Elite Mathematics
Pearson Edexcel International GCSE

IGCSE LINEAR · 4MA1

4MA1/1H June 2026 Worked Solutions

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

25	2020–2026	Single-paper solutions
paper questions	55 past papers	checked by Dr Eslam



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PAST PAPER

4MA1/1H June 2026

June 2026

25	100	2 h
questions	marks	exam time

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

4MA1/1H JUNE 2026

Question 1

3 marks | Fractions

1 Show that $4\frac{1}{7} - 2\frac{3}{5} = 1\frac{19}{35}$

(Total for Question 1 is 3 marks)

WORKED SOLUTION

Question 1 · 4MA1/1H June 2026

1 **Solution | Step 1**

$$4\frac{1}{7} = \frac{29}{7}, \qquad 2\frac{3}{5} = \frac{13}{5}.$$

Convert each mixed number to an improper fraction.

2 **Solution | Step 2**

$$\frac{29}{7} - \frac{13}{5} = \frac{145 - 91}{35} = \frac{54}{35} = 1\frac{19}{35}.$$

Use the common denominator 35, subtract, then convert back to a mixed number.

✓ **FINAL ANSWER**

$1\frac{19}{35}$

4MA1/1H JUNE 2026

Question 2

3 marks | Right-Angled Triangles - Pythagoras & Trigonometry

2

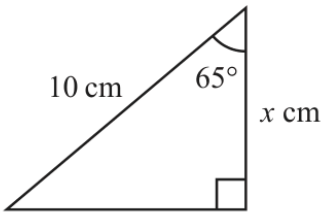


Diagram **NOT** accurately drawn

Work out the value of x
Give your answer correct to 3 significant figures.

$x =$ .....

(Total for Question 2 is 3 marks)

WORKED SOLUTION

Question 2 · 4MA1/1H June 2026

1 Solution | Step 1

$$\cos 65^\circ = \frac{x}{10}.$$

The side of length 10 cm is the hypotenuse and x is adjacent to the given angle.

2 Solution | Step 2

$$x = 10\cos 65^\circ = 4.22618\ldots = 4.23 \text{ cm} \quad (3 \text{ s.f.}).$$

Multiply by 10 and round only the final value.

FINAL ANSWER

$x = 4.23$ cm

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Question 3

3 marks | Set Notation & Venn Diagrams

3 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$

$A = \{\text{factors of } 20\}$

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

(a) List the members of the set

(i) $A \cup B$

.....

(1)

(ii) $A \cap B'$

.....

(1)

$C = \{\text{prime numbers}\}$

Ana writes down the statement $A \cap C = \varnothing$
Ana's statement is wrong.

(b) Explain why.

.....

.....

(1)

(Total for Question 3 is 3 marks)

WORKED SOLUTION

Question 3 · 4MA1/1H June 2026

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

$A = \{1, 2, 4, 5, 10\}$ and $B = \{5, 10, 15\}$, so $A \cup B = \{1, 2, 4, 5, 10, 15\}$.

Include every member of either set once; 20 lies outside the universal set.

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

$A \cap B' = \{1, 2, 4\}$.

Retain the factors of 20 in the universal set which are not multiples of 5.

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

Both 2 and 5 are prime factors of 20, so $A \cap C = \{2, 5\} \neq \varnothing$.

A shared member is enough to disprove the claim that the intersection is empty.

FINAL ANSWER

(a(i)) $\{1, 2, 4, 5, 10, 15\}$ (a(ii)) $\{1, 2, 4\}$ (b) $A \cap C = \{2, 5\}$, not the empty set.

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Question 4

4 marks | Standard & Compound Units

4 Henri competes in a race.

For the first part of the race Henri cycles 60 km at an average speed of 24 km/h
For the remaining part of the race Henri runs for 1 hour and 15 minutes at an average speed of 12 km/h

Work out Henri's average speed for the whole race.
Give your answer in km/h
Show your working clearly.

..... km/h

(Total for Question 4 is 4 marks)

WORKED SOLUTION

Question 4 · 4MA1/1H June 2026

1 Solution | Step 1

Cycling time: $60 \div 24 = 2.5$ hours. Running time: $1 + 15/60 = 1.25$ hours.
Time equals distance divided by speed.

2 Solution | Step 2

Running distance: $12 \times 1.25 = 15$ km. Total distance: $60 + 15 = 75$ km. Total time: $2.5 + 1.25 = 3.75$ hours.
Combine the actual distances and times.

3 Solution | Step 3

$$\text{Average speed} = \frac{75}{3.75} = 20 \text{ km/h}.$$

Average speed is total distance divided by total time, not the mean of the two speeds.

FINAL ANSWER

20 km/h

4MA1/1H JUNE 2026

Question 5

7 marks | Inequalities (Solving & Graphing)

5 (a) Expand $4e(2e-3)$

.....

(1)

(b) Expand and simplify $(f+3)(f-6)$

.....

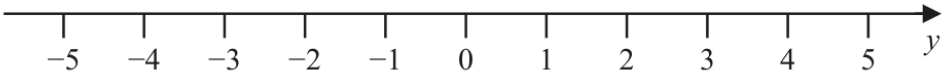
(2)

(c) Make x the subject of $t = ax - 2n$

.....

(2)

(d) On the number line, represent the inequality $-1 < y \leqslant 3$



(2)

(Total for Question 5 is 7 marks)

WORKED SOLUTION

Question 5 · 4MA1/1H June 2026

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

$$4e(2e-3) = 8e^2 - 12e.$$

Multiply 4e by both terms in the bracket.

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

$$(f+3)(f-6) = f^2 - 6f + 3f - 18 = f^2 - 3f - 18.$$

Multiply each term in the first bracket by each term in the second and collect like terms.

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

From $t = ax - 2n$, add $2n$ to give $t + 2n = ax$.

Use the same operation on both sides.

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

$$x = \frac{t + 2n}{a} \quad (a \neq 0).$$

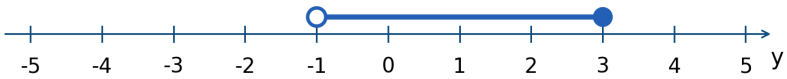
Divide by the coefficient of x.

---

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

Draw an open circle at $y = -1$, a filled circle at $y = 3$, and a straight segment joining them. The represented interval is $(-1, 3]$.

The strict lower inequality excludes -1; the non-strict upper inequality includes 3.



✓ **FINAL ANSWER**

(a) $8e^2 - 12e$ (b) $f^2 - 3f - 18$ (c) $x = (t + 2n)/a$ (d) $(-1, 3]$

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Question 6

2 marks | Algebraic Roots & Indices

6 Simplify $\left(4x^5y^6\right)^3$

.....

(Total for Question 6 is 2 marks)

WORKED SOLUTION

Question 6 · 4MA1/1H June 2026

1 Solution | Step 1

$$(4x^5y^6)^3 = 4^3x^{5\times3}y^{6\times3} = 64x^{15}y^{18}.$$

Raise each factor to the third power and multiply exponents for a power of a power.

FINAL ANSWER

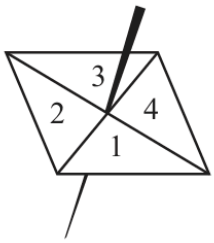
$64x^{15}y^{18}$

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Question 7

4 marks | Probability Toolkit

7 Here is a biased 4-sided spinner.



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

Number	1	2	3	4
Probability	0.12	x	$2x$	0.16

Nevan spins the spinner 500 times.

Work out the expected number of times that the spinner lands on an even number.

.....

(Total for Question 7 is 4 marks)

WORKED SOLUTION

Question 7 · 4MA1/1H June 2026

1 Solution | Step 1

$$0.12 + x + 2x + 0.16 = 1 \implies 3x = 0.72 \implies x = 0.24.$$

The four exhaustive outcome probabilities sum to 1.

2 Solution | Step 2

$$P(\text{even}) = P(2) + P(4) = 0.24 + 0.16 = 0.40.$$

The events 2 and 4 are mutually exclusive.

3 Solution | Step 3

$$\text{Expected number} = 500 \times 0.40 = 200.$$

Multiply the number of spins by the probability of an even result.

FINAL ANSWER

200

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Question 8

3 marks | Standard & Compound Units

8 Change a speed of 70 metres per second to a speed in kilometres per hour.
Show your working clearly.

..... km/h

(Total for Question 8 is 3 marks)

WORKED SOLUTION

Question 8 · 4MA1/1H June 2026

1 Solution | Step 1

$$70\ \text{m/s} = 70 \times 3600 = 252000\ \text{m/h}.$$

There are 3600 seconds in one hour.

2 Solution | Step 2

$$252000 \div 1000 = 252\ \text{km/h}.$$

There are 1000 metres in one kilometre.

FINAL ANSWER

$252\ \text{km/h}$

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Question 9

3 marks | Standard Form

9 (a) Write 0.0651 in standard form.

.....

(1)

(b) Work out $\left(4 \times 10^{56}\right) \times \left(8 \times 10^{74}\right)$

Give your answer in standard form.

.....

(2)

(Total for Question 9 is 3 marks)

WORKED SOLUTION

Question 9 · 4MA1/1H June 2026

1 Part (a) | Step 1

$$0.0651 = 6.51 \times 10^{-2}.$$

The coefficient must be at least 1 and less than 10.

2 Part (b) | Step 1

$$(4 \times 10^{56})(8 \times 10^{74}) = 32 \times 10^{130} = 3.2 \times 10^{131}.$$

Multiply the coefficients, add the exponents, and adjust the coefficient to standard form.

FINAL ANSWER

(a) 6.51×10^{-2} (b) 3.2×10^{131}

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Question 10

3 marks | Simultaneous Equations

10 Solve the simultaneous equations

$$4x + 3y = 9$$
$$2x - 2y = -13$$

Show clear algebraic working.

$x =$ .....

$y =$ .....

(Total for Question 10 is 3 marks)

WORKED SOLUTION

Question 10 · 4MA1/1H June 2026

1 Solution | Step 1

$$4x + 3y = 9, \qquad 2x - 2y = -13.$$

Use both equations.

2 Solution | Step 2

Double the second equation: $4x - 4y = -26$. Subtract this from the first: $7y = 35$, so $y = 5$.

Equal x coefficients allow elimination.

3 Solution | Step 3

$$2x - 2(5) = -13 \implies 2x = -3 \implies x = -\frac{3}{2}.$$

Substitute back to find the other unknown.

FINAL ANSWER

$x = -\frac{3}{2}$, $y = 5$

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Question 11

5 marks | Perimeter & Area

11 The diagram shows a shaded shape $ABCDEO$ made from a semicircle BCD and two identical right-angled triangles ABO and EDO

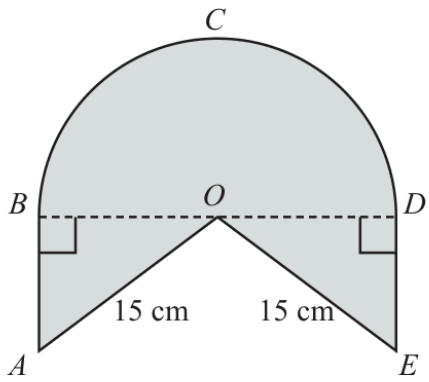


Diagram **NOT** accurately drawn

BD is the diameter of the semicircle.
O is the midpoint of BD

angle ABO = angle EDO = 90° $\quad AO = EO = 15$ cm

The area of semicircle BCD is 227 cm^2

Work out the perimeter of the shaded shape.
Show your working clearly.
Give your answer correct to one decimal place.

..... cm

(Total for Question 11 is 5 marks)

WORKED SOLUTION

Question 11 · 4MA1/1H June 2026

1 **Solution | Step 1**

Let the radius be $r = OB = OD$. Then $\frac{1}{2}\pi r^2 = 227$, so $r = \sqrt{454/\pi} = 12.021343\ldots$ cm.
The given area belongs to the semicircle.

2 **Solution | Step 2**

$$AB = DE = \sqrt{15^2 - r^2} = 8.971472\ldots \text{ cm.}$$

The identical triangles have hypotenuse 15 cm and horizontal leg r.

3 Solution | Step 3

$$P = \pi r + AB + DE + AO + EO = \pi r + 2\sqrt{225 - r^2} + 30 = 85.709107\ldots \text{ cm}.$$

The boundary contains the semicircular arc and the four outer triangle sides, but not the internal diameter.

4 Solution | Step 4

$$P = 85.7 \text{ cm} \quad (1 \text{ d.p.}).$$

Retain unrounded intermediate values.

FINAL ANSWER

85.7 cm

4MA1/1H JUNE 2026

Question 12

6 marks | Expanding Brackets

12 $\dfrac{2^3}{8^x} = 64$

(a) Find the value of x
Show clear algebraic working.

$x =$ .....

(3)

(b) Expand and simplify $4t(t + 5)(2t - 3)$

.....

(3)

(Total for Question 12 is 6 marks)

WORKED SOLUTION

Question 12 · 4MA1/1H June 2026

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

$$\frac{2^{x/3}}{8^x} = \frac{2^{x/3}}{2^{3x}} = 2^{x/3-3x} = 2^{-8x/3}.$$

Write 8 as a power of 2 and subtract exponents when dividing.

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

$$2^{-8x/3} = 64 = 2^6 \implies -\frac{8x}{3} = 6 \implies x = -\frac{9}{4}.$$

Equal powers of base 2 have equal exponents.

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

$$(t+5)(2t-3) = 2t^2 - 3t + 10t - 15 = 2t^2 + 7t - 15.$$

Expand the two brackets and collect like terms.

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

$$4t(t+5)(2t-3) = 4t(2t^2 + 7t - 15) = 8t^3 + 28t^2 - 60t.$$

Multiply every term by 4t.

FINAL ANSWER

(a) $x = -\frac{9}{4}$ (b) $8t^3 + 28t^2 - 60t$

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Question 13

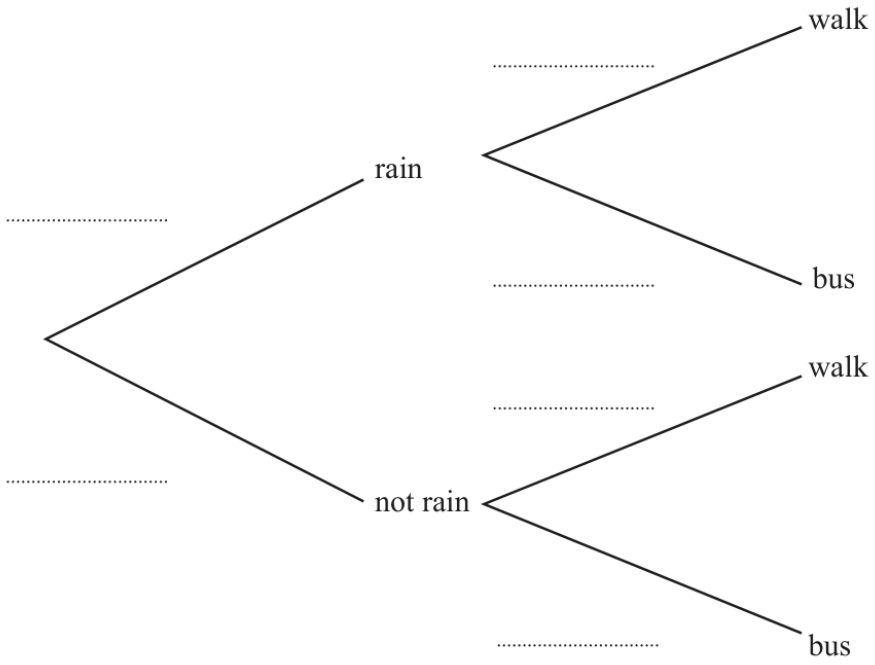
4 marks | Tree Diagrams & Conditional Probability

13 On any school day, Paulo either walks to school or travels by bus to school.

The probability that it rains on any school day is 0.15

If it rains on a school day, the probability that Paulo walks to school is 0.2
If it does not rain on a school day, the probability that Paulo walks to school is 0.75

(a) Complete the probability tree diagram for this information.



(2)

(b) Work out the probability that on a school day, it rains and Paulo walks to school.

.....

(2)

(Total for Question 13 is 4 marks)

WORKED SOLUTION

Question 13 · 4MA1/1H June 2026

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

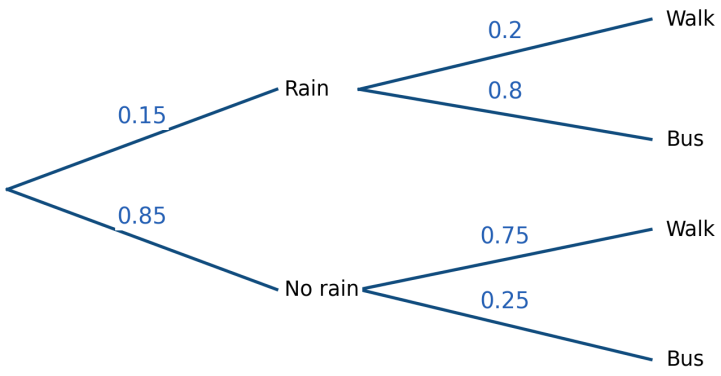
First split: rain 0.15, not rain 0.85.

Complementary branches sum to 1.

2 Part (a) | Step 2

After rain: walk 0.20, bus 0.80. After not rain: walk 0.75, bus 0.25.

Use the stated conditional probabilities and their complements on the corresponding branches.



3 Part (b) | Step 1

$$P(\text{rain and walk}) = P(\text{rain})P(\text{walk} \mid \text{rain}) = 0.15 \times 0.2 = 0.03.$$

Multiply the probabilities along the rain-then-walk path; independence is not assumed.

FINAL ANSWER

(a) Rain/not rain: $0.15, 0.85$; walk/bus after rain: $0.2, 0.8$; walk/bus after no rain: $0.75, 0.25$. (b) 0.03

4MA1/1H JUNE 2026

Question 14

3 marks | Compound Interest & Depreciation

14 In September, the sales in a shop increased by 20%
In October, the sales in the same shop decreased by x%

Over these two months, the sales in the shop decreased by 10%

Work out the value of x

$x =$ .....

(Total for Question 14 is 3 marks)

WORKED SOLUTION

Question 14 · 4MA1/1H June 2026

1 **Solution | Step 1**

Let the original sales be 100 units. After September they are $100 \times 1.20 = 120$; after both months they are $100 \times 0.90 = 90$.
Both overall percentages refer to the original sales.

2 **Solution | Step 2**

$$x = \frac{120 - 90}{120} \times 100 = 25.$$

The October decrease is measured relative to the September sales of 120.

✓ **FINAL ANSWER**

$x = 25$

4MA1/1H JUNE 2026

Question 15

2 marks | Linear Graphs

15 Point A has coordinates $(-3, 4)$
Point B has coordinates $(2, -6)$

Work out the gradient of the line AB

.....

(Total for Question 15 is 2 marks)

WORKED SOLUTION

Question 15 · 4MA1/1H June 2026

1 Solution | Step 1

$$m = \frac{-6 - 4}{2 - (-3)} = \frac{-10}{5} = -2.$$

Use change in y divided by the corresponding change in x.

FINAL ANSWER

-2

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Question 16

5 marks | Sine & Cosine Rules

16 The diagram shows triangle ABC

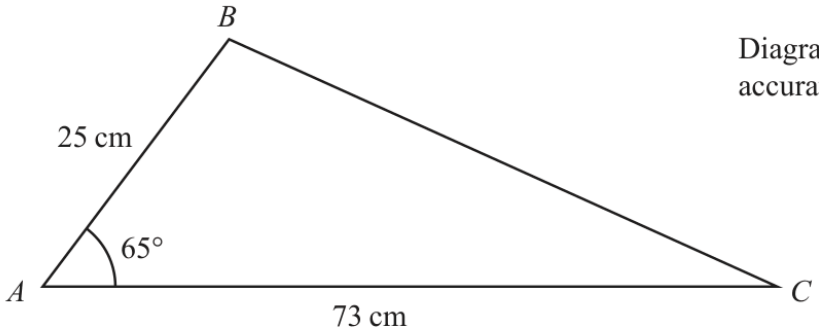


Diagram **NOT** accurately drawn

$AB = 25$ cm $\quad AC = 73$ cm $\quad$ angle $BAC = 65°$

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

..... cm

(3)

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

..... cm^2

(2)

(Total for Question 16 is 5 marks)

WORKED SOLUTION

Question 16 · 4MA1/1H June 2026

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

$$BC^2 = 25^2 + 73^2 - 2(25)(73)\cos 65°.$$

The included angle is between the two given sides.

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

$$BC^2 = 4411.443344\ldots, \quad BC = \sqrt{4411.443344\ldots} = 66.418697\ldots = 66.4 \text{ cm} \quad (3 \text{ s.f.}).$$

Take the positive square root for a length.

3 Part (b) | Step 1

$$\text{Area} = \frac{1}{2}(25)(73)\sin 65^\circ = 827.005855\ldots = 827\ \text{cm}^2 \quad (3\ \text{s.f.}).$$

Use half the product of the two sides and the sine of their included angle.

FINAL ANSWER

(a) $66.4\ \text{cm}$ (b) $827\ \text{cm}^2$

4MA1/1H JUNE 2026

Question 17

3 marks | Surds

17 Show that $\left(4-\sqrt{20}\right)\left(5-2\sqrt{5}\right)$ can be written in the form $a-\sqrt{b}$

where a and b are integers.

(Total for Question 17 is 3 marks)

WORKED SOLUTION

Question 17 · 4MA1/1H June 2026

1 Solution | Step 1

$$\sqrt{20}=2\sqrt{5}, \qquad (4-\sqrt{20})(5-2\sqrt{5})=(4-2\sqrt{5})(5-2\sqrt{5}).$$

Simplify the surd first.

2 Solution | Step 2

$$20-8\sqrt{5}-10\sqrt{5}+20=40-18\sqrt{5}.$$

Expand; the product of the two surd terms is positive 20.

3 Solution | Step 3

$$18\sqrt{5}=\sqrt{18^2\times 5}=\sqrt{1620}, \quad (4-\sqrt{20})(5-2\sqrt{5})=40-\sqrt{1620}.$$

Thus the required integer values are a=40 and b=1620.

FINAL ANSWER

$40-\sqrt{1620}$, so $a=40,\ b=1620$.

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Question 18

3 marks | Algebraic Fractions

18 Simplify fully $\dfrac{4x^2 - 9}{2x^2 - 5x - 12}$

Show clear algebraic working.

.....

(Total for Question 18 is 3 marks)

WORKED SOLUTION

Question 18 · 4MA1/1H June 2026

1 Solution | Step 1

$$4x^2 - 9 = (2x - 3)(2x + 3), \qquad 2x^2 - 5x - 12 = (2x + 3)(x - 4).$$

Use difference of squares for the numerator and factorise the denominator.

2 Solution | Step 2

$$\frac{4x^2 - 9}{2x^2 - 5x - 12} = \frac{(2x - 3)(2x + 3)}{(2x + 3)(x - 4)} = \frac{2x - 3}{x - 4}.$$

Cancel the common factor, not individual terms.

3 Solution | Step 3

The original fraction requires $x \neq -\frac{3}{2}$ and $x \neq 4$.

Cancellation does not restore excluded values.

✓ FINAL ANSWER

$\frac{2x-3}{x-4}$, $x \neq -\frac{3}{2}, 4$.

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Question 19

4 marks | Direct & Inverse Proportion

19 M is directly proportional to p^2

$M = 2$ when $p = 5$

(a) Find a formula for M in terms of p

.....

(3)

(b) Work out the value of M when $p = 15$

$M =$ .....

(1)

(Total for Question 19 is 4 marks)

WORKED SOLUTION

Question 19 · 4MA1/1H June 2026

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

$$M = kp^2, \qquad 2 = k(5^2) \implies k = \frac{2}{25}.$$

Introduce a constant of proportionality and use the given pair.

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

$$M = \frac{2p^2}{25}.$$

Substitute the constant into the general relationship.

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

$$M = \frac{2(15)^2}{25} = 18.$$

Use the formula from (a).

✓ **FINAL ANSWER**

(a) $M = 2p^2/25$ (b) $M = 18$

4MA1/1H JUNE 2026

Question 20

5 marks | Rounding, Estimation & Bounds

20 The final velocity, v m/s, of an object is given by

$$v = 2\left(\frac{s}{t}\right) - u$$

where

$s = 100$ correct to the nearest integer
$t = 1.68$ correct to 2 decimal places
$u = 0.5$ correct to 1 decimal place

By considering bounds, work out the value of v to a suitable degree of accuracy.
Show your working clearly.

.....

(Total for Question 20 is 5 marks)

WORKED SOLUTION

Question 20 · 4MA1/1H June 2026

1 Solution | Step 1

$$99.5 \leq s < 100.5, \quad 1.675 \leq t < 1.685, \quad 0.45 \leq u < 0.55.$$

Use half a rounding unit on each side of the stated value.

2 Solution | Step 2

For $v = 2s/t - u$, the lower limiting value is

$$v_L = \frac{2(99.5)}{1.685} - 0.55 = 117.550890\ldots \text{ m/s}.$$

Decrease the numerator, increase the positive denominator and subtract the largest u.

3 Solution | Step 3

The upper limiting value is

$$v_U = \frac{2(100.5)}{1.675} - 0.45 = 119.55 \text{ m/s}.$$

Increase the numerator, decrease the denominator and subtract the smallest u.

4

Solution | Step 4

Both limiting values round to $120\ \mathrm{m/s}$ to 2 significant figures. They do not round to the same integer, so

$$v = 120\ \mathrm{m/s} \quad (2\ \mathrm{s.f.}).$$

This is the greatest common significant-figure accuracy justified throughout the interval.

✓ **FINAL ANSWER**

$120\ \mathrm{m/s}$ to 2 significant figures.

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Question 21

5 marks | Differentiation & Turning Points

21 The diagram shows a solid cuboid.

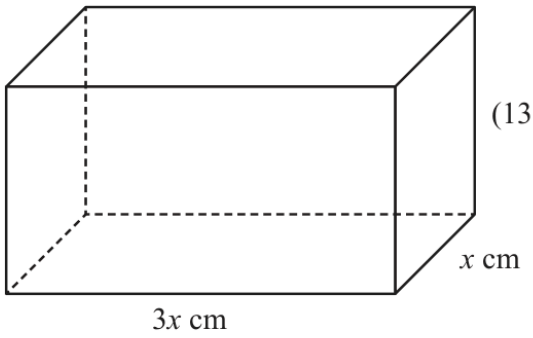


Diagram **NOT** accurately drawn

The volume of the cuboid is V cm^3

Find the maximum value of V
Show clear algebraic working.

$V =$ .....

(Total for Question 21 is 5 marks)

WORKED SOLUTION

Question 21 · 4MA1/1H June 2026

1 **Solution | Step 1**

$$V = (3x)(x)(13.5 - 2x) = 40.5x^2 - 6x^3, \qquad 0 < x < 6.75.$$

Multiply the three dimensions and require them all to be positive.

2 **Solution | Step 2**

$$\frac{dV}{dx} = 81x - 18x^2 = 9x(9 - 2x).$$

Differentiate each power of x.

3 **Solution | Step 3**

At a stationary point, $9x(9 - 2x) = 0$, giving $x = 0$ or $x = 4.5$. Only $x = 4.5$ is inside the domain.
A stationary volume has zero derivative.

4 **Solution | Step 4**

The derivative is positive for $0 < x < 4.5$ and negative for $4.5 < x < 6.75$. Hence $x = 4.5$ gives the maximum.
The volume increases then decreases; its limiting endpoint volumes are zero.

5 Solution | Step 5

$$V_{\max} = 3(4.5)^2(13.5 - 9) = 273.375 \text{ cm}^3.$$

Substitute the maximising value into the original volume.

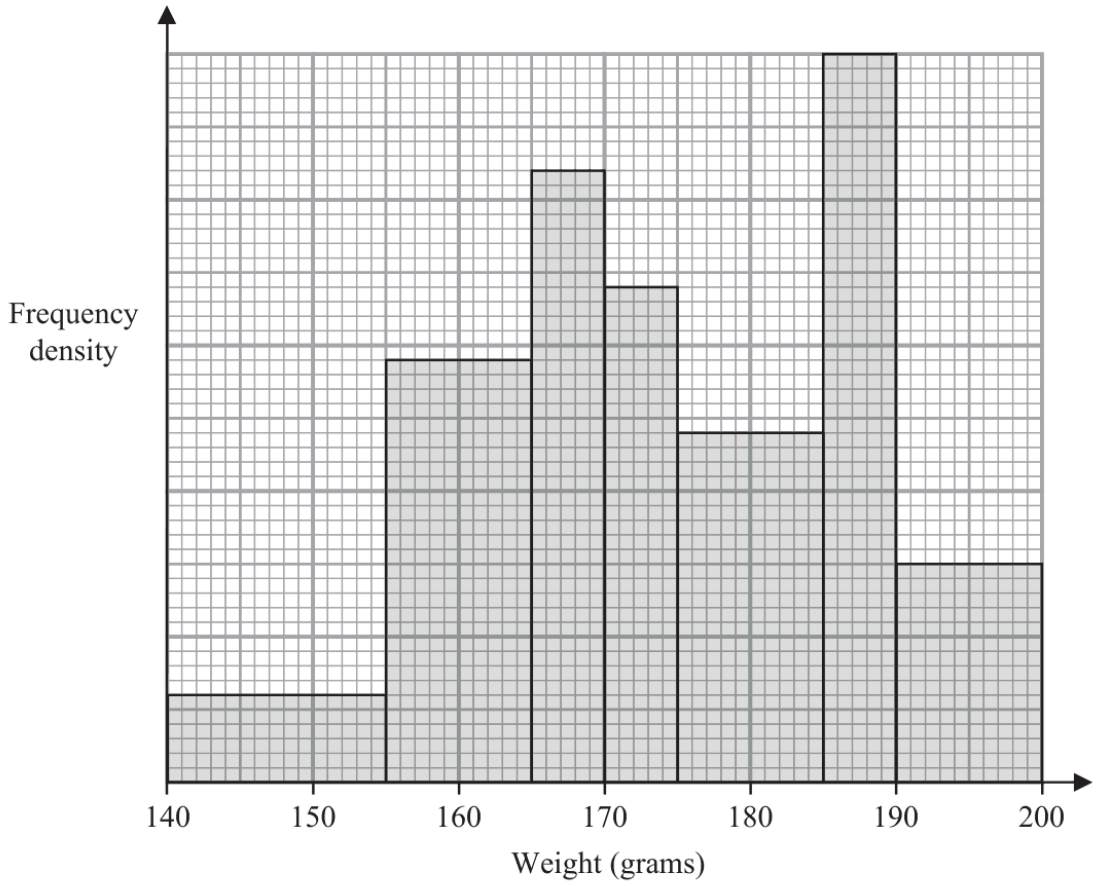
FINAL ANSWER

273.375 cm^3

Question 22

5 marks | Histograms

22 The histogram gives information about the weights, in grams, of all the apples in a shop.



There are 9 apples with a weight between 140 grams and 155 grams.

(a) Work out the number of apples with a weight less than 175 grams.

.....

(3)

An apple is classified as a large apple if it has a weight of more than 180 grams.
One of the large apples is chosen at random.

(b) Work out the probability that it has a weight of more than 190 grams.

.....

(2)

(Total for Question 22 is 5 marks)

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

The first class has width 15 g and frequency 9, so its density is $9/15 = 0.6$. Its height is 6 small grid squares, so each vertical square represents density 0.1.

Frequency is class width multiplied by frequency density.

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

The classes below 175 g have densities $0.6, 2.9, 4.2, 3.4$ and widths $15, 10, 5, 5$, respectively.

Read the bar heights using the calibrated vertical scale.

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

$$N = 15(0.6) + 10(2.9) + 5(4.2) + 5(3.4) = 9 + 29 + 21 + 17 = 76.$$

Add the frequencies, not the heights.

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

Above 180 g, the frequency from 180 to 185 is $5(2.4) = 12$, from 185 to 190 is $5(5) = 25$, and from 190 to 200 is $10(1.5) = 15$.

Use only half of the 175-185 bar and all of the two heavier classes.

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

$$P(W > 190 \mid W > 180) = \frac{15}{12 + 25 + 15} = \frac{15}{52}.$$

Restrict the denominator to the large apples.

✓ **FINAL ANSWER**

(a) 76 apples (b) $15/52$

4MA1/1H JUNE 2026

Question 23

5 marks | Tree Diagrams & Conditional Probability

23 A bag contains x marbles.
12 of the marbles are pink and the rest are yellow.

Greta takes at random 2 marbles from the bag.

The probability that Greta takes a pink marble and a yellow marble is $\frac{18}{47}$

Work out the value of x
Show clear algebraic working.

$x =$ .....

(Total for Question 23 is 5 marks)

WORKED SOLUTION

Question 23 · 4MA1/1H June 2026

1 Solution | Step 1

$$P(\text{one pink, one yellow}) = \frac{12}{x}\frac{x-12}{x-1} + \frac{x-12}{x}\frac{12}{x-1} = \frac{24(x-12)}{x(x-1)}.$$

Include pink-then-yellow and yellow-then-pink, without replacement.

2 Solution | Step 2

$$\frac{24(x-12)}{x(x-1)} = \frac{18}{47} \implies 1128(x-12) = 18x(x-1).$$

Equate to the given probability and cross-multiply.

3 Solution | Step 3

$$18x^2 - 1146x + 13536 = 0 \implies 3x^2 - 191x + 2256 = 0.$$

Rearrange and divide by 6.

4 Solution | Step 4

$$(x-48)(3x-47) = 0 \implies x = 48 \text{ or } x = \frac{47}{3}.$$

Factorise the quadratic.

5

Solution | Step 5

The number of marbles must be an integer, so $x = 48$.

Reject the non-integer root.

✓ **FINAL ANSWER**

$x = 48$

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Question 24

5 marks | Completing the Square

24 (a) Express $10 - 24x - 3x^2$ in the form $a - b(x + c)^2$ where a, b and c are integers.

.....

(3)

T is the curve with equation $y = 10 - 24(x - 1) - 3(x - 1)^2$
The point P is the maximum point on **T**

(b) Use your answer to part (a) to find the coordinates of P

(..... , ...)

(1)

(c) Write down the equation for the line of symmetry of **T**

.....

(1)

(Total for Question 24 is 5 marks)

WORKED SOLUTION

Question 24 · 4MA1/1H June 2026

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

$$10 - 24x - 3x^2 = 10 - 3(x^2 + 8x).$$

Factor -3 from the terms involving x.

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

$$x^2 + 8x = (x + 4)^2 - 16.$$

Half the coefficient of x is 4.

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

$$10 - 3\big((x + 4)^2 - 16\big) = 58 - 3(x + 4)^2.$$

Thus a=58, b=3 and c=4.

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

$$y = 58 - 3\big((x - 1) + 4\big)^2 = 58 - 3(x + 3)^2.$$

Use (a) with x replaced throughout by x-1.

5

Part (b) | Step 2

Since $(x+3)^2 \geq 0$, the greatest y is 58, attained at $x = -3$. Thus $P = (-3, 58)$.

The negative square term is largest when its square is zero.

6

Part (c) | Step 1

The parabola is symmetric about its maximum, so its line of symmetry is $x = -3$.

In 58-3(x+3)^2, equal positive and negative offsets from -3 give the same y.

✓ **FINAL ANSWER**

(a) $58 - 3(x+4)^2$ (b) $P = (-3, 58)$ (c) $x = -3$

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Question 25

5 marks | 3D Pythagoras & Trigonometry

25 The diagram shows a triangular prism $ABCDEF$ with horizontal rectangular base $ABCD$
F is vertically above A

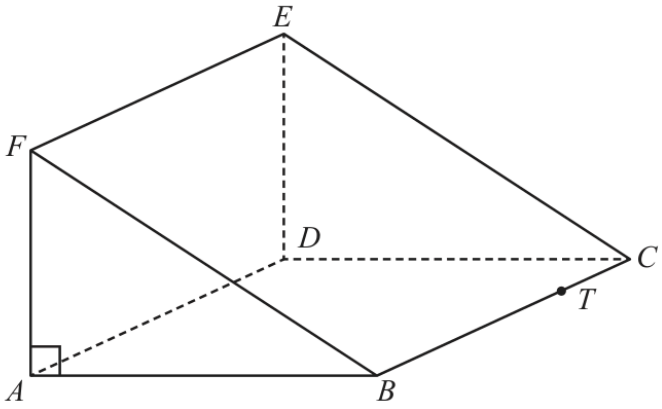


Diagram **NOT** accurately drawn

$AF = 12\,\text{cm}$ angle $ABF = 30°$ angle $BAF = 90°$

T is the point on the line BC such that $BF : BT = 3 : 2$

Work out the size of the angle between the line FT and the plane $ABCD$
Give your answer correct to one decimal place.
Show your working clearly.

.....°

(Total for Question 25 is 5 marks)

WORKED SOLUTION

Question 25 · 4MA1/1H June 2026

1 **Solution | Step 1**

$$BF = \frac{12}{\sin 30°} = 24\,\text{cm}, \qquad AB = \frac{12}{\tan 30°} = 12\sqrt{3}\,\text{cm}.$$

Use right triangle ABF.

2 **Solution | Step 2**

$$BT = \frac{2}{3}BF = 16\,\text{cm}.$$

Apply the given BF:BT ratio.

3 **Solution | Step 3**

$$AT = \sqrt{AB^2 + BT^2} = \sqrt{432 + 256} = \sqrt{688} = 4\sqrt{43}\ \text{cm}.$$

AB is perpendicular to BC in the rectangular base, so triangle ABT is right-angled at B.

4 **Solution | Step 4**

The projection of FT onto plane ABCD is AT because F lies vertically above A. Therefore the required angle is $\theta = \angle FTA$.

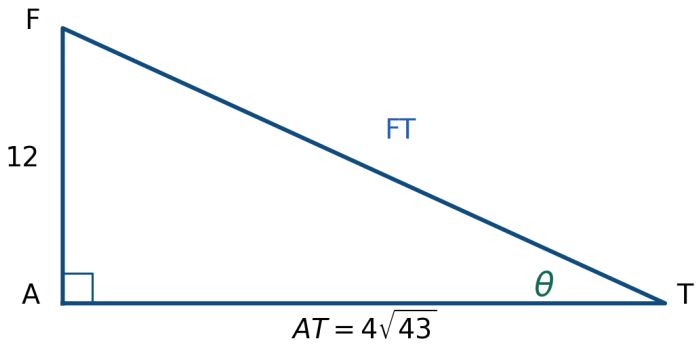
A line-plane angle is the angle between the line and its perpendicular projection onto the plane.

5 **Solution | Step 5**

$$\tan\theta = \frac{AF}{AT} = \frac{12}{4\sqrt{43}} = \frac{3}{\sqrt{43}}, \quad \theta = 24.583891\ldots^\circ = 24.6^\circ.$$

Use right triangle FAT and round to one decimal place.

FT projects onto AT in the base plane



✓ **FINAL ANSWER**

24.6°