Pearson Edexcel International GCSE

Mathematics A

Modular Unit 2

November 2024 Reconstructed Past Paper

DETAILED SOLUTIONS

Original question followed by a full worked solution

35 adaptive question sections 121 marks

Selected from Linear Higher Papers 1H and 2H

Dr Eslam Ahmed

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L-to-M | CONVERTED MODULAR EDITION

Selected from Linear Higher papers; not an original Modular examination paper.

Assistant Lecturer, Faculty of Engineering, Cairo University

B.Sc. Electrical Engineering (2017), Distinction with Honours
M.Sc. Mathematics (2023)
PhD Candidate

eliteigcse.com • **WhatsApp +20 112 000 9622**

About this reconstructed paper

Each question section appears in the same order as the Student book: the complete source demand is followed by its demand-local worked solution and final answer.

Ownership rule: Unit 2 owns a demand when its assessed or terminal statement is Unit 2, even if Unit 1 skills are prerequisites. For example, drawing boundary lines supports the Unit 2 region-of-inequalities demand. This book contains the demands owned by Unit 2; the selection contains 121 marks.

This is an Elite reconstructed teaching paper selected from official Linear Higher material; it is not an official Pearson Modular examination paper. Source assets are retained for private teaching use.

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Original question 01

4MA1-1H Q1 M01

MODULAR UNIT 2

1 marks

1 The table shows some information about the hourly rates of pay of 60 workers.

Hourly rate of pay (p dollars)	Frequency
$10 < p \leqslant 15$	18
$15 < p \leqslant 20$	16
$20 < p \leqslant 25$	14
$25 < p \leqslant 30$	8
$30 < p \leqslant 35$	4

(a) Write down the modal class.

.....

(1)

Worked solution 01

Identify the modal class

MODULAR UNIT 2
1 marks

M01 – Identify the modal class

Read the largest frequency

The largest frequency is 18, in the interval $10 < \mathrm{p} \leq 15$.

Final answer

$$10 < p \leq 15$$

Original question 02

4MA1-1H Q1 M02

MODULAR UNIT 2

4 marks

1 The table shows some information about the hourly rates of pay of 60 workers.

Hourly rate of pay (p dollars)	Frequency
$10 < p \leqslant 15$	18
$15 < p \leqslant 20$	16
$20 < p \leqslant 25$	14
$25 < p \leqslant 30$	8
$30 < p \leqslant 35$	4

(b) Work out an estimate for the mean hourly rate of pay of the 60 workers.

..... dollars

(4)

Worked solution 02

Estimate the grouped mean

MODULAR UNIT 2
4 marks

M02 – Estimate the grouped mean

Use class midpoints

$$12.5(18) + 17.5(16) + 22.5(14) + 27.5(8) + 32.5(4) = 1170.$$

Divide by the total frequency

$$\bar{p} = 1170/60 = 19.5.$$

Final answer

19.5 dollars

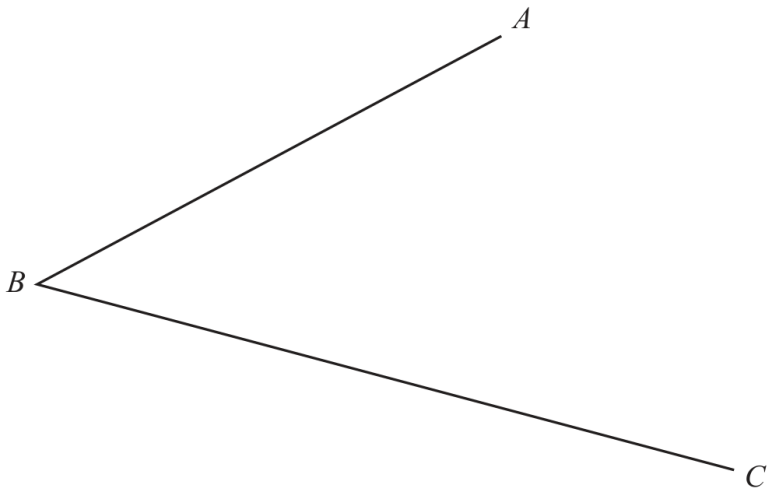
Original question 03

4MA1-1H Q2 M01

MODULAR UNIT 2

2 marks

2 Use ruler and compasses only to construct the bisector of angle ABC
You must show all your construction lines.



Worked solution 03

Construct an angle bisector

MODULAR UNIT 2
2 marks

M01 – Construct an angle bisector

Make the first arc

With centre B, draw an arc cutting BA and BC at two points.

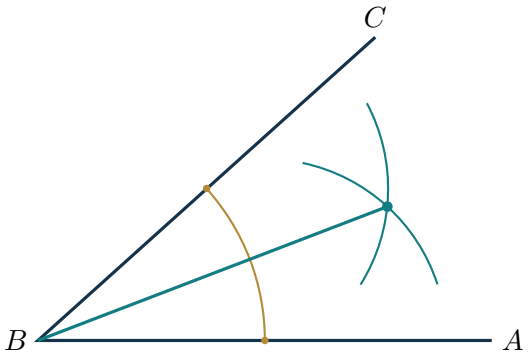
Make equal arcs and join

With the same radius draw arcs from those two points; join B to their intersection. This line bisects ∠ ABC.

Final answer

The constructed ray from B that bisects angle ABC, with all compass arcs shown

Completed solution diagram: Angle bisector with construction arcs



Original question 04

4MA1-1H Q5 M01

MODULAR UNIT 2

4 marks

5 The diagram shows a cylinder.

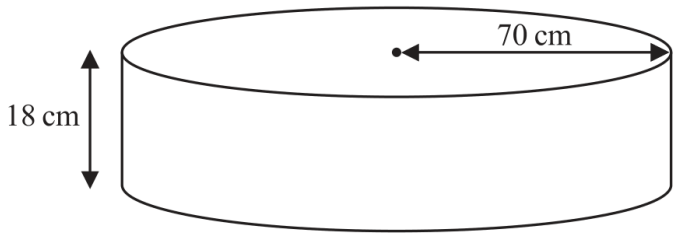


Diagram **NOT** accurately drawn

The radius of the cylinder is 70 cm
The height of the cylinder is 18 cm

Work out the volume of the cylinder.
Give your answer in litres correct to the nearest litre.

..... litres

Worked solution 04

Volume of a cylinder in litres

MODULAR UNIT 2
4 marks

M01 – Volume of a cylinder in litres

Use the cylinder formula

$$V = \pi r^2 h = \pi(70)^2(18) = 88200\pi \text{ cm}^3.$$

Convert cm^3 to litres

$$V = 88200\pi/1000 = 277.088\ldots \text{ litres}.$$

Round as requested

$$V \approx 277 \text{ litres}.$$

Final answer

277 litres

Original question 05

4MA1-1H Q6 M01

MODULAR UNIT 2

2 marks

6 $A = 2^3 \times 5^4 \times 7 \times 11$

$B = 2^2 \times 5^2 \times 7^2$

$C = 2^2 \times 5^3 \times 7^4$

Find the highest common factor (HCF) of A, B and C
Write your answer as a product of prime factors.

.....

Worked solution 05

Find the HCF from prime factors

MODULAR UNIT 2
2 marks

M01 – Find the HCF from prime factors

Take the common primes with minimum powers

The common part is $2^2 \times 5^2 \times 7$.

Write the product

$$\text{HCF} = 2^2 \times 5^2 \times 7 = 700.$$

Final answer

$$2^2 \times 5^2 \times 7$$

Original question 06

4MA1-1H Q7 M01

MODULAR UNIT 2

4 marks

7 Shop **A** and Shop **B** have offers for buying the same type of laptop.

The normal price of the laptop in Shop **A** is different to the normal price of the laptop in Shop **B**

Shop A	**Shop B**
Our normal price £475 Get 16% off our normal price	Get 15% off our normal price Only pay £408

Which shop gives more money off their normal price?
Show your working clearly.

Worked solution 06

Compare two discounts

MODULAR UNIT 2
4 marks

M01 – Compare two discounts

Shop A discount

$$0.16(475) = 76 \text{ pounds}.$$

Recover Shop B's normal price

$$0.85N_B = 408 \Rightarrow N_B = 480.$$

Shop B discount

$$0.15(480) = 72 \text{ pounds}.$$

Compare

76>72, so Shop A gives more money off.

Final answer

Shop A (76 pounds versus 72 pounds)

Original question 07

4MA1-1H Q8 M03

MODULAR UNIT 2

3 marks

(b) Solve the inequality $3y + 5 > 7y - 10$

Show clear algebraic working.

.....

(3)

Worked solution 07

Solve a linear inequality

MODULAR UNIT 2
3 marks

M03 – Solve a linear inequality

Collect terms

$$3y + 5 > 7y - 10 \Rightarrow 15 > 4y.$$

Divide by a positive number

$$y < 15/4.$$

State the interval

$$y < 3.75.$$

Final answer

$$y < \frac{15}{4}$$

Original question 08

4MA1-1H Q9 M01

MODULAR UNIT 2

1 marks

9 (a) Write 8.4×10^{-5} as an ordinary number.

.....

(1)

Worked solution 08

Convert standard form to an ordinary number

MODULAR UNIT 2

1 marks

M01 – Convert standard form to an ordinary number

Move the decimal four places left

$$8.4 \times 10^{-5} = 0.000084.$$

Final answer

0.000084

Original question 09

4MA1-1H Q9 M02

MODULAR UNIT 2

2 marks

(b) Work out $\left(6.5 \times 10^{-40}\right) \times \left(8 \times 10^{185}\right)$

Give your answer in standard form.

.....

(2)

Worked solution 09

Multiply in standard form

MODULAR UNIT 2
2 marks

M02 – Multiply in standard form

Multiply the numbers and powers

$$(6.5 \times 10^{-40})(8 \times 10^{185}) = 52 \times 10^{145}.$$

Normalise

$$52 \times 10^{145} = 5.2 \times 10^{146}.$$

Final answer

$$5.2 \times 10^{146}$$

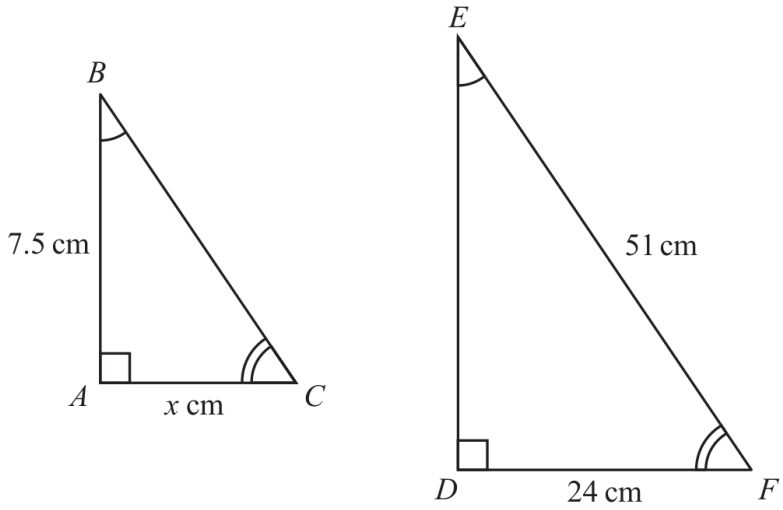
Original question 10

4MA1-1H Q10 M01

MODULAR UNIT 2

5 marks

10 Here are two similar triangles.



Diagrams **NOT** accurately drawn

Work out the value of x
Show your working clearly.

$x =$ .....

Worked solution 10

Use similarity to find x

MODULAR UNIT 2
5 marks

M01 – Use similarity to find x

Find the long corresponding side

$$DE^2 = 51^2 - 24^2 = 2025 \Rightarrow DE = 45.$$

Find the scale factor

$$\text{small:large} = 7.5/45 = 1/6.$$

Scale the corresponding side

$$x = 24(1/6) = 4 \text{ cm}.$$

Final answer

4 cm

Original question 11

4MA1-1H Q14 M01

MODULAR UNIT 2

3 marks

14 B is inversely proportional to the square of d

$B = 0.25$ when $d = 12$

Find a formula for B in terms of d

.....

Worked solution 11

Model inverse-square variation

MODULAR UNIT 2
3 marks

M01 – Model inverse-square variation

Write the model

$$B = k/d^2.$$

Use the given pair

$$0.25 = k/12^2 \Rightarrow k = 36.$$

State the formula

$$B = 36/d^2.$$

Final answer

$$B = \frac{36}{d^2}$$

Original question 12

4MA1-1H Q19 M01

MODULAR UNIT 2

5 marks

19 An arithmetic series has first term a and common difference d

The sum of the first 30 terms of the arithmetic series is 4395

The sum of the 10th term and the 20th term is 284

Work out the sum of the first 45 terms of the arithmetic series.
Show clear algebraic working.

.....

Worked solution 12

Find the sum of an arithmetic series

MODULAR UNIT 2
5 marks

M01 – Find the sum of an arithmetic series

Use the sum of 30 terms

$$30a + 435d = 4395 \Rightarrow 2a + 29d = 293.$$

Use the 10th and 20th terms

$$(a + 9d) + (a + 19d) = 284 \Rightarrow 2a + 28d = 284.$$

Eliminate

$$d = 9, \quad a = 16.$$

Use the sum formula

$$S_{45} = \frac{45}{2}[2(16) + 44(9)] = 9630.$$

Final answer

9630

Original question 13

4MA1-1H Q20 M01

MODULAR UNIT 2

4 marks

20 The curve with equation $y = 2x^4 - 64x$ has a minimum point.

Find an equation of the tangent to the curve at the minimum point.
Show clear algebraic working.

.....

Worked solution 13

Find the tangent at a minimum

MODULAR UNIT 2
4 marks

M01 – Find the tangent at a minimum

Differentiate

$$\frac{dy}{dx} = 8x^3 - 64.$$

Set the gradient to zero

$$8x^3 - 64 = 0 \Rightarrow x = 2.$$

Find the y-coordinate

$$y = 2(2^4) - 64(2) = -96.$$

State the horizontal tangent

$$y = -96.$$

Final answer

$$y = -96$$

Original question 14

4MA1-1H Q22 M01

MODULAR UNIT 2

3 marks

22 The diagram shows a bowl in the shape of a hemisphere.
The bowl is made from metal.

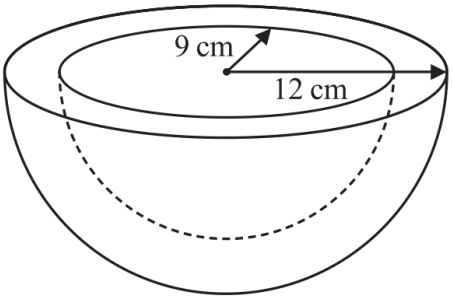


Diagram **NOT** accurately drawn

The outer radius of the bowl is 12 cm
The inner radius of the bowl is 9 cm

The thickness of the bowl is uniform.

Work out the volume of the metal.
Give your answer correct to the nearest whole number.

..... cm^3

Worked solution 14

Find the volume of metal in a hemispherical bowl

MODULAR UNIT 2

3 marks

M01 – Find the volume of metal in a hemispherical bowl

Subtract hemisphere volumes

$$V = \frac{2}{3}\pi(12^3 - 9^3).$$

Evaluate

$$V = 2091.5\ldots \text{ cm}^3.$$

Round

$$V = 2092\,\text{cm}^3.$$

Final answer

$$2092\,\text{cm}^3$$

Original question 15

4MA1-1H Q23 M01

MODULAR UNIT 2

5 marks

23 The curve **C** has equation $y = x^2 - 8x - 9$
The straight line **L** has equation $y = k$ where k is an integer.

C and **L** intersect at the points A and B

The coordinates of point A are (p, k)
The coordinates of point B are (q, k)

Given that $p - q = 14$

find the value of k
Show clear algebraic working.

Original question 15 (continued)

4MA1-1H Q23 M01

MODULAR UNIT 2

5 marks

$k =$ .....

Worked solution 15

Use the chord separation to find k

MODULAR UNIT 2
5 marks

M01 – Use the chord separation to find k

Use the equal y-values

$$p^2 - 8p - 9 = k \text{ and } q^2 - 8q - 9 = k.$$

Use symmetry

The axis is x=4, so $(p+q)/2=4$; with p-q=14, p=11, q=-3.

Substitute

$$k = 11^2 - 8(11) - 9 = 24.$$

Final answer

$$k = 24$$

Original question 16

4MA1-1H Q24 M01, M02, M03

MODULAR UNIT 2
6 marks

24 OAB is a triangle.

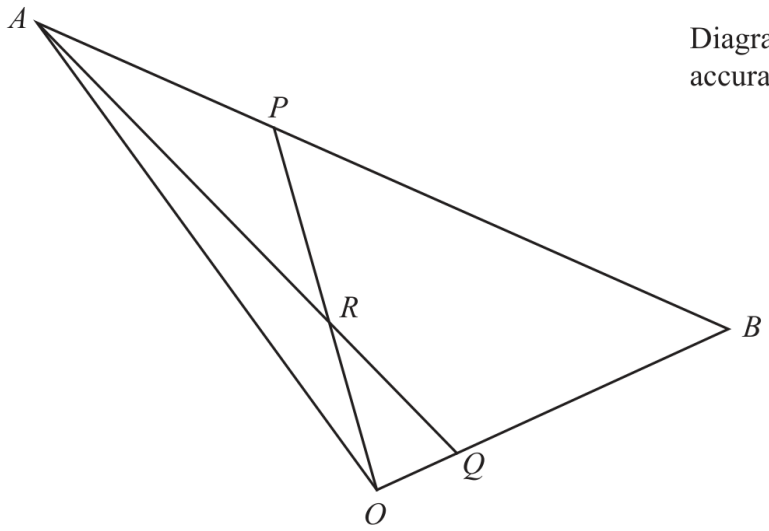


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = 10\mathbf{a}$ $\overrightarrow{OB} = 10\mathbf{b}$

ARQ and ORP are straight lines.

$\overrightarrow{AP} = \frac{1}{4}\overrightarrow{AB}$ and $\overrightarrow{OQ} = \frac{1}{5}\overrightarrow{OB}$

Write the following vectors in terms of **a** and **b**
Simplify your answers.

(i) $\overrightarrow{AQ}$

.....

(1)

(ii) $\overrightarrow{OP}$

.....

(1)

Original question 16 (continued)

4MA1-1H Q24 M01, M02, M03

MODULAR UNIT 2
6 marks

(iii) $\overrightarrow{OR}$

.....

(4)

Worked solution 16

Find AQ / Find OP / Find OR from two straight-line routes

MODULAR UNIT 2
6 marks

M01 – Find AQ

Use a route through O

$$\overrightarrow{AQ} = \overrightarrow{AO} + \overrightarrow{OQ} = -10\mathbf{a} + 2\mathbf{b}.$$

Final answer

$$-10\mathbf{a} + 2\mathbf{b}$$

M02 – Find OP

Use AP=AB/4

$$\overrightarrow{AP} = \tfrac{1}{4}(10\mathbf{b} - 10\mathbf{a}) = \tfrac{5}{2}\mathbf{b} - \tfrac{5}{2}\mathbf{a}.$$

Add OA

$$\overrightarrow{OP} = 10\mathbf{a} + \overrightarrow{AP} = \tfrac{15}{2}\mathbf{a} + \tfrac{5}{2}\mathbf{b}.$$

Final answer

$$\frac{15}{2}\mathbf{a} + \frac{5}{2}\mathbf{b}$$

M03 – Find OR from two straight-line routes

Write OR through P

$$\overrightarrow{OR} = \overrightarrow{OP} + \lambda\overrightarrow{PR}.$$

Write OR through Q

Use the line ARQ and the known AQ route to form a second expression.

Equate coefficients

The two routes give λ=1/2 and hence vector OR=(15)/(4)a+5/4b.

Simplify

$$\overrightarrow{OR} = \frac{15}{4}\mathbf{a} + \frac{5}{4}\mathbf{b}.$$

Final answer

$$\frac{15}{4}\mathbf{a} + \frac{5}{4}\mathbf{b}$$

Original question 17

4MA1-1H Q25 M01

MODULAR UNIT 2

4 marks

25 The function f is such that $f(x) = 2x^2 - 24x + 7$ where $x \geqslant 6$

Find the inverse function $f^{-1}(x)$

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

Worked solution 17

Find the inverse function

MODULAR UNIT 2
4 marks

M01 – Find the inverse function

Complete the square

$$f(x) = 2x^2 - 24x + 7 = 2(x-6)^2 - 65.$$

Rearrange

$$y + 65 = 2(x-6)^2 \Rightarrow (x-6)^2 = (y+65)/2.$$

Use the domain x >= 6

$$x = 6 + \sqrt{(y+65)/2}.$$

Swap x and y

$$f^{-1}(x) = 6 + \sqrt{(x+65)/2}.$$

Final answer

$$f^{-1}(x) = 6 + \sqrt{\frac{x+65}{2}}$$

Original question 18

4MA1-2H Q4 M01

MODULAR UNIT 2

2 marks

4 N is a number.
17% of N is 357

(a) Work out the value of N

$N =$ .....

(2)

Worked solution 18

Recover a whole from a percentage

MODULAR UNIT 2
2 marks

M01 – Recover a whole from a percentage

Write the percentage equation

$$0.17N = 357.$$

Solve

$$N = 357/0.17 = 2100.$$

Final answer

2100

Original question 19

4MA1-2H Q4 M02

MODULAR UNIT 2

3 marks

In 2019, the population of a village was 650
In 2020, the population of the village was 806

(b) Work out the percentage increase in the population.

..... %

(3)

Worked solution 19

Find a percentage increase

MODULAR UNIT 2
3 marks

M02 – Find a percentage increase

Find the increase

$$806 - 650 = 156.$$

Divide by the original

$$156/650 = 0.24.$$

Convert to percent

$$0.24 \times 100 = 24\%.$$

Final answer

24%

Original question 20

4MA1-2H Q6 M01

MODULAR UNIT 2

3 marks

6 The diagram shows a solid triangular prism.

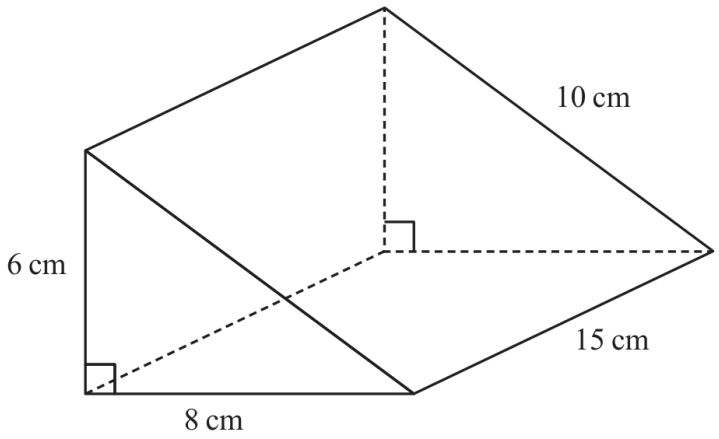


Diagram **NOT** accurately drawn

Work out the **total** surface area of the triangular prism.

..... cm^2

Worked solution 20

Surface area of a triangular prism

MODULAR UNIT 2

3 marks

M01 – Surface area of a triangular prism

Find the triangular ends

$$2\left(\tfrac{1}{2}\times 8\times 6\right)=48.$$

Find the rectangular faces

$$15(8)+15(6)+15(10)=360.$$

Add

$$48+360=408\,\text{cm}^2.$$

Final answer

$$408\,\text{cm}^2$$

Original question 21

4MA1-2H Q7 M01, M02

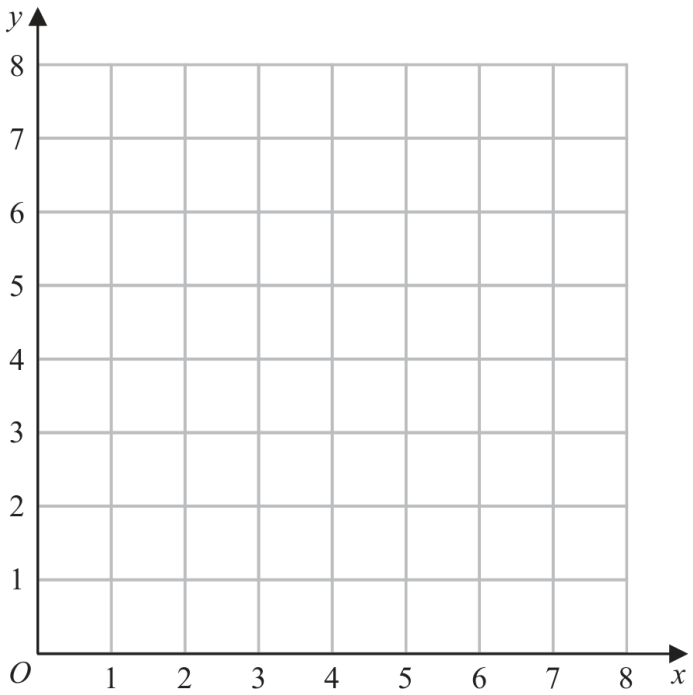
MODULAR UNIT 2

4 marks

7 (a) On the grid, draw the straight line with equation

(i) $x = 3$ (ii) $y = 1$ (iii) $x + y = 7$

Label each line with its equation.



(3)

(b) Show, by shading on the grid, the region that satisfies all three of the inequalities

$$x \geqslant 3 \qquad y \geqslant 1 \qquad x + y \leqslant 7$$

Label the region **R**

(1)

Worked solution 21

Draw three straight lines / Shade the simultaneous-inequality region

MODULAR UNIT 2
4 marks

M01 – Draw three straight lines

Draw x=3
A vertical line through x=3.

Draw y=1
A horizontal line through y=1.

Draw x+y=7
A line of gradient -1 through the intercepts (0,7) and (7,0); label all three.

Final answer
The labelled lines x=3, y=1 and x+y=7

M02 – Shade the simultaneous-inequality region

Translate each inequality

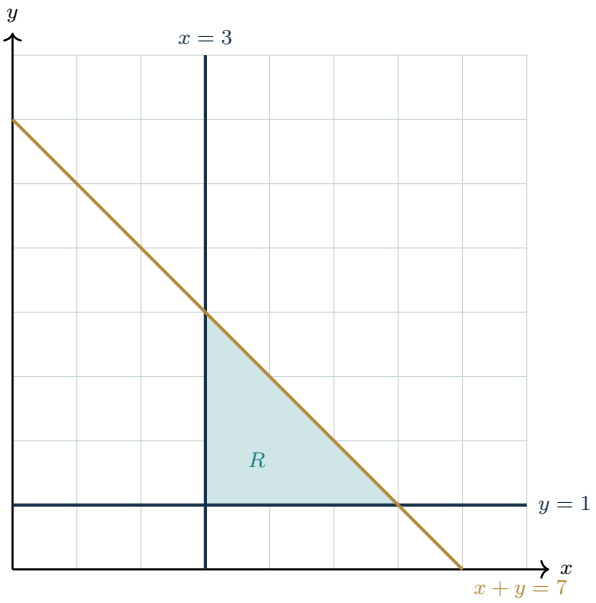
$$x \geq 3, \quad y \geq 1, \quad x + y \leq 7.$$

Shade and label
Shade the closed triangular region and label it R.

Final answer

$$R: \ x \geq 3, \ y \geq 1, \ x + y \leq 7$$

Completed solution diagram: Boundary lines and the Unit 2 feasible region


y
x = 3
R
y = 1
x
x + y = 7

Original question 22

4MA1-2H Q8 M01

MODULAR UNIT 2

3 marks

8 Kim puts 4 bananas in a bag.
The mean weight of the 4 bananas in the bag is 145 grams.

Andy puts one more banana into the bag.
The mean weight of the 5 bananas in the bag is 142 grams.

Work out the weight of the banana that Andy puts into the bag.

..... grams

Worked solution 22

Use two means to find a missing weight

MODULAR UNIT 2

3 marks

M01 – Use two means to find a missing weight

Find the old total

$$4(145) = 580 \text{ g}.$$

Find the new total

$$5(142) = 710 \text{ g}.$$

Subtract

$$710 - 580 = 130 \text{ g}.$$

Final answer

130 g

Original question 23

4MA1-2H Q9 M01

MODULAR UNIT 2

3 marks

9 Nisha invests 20 000 euros for 3 years in a savings account.
She gets 3.5% per year compound interest.

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

..... euros

Worked solution 23
Compound interest

MODULAR UNIT 2
3 marks

M01 – Compound interest

Use the yearly multiplier

$$1 + 0.035 = 1.035.$$

Compound for three years

$$20000(1.035)^3 = 22174.34\ldots.$$

Round

$$\text{balance} = 22174 \text{ euros (nearest euro)}.$$

Final answer
22174 euros

Original question 24

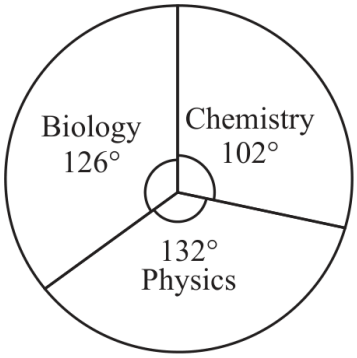
4MA1-2H Q10 M01

MODULAR UNIT 2

5 marks

10 All the students in year 10 and all the students in year 11 named their favourite science subject from Biology, Chemistry and Physics.

The pie chart shows information about the results for the year 10 students.
The table shows information about the results for the year 11 students.



Pie chart for year 10

science subject	number of students
Biology	$3x + 6$
Chemistry	$5x + 8$
Physics	$7x - 9$

Table for year 11

There are 300 students in year 10
There are 320 students in year 11

More students in year 10 than in year 11 said Biology was their favourite science subject.

How many more?

Original question 24 (continued)

4MA1-2H Q10 M01

MODULAR UNIT 2

5 marks

.....

Worked solution 24

Compare Biology counts from a pie chart and table

MODULAR UNIT 2
5 marks

M01 – Compare Biology counts from a pie chart and table

Solve the Year 11 total

$$(3x+6)+(5x+8)+(7x-9)=320 \Rightarrow 15x+5=320 \Rightarrow x=21.$$

Find Year 11 Biology

$$3x+6=69.$$

Read Year 10 Biology from the pie chart

$$(126/360)\times 300=105.$$

Compare

69-105=-36, so the number differs by 36 students.

Final answer

36 students

Original question 25

4MA1-2H Q11 M01

MODULAR UNIT 2

5 marks

11

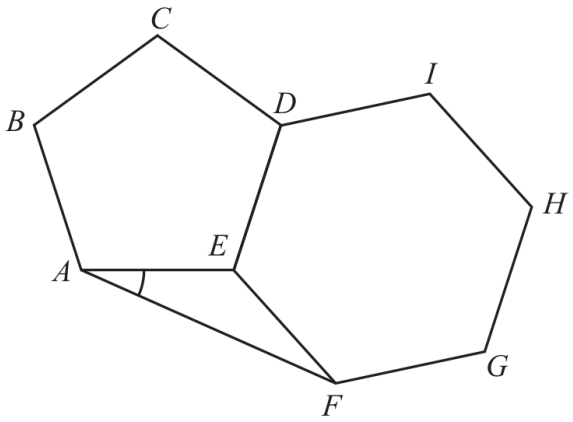


Diagram **NOT** accurately drawn

ABCDE is a regular pentagon.
DEFGHI is a regular hexagon.

AF is a straight line.

Work out the size of angle *EAF*

.....°

Worked solution 25

Angles in a regular pentagon and hexagon

MODULAR UNIT 2

5 marks

M01 – Angles in a regular pentagon and hexagon

Find the pentagon interior angle

$$(5-2)180/5 = 108^\circ.$$

Find the hexagon interior angle

$$(6-2)180/6 = 120^\circ.$$

Find the obtuse angle

$$\angle AEF = 360 - 108 - 120 = 132^\circ.$$

Use the isosceles triangle

$$\angle EAF = (180 - 132)/2 = 24^\circ.$$

Final answer

24 degrees

Original question 26

4MA1-2H Q12 M02

MODULAR UNIT 2

4 marks

(b) Make c the subject of the formula $f = \sqrt{\dfrac{a+bc}{c-d}}$

.....

(4)

Worked solution 26

Make c the subject

MODULAR UNIT 2
4 marks

M02 – Make c the subject

Square

$$f^2 = (a + bc)/(c - d).$$

Multiply out

$$cf^2 - df^2 = a + bc.$$

Collect c

$$c(f^2 - b) = a + df^2.$$

Divide

$$c = (a + df^2)/(f^2 - b).$$

Final answer

$$c = \frac{a + df^2}{f^2 - b}$$

Original question 27

4MA1-2H Q13 M01, M02, M03, M04

MODULAR UNIT 2
6 marks

13 The frequency table gives information about the weights, in kilograms, of 60 parcels in a delivery van.

Weight (w kilograms)	Frequency
$0 < w \leqslant 1$	4
$1 < w \leqslant 2$	15
$2 < w \leqslant 3$	20
$3 < w \leqslant 4$	11
$4 < w \leqslant 5$	6
$5 < w \leqslant 6$	4

(a) Complete the cumulative frequency table.

Weight (w kilograms)	Cumulative frequency
$0 < w \leqslant 1$	
$0 < w \leqslant 2$	
$0 < w \leqslant 3$	
$0 < w \leqslant 4$	
$0 < w \leqslant 5$	
$0 < w \leqslant 6$	

(1)

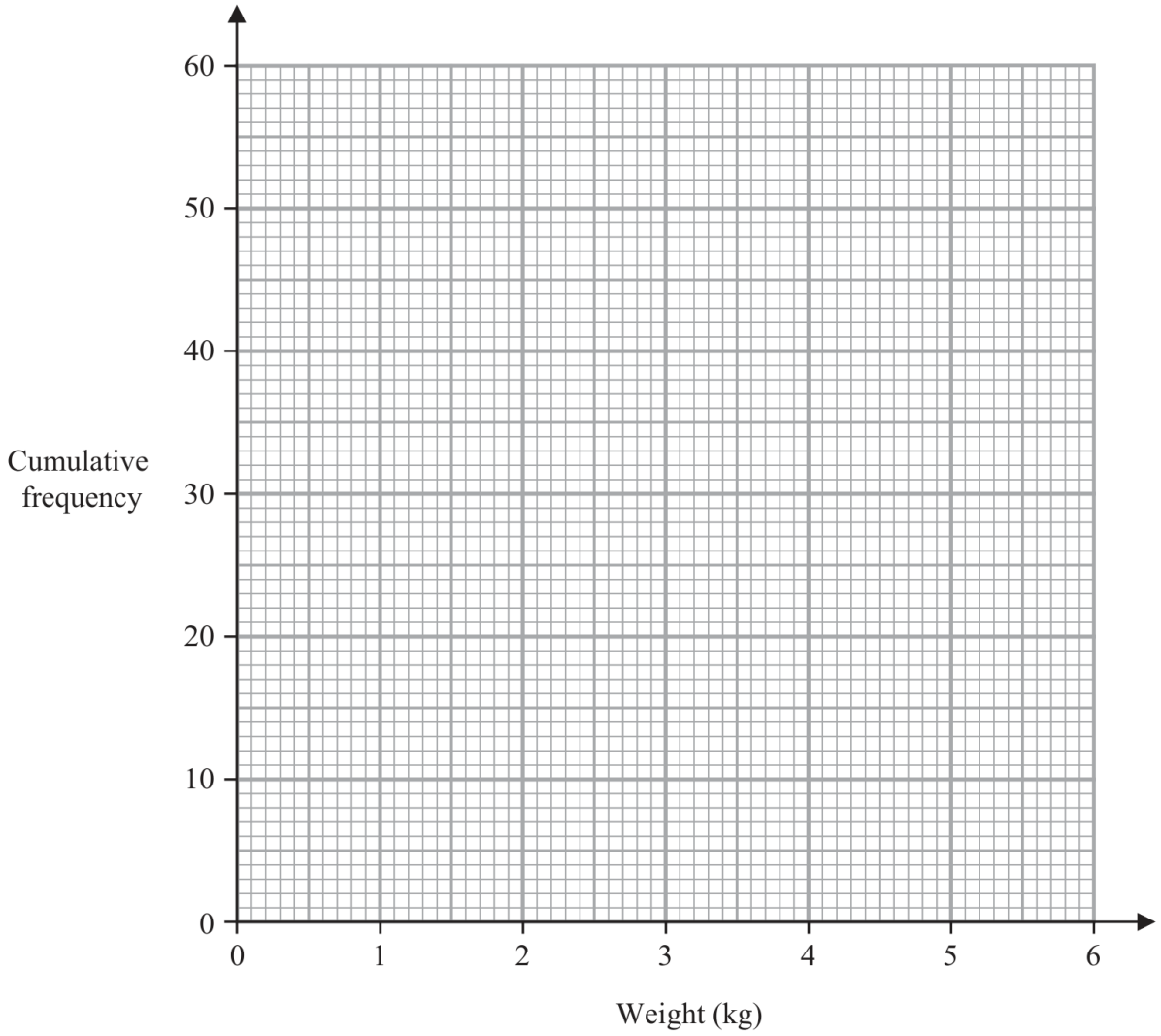
(b) On the grid opposite, draw a cumulative frequency graph for your table.

(2)

Original question 27 (continued)

4MA1-2H Q13 M01, M02, M03, M04

MODULAR UNIT 2
6 marks



(c) Use your graph to find an estimate for the median weight of the 60 parcels.

..... kilograms

(1)

(d) Use your graph to find an estimate for the number of these parcels that weigh more than 3.7 kilograms.

.....

(2)

Worked solution 27

MODULAR UNIT 2

Complete a cumulative-frequency table / Draw a cumulative-frequency graph / Read the median from the graph / Read the number above 3.7 kg

6 marks

M01 – Complete a cumulative-frequency table

Add frequencies successively

$$4,\ 4+15=19,\ 19+20=39,\ 39+11=50,\ 50+6=56,\ 56+4=60.$$

Final answer

4, 19, 39, 50, 56, 60

M02 – Draw a cumulative-frequency graph

Plot upper-bound points

$$(1,4),(2,19),(3,39),(4,50),(5,56),(6,60).$$

Join

Join the points with the accepted smooth curve or line segments.

Final answer

Correct cumulative-frequency graph

M03 – Read the median from the graph

Use the middle cumulative frequency

Half of 60 is 30; reading across at CF=30 gives about 2.3–2.7 kg.

Final answer

2.3 to 2.7 kg

M04 – Read the number above 3.7 kg

Read CF at 3.7

The graph gives approximately 45–48 parcels at or below 3.7 kg.

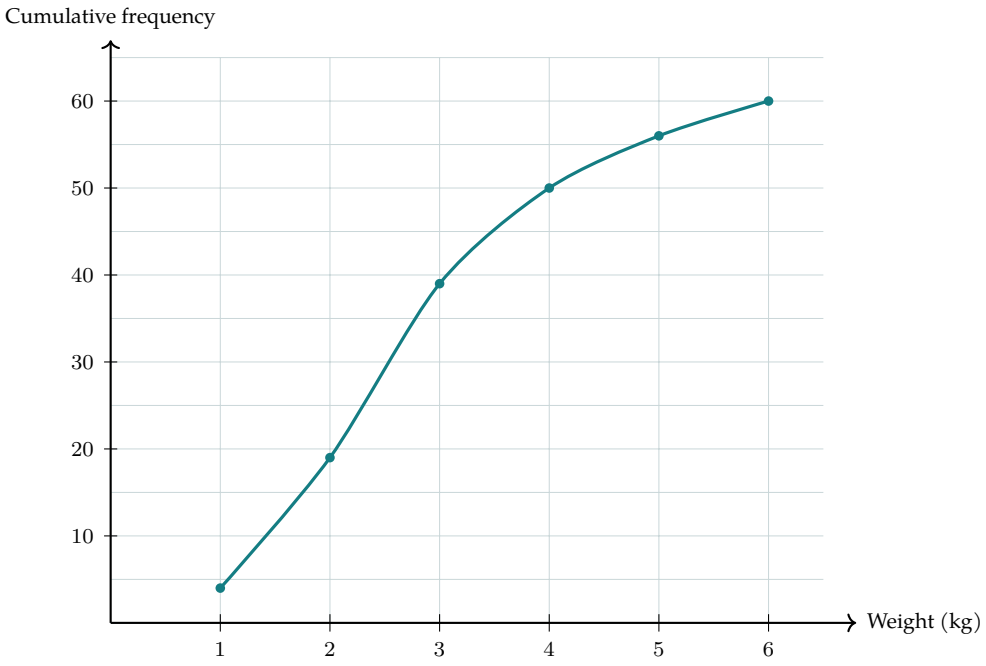
Subtract from 60

The number above 3.7 kg is 12–15.

Final answer

12 to 15 parcels

Completed solution diagram: Completed cumulative-frequency graph



Original question 28

4MA1-2H Q16 M01, M02, M03, M04

MODULAR UNIT 2
5 marks

16 A, B, C and D are points on a circle, centre O

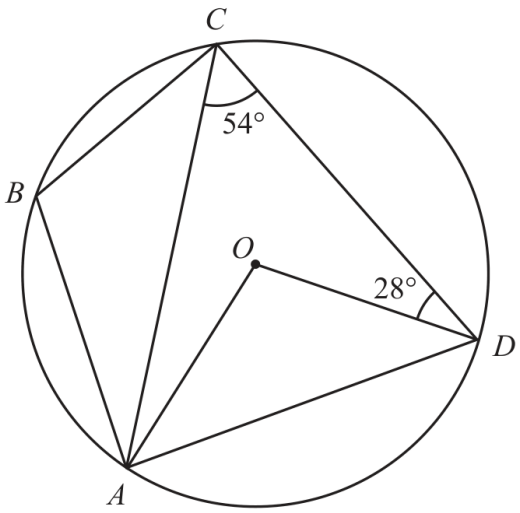


Diagram **NOT** accurately drawn

(a) (i) Work out the size of angle AOD

.....

(1)

(ii) Give a reason for your answer to part (a)(i)

.....

.....

(1)

(b) Work out the size of angle CAO

.....

(1)

(c) Work out the size of angle ABC

.....

(2)

Worked solution 28

Find a central angle / Give the circle-theorem reason / Find angle CAO / Find angle ABC

MODULAR UNIT 2

5 marks

M01 – Find a central angle

Use the central-angle theorem

$$\angle AOD = 2(54^\circ) = 108^\circ.$$

Final answer

108 degrees

M02 – Give the circle-theorem reason

State the theorem

The angle at the centre is twice the angle at the circumference standing on the same arc.

Final answer

Angle at centre is twice angle at circumference

M03 – Find angle CAO

Use equal radii

OA=OC, so the base angles in triangle AOC are equal; with the central angle, ∠ CAO=26°.

Final answer

26 degrees

M04 – Find angle ABC

Find the adjacent angle

Use the radius/chord angles to obtain the angle at C in triangle ABC.

Use angles in a triangle

$$\angle ABC = 116^\circ.$$

Final answer

116 degrees

Original question 29

4MA1-2H Q17 M01

MODULAR UNIT 2

3 marks

17 Here are two vectors.

$$\overrightarrow{FG} = \begin{pmatrix} -5 \\ 2 \end{pmatrix} \qquad \overrightarrow{HG} = \begin{pmatrix} 4 \\ 14 \end{pmatrix}$$

Calculate the magnitude of the vector $\overrightarrow{HF}$

.....

Worked solution 29

Find the magnitude of HF

MODULAR UNIT 2
3 marks

M01 – Find the magnitude of HF

Find the vector

$$\overrightarrow{HF} = \overrightarrow{HG} - \overrightarrow{FG} = (4, 14) - (-5, 2) = (9, 12).$$

Use Pythagoras

$$|HF| = \sqrt{9^2 + 12^2} = 15.$$

State the magnitude

$$|HF| = 15.$$

Final answer

15

Original question 30

4MA1-2H Q19 M01

MODULAR UNIT 2

1 marks

19 A curve has equation $y = f(x)$

There is only one minimum point on the curve.
The coordinates of this minimum point are (5, 4)

Write down the coordinates of the minimum point on the curve with equation

(i) $y = f(x + 5)$

(..... , ...)

(1)

Worked solution 30

Translate a graph horizontally

MODULAR UNIT 2

1 marks

M01 – Translate a graph horizontally

Track x-values

$y=f(x+5)$ shifts the minimum $(5,4)$ left by 5, giving $(0,4)$.

Final answer

$(0,4)$

Original question 31

4MA1-2H Q19 M02

MODULAR UNIT 2

1 marks

19 A curve has equation $y = f(x)$

There is only one minimum point on the curve.
The coordinates of this minimum point are (5, 4)

(ii) $y = 3f(x)$

(..... , ...)

(1)

Worked solution 31

Stretch graph values

MODULAR UNIT 2

1 marks

M02 – Stretch graph values

Multiply the output

For $y=3f(x)$, the x-coordinate stays 5 and the y-coordinate becomes $3(4)=12$.

Final answer

$(5,12)$

Original question 32

4MA1-2H Q19 M03

MODULAR UNIT 2

1 marks

19 A curve has equation $y = f(x)$

There is only one minimum point on the curve.
The coordinates of this minimum point are (5, 4)

(iii) $y = f(x) - 7$

(..... , ...)

(1)

Worked solution 32

Shift a graph vertically

MODULAR UNIT 2

1 marks

M03 – Shift a graph vertically

Subtract 7 from y

For $y=f(x)-7$, $(5,4)$ becomes $(5,4-7)=(5,-3)$.

Final answer

$(5,-3)$

Original question 33

4MA1-2H Q20 M01

MODULAR UNIT 2

3 marks

20 Solve the inequality $10x^2 + 11x - 21 < 0$

Show clear algebraic working.

.....

Worked solution 33

Solve a quadratic inequality

MODULAR UNIT 2
3 marks

M01 – Solve a quadratic inequality

Factorise

$$10x^2 + 11x - 21 = (10x + 21)(x - 1).$$

Find critical values

$$x = -21/10 = -2.1 \text{ or } x = 1.$$

Choose the interval

The upward-opening quadratic is negative between the roots: -2.1<x<1.

Final answer

$$-2.1 < x < 1$$

Original question 34

4MA1-2H Q22 M01

MODULAR UNIT 2

5 marks

22 Solve the simultaneous equations

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

$$x + 2 = y$$

Show clear algebraic working.

.....

Worked solution 34

Solve simultaneous equations

MODULAR UNIT 2

5 marks

M01 – Solve simultaneous equations

Substitute y=x+2

$$x^2 + y^2 + y = 3 \Rightarrow x^2 + (x+2)^2 + (x+2) = 3.$$

Form the quadratic

$$2x^2 + 5x + 3 = 0 = (2x+3)(x+1).$$

Find x-values

$$x = -3/2 \text{ or } x = -1.$$

Find y-values

$$y = x + 2 \Rightarrow y = 1/2 \text{ or } y = 1.$$

Pair the solutions

$$(-3/2, 1/2) \text{ and } (-1, 1).$$

Final answer

$$(-\frac{3}{2}, \frac{1}{2}) \text{ and } (-1, 1)$$

Original question 35

4MA1-2H Q24 M01

MODULAR UNIT 2

6 marks

24 A, B and C are three points on horizontal ground.

$AB = 8.4$ metres $BC = 9.2$ metres

B is on a bearing of 067° from A
C is on a bearing of 129° from B

Calculate the bearing of A from C
Give your answer correct to the nearest degree.

Original question 35 (continued)

4MA1-2H Q24 M01

MODULAR UNIT 2

6 marks

.....

Worked solution 35

Find a bearing using the cosine and sine rules

MODULAR UNIT 2
6 marks

M01 – Find a bearing using the cosine and sine rules

Find the included angle

$$\angle ABC = 67^\circ + (180^\circ - 129^\circ) = 118^\circ.$$

Find AC

$$AC^2 = 8.4^2 + 9.2^2 - 2(8.4)(9.2)\cos 118^\circ \Rightarrow AC = 15.09\ldots.$$

Find an angle

Use the sine rule to obtain the angle at C, about 29–30°.

Convert to a bearing

The bearing of A from C is 280° (nearest degree).

Final answer

280 degrees