Elite Mathematics
Pearson Edexcel International GCSE

IGCSE LINEAR · 4MA1

4MA1/1HR June 2026 Worked Solutions

June 2026 paper rebuilt with the worked solution after each question.

26	2020–2026	Single-paper solutions
paper questions	55 past papers	checked by Dr Eslam



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PAST PAPER

4MA1/1HR June 2026

June 2026

26	100	2 h
questions	marks	exam time

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

4MA1/1HR JUNE 2026

Question 1

3 marks | Fractions

1 Show that $2\frac{4}{5} \times 3\frac{3}{7} = 9\frac{3}{5}$

(Total for Question 1 is 3 marks)

WORKED SOLUTION

Question 1 · 4MA1/1HR June 2026

1 Solution | Step 1

$$2\frac{4}{5} = \frac{14}{5}, \qquad 3\frac{3}{7} = \frac{24}{7}.$$

Convert each mixed number into an improper fraction.

2 Solution | Step 2

$$\frac{14}{5} \times \frac{24}{7} = \frac{2 \times 24}{5} = \frac{48}{5} = 9\frac{3}{5}.$$

Cancel the common factor 7, multiply, then convert back to a mixed number.

✓ FINAL ANSWER

$2\frac{4}{5} \times 3\frac{3}{7} = 9\frac{3}{5}$

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Question 2

3 marks | Number Toolkit

2 Write 504 as a product of powers of its prime factors.
Show your working clearly.

.....

(Total for Question 2 is 3 marks)

WORKED SOLUTION

Question 2 · 4MA1/1HR June 2026

1 Solution | Step 1

$$504 = 2 \times 252 = 2^2 \times 126 = 2^3 \times 63.$$

Divide repeatedly by the prime 2.

2 Solution | Step 2

$$63 = 3 \times 21 = 3^2 \times 7, \qquad 504 = 2^3 \times 3^2 \times 7.$$

All remaining factors are prime; group repeated factors as powers.

✓ FINAL ANSWER

$504 = 2^3 \times 3^2 \times 7$

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Question 3

2 marks | Algebraic Roots & Indices

3 (a) Simplify $e^7 \times e^3$

.....

(1)

(b) Simplify $g^5 \div g^2$

.....

(1)

(Total for Question 3 is 2 marks)

WORKED SOLUTION

Question 3 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

$$e^7 \times e^3 = e^{7+3} = e^{10}.$$

For equal bases, add the indices when multiplying.

2 **Part (b) | Step 1**

$$g^5 \div g^2 = g^{5-2} = g^3 \quad (g \neq 0).$$

For equal bases, subtract the indices when dividing.

✓ **FINAL ANSWER**

(a) e^{10} (b) g^3

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Question 4

2 marks | Rounding, Estimation & Bounds

4 The weight of a giraffe is 1178 kg, correct to the nearest kg

(i) Write down the lower bound of the weight of the giraffe.

..... kg

(1)

(ii) Write down the upper bound of the weight of the giraffe.

..... kg

(1)

(Total for Question 4 is 2 marks)

WORKED SOLUTION

Question 4 · 4MA1/1HR June 2026

1 Part (i) | Step 1

$$1178 - 0.5 = 1177.5 \text{ kg}.$$

Rounding to the nearest kilogram allows half a kilogram below the stated value.

2 Part (ii) | Step 1

$$1178 + 0.5 = 1178.5 \text{ kg}.$$

The rounding interval is $1177.5 \leq w < 1178.5$; the upper endpoint is the upper bound, not an included weight.

FINAL ANSWER

(i) 1177.5 kg (ii) 1178.5 kg

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Question 5

4 marks | Probability Toolkit

5 A bag contains only blue counters, green counters, red counters and yellow counters.

Danny takes a counter at random from the bag.

The table gives information about the probabilities that he takes a blue counter or a green counter or a red counter or a yellow counter.

Colour	blue	green	red	yellow
Probability	0.45	0.31	$5x$	x

There are 400 counters in the bag.

Work out the number of red counters in the bag.

.....

(Total for Question 5 is 4 marks)

WORKED SOLUTION

Question 5 · 4MA1/1HR June 2026

1 Solution | Step 1

$$0.45 + 0.31 + 5x + x = 1.$$

The four colours are mutually exclusive and exhaust all counters, so their probabilities sum to 1.

2 Solution | Step 2

$$6x = 1 - 0.76 = 0.24, \qquad x = 0.04.$$

Collect the unknown probabilities and solve the linear equation.

3 Solution | Step 3

$$P(\text{red}) = 5(0.04) = 0.20, \qquad N_{\text{red}} = 400(0.20) = 80.$$

Multiply the red proportion by the total number of counters.

✓ **FINAL ANSWER**

80 red counters

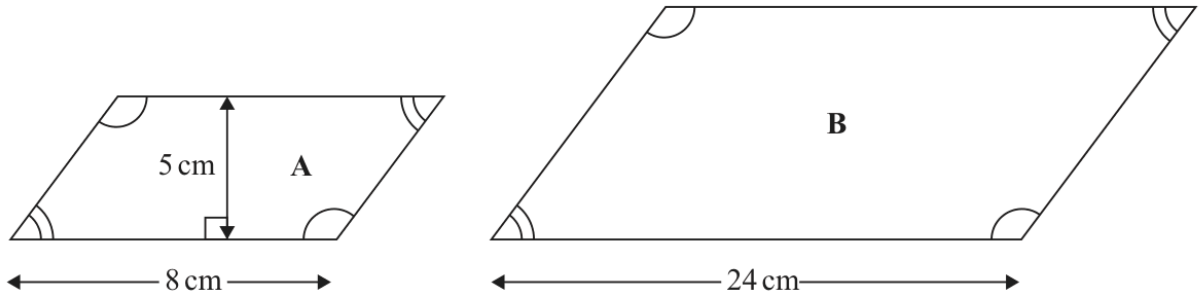
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Question 6

3 marks | Area & Volume of Similar Shapes

6

Diagram **NOT** accurately drawn



A and **B** are similar parallelograms.

Work out the area of **B**

..... cm^2

(Total for Question 6 is 3 marks)

WORKED SOLUTION

Question 6 · 4MA1/1HR June 2026

1 Solution | Step 1

$$k = \frac{24}{8} = 3.$$

The marked corresponding bases give the linear scale factor from A to B.

2 Solution | Step 2

$$\text{area}(A) = 8 \times 5 = 40 \text{ cm}^2.$$

The 5 cm measurement is the perpendicular height.

3 Solution | Step 3

$$\text{area}(B) = k^2 \, \text{area}(A) = 3^2 \times 40 = 360 \text{ cm}^2.$$

Areas scale by the square of the linear scale factor.

FINAL ANSWER

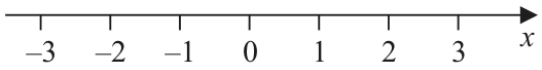
$360\ \text{cm}^2$

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Question 7

5 marks | Inequalities (Solving & Graphing)

7



(a) Represent the inequality $x < 1$ on the number line above.

(1)

$2 \leqslant y + 3 < 7$
y is an integer.

(b) Write down all the possible values of y

.....

(2)

(c) Solve the inequality $8 - 5w > -10$

.....

(2)

(Total for Question 7 is 5 marks)

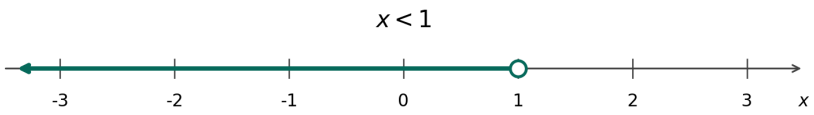
WORKED SOLUTION

Question 7 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

Place an open circle at 1 and draw a horizontal ray from it to the left, with a left-pointing arrow. Do not fill the circle.

The strict inequality excludes 1 and includes every real number less than 1.



2 **Part (b) | Step 1**

$$2 \leq y + 3 < 7 \implies -1 \leq y < 4.$$

Subtract 3 from all three expressions.

3 **Part (b) | Step 2**

The integer values in this interval are $-1, 0, 1, 2, 3$.

Include the lower endpoint but exclude 4.

4 **Part (c) | Step 1**

$$8 - 5w > -10 \quad \Longrightarrow \quad -5w > -18.$$

Subtract 8 from both sides.

5 **Part (c) | Step 2**

$$w < \frac{18}{5} = 3.6.$$

Division by a negative number reverses the inequality sign.

✓ **FINAL ANSWER**

(a) Open circle at 1, ray to the left: $(-\infty, 1)$. (b) $y = -1, 0, 1, 2, 3$ (c) $w < 3.6$

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Question 8

2 marks | Factorising

8 Factorise $x^2 - 12x + 32$

.....

(Total for Question 8 is 2 marks)

WORKED SOLUTION

Question 8 · 4MA1/1HR June 2026

1 Solution | Step 1

$$(-4)(-8) = 32, \qquad -4 + (-8) = -12.$$

Choose two numbers with product 32 and sum -12.

2 Solution | Step 2

$$x^2 - 12x + 32 = (x - 4)(x - 8).$$

The chosen numbers give the two constant terms in the factors.

FINAL ANSWER

$(x - 4)(x - 8)$

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Question 9

3 marks | Statistics Toolkit

9 Caleb owns 11 sheep.

The mean weight of all 11 sheep is 77 kg
The mean weight of 8 of the sheep is 75.2 kg

Work out the mean weight of the other 3 sheep.

..... kg

(Total for Question 9 is 3 marks)

WORKED SOLUTION

Question 9 · 4MA1/1HR June 2026

1 Solution | Step 1

$$W_{11} = 11(77) = 847 \text{ kg}, \qquad W_8 = 8(75.2) = 601.6 \text{ kg}.$$

Total weight equals number of sheep multiplied by their mean weight.

2 Solution | Step 2

$$W_3 = 847 - 601.6 = 245.4 \text{ kg}, \qquad \overline{w}_3 = \frac{245.4}{3} = 81.8 \text{ kg}.$$

Subtract the known subgroup total and divide the remaining total by 3.

FINAL ANSWER

81.8 kg

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Question 10

3 marks | Compound Interest & Depreciation

10 Arwa invests 200 000 yen in a savings account for 3 years.
She gets 1.4% per year compound interest.

Work out how much money Arwa will have in her savings account at the end of 3 years.
Give your answer correct to the nearest yen.

..... yen

(Total for Question 10 is 3 marks)

WORKED SOLUTION

Question 10 · 4MA1/1HR June 2026

1 Solution | Step 1

$$\text{annual multiplier} = 1 + \frac{1.4}{100} = 1.014.$$

An increase of 1.4% retains the original amount and adds 1.4%.

2 Solution | Step 2

$$A = 200000(1.014)^3 = 208518.1488 \text{ yen.}$$

Apply the multiplier once for each of the 3 years.

3 Solution | Step 3

$$A \approx 208518 \text{ yen.}$$

Round to the nearest whole yen.

FINAL ANSWER

208518 yen

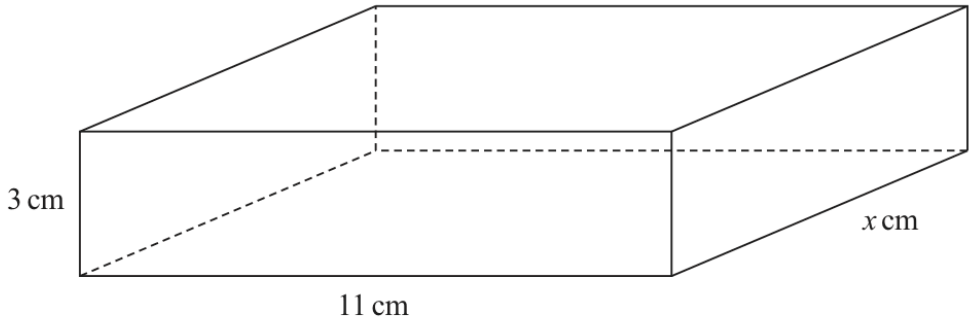
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Question 11

4 marks | Volume & Surface Area

11 The diagram shows a solid cuboid.

Diagram **NOT** accurately drawn



The cuboid measures 3 cm by 11 cm by x cm

The volume of the cuboid is 264 cm^3

Work out the total surface area of the cuboid.

..... cm^2

(Total for Question 11 is 4 marks)

WORKED SOLUTION

Question 11 · 4MA1/1HR June 2026

1 **Solution | Step 1**

$$3 \times 11 \times x = 264, \qquad x = \frac{264}{33} = 8 \text{ cm}.$$

The volume is the product of the three perpendicular edge lengths.

2 **Solution | Step 2**

$$S = 2(3 \times 11) + 2(3 \times 8) + 2(11 \times 8).$$

There are two faces of each of the three rectangular sizes.

3 **Solution | Step 3**

$$S = 66 + 48 + 176 = 290 \text{ cm}^2.$$

Add all six face areas.

FINAL ANSWER

$290\ \text{cm}^2$

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Question 12

3 marks | Simultaneous Equations

12 Solve the simultaneous equations

$$4x + 4y = 5$$
$$x + 2y = 1$$

Show clear algebraic working.

$x =$ .....

$y =$ .....

(Total for Question 12 is 3 marks)

WORKED SOLUTION

Question 12 · 4MA1/1HR June 2026

1 Solution | Step 1

$$4x + 4y = 5, \qquad x + 2y = 1.$$

Use the two given equations.

2 Solution | Step 2

$$4(x + 2y) = 4 \implies 4x + 8y = 4.$$

Multiply the second equation by 4 to match the coefficients of x.

3 Solution | Step 3

$$(4x + 8y) - (4x + 4y) = 4 - 5 \implies 4y = -1, \quad y = -\frac{1}{4}.$$

Subtract the first equation to eliminate x.

4 Solution | Step 4

$$x + 2\left(-\frac{1}{4}\right) = 1 \implies x = \frac{3}{2}.$$

Substitute into the second original equation.

FINAL ANSWER

$x = \frac{3}{2},\ y = -\frac{1}{4}$

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Question 13

3 marks | Linear Graphs

13 The straight line **L** has equation $4y - 10x - 5 = 0$

(a) Find the gradient of **L**

.....

(2)

(b) Find the coordinates of the point where **L** crosses the y-axis.

(..... , ...)

(1)

(Total for Question 13 is 3 marks)

WORKED SOLUTION

Question 13 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

$$4y - 10x - 5 = 0 \implies 4y = 10x + 5 \implies y = \frac{5}{2}x + \frac{5}{4}.$$

Rearrange into the form y=mx+c.

2 **Part (a) | Step 2**

The gradient is $\frac{5}{2}$.

The coefficient of x is the gradient.

3 **Part (b) | Step 1**

$$x = 0 \implies 4y - 5 = 0 \implies y = \frac{5}{4}.$$

Every point on the y-axis has x-coordinate zero.

✓ **FINAL ANSWER**

(a) $\frac{5}{2}$ (b) $\left(0, \frac{5}{4}\right)$

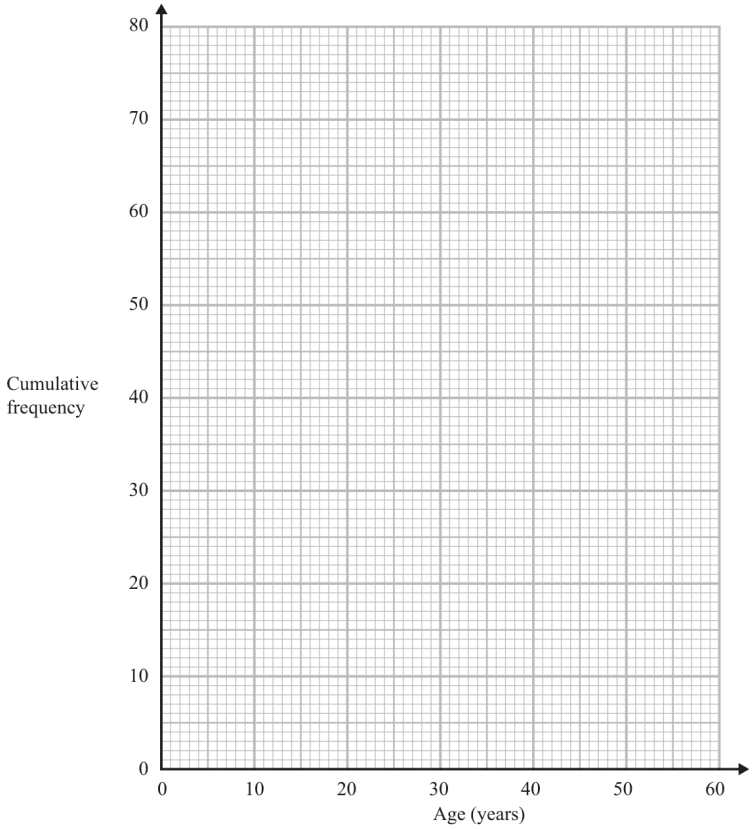
Question 14

4 marks | Cumulative Frequency Diagrams

14 The cumulative frequency table gives information about the ages, in years, of 80 people who went to a cinema on Saturday.

Age (a years)	Cumulative frequency
$0 < a \leqslant 10$	19
$0 < a \leqslant 20$	37
$0 < a \leqslant 30$	52
$0 < a \leqslant 40$	63
$0 < a \leqslant 50$	73
$0 < a \leqslant 60$	80

(a) On the grid below, draw a cumulative frequency graph for this information.



(2)

(b) Use your graph to find an estimate for the median age of the 80 people.

..... years

(1)

(c) Use your graph to find an estimate for the number of the 80 people aged 16 and under.

.....

(1)

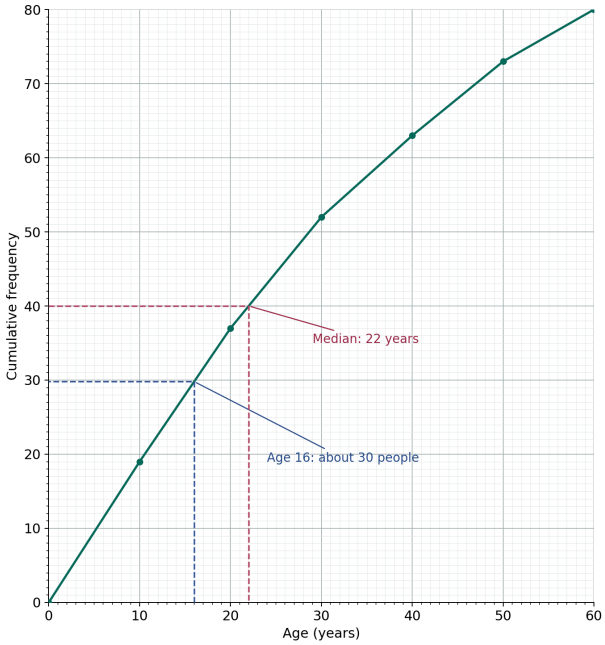
(Total for Question 14 is 4 marks)

1 **Part (a) | Step 1**

Use age (years) on the horizontal axis from 0 to 60, and cumulative frequency on the vertical axis from 0 to 80. Plot $(0, 0), (10, 19), (20, 37), (30, 52), (40, 63), (50, 73), (60, 80)$.
Each cumulative total is plotted at its upper age boundary.

2 **Part (a) | Step 2**

Join the points in order with an increasing curve or straight line segments. Do not draw bars or a staircase.
This represents the accumulated number up to each age boundary.



3 **Part (b) | Step 1**

$$\text{median position} = \frac{80}{2} = 40.$$

Read horizontally from cumulative frequency 40 to the graph, then vertically down to the age axis.

4 **Part (b) | Step 2**

Using straight segments,

$$20 + \frac{40 - 37}{52 - 37} \times 10 = 22 \text{ years}.$$

The median is estimated between ages 20 and 30; a smooth graph gives a nearby estimate.

5 **Part (c) | Step 1**

Read vertically from age 16 to the graph, then horizontally to the cumulative-frequency axis.
The ordinate is the estimated number aged 16 and under.

6

Part (c) | Step 2

Using straight segments,

$$19 + \frac{16 - 10}{20 - 10}(37 - 19) = 29.8 \approx 30.$$

Round the estimated count to a whole number of people.

FINAL ANSWER

(a) Increasing cumulative-frequency graph through $(0, 0), (10, 19), (20, 37), (30, 52), (40, 63), (50, 73), (60, 80)$. (b) Approximately 22 years. (c) Approximately 30 people.

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Question 15

3 marks | Angles in Polygons & Parallel Lines

15

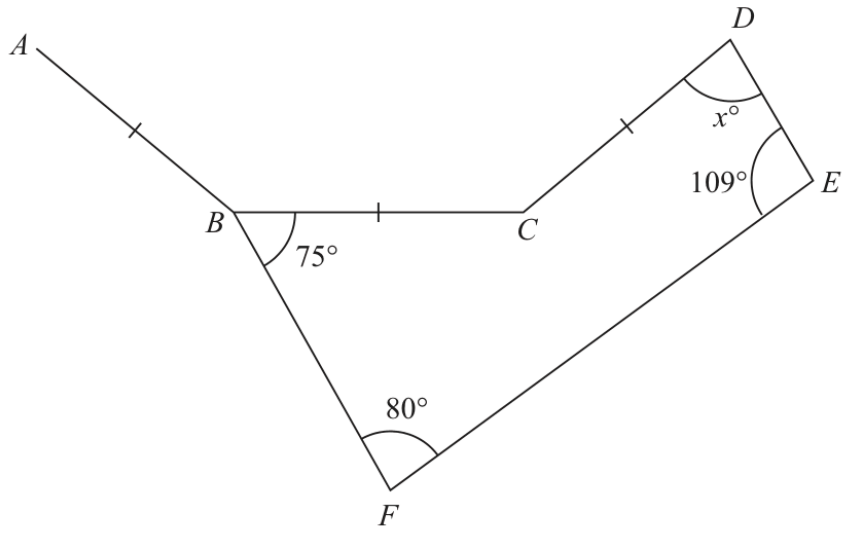


Diagram **NOT** accurately drawn

BCDEF is a pentagon.
AB, *BC* and *CD* are three sides of a regular 10-sided polygon.

Find the value of x

$x =$ .....

(Total for Question 15 is 3 marks)

WORKED SOLUTION

Question 15 · 4MA1/1HR June 2026

1 **Solution | Step 1**

$$\text{interior angle of a regular decagon} = \frac{(10-2)180^\circ}{10} = 144^\circ.$$

BC and CD are consecutive sides of the regular decagon.

2 **Solution | Step 2**

$$\text{reflex interior angle at C} = 360^\circ - 144^\circ = 216^\circ.$$

The pentagon BCDEF is concave at C, and its interior lies on the other side from the decagon interior angle.

3 Solution | Step 3

$$75^\circ + 216^\circ + x + 109^\circ + 80^\circ = (5-2)180^\circ = 540^\circ,$$

The interior-angle sum formula also applies to a simple concave pentagon.

4 Solution | Step 4

$$x = 540^\circ - 480^\circ = 60^\circ.$$

Subtract the four known interior angles.

FINAL ANSWER

$x = 60^\circ$

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Question 16

6 marks | Algebraic Fractions

16 (a) Express $\frac{5}{8} - \frac{x+2}{4x}$ as a single fraction in its simplest form.

.....

(3)

(b) Expand and simplify $3x(2x - 1)(x + 4)$

.....

(3)

(Total for Question 16 is 6 marks)

WORKED SOLUTION

Question 16 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

$$\frac{5}{8} - \frac{x+2}{4x} = \frac{5x}{8x} - \frac{2(x+2)}{8x}, \qquad x \neq 0.$$

Use 8x as a common denominator.

2 **Part (a) | Step 2**

$$\frac{5x - 2(x+2)}{8x} = \frac{5x - 2x - 4}{8x} = \frac{3x - 4}{8x}.$$

Subtract the entire numerator of the second fraction and collect like terms.

3 **Part (b) | Step 1**

$$(2x - 1)(x + 4) = 2x^2 + 8x - x - 4 = 2x^2 + 7x - 4.$$

Multiply each term in the first bracket by each term in the second.

4 **Part (b) | Step 2**

$$3x(2x^2 + 7x - 4) = 6x^3 + 21x^2 - 12x.$$

Multiply every term by 3x.

FINAL ANSWER

(a) $\frac{3x-4}{8x}$ (b) $6x^3 + 21x^2 - 12x$

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Question 17

5 marks | Differentiation & Turning Points

17 $y = x^3 + 5x^2 - 8x$

(a) Find $\dfrac{dy}{dx}$

$\dfrac{dy}{dx} =$ .....

(2)

The curve with equation $y = x^3 + 5x^2 - 8x$ has two stationary points, P and Q
The x-coordinate of P is less than the x-coordinate of Q

(b) Work out the coordinates of P
Show clear algebraic working.

(..... , ...)

(3)

(Total for Question 17 is 5 marks)

WORKED SOLUTION

Question 17 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

$$\frac{dy}{dx} = 3x^2 + 10x - 8.$$

Apply the power rule to each term of y=x^3+5x^2-8x.

2 **Part (b) | Step 1**

$$3x^2 + 10x - 8 = 0 \quad \Longrightarrow \quad (3x - 2)(x + 4) = 0.$$

At a stationary point the derivative is zero.

3 **Part (b) | Step 2**

$$x = \frac{2}{3} \quad \text{or} \quad x = -4.$$

Set each factor equal to zero.

4

Part (b) | Step 3

P has the smaller x-coordinate, so $x_P = -4$. Then

$$y_P = (-4)^3 + 5(-4)^2 - 8(-4) = -64 + 80 + 32 = 48.$$

Choose the left-hand stationary point and substitute into the original curve equation.

FINAL ANSWER

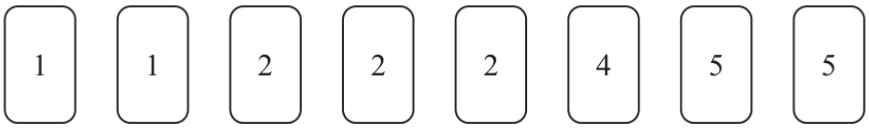
(a) $\frac{dy}{dx} = 3x^2 + 10x - 8$ (b) $P = (-4, 48)$

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Question 18

3 marks | Tree Diagrams & Conditional Probability

18 Here are 8 cards.
There is a number on each card.



Gordon puts the 8 cards in a bag.
He takes at random a card from the bag and does not replace it.
Gordon then takes at random a second card from the bag.

Calculate the probability that the number on the second card is 3 more than the number on the first card.

.....

(Total for Question 18 is 3 marks)

WORKED SOLUTION

Question 18 · 4MA1/1HR June 2026

1 Solution | Step 1

The only possible ordered number pairs are $(1, 4)$ and $(2, 5)$.
The second number must be exactly 3 more than the first, not merely differ by 3.

2 Solution | Step 2

$$P(1 \text{ then } 4) = \frac{2}{8} \times \frac{1}{7}, \qquad P(2 \text{ then } 5) = \frac{3}{8} \times \frac{2}{7}.$$

There are 7 cards remaining for the second draw; there are two 1s, three 2s, one 4 and two 5s.

3 Solution | Step 3

$$P = \frac{2}{56} + \frac{6}{56} = \frac{8}{56} = \frac{1}{7}.$$

The two ordered events are mutually exclusive, so add their probabilities.

FINAL ANSWER

$\frac{1}{7}$

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Question 19

5 marks | Circle Theorems

19 P, Q, R and S are points on a circle, centre O

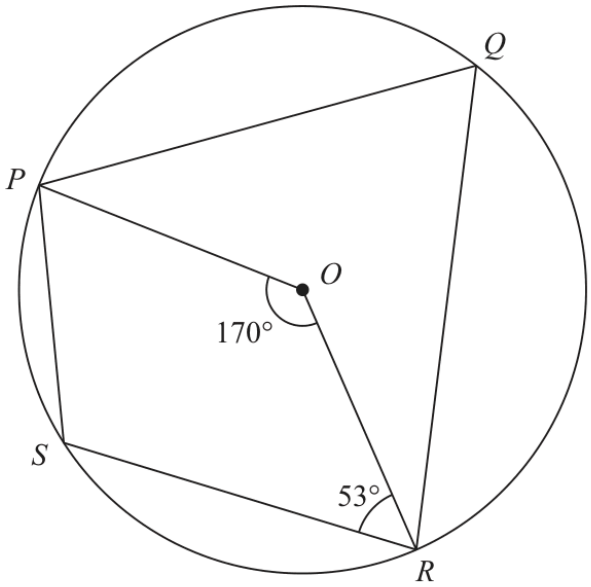


Diagram **NOT** accurately drawn

Angle $POR = 170°$ Angle $ORS = 53°$

Find the size of angle SPO
Give a reason for each stage of your working.

.....°

.....

(Total for Question 19 is 5 marks)

WORKED SOLUTION

Question 19 · 4MA1/1HR June 2026

1 **Solution | Step 1**

$$\angle PQR = \frac{170°}{2} = 85°.$$

The angle at the centre is twice the angle at the circumference subtended by the same arc PR containing S.

2 **Solution | Step 2**

$$\angle PSR = 180° - 85° = 95°.$$

Opposite angles of cyclic quadrilateral PQRS sum to 180 degrees.

3 **Solution | Step 3**

$$\angle SPO = 360^\circ - (170^\circ + 53^\circ + 95^\circ) = 42^\circ.$$

The interior angles of quadrilateral PSRO sum to 360 degrees; its other angles are POR, ORS and PSR.

✓ **FINAL ANSWER**

$\angle SPO = 42^\circ$

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Question 20

5 marks | Direct & Inverse Proportion

20 y is directly proportional to t^2
$y = 40$ when $t = 4$

t is directly proportional to the cube root of x
$t = 12$ when $x = 8$

Work out the value of y when $x = 27$

$y =$ .....

(Total for Question 20 is 5 marks)

WORKED SOLUTION

Question 20 · 4MA1/1HR June 2026

1 Solution | Step 1

$$y = kt^2, \qquad 40 = k(4^2) \implies k = \frac{5}{2}.$$

Direct proportionality to t squared means a constant times t squared.

2 Solution | Step 2

$$t = c\sqrt[3]{x}, \qquad 12 = c\sqrt[3]{8} = 2c \implies c = 6.$$

Find the second proportionality constant using the given pair of values.

3 Solution | Step 3

$$x = 27 \implies t = 6\sqrt[3]{27} = 18.$$

Use the cube-root relationship first.

4 Solution | Step 4

$$y = \frac{5}{2}(18)^2 = 810.$$

Substitute the new value of t into the square relationship.

FINAL ANSWER

$y = 810$

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Question 21

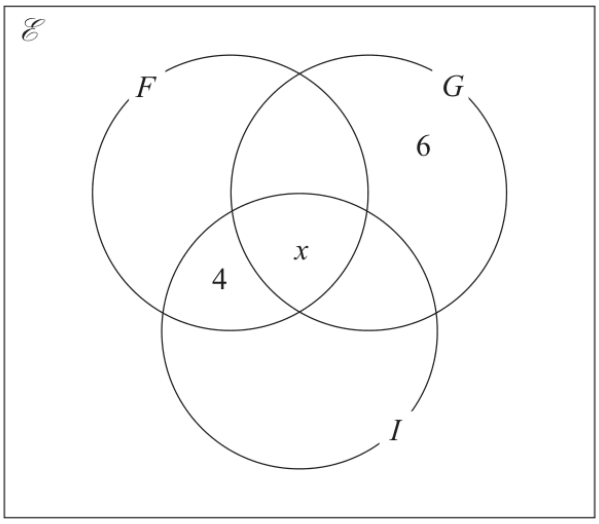
5 marks | Set Notation & Venn Diagrams

21 60 students were asked if they study French (F), German (G) or Italian (I)

Of these students

32 students study French
24 students study German
27 students study Italian
16 students study French and German
15 students study German and Italian

The incomplete Venn diagram gives some more information about the languages the 60 students study.



(a) Work out the value of x

$x =$ .....

(3)

(b) Work out how many of the 60 students study none of French or German or Italian.

.....

(2)

(Total for Question 21 is 5 marks)

WORKED SOLUTION

Question 21 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

The French-and-German-only region is $16 - x$, and the German-and-Italian-only region is $15 - x$. The totals 16 and 15 each include the triple intersection x.

2 **Part (a) | Step 2**

$$6 + (16 - x) + (15 - x) + x = 24.$$

The four disjoint regions in the German set must total 24.

---

3 **Part (a) | Step 3**

$$37 - x = 24 \quad \Longrightarrow \quad x = 13.$$

Solve for the common triple-intersection count.

---

4 **Part (b) | Step 1**

$$FG \text{ only} = 16 - 13 = 3, \qquad GI \text{ only} = 15 - 13 = 2.$$

Use the triple-intersection value from part (a).

---

5 **Part (b) | Step 2**

$$F \text{ only} = 32 - (3 + 4 + 13) = 12, \qquad I \text{ only} = 27 - (4 + 2 + 13) = 8.$$

The French-and-Italian-only count is the given 4.

---

6 **Part (b) | Step 3**

$$n(F \cup G \cup I) = 12 + 6 + 8 + 3 + 4 + 2 + 13 = 48.$$

Sum all seven mutually exclusive interior regions.

---

7 **Part (b) | Step 4**

$$n(\text{none}) = 60 - 48 = 12.$$

Subtract the union from the total number of students.

✓ **FINAL ANSWER**

(a) $x = 13$ (b) 12 students.

4MA1/1HR JUNE 2026

Question 22

4 marks | Sine & Cosine Rules

22 The diagram shows triangle ABC

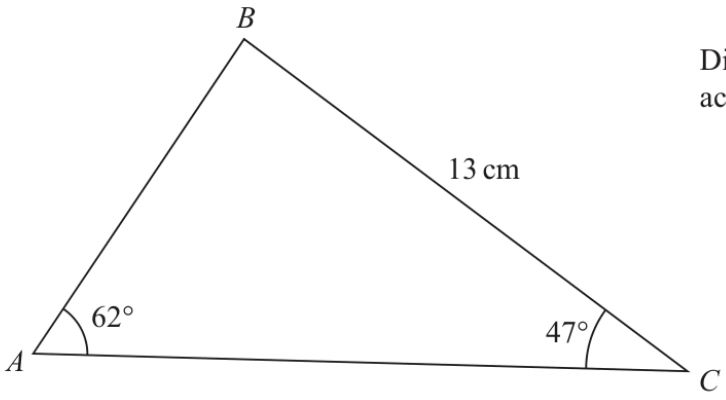


Diagram **NOT** accurately drawn

Calculate the area of the triangle.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 22 is 4 marks)

WORKED SOLUTION

Question 22 · 4MA1/1HR June 2026

1 **Solution | Step 1**

$$\angle ABC = 180^\circ - 62^\circ - 47^\circ = 71^\circ.$$

The three triangle angles sum to 180 degrees.

2 **Solution | Step 2**

$$\frac{AB}{\sin 47^\circ} = \frac{13}{\sin 62^\circ} \quad \Longrightarrow \quad AB = \frac{13 \sin 47^\circ}{\sin 62^\circ} = 10.7680208859\ldots \text{ cm}.$$

Match each side to its opposite angle in the sine rule.

3 **Solution | Step 3**

$$\text{Area} = \frac{1}{2}(13)\left(\frac{13 \sin 47^\circ}{\sin 62^\circ}\right)\sin 71^\circ = 66.1788645053\ldots \text{ cm}^2.$$

Use half the product of two sides times the sine of their included angle; retain unrounded values.

4 Solution | Step 4

$$\text{Area} = 66.2\ \text{cm}^2 \quad (3\ \text{significant figures}).$$

Round only the final area.

FINAL ANSWER

$66.2\ \text{cm}^2$

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Question 23

7 marks | Functions

23 The function f is such that $f(x) = \frac{1}{x}$

(a) Write down the value of x that cannot be included in any domain of f

.....

(1)

The function g is such that $g(x) = 4x^2 - 8x + 15$
The domain of g is $x \geqslant 1$

(b) Work out $gf(0.5)$

.....

(2)

(c) Express the inverse function g^{-1} in the form $g^{-1}(x) = ...$

$g^{-1}(x) =$ .....

(4)

(Total for Question 23 is 7 marks)

WORKED SOLUTION

Question 23 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

For $f(x) = \frac{1}{x}$, the denominator is zero when $x = 0$.
Division by zero is undefined, so this input must be excluded.

2 **Part (b) | Step 1**

$$f(0.5) = \frac{1}{0.5} = 2.$$

In gf, apply f first.

3 **Part (b) | Step 2**

$$gf(0.5) = g(2) = 4(2)^2 - 8(2) + 15 = 16 - 16 + 15 = 15.$$

The input 2 lies in the stated domain x>=1 of g.

4 **Part (c) | Step 1**

$$y = 4x^2 - 8x + 15 = 4(x - 1)^2 + 11.$$

Complete the square to isolate the expression containing x.

5 **Part (c) | Step 2**

$$(x-1)^2 = \frac{y-11}{4}, \qquad x-1 = \frac{\sqrt{y-11}}{2}.$$

Choose the nonnegative root because the domain of g is x>=1.

6 **Part (c) | Step 3**

$$x = 1 + \frac{\sqrt{y-11}}{2}.$$

Rearrange to make the original input the subject.

7 **Part (c) | Step 4**

$$g^{-1}(x) = 1 + \frac{\sqrt{x-11}}{2}, \qquad x \geq 11.$$

Exchange the input and output labels; the range of g becomes the domain of the inverse.

✓ **FINAL ANSWER**

(a) $x = 0$ must be excluded. (b) $gf(0.5) = 15$ (c) $g^{-1}(x) = 1 + \frac{\sqrt{x-11}}{2}, \quad x \geq 11$

4MA1/1HR JUNE 2026

Question 24

4 marks | Circle Theorems

24 The centre of a circle is the point with coordinates (3, 1)

The point P with coordinates (7, 6) lies on the circle.

The line **L** is the tangent to the circle at P

Find an equation for **L**
Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

.....

(Total for Question 24 is 4 marks)

WORKED SOLUTION

Question 24 · 4MA1/1HR June 2026

1 **Solution | Step 1**

$$m_{CP} = \frac{6-1}{7-3} = \frac{5}{4}.$$

Find the gradient of the radius from the centre C=(3,1) to P=(7,6).

2 **Solution | Step 2**

$$m_L = -\frac{4}{5}.$$

The tangent is perpendicular to the radius at P, so its gradient is the negative reciprocal.

3 **Solution | Step 3**

$$y - 6 = -\frac{4}{5}(x - 7).$$

Use the tangent gradient and the given point of contact.

4 **Solution | Step 4**

$$5y - 30 = -4x + 28 \quad \Longrightarrow \quad 4x + 5y - 58 = 0.$$

Multiply by 5 and collect all terms on one side to obtain integer coefficients.

✓ **FINAL ANSWER**

$$4x + 5y - 58 = 0$$

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Question 25

6 marks | Vectors

25

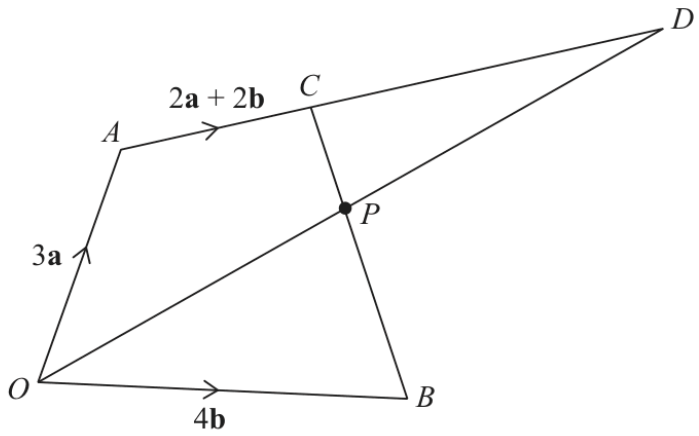


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = 3\mathbf{a}$ $\overrightarrow{OB} = 4\mathbf{b}$ $\overrightarrow{AC} = 2\mathbf{a} + 2\mathbf{b}$ $\overrightarrow{CD} = \frac{3}{2} \times \overrightarrow{AC}$

P is the point on BC such that OPD is a straight line.

(a) Find $\overrightarrow{OD}$ in terms of **a** and **b**
Give your answer in its simplest form.

.....

(2)

(b) Find the ratio $OP : PD$
Show your working clearly.

.....

(4)

(Total for Question 25 is 6 marks)

WORKED SOLUTION

Question 25 · 4MA1/1HR June 2026

1 **Part (a) | Step 1**

$$\overrightarrow{CD} = \frac{3}{2}(2\mathbf{a} + 2\mathbf{b}) = 3\mathbf{a} + 3\mathbf{b}.$$

Use the stated relationship between CD and AC.

2 **Part (a) | Step 2**

$$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AC} + \overrightarrow{CD} = 3\mathbf{a} + (2\mathbf{a} + 2\mathbf{b}) + (3\mathbf{a} + 3\mathbf{b}) = 8\mathbf{a} + 5\mathbf{b}.$$

Add consecutive vectors along the route O-A-C-D.

3 **Part (b) | Step 1**

$$\overrightarrow{OC} = 3\mathbf{a} + (2\mathbf{a} + 2\mathbf{b}) = 5\mathbf{a} + 2\mathbf{b}, \qquad \overrightarrow{BC} = 5\mathbf{a} - 2\mathbf{b}.$$

Use OC=OA+AC and BC=OC-OB.

4 **Part (b) | Step 2**

Write $\overrightarrow{OP} = t\overrightarrow{OD} = 8t\mathbf{a} + 5t\mathbf{b}$. Also, because P lies on BC,

$$\overrightarrow{OP} = \overrightarrow{OB} + s\overrightarrow{BC} = 5s\mathbf{a} + (4 - 2s)\mathbf{b}.$$

Use one scalar parameter on each of the two intersecting lines.

5 **Part (b) | Step 3**

$$8t = 5s, \qquad 5t = 4 - 2s, \qquad s = \frac{8}{5}t.$$

Equate the coefficients of the two nonparallel base vectors.

6 **Part (b) | Step 4**

$$5t = 4 - \frac{16}{5}t \quad \Longrightarrow \quad 41t = 20 \quad \Longrightarrow \quad t = \frac{20}{41}.$$

Substitute the first relation into the second and solve.

7 **Part (b) | Step 5**

$$OP : PD = t : (1 - t) = \frac{20}{41} : \frac{21}{41} = 20 : 21.$$

OD is divided into the fractions t and 1-t at P.

✓ **FINAL ANSWER**

(a) $\overrightarrow{OD} = 8\mathbf{a} + 5\mathbf{b}$ (b) $OP : PD = 20 : 21$

4MA1/1HR JUNE 2026

Question 26

3 marks | Algebraic Roots & Indices

26

$$\frac{27^x \times 3^{n+6}}{9^{4-n}} = \frac{6^x}{2^x}$$

Express x in terms of n
Show your working clearly and simplify your expression.

$x =$ .....

(Total for Question 26 is 3 marks)

WORKED SOLUTION

Question 26 · 4MA1/1HR June 2026

1 Solution | Step 1

$$27 = 3^3, \qquad 9 = 3^2, \qquad \frac{6^x}{2^x} = \left(\frac{6}{2}\right)^x = 3^x.$$

Write both sides in a common base.

2 Solution | Step 2

$$\frac{27^x \times 3^{n+6}}{9^{4-n}} = 3^{3x+n+6-2(4-n)} = 3^{3x+3n-2}.$$

Multiply powers by adding indices and divide powers by subtracting indices.

3 Solution | Step 3

$$3^{3x+3n-2} = 3^x \quad \Longrightarrow \quad 3x + 3n - 2 = x.$$

The base-3 exponential is one-to-one, so equal powers have equal indices.

4 Solution | Step 4

$$2x = 2 - 3n \quad \Longrightarrow \quad x = 1 - \frac{3n}{2}.$$

Collect the x terms and divide by 2.

FINAL ANSWER

$x = 1 - \frac{3n}{2}$