Pearson Edexcel International GCSE

Mathematics A

Modular Unit 2

June 2022 Reconstructed Past Paper

DETAILED SOLUTIONS

Original question followed by a full worked solution

32 adaptive question sections 100 marks

Selected from Linear Higher Papers 1H and 2H

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L-to-M | CONVERTED MODULAR EDITION

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

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About this reconstructed paper

Each original source section is followed by the demand-local candidate solution and final answer in the same order as the Student book.

Ownership rule: Unit 2 owns a demand when its assessed or terminal statement is Unit 2, even if Unit 1 skills are prerequisites. This book contains the demands owned by Unit 2; the selection contains 100 marks.

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Original question 01

4MA1-1H Q1 Q1(a)

ORIGINAL QUESTION
2 marks

1 Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

Worked solution 01

Chapter: Sequences

MODULAR UNIT 2
2 marks

Q1(a) – Chapter: Sequences

Family: Use an arithmetic nth term • Variant: Arithmetic nth term from listed terms

Method

The common difference is 4, so the nth term has the form $4n + c$.
Why: An arithmetic sequence with difference 4 has coefficient 4 on n.

Method

Using the first term, $4(1) + c = 1$, so $c = -3$ and the nth term is $4n - 3$.
Why: Substitute $n = 1$ to determine the constant term.

Final answer

nth term: $4n - 3$

Original question 02

4MA1-1H Q1 Q1(b)

ORIGINAL QUESTION

1 marks

The nth term of another arithmetic sequence is $3n + 5$

(b) Find an expression, in terms of m, for the $(2m)$th term of this sequence.

.....

(1)

Worked solution 02

Chapter: Sequences

MODULAR UNIT 2
1 marks

Q1(b) – Chapter: Sequences

Family: Use an arithmetic nth term • Variant: Arithmetic term at a symbolic position

Method

Replace n by 2m in $3n + 5$: $3(2m) + 5 = 6m + 5$.

Why: The $(2m)$th term is obtained by substituting $n = 2m$.

Final answer

term: $6m + 5$

Original question 03

4MA1-1H Q3 Q3(a)

ORIGINAL QUESTION

2 marks

3 (a) Find the highest common factor (HCF) of 56 and 84
Show your working clearly.

.....

(2)

Worked solution 03

Chapter: Prime Factors, HCF & LCM

MODULAR UNIT 2
2 marks

Q3(a) – Chapter: Prime Factors, HCF & LCM

Family: Choose the common-prime envelope • Variant: HCF of ordinary integers

Method

56 = 2^3 x 7 and 84 = 2^2 x 3 x 7.
Why: Prime factorisation displays the factors common to both numbers.

Method

The common prime factors with the smaller powers give HCF = 2^2 x 7 = 28.
Why: The HCF uses only primes shared by both numbers at their minimum exponents.

Final answer

HCF: 28

Original question 04

4MA1-1H Q3 Q3(b)

ORIGINAL QUESTION

2 marks

(b) Find the lowest common multiple (LCM) of 60 and 72
Show your working clearly.

.....

(2)

Worked solution 04

Chapter: Prime Factors, HCF & LCM

MODULAR UNIT 2
2 marks

Q3(b) – Chapter: Prime Factors, HCF & LCM

Family: Choose the common-prime envelope • Variant: LCM of ordinary integers

Method

60 = 2^2 x 3 x 5 and 72 = 2^3 x 3^2.

Why: Prime factorisation displays every factor needed by either number.

Method

LCM = 2^3 x 3^2 x 5 = 360.

Why: The LCM uses every prime at its greatest exponent.

Final answer

LCM: 360

Original question 05

4MA1-1H Q4 Q4

ORIGINAL QUESTION
4 marks

4 The diagram shows parts of three regular polygons, **A**, **B** and **C**, meeting at a point.

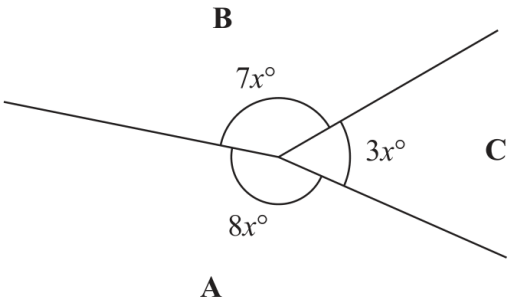


Diagram **NOT** accurately drawn

Polygon **B** has n sides.

Work out the value of n.

$n =$ .....

Worked solution 05

Chapter: Angles in Polygons & Parallel Lines

MODULAR UNIT 2
4 marks

Q4 – Chapter: Angles in Polygons & Parallel Lines

Family: Use regular and general polygon angles • Variant: Combine several regular polygons around lines or a point

Method

The three angles around the point give $7x + 3x + 8x = 360$ degrees.

Why: Angles around one point total 360 degrees.

Method

$18x = 360$, so $x = 20$ degrees.

Why: Solve the linear equation.

Method

Polygon B has interior angle $7x = 140$ degrees, so its exterior angle is $180 - 140 = 40$ degrees.

Why: An interior angle and its corresponding exterior angle are supplementary.

Method

For a regular polygon, $n = 360/40 = 9$.

Why: The exterior angles of any polygon total 360 degrees.

Final answer

number of sides: $n = 9$

Original question 06

4MA1-1H Q6 Q6(a)

ORIGINAL QUESTION

3 marks

6 Asha bought an apartment.

The table gives information about the value of apartments, in euros, and the annual service charge band.

Value (x euros)	Service charge band
$x \geqslant 700\,000$	A
$600\,000 \leqslant x < 700\,000$	B
$500\,000 \leqslant x < 600\,000$	C
$400\,000 \leqslant x < 500\,000$	D
$0 < x < 400\,000$	E

In 2021, the value of Asha's apartment was 634 400 euros.

The value of Asha's apartment had increased by 4% from its value in 2020

(a) Has the annual service charge band changed for Asha's apartment?
Show your working clearly.

(3)

Worked solution 06

Chapter: Percentages

MODULAR UNIT 2
3 marks

Q6(a) – Chapter: Percentages

Family: Recover an original amount • Variant: Reverse an increase or changed population/value

Method
A 4% increase has multiplier 1.04.
Why: Convert the percentage increase to its multiplier.

Method
The 2020 value was $634400/1.04 = 610000$ euros.
Why: Reverse the increase by dividing the later value by the multiplier.

Method
Both 610000 euros and 634400 euros are in band B, so the band did not change.
Why: Compare each value with the stated band boundaries.

Final answer
decision: No; the 2020 value was 610000 euros and both years are band B

Original question 07

4MA1-1H Q6 Q6(b)

ORIGINAL QUESTION

3 marks

Pam bought a boat.

In each year after Pam bought the boat, the value of the boat depreciated by 15%

(b) Work out the total percentage by which the value of the boat had depreciated by the end of the second year after Pam bought the boat.

..... %

(3)

Worked solution 07

Chapter: Compound Interest & Depreciation

MODULAR UNIT 2
3 marks

Q6(b) – Chapter: Compound Interest & Depreciation

Family: Accumulate depreciation • Variant: Known annual depreciation rate

Method
After each year, 85% of the value remains, so the multiplier is 0.85.
Why: A 15% depreciation leaves 100% - 15% = 85%.

Method
After two years the remaining proportion is 0.85^2 = 0.7225.
Why: Apply the same depreciation multiplier twice.

Method
The total depreciated proportion is 1 - 0.7225 = 0.2775, so the depreciation is 27.75%.
Why: Subtract the remaining proportion from the original whole.

Final answer
depreciation: 27.75%

Original question 08

4MA1-1H Q7 Q7

ORIGINAL QUESTION
4 marks

7 A cylinder is placed on the ground.

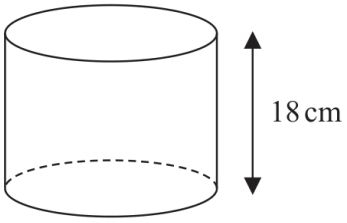


Diagram **NOT** accurately drawn

The height of the cylinder is 18 cm.

The force exerted by the cylinder on the ground is 72 newtons.
The pressure on the ground due to the cylinder is 1.4 newtons / cm^2

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

Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^3

Worked solution 08

Chapter: Volume & Surface Area

MODULAR UNIT 2
4 marks

Q7 – Chapter: Volume & Surface Area

Family: Find volume of prisms and cylinders • Variant: Find volume of a cuboid or cylinder

Method
Using pressure = force/area, 1.4 = 72/A.
Why: Substitute the given pressure and force into the stated formula.

Method
The circular base area is A = 72/1.4 = 51.428571... cm^2.
Why: Rearrange the pressure formula for area.

Method
The cylinder volume is base area x height = 51.428571... x 18 = 925.714... cm^3.
Why: A cylinder is a prism, so volume is cross-sectional area multiplied by length.

Method
To 3 significant figures, the volume is 926 cm^3.
Why: Round the unrounded volume once at the end.

Final answer
volume: 926 cm^3

Original question 09

4MA1-1H Q8 Q8(a)

ORIGINAL QUESTION

1 marks

8 (a) Write 0.000 089 in standard form.

.....

(1)

Worked solution 09

Chapter: Powers, Roots & Standard Form

MODULAR UNIT 2

1 marks

Q8(a) – Chapter: Powers, Roots & Standard Form

Family: Convert and compare standard form • Variant: Ordinary number to standard form

Method

0.000089 = 8.9 x 10^-5.

Why: Move the decimal point five places right to obtain a number between 1 and 10.

Final answer

standard form: 8.9 x 10^-5

Original question 10

4MA1-1H Q8 Q8(b)

ORIGINAL QUESTION

1 marks

(b) Write 8.34×10^4 as an ordinary number.

.....

(1)

Worked solution 10

Chapter: Powers, Roots & Standard Form

MODULAR UNIT 2

1 marks

Q8(b) – Chapter: Powers, Roots & Standard Form

Family: Convert and compare standard form • Variant: Standard form to ordinary number

Method

8.34 x 10^4 = 8.34 x 10000 = 83400.

Why: A positive power of 10 moves the decimal point four places right.

Final answer

ordinary number: 83400

Original question 11

4MA1-1H Q10 Q10(a), Q10(b)

ORIGINAL QUESTION

4 marks

10 Two circles, C_1 and C_2, are drawn on a centimetre grid, with a scale of 1 cm for 1 unit on each axis.

The centre of circle C_1 is at the point with coordinates (–1, 3) and the radius of C_1 is 13 cm.

The centre of circle C_2 is at the point with coordinates (7, 18) and the radius of C_2 is 6 cm.

(a) Work out the distance between the centre of C_1 and the centre of C_2

..... cm

(3)

(b) Explain why circle C_1 intersects circle C_2

.....

.....

(1)

Worked solution 11

Chapter: Right-Angled Triangles - Pythagoras & Trigonometry; Circles, Arcs & Sectors

MODULAR UNIT 2

4 marks

Q10(a) – Chapter: Right-Angled Triangles - Pythagoras & Trigonometry

Family: Use Pythagoras in two dimensions • Variant: Find a hypotenuse

Method

The coordinate changes between the centres are 7 - (-1) = 8 and 18 - 3 = 15.

Why: Subtract corresponding coordinates.

Method

Distance = sqrt(8^2 + 15^2) = sqrt(64 + 225) = sqrt(289).

Why: Apply Pythagoras to the horizontal and vertical changes.

Method

The distance between the centres is 17 cm.

Why: Evaluate the square root and use the stated scale.

Final answer

distance: 17 cm

Q10(b) – Chapter: Circles, Arcs & Sectors

Family: Recognise parts of a circle • Variant: Identify centre, radius, diameter, chord and circumference

Method

The radii total 13 + 6 = 19 cm, and the centre distance is 17 cm; since 17 < 19, the circles overlap and intersect.

Why: Two circles can meet when the centre distance is less than the sum of their radii; here it is also greater than their radius difference.

Final answer

explanation: They intersect because the centre distance 17 cm is less than 13 + 6 = 19 cm

Original question 12

4MA1-1H Q13 Q13

ORIGINAL QUESTION

5 marks

13 Antoine is going on holiday.
He makes 3 separate payments to cover the total cost of his holiday.

The following table shows how much money Antoine pays to the holiday company.

Payment	Amount paid
Payment 1	$\frac{3}{8}$ of the total cost
Payment 2	45% of the total cost
Payment 3	\$406

Work out how much Antoine has to pay for Payment 2

\$ .....

Worked solution 12

Chapter: Percentages

MODULAR UNIT 2
5 marks

Q13 – Chapter: Percentages

Family: Apply a percentage operator • Variant: Find a percentage of an amount

Method
Payments 1 and 2 are 3/8 + 45% = 0.375 + 0.45 = 0.825 of the total.
Why: Convert the fraction and percentage to the same form before adding.

Method
Payment 3 is the remaining 1 - 0.825 = 0.175 of the total.
Why: All three payments together make the full cost.

Method
If the total cost is T, then 0.175T = 406.
Why: Match the known third payment to its fraction of the total.

Method
T = 406/0.175 = 2320 dollars.
Why: Divide by the remaining proportion to find the whole.

Method
Payment 2 is 0.45 x 2320 = 1044 dollars.
Why: Apply the given 45% to the total cost.

Final answer
Payment 2: $1044

Original question 13

4MA1-1H Q14 Q14(a)

ORIGINAL QUESTION

1 marks

14 The function f is defined as

$$f: x \mapsto \frac{2x}{x-6} \qquad x \neq 6$$

(a) Find f(10)

.....

(1)

Worked solution 13

Chapter: Functions

MODULAR UNIT 2
1 marks

Q14(a) – Chapter: Functions

Family: Interpret function notation and mapping • Variant: Evaluate a function at a numerical input

Method

$f(10) = 2(10)/(10 - 6) = 20/4 = 5$.

Why: Substitute $x = 10$ into the function definition.

Final answer

f(10): 5

Original question 14

4MA1-1H Q14 Q14(b)

ORIGINAL QUESTION

3 marks

14 The function f is defined as

$$f: x \mapsto \frac{2x}{x-6} \qquad x \neq 6$$

(b) Express the inverse function f^{-1} in the form $f^{-1}: x \mapsto \ldots$

$f^{-1}: x \mapsto$ .....

(3)

Worked solution 14

Chapter: Functions

MODULAR UNIT 2

3 marks

Q14(b) – Chapter: Functions

Family: Construct an inverse function • Variant: Inverse of a linear or fractional function

Method

Let $y = 2x/(x - 6)$; then $y(x - 6) = 2x$.

Why: Introduce y and clear the denominator.

Method

$yx - 6y = 2x$, so $x(y - 2) = 6y$ and $x = 6y/(y - 2)$.

Why: Collect the terms containing x and factor them.

Method

Interchanging the input and output letters gives $f^{-1}(x) = 6x/(x - 2)$.

Why: The inverse reverses the mapping between x and y.

Final answer

inverse function: $f^{-1}(x) = 6x/(x - 2)$

Original question 15

4MA1-1H Q17 Q17

ORIGINAL QUESTION

5 marks

17 A particle P moves along a straight line.
The fixed point O lies on this line.

The displacement of P from O at time t seconds, $t \geqslant 1$, is s metres where

$$s = 4t^2 + \frac{125}{t}$$

The velocity of P at time t seconds, $t \geqslant 1$, is v m/s

Work out the distance of P from O at the instant when $v = 0$

..... m

Worked solution 15

Chapter: Differentiation

MODULAR UNIT 2

5 marks

Q17 – Chapter: Differentiation

Family: Apply differentiation to linear kinematics • Variant: Instantaneous rest or direction reversal

Method

s = 4t^2 + 125t^-1, so v = ds/dt.

Why: Velocity is the derivative of displacement with respect to time.

Method

v = 8t - 125t^-2 = 8t - 125/t^2.

Why: Differentiate each power of t.

Method

When v = 0, 8t - 125/t^2 = 0, so 8t^3 = 125 and t = 2.5 seconds.

Why: Multiply by t^2 and solve the resulting cubic for t >= 1.

Method

At this time, s = 4(2.5)^2 + 125/2.5.

Why: Substitute the stationary time into the original displacement expression.

Method

s = 25 + 50 = 75, so the distance from O is 75 m.

Why: The displacement is positive, so its magnitude is the distance.

Final answer

distance: 75 m

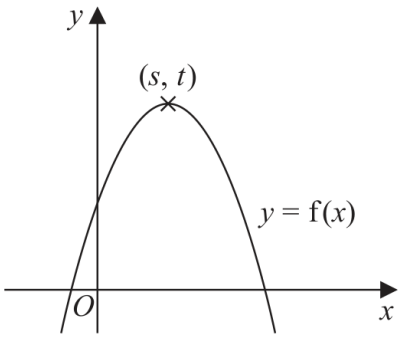
Original question 16

4MA1-1H Q20 Q20(i)

ORIGINAL QUESTION

1 marks

20 The diagram shows a sketch of part of the curve with equation $y = f(x)$



There is one maximum point on this curve.
The coordinates of this maximum point are (s, t)

Find, in terms of s and t, the coordinates of the maximum point on the curve with equation

(i) $y = f(x - 2)$

(.....,.....)

(1)

Worked solution 16

Chapter: Transformations of Graphs

MODULAR UNIT 2

1 marks

Q20(i) – Chapter: Transformations of Graphs

Family: Map a known graph feature • Variant: Horizontal translation

Method

Replacing x by x - 2 translates the graph 2 units right, so the maximum moves from (s, t) to $(s + 2, t)$.

Why: For $y = f(x - a)$, every point shifts a units in the positive x-direction.

Final answer

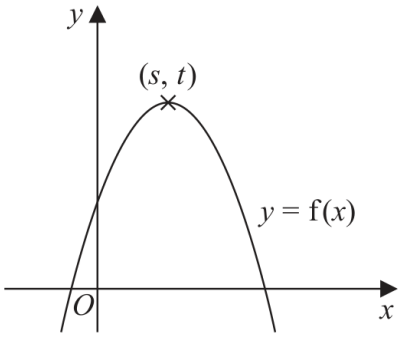
maximum: $(s + 2, t)$

Original question 17

4MA1-1H Q20 Q20(ii)

ORIGINAL QUESTION
1 marks

20 The diagram shows a sketch of part of the curve with equation $y = f(x)$



There is one maximum point on this curve.
The coordinates of this maximum point are (s, t)

Find, in terms of s and t, the coordinates of the maximum point on the curve with equation

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

(..... , ...)

(1)

Worked solution 17

Chapter: Transformations of Graphs

MODULAR UNIT 2

1 marks

Q20(ii) – Chapter: Transformations of Graphs

Family: Map a known graph feature • Variant: Vertical scale or x-axis reflection

Method

Multiplying f(x) by 3 keeps the x-coordinate and triples the y-coordinate, so the maximum is (s, 3t).

Why: The transformation $y = 3f(x)$ is a vertical stretch by scale factor 3.

Final answer

maximum: (s, 3t)

Original question 18

4MA1-1H Q22 Q22

ORIGINAL QUESTION

5 marks

22 A solid is made from a cone and a hemisphere.

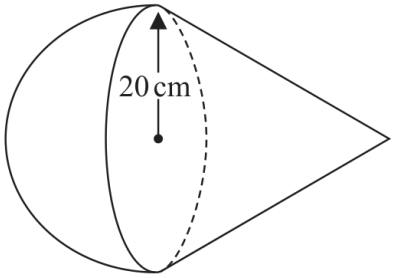


Diagram **NOT** accurately drawn

The circular plane face of the hemisphere coincides with the circular base of the cone.
The radius of the hemisphere and the radius of the circular base of the cone are both 20 cm.

The curved surface area of the cone is $580\pi\,\text{cm}^2$

The volume of the solid is $k\pi\,\text{cm}^3$

Work out the exact value of k

$k =$ .....

Worked solution 18

Chapter: Volume & Surface Area

MODULAR UNIT 2

5 marks

Q22 – Chapter: Volume & Surface Area

Family: Resolve composite solids and volume-unit constraints • Variant: Find volume of a joined composite solid

Method

For the cone, curved surface area pi r l = 580pi gives pi(20)l = 580pi.

Why: Use the given radius in the curved-surface-area formula.

Method

The cone slant height is l = 29 cm.

Why: Cancel pi and divide by 20.

Method

The cone height is sqrt(29^2 - 20^2) = sqrt(441) = 21 cm.

Why: The radius, height, and slant height form a right triangle.

Method

The solid volume is (2/3)pi(20)^3 + (1/3)pi(20)^2(21).

Why: Add the hemisphere volume to the cone volume.

Method

This is (16000/3 + 8400/3)pi = (24400/3)pi, so k = 24400/3.

Why: Combine the exact coefficients of pi.

Final answer

k: k = 24400/3

Original question 19

4MA1-1H Q23 Q23

ORIGINAL QUESTION
6 marks

23 A polygon has n sides, where $n > 5$

When arranged in order of size, starting with the largest number, the sizes of the interior angles of the polygon, in degrees, are the terms of an arithmetic sequence.

Here are the first five terms of this sequence.

177 175 173 171 169

Find the value of n
Show clear algebraic working.

Question 23 continued

$n =$ .....

Worked solution 19

Chapter: Angles in Polygons & Parallel Lines

MODULAR UNIT 2
6 marks

Q23 – Chapter: Angles in Polygons & Parallel Lines

Family: Use regular and general polygon angles • Variant: Solve an irregular polygon angle or side-count problem

Method
The interior-angle sequence has first term 177 and common difference d = -2.
Why: Successive listed angles decrease by 2 degrees.

Method
Its sum is S_n = n/2[2(177) + (n - 1)(-2)].
Why: Apply the arithmetic-series sum formula.

Method
The interior-angle sum of an n-sided polygon is 180(n - 2), so n/2[354 - 2(n - 1)] = 180(n - 2).
Why: Equate the sequence sum to the polygon angle sum.

Method
Simplifying gives n^2 + 2n - 360 = 0.
Why: Expand and collect all terms on one side.

Method
n^2 + 2n - 360 = (n - 18)(n + 20), so n = 18 or n = -20.
Why: Factorise the quadratic and use the zero-product rule.

Method
The number of sides is positive and n > 5, hence n = 18.
Why: Apply the domain condition for a polygon.

Final answer
number of sides: n = 18

Original question 20

4MA1-2H Q1 Q1

ORIGINAL QUESTION

3 marks

1 Here are some integers where $a < b < c < d$

$$a \quad b \quad c \quad d \quad d \quad d$$

The mode of the integers is 9
The median of the integers is 8
The range of the integers is 4

Work out the value of a, the value of b, the value of c and the value of d

$a =$ .....

$b =$ .....

$c =$ .....

$d =$ .....

Worked solution 20

Chapter: Statistics Toolkit

MODULAR UNIT 2

3 marks

Q1 – Chapter: Statistics Toolkit

Family: Calculate and reverse discrete averages • Variant: Construct a data set from stated averages and range

Method

Because d occurs three times, the mode gives $d = 9$.

Why: The repeated largest entry is the unique modal value.

Method

The median gives $(c + d)/2 = 8$, so $c = 7$.

Why: There are six ordered values, so the median is the mean of the third and fourth.

Method

The range gives $d - a = 4$, so $a = 5$; the only integer strictly between 5 and 7 is $b = 6$.

Why: Use the range and the strict integer ordering.

Final answer

a: $a = 5$

Final answer

b: $b = 6$

Final answer

c: $c = 7$

Final answer

d: $d = 9$

Original question 21

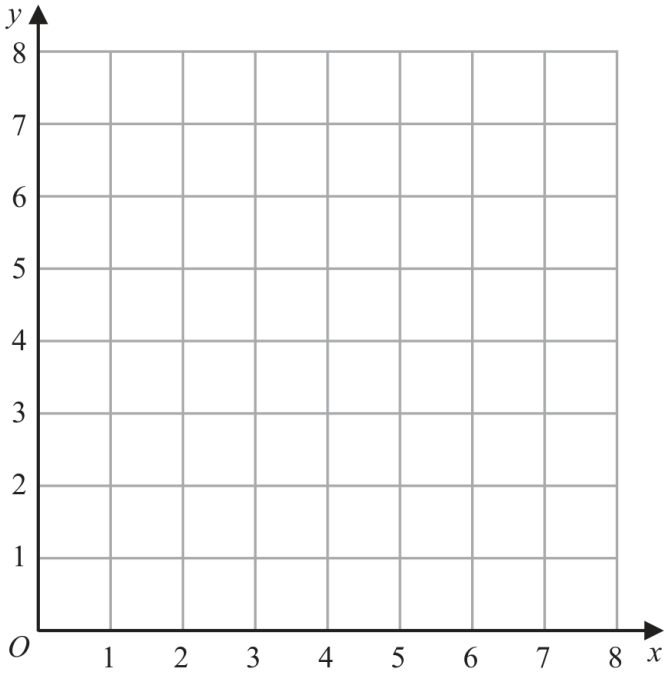
4MA1-2H Q2 Q2(a), Q2(b)

ORIGINAL QUESTION

4 marks

2 (a) On the grid, draw and label with its equation the straight line with equation

(i) $y = 1$ (ii) $x = 2$ (iii) $x + y = 7$



(3)

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

$y \geqslant 1$ $x \geqslant 2$ $x + y \leqslant 7$

Label the region **R**.

(1)

Worked solution 21

Chapter: Linear Graphs (y = mx + c); Graphing Inequalities

MODULAR UNIT 2
4 marks

Q2(a) – Chapter: Linear Graphs (y = mx + c)

Family: Generate and plot a linear graph • Variant: Plot a line from generated values

Method
Draw and label the horizontal line $y = 1$.
Why: Every point on this line has y-coordinate 1.

Method
Draw and label the vertical line $x = 2$.
Why: Every point on this line has x-coordinate 2.

Method
Draw and label $x + y = 7$ through $(0, 7)$ and $(7, 0)$.
Why: Two intercepts determine the straight line.

Final answer
line 1: $y = 1$

Final answer
line 2: $x = 2$

Final answer
line 3: $x + y = 7$

Q2(b) – Chapter: Graphing Inequalities

Family: Construct the feasible region from inequalities • Variant: Boundaries drawn as an inseparable prerequisite

Method
Shade the region above $y = 1$, to the right of $x = 2$, and below $x + y = 7$; label it R.
Why: All three inequalities must hold simultaneously.

Final answer
region: R has vertices $(2, 1)$, $(2, 5)$, $(6, 1)$

Completed diagram 21

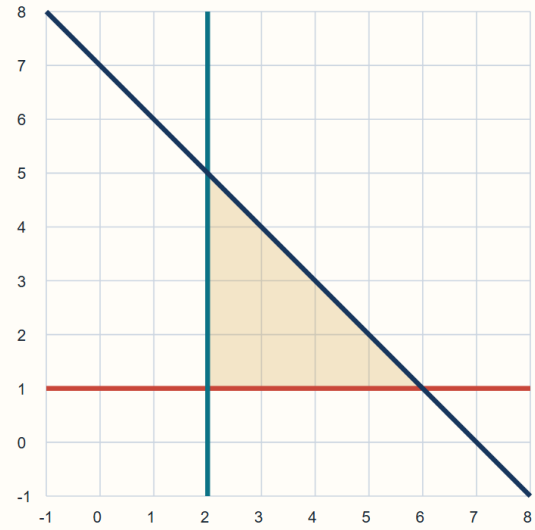
Chapter: Linear Graphs (y = mx + c); Graphing Inequalities

MODULAR UNIT 2

4 marks

Q2 Completed Cartesian graph

Boundary lines for y=1, x=2 and x+y=7



y = 1

x = 2

x + y = 7

Region: x≥2, y≥1, x+y≤7

Vertices: (2,1), (6,1), (2,5)

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Original question 22

4MA1-2H Q8 Q8

ORIGINAL QUESTION

5 marks

8 Behnaz makes 300 celebration cards so that

$$\text{number of birthday cards} : \text{number of anniversary cards} : \text{number of congratulations cards} = 7:5:3$$

$\frac{2}{5}$ of the birthday cards have numbers on them.

36% of the anniversary cards have numbers on them.

None of the congratulations cards have numbers on them.

Work out what fraction of the 300 cards have numbers on them.

Give your answer in its simplest form.

.....

Worked solution 22

Chapter: Percentages

MODULAR UNIT 2
5 marks

Q8 – Chapter: Percentages

Family: Apply a percentage operator • Variant: Combine percentage with fraction or ratio groups

Method

There are $7 + 5 + 3 = 15$ ratio parts, so one part represents $300/15 = 20$ cards.

Why: Convert the ratio to actual card counts.

Method

There are $7 \times 20 = 140$ birthday cards, and $(2/5) \times 140 = 56$ have numbers.

Why: Apply the stated fraction to the birthday cards.

Method

There are $5 \times 20 = 100$ anniversary cards, and $36\% \times 100 = 36$ have numbers.

Why: Apply the stated percentage to the anniversary cards.

Method

The total with numbers is $56 + 36 = 92$, so the fraction is $92/300 = 23/75$.

Why: Combine the two groups and simplify the fraction.

Final answer

fraction: $23/75$

Original question 23

4MA1-2H Q9 Q9

ORIGINAL QUESTION
3 marks

9 Pasha invests 50 000 dollars in a savings account for 4 years.
He gets 1.3% per year compound interest.

Work out how much money Pasha will have in his savings account at the end of 4 years.
Give your answer correct to the nearest dollar.

..... dollars

Worked solution 23

Chapter: Compound Interest & Depreciation

MODULAR UNIT 2
3 marks

Q9 – Chapter: Compound Interest & Depreciation

Family: Accumulate compound growth • Variant: Known annual compound-interest rate

Method

The annual multiplier is $1 + 1.3/100 = 1.013$.

Why: Convert the annual percentage increase to a multiplier.

Method

After 4 years the balance is $50000(1.013)^4 = 52650.913...$ dollars.

Why: Compound the same multiplier for four years.

Method

To the nearest dollar, the balance is 52651 dollars.

Why: Round only the final balance.

Final answer

balance: \$52,651

Original question 24

4MA1-2H Q10 Q10

ORIGINAL QUESTION

3 marks

10 Solve the simultaneous equations

$$7x + 3y = 3$$
$$3x - y = 7$$

Show clear algebraic working.

$x =$ .....

$y =$ .....

Worked solution 24

Chapter: Simultaneous Equations

MODULAR UNIT 2

3 marks

Q10 – Chapter: Simultaneous Equations

Family: Eliminate between two linear equations • Variant: Direct linear elimination

Method

Multiply $3x - y = 7$ by 3 to get $9x - 3y = 21$.

Why: Create opposite y-coefficients for elimination.

Method

Add to $7x + 3y = 3$: $16x = 24$, so $x = 3/2$.

Why: Eliminate y and solve for x.

Method

Then $y = 3x - 7 = -5/2$.

Why: Substitute x into either original equation.

Final answer

x: $x = 1.5$

Final answer

y: $y = -2.5$

Original question 25

4MA1-2H Q12 Q12

ORIGINAL QUESTION

3 marks

12 Larry is a delivery man.

He has 7 parcels to deliver.
The mean weight of the 7 parcels is 2.7 kg

Larry delivers 3 of the parcels.
Each of these 3 parcels has a weight of W kg

The mean weight of the other 4 parcels is 3.3 kg

Work out the value of W

$W =$ .....

Worked solution 25

Chapter: Statistics Toolkit

MODULAR UNIT 2

3 marks

Q12 – Chapter: Statistics Toolkit

Family: Calculate and reverse discrete averages • Variant: Combine or separate subgroup means

Method

The total mass of all seven parcels is $7 \times 2.7 = 18.9$ kg.

Why: Mean multiplied by count gives the total.

Method

The other four parcels total $4 \times 3.3 = 13.2$ kg, so the three equal parcels total $18.9 - 13.2 = 5.7$ kg.

Why: Subtract the known group total.

Method

Therefore $W = 5.7/3 = 1.9$ kg.

Why: Divide the remaining total equally among three parcels.

Final answer

W: $W = 1.9$ kg

Original question 26

4MA1-2H Q13 Q13(a), Q13(b), Q13(c), Q13(d)

ORIGINAL QUESTION
7 marks

13 The table gives information about the ages, in years, of 80 people in a train carriage.

Age (a years)	Frequency
$0 < a \leqslant 20$	7
$20 < a \leqslant 30$	25
$30 < a \leqslant 40$	20
$40 < a \leqslant 50$	14
$50 < a \leqslant 60$	8
$60 < a \leqslant 70$	6

(a) Complete the cumulative frequency table.

Age (a years)	Cumulative frequency
$0 < a \leqslant 20$	
$0 < a \leqslant 30$	
$0 < a \leqslant 40$	
$0 < a \leqslant 50$	
$0 < a \leqslant 60$	
$0 < a \leqslant 70$	

(1)

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

Original question 26 (continued)

4MA1-2H Q13 Q13(a), Q13(b), Q13(c), Q13(d)

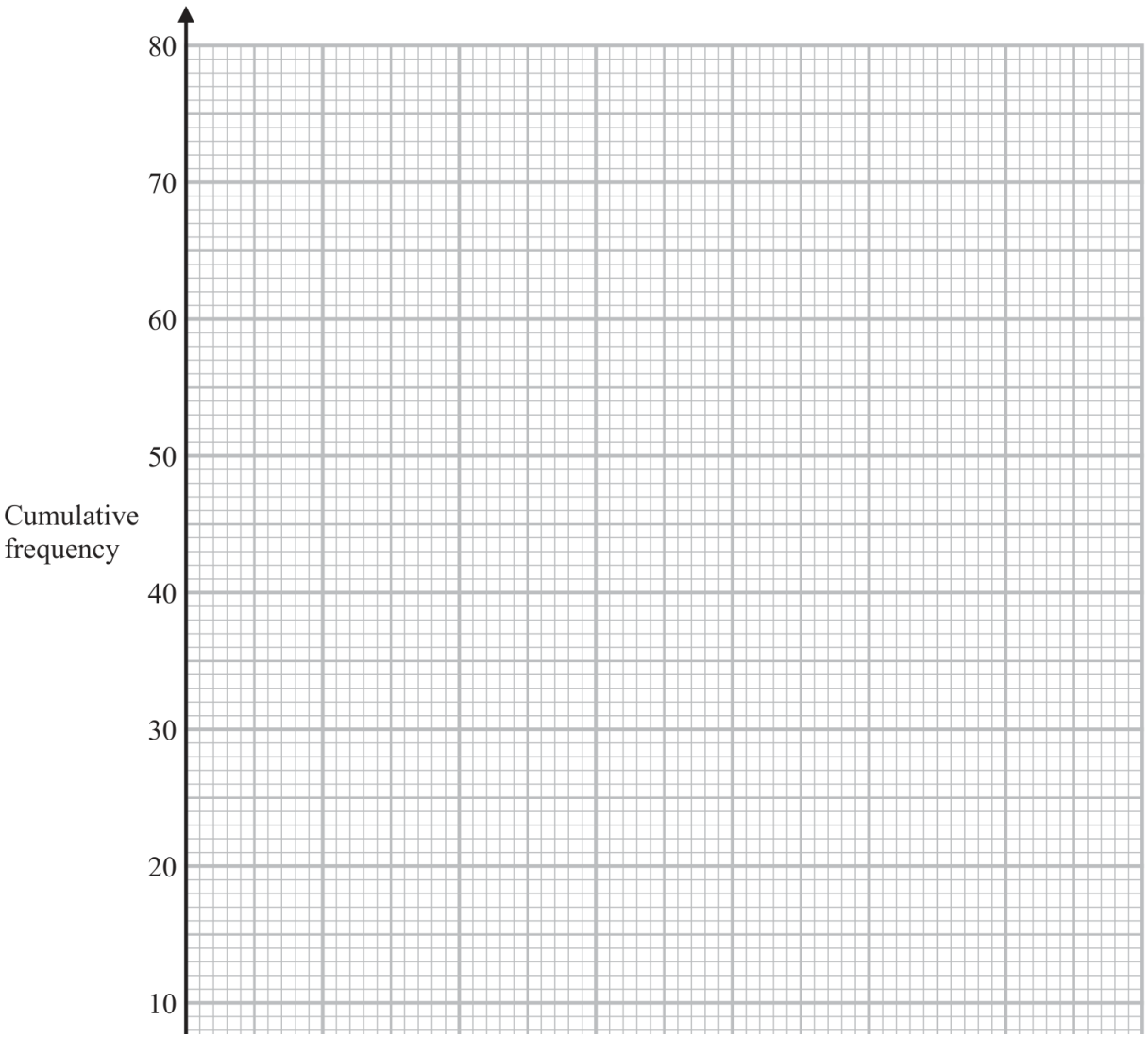
ORIGINAL QUESTION
7 marks

(2)

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

..... years

(1)

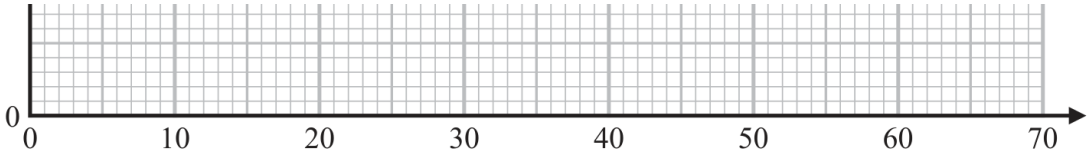


Original question 26 (continued)

4MA1-2H Q13 Q13(a), Q13(b), Q13(c), Q13(d)

ORIGINAL QUESTION

7 marks



Age (years)

Of the people in the train carriage, 60% of those who are aged between 18 and 65 are going to work. None of the other people in the train carriage are going to work.

(d) Use your graph to find an estimate for the number of people in the train carriage who are going to work.

.....

(3)

Worked solution 26

Chapter: Cumulative Frequency Diagrams

MODULAR UNIT 2
7 marks

Q13(a) – Chapter: Cumulative Frequency Diagrams

Family: Construct cumulative-frequency diagrams • Variant: Complete cumulative totals from a frequency table

Method

Successive cumulative totals are 7, 32, 52, 66, 74, 80.
Why: Add each class frequency to the running total.

Final answer

cumulative frequencies: 7, 32, 52, 66, 74, 80

Q13(b) – Chapter: Cumulative Frequency Diagrams

Family: Construct cumulative-frequency diagrams • Variant: Plot a cumulative-frequency curve from class frequencies

Method

Plot (20, 7), (30, 32), (40, 52), (50, 66), (60, 74), and (70, 80).
Why: Cumulative frequencies are plotted at upper class boundaries.

Method

Join the points with a smooth increasing curve or straight line segments.
Why: A cumulative-frequency graph must preserve the cumulative order.

Final answer

graph: CF points (20,7), (30,32), (40,52), (50,66), (60,74), (70,80)

Q13(c) – Chapter: Cumulative Frequency Diagrams

Family: Estimate and compare location and spread from cumulative frequency • Variant: Estimate the median from a cumulative-frequency diagram

Method

Read across from cumulative frequency 40 to the graph and then down to the age axis: the median is about 34 years.
Why: The median is the 40th value out of 80.

Final answer

median age: about 34 years

Q13(d) – Chapter: Cumulative Frequency Diagrams

Family: Read counts and thresholds from cumulative frequency • Variant: Estimate the number above or between thresholds

Method
From the graph, CF(18) is about 6 and CF(65) is about 77.
Why: Use cumulative-frequency readings at both age limits.

Method
About 77 - 6 = 71 people are aged between 18 and 65.
Why: Subtract the lower cumulative count from the upper one.

Method
60% of 71 is 42.6, so an estimate is 43 people.
Why: Apply the percentage and give a whole-person estimate.

Final answer
people going to work: about 43 people

Completed diagram 26

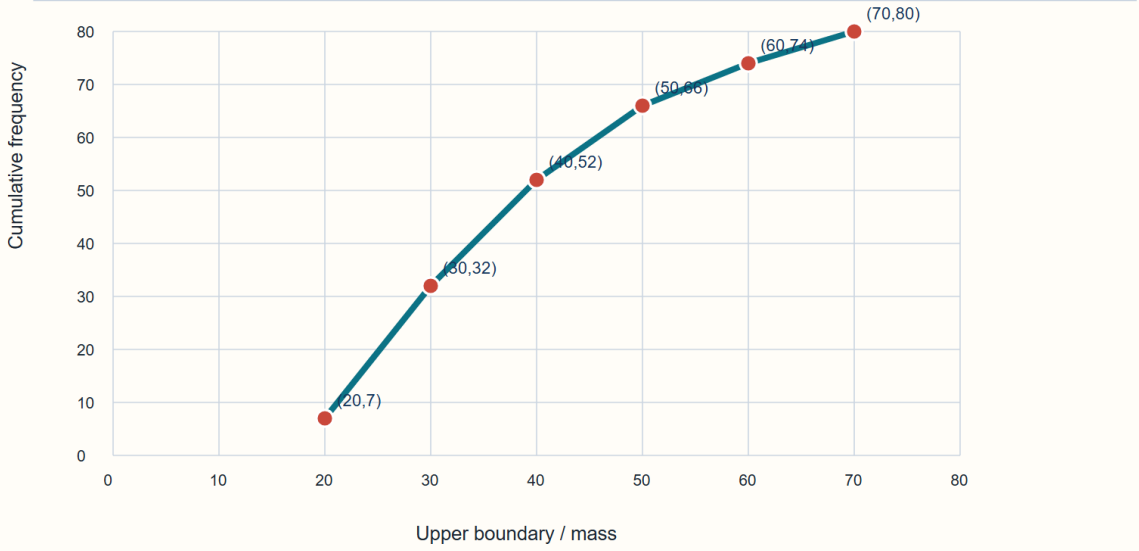
Chapter: Cumulative Frequency Diagrams

MODULAR UNIT 2

7 marks

Q13(b) Completed cumulative-frequency graph

Plot upper-bound points, then join in increasing order



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Original question 27

4MA1-2H Q14 Q14(b)

ORIGINAL QUESTION

4 marks

(b) Make c the subject of $g = \dfrac{c+3}{4+c} - 7$

.....

(4)

Worked solution 27

Chapter: Algebra Toolkit

MODULAR UNIT 2

4 marks

Q14(b) – Chapter: Algebra Toolkit

Family: Change a subject that appears twice or as a power • Variant: Subject appears in two linear terms

Method

$g + 7 = (c + 3)/(c + 4)$.

Why: Add 7 to both sides.

Method

$(g + 7)(c + 4) = c + 3$, so $gc + 7c + 4g + 28 = c + 3$.

Why: Remove the fraction and expand.

Method

$c(g + 6) = -(4g + 25)$.

Why: Collect all c-terms on one side.

Method

Therefore $c = -(4g + 25)/(g + 6)$.

Why: Divide by the coefficient of c.

Final answer

c: $c = -(4g + 25)/(g + 6)$

Original question 28

4MA1-2H Q15 Q15(b)

ORIGINAL QUESTION

3 marks

(b) Solve the inequality $2y^2 - 7y - 30 \leqslant 0$

Show your working clearly.

.....

(3)

Worked solution 28

Chapter: Solving Inequalities

MODULAR UNIT 2

3 marks

Q15(b) – Chapter: Solving Inequalities

Family: Solve quadratic inequalities • Variant: Quadratic inequality with inclusive roots

Method

2y^2 - 7y - 30 = (2y + 5)(y - 6).

Why: Factorise the quadratic.

Method

The critical values are y = -2.5 and y = 6.

Why: Set each factor equal to zero.

Method

The quadratic opens upwards, so it is at most zero between the roots: -2.5 <= y <= 6.

Why: Select the interval where the product is non-positive and include both roots.

Final answer

solution set: -2.5 <= y <= 6

Original question 29

4MA1-2H Q17 Q17

ORIGINAL QUESTION

4 marks

17 M varies directly as the cube of h
$M = 4$ when $h = 0.5$

Find the value of h when $M = 500$

.....

Worked solution 29

Chapter: Direct & Inverse Proportion

MODULAR UNIT 2

4 marks

Q17 – Chapter: Direct & Inverse Proportion

Family: Build an algebraic direct-variation model • Variant: Power direct variation y=kx^n

Method

Direct variation gives M = kh^3.

Why: Translate the variation statement into an equation.

Method

4 = k(0.5)^3, so k = 32.

Why: Use the given pair to determine the constant.

Method

500 = 32h^3, so h^3 = 15.625.

Why: Substitute the new M value and isolate h cubed.

Method

h = cube root of 15.625 = 2.5.

Why: Take the real cube root.

Final answer

h: h = 2.5

Original question 30

4MA1-2H Q21 Q21

ORIGINAL QUESTION

5 marks

21

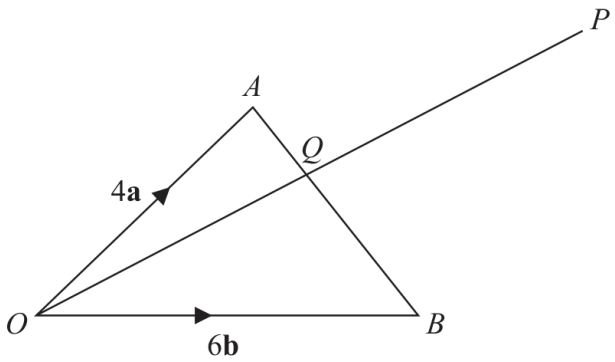


Diagram **NOT** accurately drawn

OAB is a triangle.
Q is the point on AB such that OQP is a straight line.

$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AP} = 2\mathbf{a} + 8\mathbf{b}$

Using a vector method, find the ratio $AQ : QB$

$AQ : QB =$ .....

Worked solution 30

Chapter: Vectors

MODULAR UNIT 2
5 marks

Q21 – Chapter: Vectors

Family: Use vectors with ratios and intersections • Variant: Recover a division ratio using vector parameters

Method
OP = OA + AP = 6a + 8b.
Why: Add the consecutive displacement vectors.

Method
Let AQ = t AB. Then OQ = OA + t(OB - OA) = (4 - 4t)a + 6tb.
Why: Parameterise Q along AB.

Method
Since O, Q, P are collinear, OQ = lambda(6a + 8b).
Why: Parallel vectors are scalar multiples.

Method
Equating coefficients gives 4 - 4t = 6 lambda and 6t = 8 lambda, so t = 8/17.
Why: Use independence of a and b to solve the two scalar equations.

Method
Therefore AQ:QB = (8/17):(9/17) = 8:9.
Why: The remaining fraction of AB is 1 - t.

Final answer
ratio: AQ : QB = 8 : 9

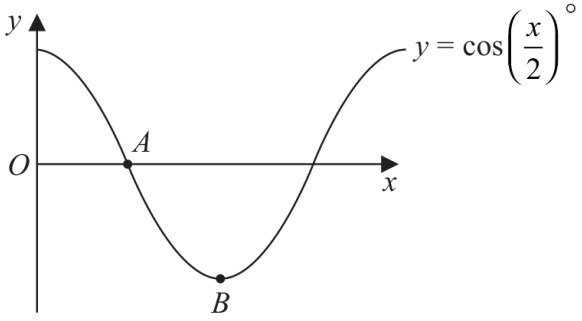
Original question 31

4MA1-2H Q23 Q23(i)

ORIGINAL QUESTION

1 marks

23 The diagram shows a sketch of the graph of $y = \cos\left(\frac{x}{2}\right)^\circ$



(i) Find the coordinates of the point A

(..... , ...)

(1)

Worked solution 31

Chapter: Transformations of Graphs

MODULAR UNIT 2

1 marks

Q23(i) – Chapter: Transformations of Graphs

Family: Map a known graph feature • Variant: Horizontal scale or y-axis reflection

Method

At A, $\cos(x/2) = 0$. The first positive solution is $x/2 = 90$ degrees, so A $= (180, 0)$.

Why: Read the first positive x-intercept of the cosine graph in degree mode.

Final answer

A: A $= (180, 0)$

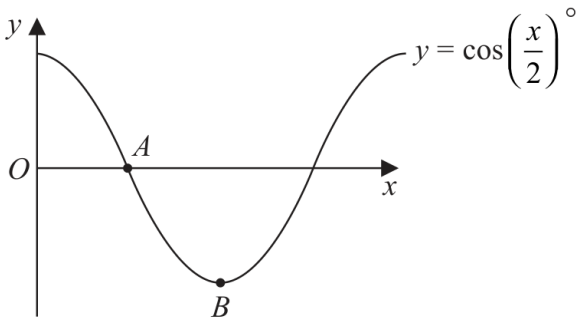
Original question 32

4MA1-2H Q23 Q23(ii)

ORIGINAL QUESTION

1 marks

23 The diagram shows a sketch of the graph of $y = \cos\left(\frac{x}{2}\right)^\circ$



(ii) Find the coordinates of the point B

(..... , ...)

(1)

Worked solution 32

Chapter: Transformations of Graphs

MODULAR UNIT 2

1 marks

Q23(ii) – Chapter: Transformations of Graphs

Family: Map a known graph feature • Variant: Horizontal scale or y-axis reflection

Method

At the first minimum, $x/2 = 180$ degrees, so $x = 360$ degrees and $y = -1$; hence $B = (360, -1)$.

Why: Use the first minimum of the cosine graph in degree mode.

Final answer

B: $B = (360, -1)$