}{3}$.

5 **The line through and passes**

The line through Q and S passes through $(6, 1)$, so

$$y - 1 = \frac{1}{3}(x - 6)$$

$$3y - 3 = x - 6$$

$$3y = x - 3$$

✓ **FINAL ANSWER**

$3y = x - 3$

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Question 25

5 marks | Completing the Square

25 (a) Express $8 - 12x - 4x^2$ in the form $a - b(x + c)^2$ where a, b and c are constants.

.....

(3)

(b) Hence solve $8 - 12x - 4x^2 = 0$
Show your working clearly.
Give your solutions in surd form.

.....

(2)

(Total for Question 25 is 5 marks)

WORKED SOLUTION

Question 25 · 4WM1/01 May 2025

1 **Simplify surd**

$$8x^2 - 12x - 4 = 8\left(x^2 - \frac{3}{2}x\right) - 4$$

2 **Complete the square**

Complete the square.

$$x^2 - \frac{3}{2}x = \left(x - \frac{3}{4}\right)^2 - \frac{9}{16}$$

3 **Simplify surd**

So

$$8x^2 - 12x - 4 = 8\left(x - \frac{3}{4}\right)^2 - \frac{17}{2}$$

4 **Simplify surd**

Now solve

$$8x^2 - 12x - 4 = 0$$

$$8\left(x - \frac{3}{4}\right)^2 - \frac{17}{2} = 0$$

$$\left(x - \frac{3}{4}\right)^2 = \frac{17}{16}$$

$$x - \frac{3}{4} = \pm\frac{\sqrt{17}}{4}$$

$$x = \frac{3 \pm \sqrt{17}}{4}$$

✓ **FINAL ANSWER**

$8\left(x - \frac{3}{4}\right)^2 - \frac{17}{2}$, and $x = \frac{3 \pm \sqrt{17}}{4}$.