Elite Mathematics
Pearson Edexcel International GCSE

IGCSE LINEAR · 4MA1

4MA1/1H May 2024 Worked Solutions

May 2024 paper rebuilt with the worked solution after each question.

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



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PAST PAPER

4MA1/1H May 2024

May 2024

25	100	2 h
questions	marks	exam time

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

4MA1/1H MAY 2024

Question 1

3 marks | Sequences

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

1 4 7 10

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

.....

(2)

The nth term of a different arithmetic sequence is $5n + 17$

(b) Find the 12th term of this sequence.

.....

(1)

(Total for Question 1 is 3 marks)

WORKED SOLUTION

Question 1 · 4MA1/1H May 2024

1 The sequence is

The sequence is

$$1,\ 4,\ 7,\ 10$$

2 The common difference is

The common difference is 3.

$$\text{nth term} = 1 + 3(n-1) = 3n - 2$$

3 Find the nth term

For the other sequence,

$$5n + 17$$

4 The 12th term is

The 12th term is

$$5(12) + 17 = 77$$

FINAL ANSWER

$3n - 2$, and 77.

4MA1/1H MAY 2024

Question 2

4 marks | Probability Toolkit

2 450 students were asked how they travelled to school on Monday.
Each student walked or travelled by bus or travelled by car or travelled by bicycle.
Each student used just one method of travel.

One of these students is chosen at random.
The table shows information about the probability of each method of travel.

Method of travel	walk	bus	car	bicycle
Probability	0.20	x	$2x$	0.26

Work out how many of the 450 students travelled by car.

(Total for Question 2 is 4 marks)

WORKED SOLUTION

Question 2 · 4MA1/1H May 2024

1 Find x

$$0.20 + x + 2x + 0.26 = 1 \Rightarrow 3x = 0.54 \Rightarrow x = 0.18$$

2 Probability of travelling by car

$$2x = 0.36$$

3 Number of students

$$450 \times 0.36 = 162$$

✓ **FINAL ANSWER**

162

4MA1/1H MAY 2024

Question 3

2 marks | Prime Factors, HCF & LCM

3 Find the highest common factor (HCF) of 72 and 108
Show your working clearly.

(Total for Question 3 is 2 marks)

WORKED SOLUTION

Question 3 · 4MA1/1H May 2024

1 Find the LCM

$$72 = 2^3 \times 3^2$$

$$108 = 2^2 \times 3^3$$

2 Find the LCM

For the HCF, take the smaller power of each common prime:

$$\text{HCF} = 2^2 \times 3^2$$

$$2^2 \times 3^2 = 4 \times 9 = 36$$

✓ **FINAL ANSWER**

36

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Question 4

3 marks | Reverse Percentages

4 Ava records the number of kilometres she drives each month.

In April, Ava drove 943 kilometres.
This is 15% more than the number of kilometres she drove in March.

Work out the number of kilometres Ava drove in March.

..... kilometres

(Total for Question 4 is 3 marks)

WORKED SOLUTION

Question 4 · 4MA1/1H May 2024

1 **Calculate percentage**

April is 15% more than March, so April is 115% of March.

$$1.15 \times \text{March} = 943$$

$$\text{March} = \frac{943}{1.15} = 820$$

FINAL ANSWER

820 kilometres

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Question 5

4 marks | Angles in Polygons & Parallel Lines

5 In the diagram, $ABCDE$ is a regular pentagon.

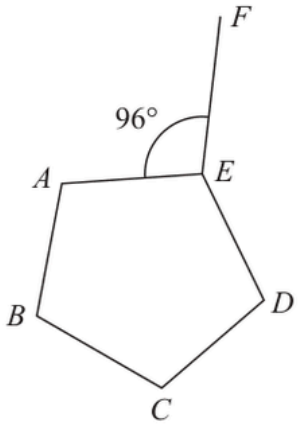


Diagram **NOT** accurately drawn

Angle $AEF = 96°$

Work out the size of the obtuse angle FED
Show your working clearly.

.....°

(Total for Question 5 is 4 marks)

WORKED SOLUTION

Question 5 · 4MA1/1H May 2024

1 **The interior angle of a**

The interior angle of a regular pentagon is

$$\frac{(5-2)\times 180}{5} = 108°$$

2 **Find the gradient**

At E, angles around a point add to $360°$.

$$\angle FED = 360° - 96° - 108° = 156°$$

✓ **FINAL ANSWER**

$156°$.

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Question 6

5 marks | Linear Equations

6 (a) Expand and simplify $(m + 5)(m - 8)$

.....

(2)

(b) Solve $3n - 4 = \frac{5n + 6}{3}$

Show clear algebraic working.

$n =$ .....

(3)

(Total for Question 6 is 5 marks)

WORKED SOLUTION

Question 6 · 4MA1/1H May 2024

1 **(a)**

(a)

$$(m+5)(m-8) = m^2 - 3m - 40$$

2 **(b)**

(b)

$$3n - 4 = \frac{5n+6}{3}$$

$$9n - 12 = 5n + 6$$

$$4n = 18$$

FINAL ANSWER

(a) $m^2 - 3m - 40$, (b) $n = \frac{9}{2}$

Question 7

5 marks | Set Notation & Venn Diagrams

7 $\mathscr{E} = \{23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34\}$
$A = \{\text{even numbers}\}$
$B = \{23, 29, 31\}$
$C = \{\text{multiples of 3}\}$

(a) List the members of the set

(i) $B \cup C$

.....

(1)

(ii) $A' \cap C$

.....

(1)

(b) Is it true that $B \cap C = \varnothing$?

Tick (✓) one of the boxes below.

Yes	No
☐	☐

Give a reason for your answer.

.....

(1)

The set D has 4 members and is such that $D \cap (A \cup C) = \varnothing$

(c) List the members of set D

.....

(2)

(Total for Question 7 is 5 marks)

1 **Calculate value**

$$\mathcal{E} = \{23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34\}$$

$$A = \{24, 26, 28, 30, 32, 34\}$$

$$B = \{23, 29, 31\}$$

$$C = \{24, 27, 30, 33\}$$

2 **Calculate value**

So

$$B \cup C = \{23, 24, 27, 29, 30, 31, 33\}$$

3 **Set of odd numbers**

Also A' is the set of odd numbers in $\mathcal{E}$, so

$$A' \cap C = \{27, 33\}$$

4 **The statement is true because**

The statement $B \cap C = \emptyset$ is true because none of $23, 29, 31$ is a multiple of 3.

5 **Calculate value**

For D, we need $D \cap (A \cup C) = \emptyset$. So D must contain the four numbers outside $A \cup C$:

$$D = \{23, 25, 29, 31\}$$

✓ **FINAL ANSWER**

(a)(i) $\{23, 24, 27, 29, 30, 31, 33\}$, (a)(ii) $\{27, 33\}$, (b) Yes, (c) $\{23, 25, 29, 31\}$

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Question 8

3 marks | Standard & Compound Units

8 A cylinder is placed on a table.

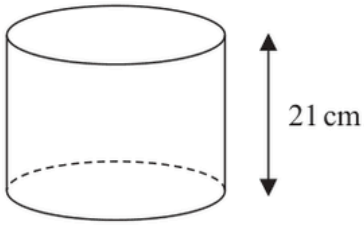


Diagram **NOT** accurately drawn

The volume of the cylinder is $1575\,\text{cm}^3$
The force exerted by the cylinder on the table is 84 newtons.

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

Work out the pressure on the table due to the cylinder.

..... newtons/cm^2

(Total for Question 8 is 3 marks)

WORKED SOLUTION

Question 8 · 4MA1/1H May 2024

1 The volume of a cylinder

The volume of a cylinder is

$$\text{volume} = \text{area of base} \times \text{height}$$

2 Calculate area

So the area in contact with the table is

$$1575 \div 21 = 75\ \text{cm}^2$$

3 Use

Use

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

$$\text{pressure} = \frac{84}{75} = 1.12$$

FINAL ANSWER

1.12 newtons/cm^2.

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Question 9

3 marks | Standard Form

9 The table gives the amount of rice produced by each of two countries in 2020

Country	Amount of rice (tonnes)
Indonesia	3.5×10^7
Argentina	8.2×10^5

(a) Write 3.5×10^7 as an ordinary number.

.....

(1)

In 2020, Japan produced 6 780 000 more tonnes of rice than Argentina.

(b) Work out the amount of rice Japan produced in 2020
Give your answer in standard form.

..... tonnes

(2)

(Total for Question 9 is 3 marks)

WORKED SOLUTION

Question 9 · 4MA1/1H May 2024

1 Convert standard form

$$3.5 \times 10^7 = 35000000$$

2 Argentina produced

Argentina produced

$$8.2 \times 10^5 = 820000$$

3 tonnes of rice

tonnes of rice.

4 Japan produced more tonnes than

Japan produced 6780000 more tonnes than Argentina, so

$$820000 + 6780000 = 7600000$$

5 Convert standard form

In standard form,

$$7600000 = 7.6 \times 10^6$$

FINAL ANSWER

(a) 35000000, (b) 7.6×10^6 tonnes

4MA1/1H MAY 2024

Question 10

4 marks | Algebraic Roots & Indices

10 (a) Simplify $(2p)^0$ where $p > 0$

.....

(1)

$y^9 \times y^{-3} = y^n$

(b) Find the value of n

$n =$ .....

(1)

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

.....

(2)

(Total for Question 10 is 4 marks)

WORKED SOLUTION

Question 10 · 4MA1/1H May 2024

1 **(a)**

(a) $(2p)^0 = 1$.

2 **Use index laws**

(b) $y^9 \times y^{-3} = y^{9-3} = y^6$, so $n = 6$.

3 **(c)**

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

✓ **FINAL ANSWER**

(a) 1, (b) 6, (c) $125a^{12}c^6$

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Question 11

4 marks | Right-Angled Triangles - Pythagoras & Trigonometry

11 The diagram shows a roof support.

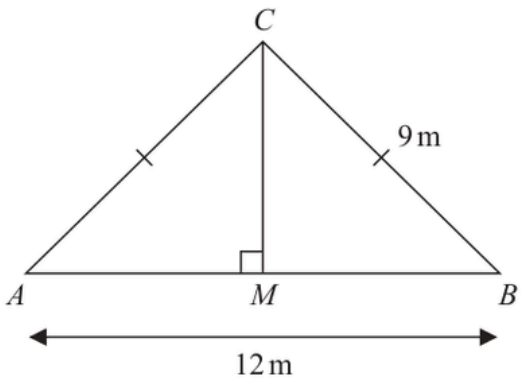


Diagram **NOT** accurately drawn

The roof support is made from four lengths of wood, AB, AC, BC and MC

$AC = BC = 9\,\text{m}$ $AB = 12\,\text{m}$

angle $AMC = 90°$

Lewis is going to buy lengths of wood to make the roof support.

The wood costs 21.50 euros per metre.
Each length of wood he buys has to be a whole number of metres.

Work out the total cost of the wood Lewis needs to buy.
Show your working clearly.

..... euros

(Total for Question 11 is 4 marks)

WORKED SOLUTION

Question 11 · 4MA1/1H May 2024

1 **Find the gradient**

Since $AC = BC$, the perpendicular support from C meets AB at its midpoint.

$$AM = \frac{12}{2} = 6$$

2 **Use trigonometry**

In right-angled triangle AMC,

$$AC^2 = AM^2 + MC^2$$

$$9^2 = 6^2 + MC^2$$

$$MC^2 = 81 - 36 = 45$$

$$MC = \sqrt{45} = 6.708\ldots$$

---

3 **A whole number of metres**

A whole number of metres must be bought, so buy 7 m for MC.

---

4 **Total length needed**

Total length needed:

$$12 + 9 + 9 + 7 = 37$$

---

5 **Cost**

Cost:

$$37 \times 21.50 = 795.50$$

✓ **FINAL ANSWER**

795.50 euros.

4MA1/1H MAY 2024

Question 12

5 marks | Algebraic Fractions

12 (a) Factorise fully $6y^2 - 5y - 4$

.....

(2)

(b) Express $\frac{2x+1}{4x} + \frac{7-5x}{3x}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 12 is 5 marks)

WORKED SOLUTION

Question 12 · 4MA1/1H May 2024

1 **(a)**

(a)

$$6y^2 - 5y - 4 = (3y - 4)(2y + 1)$$

2 **(b)**

(b)

$$\frac{2x+1}{4x} + \frac{7-5x}{3x}$$

3 **Use denominator**

Use denominator $12x$:

$$\frac{3(2x+1) + 4(7-5x)}{12x}$$

$$= \frac{6x + 3 + 28 - 20x}{12x} = \frac{31 - 14x}{12x}$$

FINAL ANSWER

(a) $(3y - 4)(2y + 1)$, (b) $\frac{31-14x}{12x}$

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Question 13

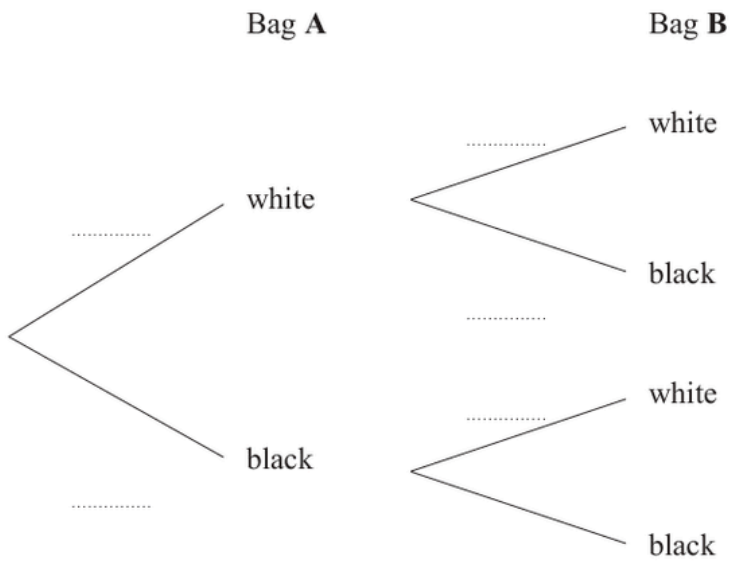
5 marks | Tree Diagrams & Conditional Probability

13 Harman has two bags of beads.

In bag **A**, there are 3 white beads and 7 black beads.
In bag **B**, there are 5 white beads and 4 black beads.

Harman takes at random a bead from bag **A** and a bead from bag **B**

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Harman takes two beads of the same colour.

.....

(3)

(Total for Question 13 is 5 marks)

WORKED SOLUTION

Question 13 · 4MA1/1H May 2024

1 **(a) Complete the tree**

Bag A: white $\frac{3}{10}$, black $\frac{7}{10}$.
Bag B (on both branches): white $\frac{5}{9}$, black $\frac{4}{9}$.

2 **(b) Same colour = both white or both black**

$$\frac{3}{10} \times \frac{5}{9} + \frac{7}{10} \times \frac{4}{9} = \frac{15}{90} + \frac{28}{90} = \frac{43}{90}$$

FINAL ANSWER

(a) $\frac{3}{10}, \frac{7}{10}$; $\frac{5}{9}, \frac{4}{9}$ on both branches (b) $\frac{43}{90}$

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Question 14

5 marks | Reverse Percentages

14 The combined savings of Abel and Bahira are 15 435 dinars.

The savings of Bahira are 45% more than the savings of Abel.

The savings of Bahira are $\frac{3}{2}$ times the savings of Chanda.

Work out the savings of Chanda.

..... dinars

(Total for Question 14 is 5 marks)

WORKED SOLUTION

Question 14 · 4MA1/1H May 2024

1 Let Abel s savings be

Let Abel's savings be A.

2 Calculate percentage

Bahira has 45% more than Abel, so

$$B = 1.45A$$

3 Their combined savings are

Their combined savings are

$$A + 1.45A = 15435$$

$$2.45A = 15435$$

$$A = 6300$$

4 Calculate percentage

So

$$B = 1.45 \times 6300 = 9135$$

5 **Bahira s savings are times**

Bahira's savings are $\frac{3}{2}$ times Chanda's savings, so

$$9135 = \frac{3}{2}C$$

$$C = 9135 \times \frac{2}{3} = 6090$$

✓ **FINAL ANSWER**

6090 dinars

4MA1/1H MAY 2024

Question 15

4 marks | Functions

15 The function f is defined as

$$f: x \mapsto \frac{3x+1}{x-2}$$

(a) State the value of x that cannot be included in any domain of the function f

.....

(1)

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

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

(3)

(Total for Question 15 is 4 marks)

WORKED SOLUTION

Question 15 · 4MA1/1H May 2024

1 **Evaluate fraction**

$$f(x) = \frac{3x+1}{x-2}$$

2 **(a) The denominator cannot be**

(a) The denominator cannot be zero, so

$$x - 2 = 0$$

$$x = 2$$

3 **(b) Let**

(b) Let

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

$$y(x-2) = 3x+1$$

$$yx - 2y = 3x + 1$$

$$x(y-3) = 2y+1$$

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

---

4 **Evaluate fraction**

So

$$f^{-1}(x) = \frac{2x+1}{x-3}$$

✓ **FINAL ANSWER**

Excluded value 2, and $f^{-1}(x) = \frac{2x+1}{x-3}$.

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Question 16

4 marks | Tree Diagrams & Conditional Probability

16 There are 20 sweets in a box.

15 of the sweets are red
5 of the sweets are yellow

Fred takes at random 3 sweets from the box.

Work out the probability that Fred takes at least one sweet of each colour from the box.

(Total for Question 16 is 4 marks)

WORKED SOLUTION

Question 16 · 4MA1/1H May 2024

1 Use the complement

"At least one of each colour" fails only if all three sweets are red or all three are yellow.

2 All red, all yellow (no replacement)

$$P(RRR) = \frac{15}{20} \times \frac{14}{19} \times \frac{13}{18} = \frac{2730}{6840}, \qquad P(YYY) = \frac{5}{20} \times \frac{4}{19} \times \frac{3}{18} = \frac{60}{6840}$$

3 At least one of each

$$1 - \frac{2730 + 60}{6840} = \frac{4050}{6840} = \frac{45}{76}$$

FINAL ANSWER

$$\frac{45}{76}$$

4MA1/1H MAY 2024

Question 17

3 marks | Algebraic Proof

17 Show that $\dfrac{1+\sqrt{5}}{3-\sqrt{5}}$ can be written in the form $a+\sqrt{b}$ where a and b are integers.

Show each stage of your working clearly.

(Total for Question 17 is 3 marks)

WORKED SOLUTION

Question 17 · 4MA1/1H May 2024

1 **Simplify surd**

$$\frac{1+\sqrt{5}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} = \frac{(1+\sqrt{5})(3+\sqrt{5})}{9-5}$$

$$= \frac{3+\sqrt{5}+3\sqrt{5}+5}{4}$$

$$= \frac{8+4\sqrt{5}}{4} = 2+\sqrt{5}$$

FINAL ANSWER

$2+\sqrt{5}$, so $a=2$ and $b=5$.

4MA1/1H MAY 2024

Question 18

5 marks | Differentiation & Turning Points

18 A curve C has equation $y = x^3 - 40x + 1$

Find the coordinates of both the points on C at which the gradient is 8

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

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

(Total for Question 18 is 5 marks)

WORKED SOLUTION

Question 18 · 4MA1/1H May 2024

1 Differentiate

$$y = x^3 - 40x + 1$$

$$\frac{dy}{dx} = 3x^2 - 40$$

2 Find the gradient

The gradient is 8, so

$$3x^2 - 40 = 8$$

$$3x^2 = 48$$

$$x^2 = 16$$

$$x = 4 \quad \text{or} \quad x = -4$$

3 Differentiate

When $x = 4$:

$$y = 4^3 - 40(4) + 1 = -95$$

4 Differentiate

When $x = -4$:

$$y = (-4)^3 - 40(-4) + 1 = 97$$

FINAL ANSWER

$(-4, 97)$ and $(4, -95)$.

4MA1/1H MAY 2024

Question 19

5 marks | Sine & Cosine Rules

19 Here is quadrilateral $ABCD$

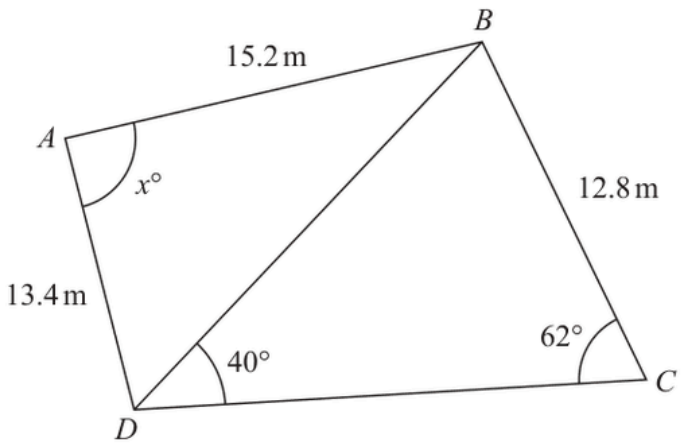


Diagram **NOT** accurately drawn

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

$x =$ .....

(Total for Question 19 is 5 marks)

WORKED SOLUTION

Question 19 · 4MA1/1H May 2024

1 **Use trigonometry**

In triangle BCD,

$$\angle DBC = 180° - 40° - 62° = 78°$$

2 **Use trigonometry**

By the sine rule,

$$\frac{DB}{\sin 62°} = \frac{12.8}{\sin 40°}$$

$$DB = 17.582\ldots$$

3 Use trigonometry

Now use cosine rule in triangle ABD:

$$\cos x = \frac{15.2^2 + 13.4^2 - 17.582\ldots^2}{2(15.2)(13.4)}$$

$$x = 75.577\ldots^\circ$$

FINAL ANSWER

75.6°.

4MA1/1H MAY 2024

Question 20

4 marks | Circles, Arcs & Sectors

20 The diagram shows a sector $OABC$ of a circle centre O

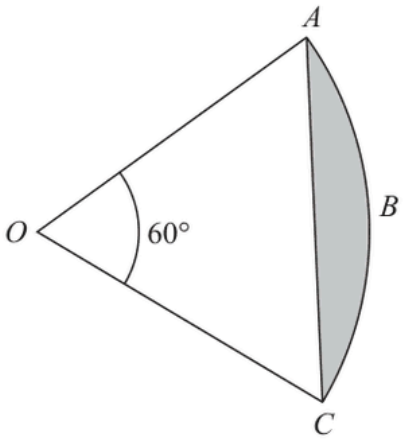


Diagram **NOT** accurately drawn

Angle $AOC = 60°$

The area of the shaded segment ABC is $38\,\text{cm}^2$

Work out the perimeter of the shaded segment ABC
Give your answer correct to one decimal place.

..... cm

(Total for Question 20 is 4 marks)

WORKED SOLUTION

Question 20 · 4MA1/1H May 2024

1 **Let the radius of the**

Let the radius of the sector be r.

2 **The shaded segment is**

The shaded segment is

$$\text{sector area} - \text{triangle area}$$

3 **Use trigonometry**

The angle is $60°$, so

$$38 = \frac{60}{360}\pi r^2 - \frac{1}{2}r^2 \sin 60°$$

$$38 = r^2\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$$

$$r = 20.4815\ldots$$

4 **The perimeter of the shaded**

The perimeter of the shaded segment is the arc AC plus the chord AC.

5 **Arc length**

Arc length:

$$\frac{60}{360} \times 2\pi r = \frac{\pi r}{3}$$

6 **Chord length**

Chord length:

$$2r \sin 30° = r$$

7 **Evaluate fraction**

So the perimeter is

$$\frac{\pi r}{3} + r$$

$$= \frac{\pi(20.4815\ldots)}{3} + 20.4815\ldots$$

$$= 41.9296\ldots$$

✓ **FINAL ANSWER**

$\boxed{41.9\text{ cm}}$

4MA1/1H MAY 2024

Question 21

2 marks | Transformations of Graphs

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

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

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

(i) $y = f(x + 7)$

(.....,.....)
(1)

(ii) $y = f(x) - 6$

(.....,.....)
(1)

(Total for Question 21 is 2 marks)

WORKED SOLUTION

Question 21 · 4MA1/1H May 2024

1 The minimum point of is

The minimum point of $y = f(x)$ is $(5, -4)$.

2 Calculate value

For

$$y = f(x + 7)$$

3 the graph moves 7 units

the graph moves 7 units left:

$$(5, -4) \rightarrow (-2, -4)$$

4 Calculate value

For

$$y = f(x) - 6$$

5 **the graph moves 6 units**

the graph moves 6 units down:

$$(5, -4) \rightarrow (5, -10)$$

✓ **FINAL ANSWER**

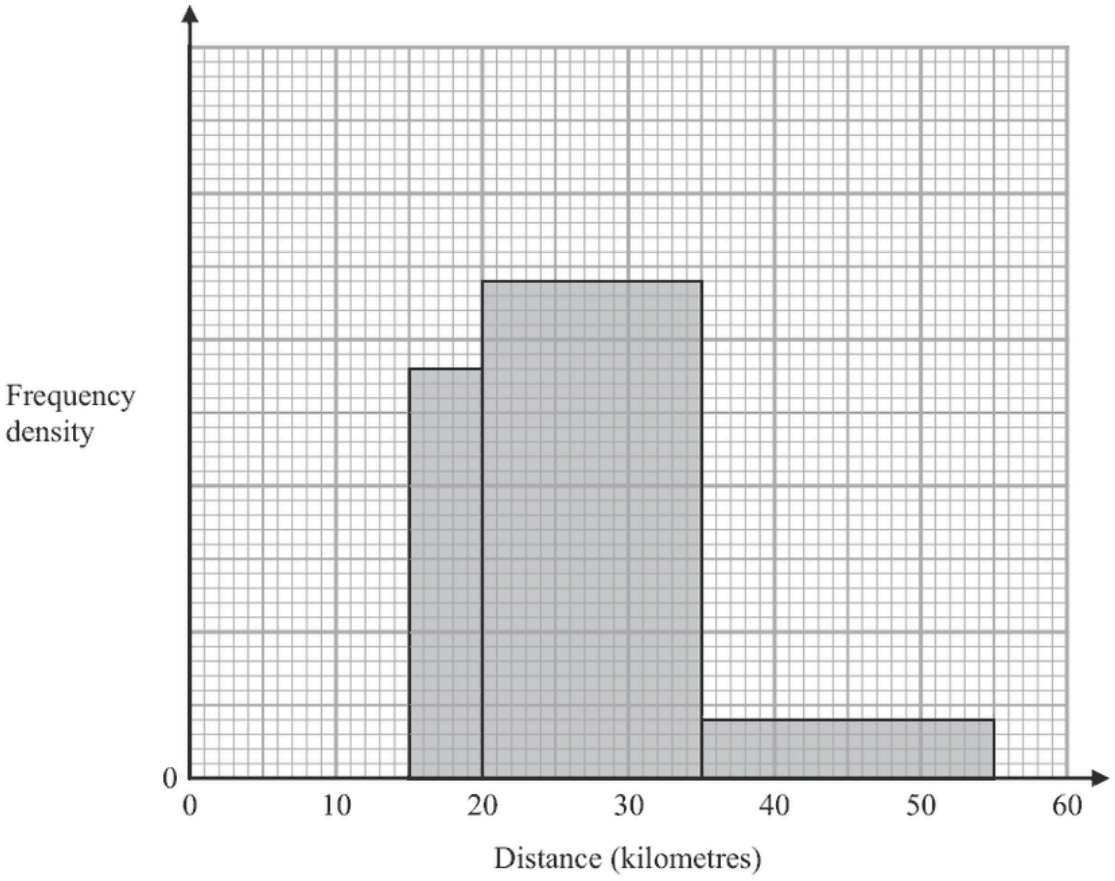
$(-2, -4)$ and $(5, -10)$

4MA1/1H MAY 2024

Question 22

3 marks | Histograms

22 The incomplete histogram shows some information about the distances, in kilometres, that 100 adults ran last week.



All of the adults ran at least 5 kilometres.
None of the adults ran more than 55 kilometres.
14 adults ran between 15 kilometres and 20 kilometres.

Complete the histogram.

(Total for Question 22 is 3 marks)

WORKED SOLUTION

Question 22 · 4MA1/1H May 2024

1 **Use histogram**

For a histogram,

$$\text{frequency} = \text{class width} \times \text{frequency density}$$

2 **Use frequency table**

For $15 \leq d < 20$, the frequency is 14 and the class width is 5, so

$$\text{frequency density} = \frac{14}{5} = 2.8$$

3 **Use histogram**

Using this scale from the histogram:

$$20 \leq d < 35 \quad \text{has frequency density } 3.4$$

$$35 \leq d \leq 55 \quad \text{has frequency density } 0.4$$

4 **Calculate value**

So the known frequencies are

$$14 + (15)(3.4) + (20)(0.4)$$

$$= 14 + 51 + 8 = 73$$

5 **Use frequency table**

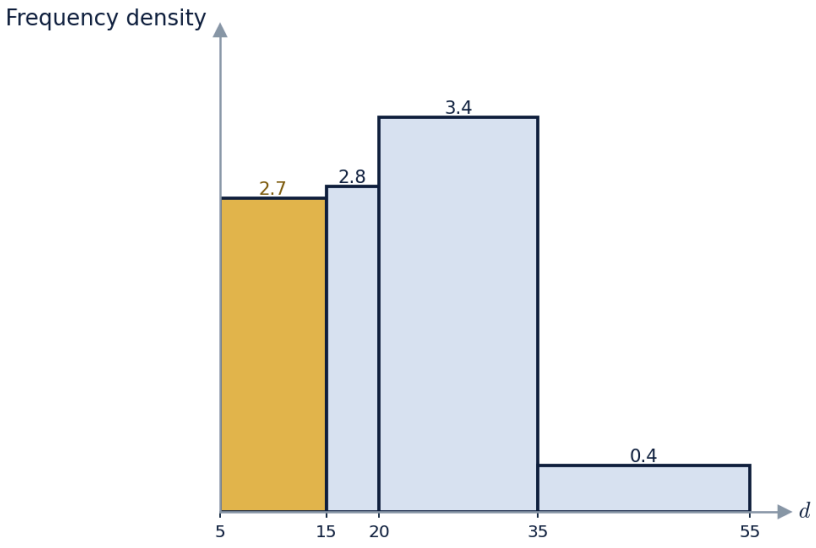
There are 100 adults in total, so the missing frequency from 5 km to 15 km is

$$100 - 73 = 27$$

6 **The missing class width is**

The missing class width is 10, so its frequency density is

$$\frac{27}{10} = 2.7$$



FINAL ANSWER

draw the missing bar from 5 to 15 with frequency density 2.7

4MA1/1H MAY 2024

Question 23

5 marks | Volume & Surface Area

23 A solid shape is made by removing a hemisphere, shown shaded, from a cone as shown in the diagram.

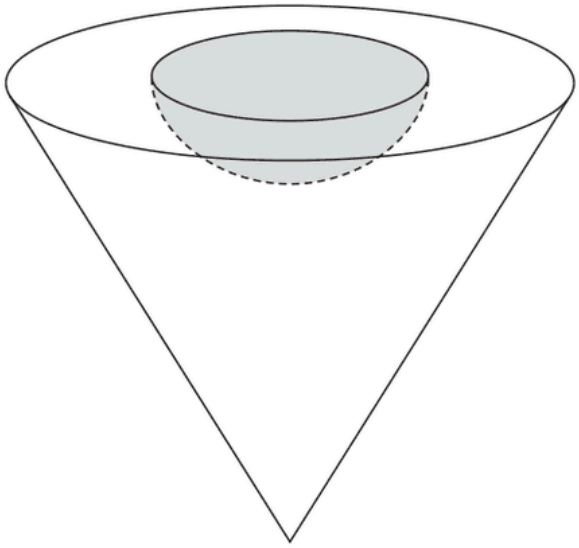


Diagram **NOT** accurately drawn

The radius of the hemisphere is $2x$ cm
The radius of the base of the cone is $5x$ cm
The vertical height of the cone is $6x$ cm

The volume of the solid shape is 6948π cm^3

Work out the **total** surface area of the solid hemisphere that has been removed from the cone.
Give your answer correct to the nearest integer.

..... cm^2

(Total for Question 23 is 5 marks)

WORKED SOLUTION

Question 23 · 4MA1/1H May 2024

1 **Define cone dimensions**

The cone has radius $5x$ and height $6x$.

2 **Volume of the cone**

Volume of the cone:

$$\frac{1}{3}\pi(5x)^2(6x)$$

$$= 50\pi x^3$$

---

3 **The removed hemisphere has radius**

The removed hemisphere has radius $2x$.

---

4 **Volume of the hemisphere**

Volume of the hemisphere:

$$\frac{2}{3}\pi(2x)^3$$

$$= \frac{16}{3}\pi x^3$$

---

5 **The remaining solid has volume**

The remaining solid has volume 6948π, so

$$50\pi x^3 - \frac{16}{3}\pi x^3 = 6948\pi$$

$$\frac{134}{3}\pi x^3 = 6948\pi$$

---

6 **Cancel**

Cancel π:

$$\frac{134}{3}x^3 = 6948$$

$$x^3 = \frac{10422}{67}$$

$$x = 5.3781\ldots$$

---

7 **The solid hemisphere removed has**

The solid hemisphere removed has radius $2x$.

---

8 **Total surface area of a**

Total surface area of a solid hemisphere is

$$3\pi r^2$$

9 **Calculate value**

So

$$3\pi(2x)^2 = 12\pi x^2$$

$$12\pi(5.3781\ldots)^2 = 1090.3903\ldots$$

✓ **FINAL ANSWER**

$\boxed{1090\ \text{cm}^2}$

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Question 24

6 marks | Sequences

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

The interior angles of the polygon form an arithmetic sequence.

The smallest angle of the polygon is 84°
The common difference of the sequence is 4°

Work out the sum of the interior angles of the polygon.
Show clear algebraic working.

.....°

(Total for Question 24 is 6 marks)

WORKED SOLUTION

Question 24 · 4MA1/1H May 2024

1 **The interior angles form an**

The interior angles form an arithmetic sequence with first term 84 and common difference 4.

2 **Use trigonometry**

So the sum of the angles is

$$\frac{n}{2}(2(84) + (n-1)4)$$

$$= \frac{n}{2}(168 + 4n - 4)$$

$$= 2n^2 + 82n$$

3 **The sum of the interior**

The sum of the interior angles of an n-sided polygon is

$$180(n-2)$$

4 **Calculate value**

So

$$2n^2 + 82n = 180(n-2)$$

$$2n^2 - 98n + 360 = 0$$

$$n^2 - 49n + 180 = 0$$

$$(n-45)(n-4) = 0$$

---

5 **Solve inequality**

Since $n > 5$,

$$n = 45$$

---

6 **Use trigonometry**

Therefore the sum of the interior angles is

$$180(45-2) = 7740$$

✓ **FINAL ANSWER**

7740 degrees

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Question 25

4 marks | Completing the Square

25 $f(x) = 17 - 3x^2 + 12x$

Write $f(x)$ in the form $a - b(x - c)^2$ where a, b and c are constants.

$f(x) =$ .....

(Total for Question 25 is 4 marks)

WORKED SOLUTION

Question 25 · 4MA1/1H May 2024

1 Solve inequality

$$f(x) = 17 - 3x^2 + 12x$$

$$= -3x^2 + 12x + 17$$

$$= -3(x^2 - 4x) + 17$$

$$= -3\left((x - 2)^2 - 4\right) + 17$$

$$= -3(x - 2)^2 + 12 + 17$$

$$= 29 - 3(x - 2)^2$$

FINAL ANSWER

$f(x) = 29 - 3(x - 2)^2$