Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2024
Deferred Examinations

Marking Scheme

Mathematics

Ordinary Level

Note to teachers and students on the marking schemes for the deferred examinations

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. However, it should be noted that the marking schemes for the deferred examinations may not necessarily be as detailed as the corresponding marking schemes for the main sitting of an examination, which serve to ensure consistency across a large team of examiners.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination, and the need to maintain consistency in standards between the main sitting and the deferred sitting and from year to year. In the case of the deferred examinations, this means that the level of detail may vary by question, as the marking scheme will only have been finalised for the questions attempted by the candidates who sat these examinations.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with a senior examiner when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes (whether for the main examinations or the deferred examinations) should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination concerned. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination will not necessarily be the same for the deferred sitting as for the main sitting or from one year to the next.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination

Deferred Examination 2024

Mathematics

Ordinary Level

Paper 1

Marking scheme

300 marks

Marking Scheme – Paper 1, Section A and Section B

Structure of the marking scheme

Candidate responses are marked according to different scales, depending on the types of response anticipated. Scales labelled A divide candidate responses into two categories (correct and incorrect). Scales labelled B divide responses into three categories (correct, partially correct, and incorrect), and so on. The scales and the marks that they generate are summarised in this table:

Scale label	A	B	C	D
No of categories	2	3	4	5
5 mark scales	0, 5	0, 2, 5	0, 2, 3, 5	0, 2, 3, 4, 5
10 mark scales		0, 4, 10	0, 4, 6, 10	0, 3, 5, 7, 10
15 mark scales			0, 5, 8, 15	0, 5, 7, 9, 15
20 mark scales				0, 7, 10, 12, 20

A general descriptor of each point on each scale is given below. More specific directions in relation to interpreting the scales in the context of each question are given in the scheme, where necessary.

Marking scales – level descriptors

A-scales (two categories)
- incorrect response
- correct response

B-scales (three categories)
- response of no substantial merit
- partially correct response
- correct response

C-scales (four categories)
- response of no substantial merit
- response with some merit
- almost correct response
- correct response

D-scales (five categories)
- response of no substantial merit
- response with some merit
- response about half-right
- almost correct response
- correct response

In certain cases, typically involving incorrect rounding, omission of or incorrect units, a misreading that does not oversimplify the work, or an arithmetical error that does not oversimplify the work, a mark that is one mark below the full-credit mark may also be awarded. Such cases are denoted with a * and this level of credit is referred to as *Full Credit -1*. Thus, for example, in Scale 10C, *Full Credit -1* of 9 marks may be awarded.

The only marks that may be awarded for a question are those on the scale below, or *Full Credit -1*.

A rounding penalty is applied each time it occurs in the scheme. There is no penalty for omitted units if the question specifies the unit to be used in the answer, and there is generally no penalty for an omitted euro symbol in questions involving money.

In general, accept a candidate's work in one part of a question for use in subsequent parts of the question, unless this oversimplifies the work involved.

Unless otherwise specified, an answer without sufficient supporting work is generally awarded the lowest non-zero level of credit (typically *Partial Credit* or *Low Partial Credit*, as appropriate).

Summary of mark allocations and scales to be applied

<table>
<tr><th colspan="2">Section A (150)
Answer any five questions</th><th colspan="2">Section B (150)
Answer any three questions</th></tr>
<tr>
<td>
Question 1 (30)
(a)(i)(ii) 15D
(b) 15D

Question 2 (30)
(a)(i)(ii) 10D
(a)(iii) 10C
(b) 10D

Question 3 (30)
(a) 10D
(b) 5C
(c) 15D
</td>
<td>
Question 4 (30)
(a)(i)(ii) 15D
(b) 10C
(c) 5C

Question 5 (30)
(a)(i) (ii) 15D
(a)(iii) 5D
(b) 10C

Question 6 (30)
(a)(i)(ii) 15D
(a)(iii) 5B
(b) 10C
</td>
<td>
Question 7 (50)
(a)(i) 5B
(a)(ii) 5C
(a)(iii) 5B
(b)(i)(ii) 15D
(c) 5B
(d)(i)(ii) 15D

Question 8 (50)
(a)(i) 5B
(a)(ii)(iii) 15D
(a)(iv) 5B
(b)(i)(ii) 10D
(c)(i) 10C
(c)(ii) 5B
</td>
<td>
Question 9 (50)
(a)(i)(ii) 15D
(b) 5C
(c)(i) 5B
(c)(ii) 10C
(d)(i) 5C
(d)(ii)(iii) 10C

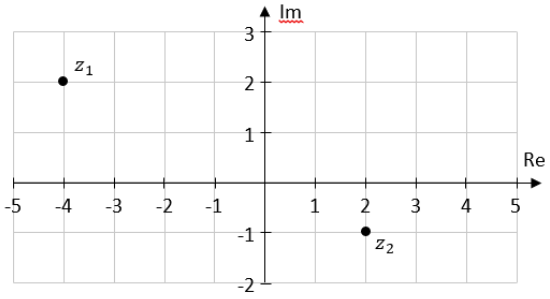
Question 10 (50)
(a) 5B
(b) 10C
(c)(i) 5C
(c)(ii) 5B
(c)(iii) 5C
(c)(iv) 5B
(d)(i)(ii) 15D
</td>
</tr>
</table>

Detailed marking notes

Model Solutions & Marking Notes

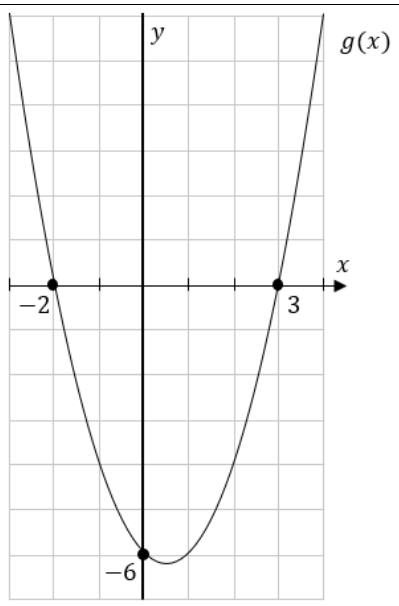
Note: The model solutions for each question are not intended to be exhaustive – there may be other correct solutions. Any Examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his / her Advising Examiner.

Q1	Model Solution –30 Marks	Marking Notes
(a) **(i)** **(ii)**	**(i)** $F = P(1+i)^n$ $F = 1500(1 \cdot 03)^1$ $= [€]1545$ **OR** $1500(0.03) = 45$ $1500 + 45 = [€]1545$ **(ii)** $1545(1.03)^2 = [€]1591.35$ **OR** $1545(0.03) = 46.35$ $1545 + 46.35 = [€]1591.35$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • $1500 \times 3\%$ or equivalent • At least one correct substitution *Mid Partial Credit:* • **(i)** correct *High Partial Credit* • **(i)** correct and work of merit in **(ii)** • **(ii)** correct • Formulas fully substituted in **(i)** and **(ii)**
(b) **(i)** **(ii)**	**(i)** $12\,012 + 13\,748 + 44\,284 = [€]70\,044$ **(ii)** $12012 \times 0.005 = 60.06$ $13748 \times 0.02 = 274.96$ $12012 + 13748 = 25\,760$ $65000 - 25760 = 39240$ $39240 \times 0.04 = 1569.60$ Total USC: $60.06 + 274.96 + 1569.60$ $= [€]1904.62$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Work of merit, for example, some relevant addition in **(i)** • Work of merit, for example, some relevant work with any one of the given percentages • **(i)** correct *Mid Partial Credit:* • Work of merit in both parts • Correct formulation of any **two** USC rates *High Partial Credit:* • **(ii)** correct • **(i)** correct and correct formulation of any **two** USC rates

Q2	Model Solution – 30 Marks	Marking Notes
(a) **(i)** **(ii)**	**(i)**  **(ii)** $\overline{z_1} = -4 - 2i$	**Scale 10D (0, 3, 5, 7, 10)** **Four items involved in solution:** **1.** z_1 plotted correctly **2.** z_2 plotted correctly **3.** $\overline{z_1}$ found *Low Partial Credit:* • Work of merit, for example, one ordinate of one complex number correct in **(i)** or some work towards finding the conjugate in **(ii)** *Mid Partial Credit:* • One item correct *High Partial Credit* • Two items correct
(iii)	$\sqrt{(-4)^2 + (2)^2} =$ $\sqrt{20}$ $= 2\sqrt{5}$	**Scale 10C (0, 4, 6, 10)** *Low Partial Credit:* • Modulus formula *High Partial Credit:* • Fully correct substitution into modulus formula *Full credit – 1:* • Answer as $\sqrt{20}$

Q2	Model Solution – 30 Marks	Marking Notes
(b)	$1 + 4i - 2(a + bi) = -3 + 10i$ $-2(a + bi) = -3 + 10i - 1 - 4i$ $-2(a + bi) = -4 + 6i$ $a + bi = \frac{-4 + 6i}{-2}$ $= 2 - 3i$ $a = 2$ and $b = -3$ **OR** $1 + 4i - 2a - 2bi = -3 + 10i$ $\therefore 1 - 2a = -3$ and $4 - 2b = 10$ $a = 2$ and $b = -3$	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Any relevant substitution in the given equation. *Mid Partial Credit:* • u and v substituted in the given equation. *High Partial Credit:* • $-2(a + bi) = -4 + 6i$ • Correct equation in $\boldsymbol{a}$ and correct equation in $\boldsymbol{b}$ found

Q3	Model Solution – 30 Marks	Marking Notes
(a)	$5x - 15 + 2 < 11$ $5x < 11 + 13$ $5x < 24$ $x < \frac{24}{5}$ Solution set: $\{1, 2, 3, 4\}$	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Any correct multiplication *Mid Partial Credit:* • Isolates the x term to one side of the equation *High Partial Credit:* • $x < \frac{24}{5}$ but solution set not listed.
(b)	$\frac{1}{x} - \frac{2}{x+1} = \frac{1(x+1) - 2x}{x(x+1)}$ $= \frac{x + 1 - 2x}{x(x+1)}$ $= \frac{1 - x}{x(x+1)}$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • $x(x+1)$ identified as the lowest common denominator. • Some relevant multiplication. *High Partial Credit:* • $\frac{1(x+1)-2x}{x(x+1)}$
(c)	$x = y + 1$ $y(y+1) = 6$ $y^2 + y - 6 = 0$ $(y+3)(y-2) = 0$ $y = -3$ | $y = 2$ $x = -3 + 1$ | $x = 2 + 1$ $x = -2$ | $x = 3$	**Scale 15D (0, 5, 7, 9, 15)** **Four steps involved in solution:** **1.** Writes one variable in terms of the other **2.** Substitute this into the quadratic **3.** Finds both values of x (or y) **OR** one co-ordinate set **4.** Finds the two co-ordinate sets *Low Partial Credit* • Some work of merit, for example, one correct transposition on any step • Trial and improvement • Writes the quadratic formula *Mid Partial Credit* • Two steps correct • One co-ordinate set found by trialling *High Partial Credit* • Three steps correct

Q4	Model Solution – 30 Marks	Marking Notes
(a) **(i)** **(ii)**	**(i)** $$f(0) = (0+3)^2 + 5$$ $$= 14$$ **(ii)** $$(x+3)^2 + 5$$ $$x^2 + 6x + 9 + 5$$ $$x^2 + 6x + 14$$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Work of merit, for example, some correct substitution in **(i)** or some correct expansion in **(ii)** *Mid Partial Credit:* • **(i)** correct • $(x = 3)^2$ fully expanded correctly. *High Partial Credit:* • **(ii)** correct. • **(i)** correct and work of merit in **(ii)**.
(b)	$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-9)}}{2(3)}$$ $$= \frac{4 \pm \sqrt{124}}{6}$$ $$x = -1.19 \text{ or } x = 2.52$$	**Scale 10C (0, 4, 6, 10)** **Three steps involved in solution:** **1.** Identifies **a, b,** and **c** **2.** Fully substituted formula **3.** Both correctly evaluated *Low Partial Credit* • Quadratic formula written • Work of merit, for example, identifies one of a, b or c *High Partial Credit* • Two steps correct • Formula fully correctly substituted • Second value not found *Full Credit -1* • Apply a * for no or incorrect rounding
(c)		**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, any correct point plotted and labelled on the diagram *High Partial Credit:* • $x = -2$ and $x = 3$ indicated on the diagram. • y axis drawn but no labels *Full credit – 1:* • y axis not labelled

Q5	Model Solution – 30 Marks	Marking Notes
(a)(i) **(ii)**	**(i)** Volume of gas used: $12518 - 12398 = 120\ [\mathrm{m}^3]$ Convert to kilowatt-hours: $120 \times 11.5452 = 1385 \cdot 424\ [\mathrm{KWh}]$ **(ii)** $1385 \cdot 42 \times 13.46 = 18647 \cdot 80704$ $= [€]186 \cdot 48$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Work of merit, for example, some relevant subtraction in **(i)** or some use of $1385 \cdot 42$ in **(ii)** *Mid Partial Credit:* • **(i)** or **(ii)** correct • Work of merit in both parts *High Partial Credit:* • One part correct and work of merit in the other part
(iii)	$\text{total} = 227 \cdot 47(0.09)$ $\text{VAT} = \underline{20 \cdot 47}$ $\text{Total} = [€]247 \cdot 94$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Some work of merit, for example, some relevant use of 9% *High Partial Credit* • Finds the total VAT
(b)	$A \approx \frac{200}{2}[0 + 440 + 2(430 + 510 + 450 + 360)]$ $= 100(3940)$ $= 394000\ [\mathrm{m}^2]$	**Scale 10C (0, 4, 6, 10)** *Low Partial Credit:* • Trapezoidal rule written. • Some work of merit on the diagram. *High Partial Credit:* • Fully correct substitution.

<table>
<tr><th>Q6</th><th>Model Solution – 30 Marks</th><th>Marking Notes</th></tr>
<tr><td>(a)
(i)
(ii)</td><td>(i)
$$h'(x) = 3x^2 - 12x + 7$$
(ii)
$$h'(1) = 3(1)^2 - 12(1) + 7$$
$$= -2$$</td><td>Scale 15D (0, 5, 7, 9, 15)

Low Partial Credit:
• Work of merit, for example, some correct differentiation in (i) or some correct substitution in (ii)

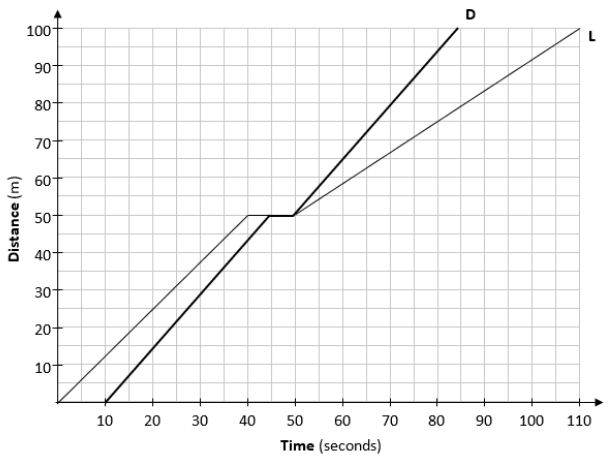
Mid Partial Credit:
• Work of merit in both parts
• (i) or (ii) correct

High Partial Credit:
• One part correct and work of merit in the other part</td></tr>
<tr><td>(iii)</td><td> 
</td><td>Scale 5B (0, 2, 5)

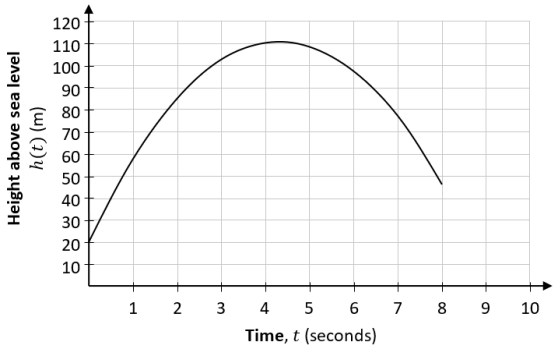
Partial Credit:
• The point $(1, 8)$ indicated on the diagram.
• A line with a consistent slope with (a)(ii)</td></tr>
<tr><td>(b)</td><td><table><tr><th>Function</th><th>Slope function (d, e or f)</th></tr><tr><td>a</td><td>e</td></tr><tr><td>b</td><td>f</td></tr><tr><td>c</td><td>d</td></tr></table></td><td>Scale 10C (0, 4, 6, 10)

Low Partial Credit:
• Work of merit on the diagram, for example, some relevant work on diagrams

High Partial Credit:
• One correct.</td></tr>
</table>

Q7	Model Solution – 50 Marks	Marking Notes
(a) (i)	10 [seconds]	**Scale 5B (0, 2, 5)** *Partial Credit:* • Indicates the period on the diagram. • States, *'between* 45 *and* 55 *seconds*.'
(ii)	$\text{Speed} = \frac{50}{40}$ $= 1.25$ [ms^{-1}]	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Time = 40 • $Speed = \frac{Distance}{Time}$ *High Partial Credit:* • Answer given as $\frac{50}{40}$ or equivalent fraction
(iii)	Decreases Reason: $m_1 = 1 \cdot 25$ $m_2 = \frac{50}{60} \approx 0.83$ **OR** The slope is steeper for the first 50 m	**Scale 5B (0, 2, 5)** *Partial Credit:* • Correct answer with no reason or incorrect reason • Some reference to steepness of slope or effort at finding the speed for the second 50m.
(b) **(i)** **(ii)**	**(i)** $Time = 5 \times 7$ $= 35$ [s] **(ii)**  	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Work of merit, for example, $\frac{50}{10}$. • Any relevant point on the graph. *Mid Partial Credit:* • **(i)** correct • Work of merit in **(i) AND (ii)** *High Partial Credit* • **(i)** correct and one section of the graph correct • **(ii)** correct.

Q7	Model Solution – 50 Marks	Marking Notes
(c)	$$\text{Time} = \frac{100}{1.934}$$ $$= 51 \cdot 71 \text{ [s]}$$	**Scale 5B (0, 2, 5)** *Partial Credit:* • $Time = \frac{Distance}{Speed}$ • Some use of given values *Full Credit -1* • Apply a * for no or incorrect rounding
(d) **(i)** **(ii)**	**(i)** $C = 1.163 \times 0.431 \times 9 \times (25 - 13)$ $= [€]54 \cdot 14$ **(ii)** $21 \cdot 20 = 1 \cdot 163 \times 0.431 \times 9 \times (25 - T_1)$ $25 - T_1 = 4.6993$ $T_1 = 20 \cdot 27$ $= 20{\cdot}3$ [℃]	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Work of merit, for example, some correct substitution into the given formula in (i) or (ii) *Mid Partial Credit:* • **(i)** or **(ii)** correct • Work of merit in both parts *High Partial Credit* • One part correct and work of merit in the other part *Full Credit -1* • Apply a * for no or incorrect rounding

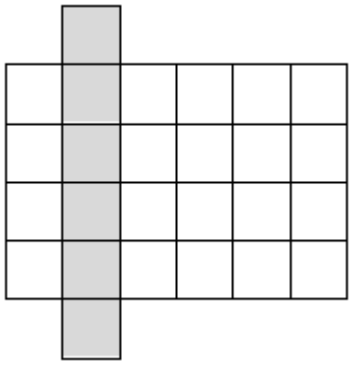
Q8	Model Solution – 50 Marks	Marking Notes
(a)(i)	$h(0) = -4.8(0)^2 + 41.65(0) + 20$ $= 20$	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit, for example, some correct substitution in $h(t)$
(ii) **(iii)**	**(ii)** **(iii)** 	**Scale 15D (0, 5, 7, 9, 15)** **Note:** Solution requires 16 items, 6 values in table, 9 points plotted and the curve *Low Partial Credit* • 1 to 5 items correct *Mid Partial Credit* • 6 to 12 items correct *High Partial Credit* • 12 to 14 items correct *Full Credit -1* • Apply a * if 15 items correct
(iv)	9.1	**Scale 5B (0, 2, 5)** Allow $8 < x \leq 10$ *Partial Credit:* • Work of merit, for example, continues the graph.
(b) **(i)** **(ii)**	**(i)** $g'(t) = -10t + 45$ $-10t + 45 = 0$ $10t = 45$ $t = 4.5$ **(ii)** $g(4.5) = -5(4.5)^2 + 45(4.5) + 20$ $= 121.25$ m	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, for example, some correct differentiation in **(i)** or some relevant substitution in **(ii)** *Mid Partial Credit:* • Work of merit in both parts *High Partial Credit:* • **(i)** correct *Full credit -1* • No units or incorrect units

t	0	1	2	3	4	5	6	7	8
h	20	57	84	102	110	108	97	76	46

Q8	Model Solution – 50 Marks	Marking Notes
(c)(i)	$\frac{3}{4}:\frac{3}{20}:\frac{1}{10}$ $15:3:2$	**Scale 10C (0, 4, 6, 10)** *Low Partial Credit:* • Correct common denominator identified. *High Partial Credit* • a, b and $c \in N$, but ratio not in simplest form.
(ii)	$\frac{3}{20} \rightarrow 25$ g $\frac{15}{20} \rightarrow 125$ g 125 g of potassium nitrate in the mixture.	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit, for example, $\frac{3}{4}$ written as $\frac{15}{20}$.

Q9	Model Solution – 50 Marks	Marking Notes
(a) (i) (ii)	**(i)** $$\text{Discount} = 19 \cdot 99 - 16 \cdot 99$$ $$= 3$$ $$\%\ \text{Discount} = \frac{3}{19 \cdot 99} \times 100$$ $$= 15\%\ (\text{nearest}\ \%)$$ **(ii)** $$10000\ units\ @\ \$9 \cdot 50 = \$95000$$ Amount in €'s: $$\frac{95000}{1.09} = [€]87\ 155.96$$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Finds the discount. • Finds the cost of 10000 units in dollars. *Mid Partial Credit* • One part correct • Work of merit in **(i)** and **(ii)**. *High Partial Credit* • One part correct and work of merit in the other part *Full Credit -1* • Apply a * for no or incorrect rounding
(b)	$$09{:}45 + 7{:}35$$ $$= 17{:}20 - 5$$ $$= 12{:}20$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, some relevant addition or subtraction • 04:45 found *High Partial Credit:* • 17:20 or 5.20 found
(c) (i)	$$1\ \text{gigabyte} = 2^{30}$$ $$= 1073741824$$ $$= 1 \cdot 07 \times 10^9\ \text{bytes}$$	**Scale 5B (0, 2, 5)** *Partial Credit* • 2^{30} evaluated *Full Credit -1* • Apply a * for no or incorrect rounding
(ii)	Number of desktop computers: $$\frac{7 \cdot 6 \times 2^{60}}{2^{40}} = 7 \cdot 6 \times 2^{20}$$ $$= 7969177 \cdot 6$$ $$= 7969178$$	**Scale 10C (0, 4, 6, 10)** *Low Partial Credit:* • Converts either 1 terabyte or $7 \cdot 6$ petabytes to bytes. *High Partial Credit:* • $\frac{7 \cdot 6 \times 2^{60}}{2^{40}}$ or equivalent. *Full Credit -1* • Apply a * for no or incorrect rounding

Q9	Model Solution – 50 Marks	Marking Notes
(d) **(i)**	$$d(5) = 64(1 \cdot 19)^5$$ $$= 152 \cdot 7 \text{ zettabytes}$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Uses the graph to find $d(5)$. • $t = 5$ identified. *High Partial Credit* • 5 substituted for t in the given function. • Evaluates $d(4)$ or $d(6)$. *Full Credit -1* • Apply a * for no or incorrect rounding
(ii) **(iii)**	**(ii)** $$2027$$ **(iii)** Number of zettabytes at the start of 2022 ≈ 75 Number of zettabytes at the start of 2026 ≈ 150 Therefore, approximately 4 years for data to double Or similar	**Scale 10C (0, 4, 6, 10)** *Low Partial Credit:* • Some relevant work, for example, uses the graph find the number of zettabytes of data at the start of any of the given years. • **(i)** correct *High Partial Credit:* • **(i)** correct and work of merit in **(ii)** • **(ii)** correct

<table>
<tr><th>Q10</th><th>Model Solution – 50 Marks</th><th>Marking Notes</th></tr>
<tr><td>(a)</td><td>  </td><td>Scale 5B (0, 2, 5)

Partial Credit:
• Work of merit, for example, correct number of grey tiles.

Full Credit -1:
• No shading
• One tile missing</td></tr>
<tr><td>(b)</td><td><table><tr><th>Pattern</th><th>Grey Tiles</th><th>White Tiles</th><th>Total</th></tr><tr><td>1</td><td>3</td><td>2</td><td>5</td></tr><tr><td>2</td><td>4</td><td>6</td><td>10</td></tr><tr><td>3</td><td>5</td><td>12</td><td>17</td></tr><tr><td>4</td><td>6</td><td>20</td><td>26</td></tr></table></td><td>Scale 10C (0, 4, 6, 10)

Solution consists of 6 table entries:

Low Partial Credit:
• 1 correct table entry.

High Partial Credit:
• 4 correct table entries.</td></tr>
<tr><td>(c) (i)</td><td>$T_n = n + 2$</td><td>Scale 5C (0, 2, 3, 5)

Low Partial Credit:
• Correct formula
• Identifies a or d.

High Partial Credit:
• Identifies a and d.</td></tr>
<tr><td>(ii)</td><td>$T_{25} = 25 + 2$
$= 27$</td><td>Scale 5B (0, 2, 5)

Partial Credit:
• Work of merit, for example, some correct substitution into formula derived in (i).
• Finds a new term in the pattern</td></tr>
</table>

Q10	Model Solution – 50 Marks	Marking Notes
(iii)	$$S_{25} = \frac{25}{2}\{2(3) + (25-1)1\}$$ $$= 375 \text{ tiles}$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Correct formula • Identifies a **or** d. *High Partial Credit:* • Formula fully substituted.
(iv)	72 tiles	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit, for example, finding Pattern 5.
(d) (i) (ii)	**(i)** $T_2 = (2)^2 + b(2) + c = 10$ $2b + c = 6$ **(ii)** $2b + c = 6$ $\underline{b + c = 4}$ $b = 2$ $2 + c = 4$ $c = 2$	**Scale 15D (0, 5, 7, 9, 15)** *Low Partial Credit:* • Some work of merit in forming equation. *Mid Partial Credit* • One part correct • Work of merit in both parts *High Partial Credit* • One part correct and work of merit in the other part

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination

Deferred Examination 2024

Mathematics

Ordinary Level

Paper 2

Marking scheme

300 marks

Marking Scheme – Paper 2, Section A and Section B

Structure of the marking scheme

Candidate responses are marked according to different scales, depending on the types of response anticipated. Scales labelled A divide candidate responses into two categories (correct and incorrect). Scales labelled B divide responses into three categories (correct, partially correct, and incorrect), and so on. The scales and the marks that they generate are summarised in this table:

Scale label	A	B	C	D
No of categories		3	4	5
5-mark scale	0, 5	0, 2, 5	0, 2, 3, 5	0, 2, 3, 4, 5
10-mark scale		0, 4, 10	0, 4, 5, 10	0, 3, 5, 7, 10
15-mark scale			0, 6, 9, 15	0, 4, 6, 8, 15

A general descriptor of each point on each scale is given below. More specific directions in relation to interpreting the scales in the context of each question are given in the scheme, where necessary.

Marking scales – level descriptors

B-scales (three categories)

- response of no substantial merit (no credit)
- partially correct response (partial credit)
- correct response (full credit)

C-scales (four categories)

- response of no substantial merit (no credit)
- response with some merit (low partial credit)
- almost correct response (high partial credit)
- correct response (full credit)

D-scales (five categories)

- response of no substantial merit (no credit)
- response with some merit (low partial credit)
- response about half-right (mid partial credit)
- almost correct response (high partial credit)
- correct response (full credit)

In certain cases, typically involving incorrect rounding, omission of or incorrect units, a misreading that does not oversimplify the work, or an arithmetical error that does not oversimplify the work, a mark that is one mark below the full-credit mark may also be awarded. Such cases are denoted with a * and this level of credit is referred to as *Full Credit -1*. Thus, for example, in Scale 10C, *Full Credit -1* of 9 marks may be awarded.

The only marks that may be awarded for a question are those on the scale above, or *Full Credit -1*.

A rounding penalty is applied each time it occurs in the scheme. There is no penalty for omitted units if the question specifies the unit to be used in the answer, and there is generally no penalty for an omitted euro symbol in questions involving money.

Throughout the scheme a correct relevant formula written is regarded as Work of merit, award the lowest non-zero level of credit (typically *Partial Credit* or *Low Partial Credit*, as appropriate).

In general, accept a candidate's work in one part of a question for use in subsequent parts of the question, unless this oversimplifies the work involved.

Unless otherwise specified, an answer without sufficient supporting work is generally awarded the lowest non-zero level of credit (typically *Partial Credit* or *Low Partial Credit*, as appropriate).

Summary of mark allocations and scales to be applied

<table>
<tr><th colspan="2">Section A (150)
Answer any five questions</th><th colspan="2">Section B (150)
Answer any three questions</th></tr>
<tr>
<td>Question 1 (30)
(a)(i) 10C
(a)(ii) 5C
(a)(iii) 5C
(b) 10C

Question 2 (30)
(a)(i) 10C
(a)(ii) 5B
(a)(iii) 5B
(b)(i) 5C
(b)(ii) 5B

Question 3 (30)
(a)(i) 10C
(a)(ii)(iii) 10C
(b) 10C</td>
<td>Question 4 (30)
(a)(i)(ii) 10D
(b)(i)(ii) 15D
(b)(iii) 5B

Question 5 (30)
(a)(i) 5C
(a)(ii) 5B
(b)(i)(ii) 10D
(b)(iii) 10C

Question 6 (30)
(a) 10C
(b)(i) 10C
(b)(ii)(iii) 10D</td>
<td>Question 7 (50)
(a)(i) 10B
(a)(ii) 10B
(a)(iii) 5A
(a)(iv) 5C
(b)(i) 5C
(b)(ii) 5B
(c)(i)(ii) 5C
(c)(iii) 5C

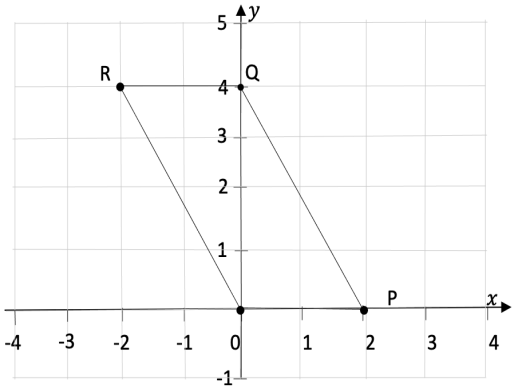
Question 8 (50)
(a)(i) 5B
(a)(ii) 10C
(a)(iii) 10C
(b)(i)(ii) 10D
(c)(i) 5C
(c)(ii) 10D</td>
<td>Question 9 (50)
(a)(i) 5C
(a)(ii) 5C
(a)(iii) 10C
(b)(i) 5B
(b)(ii) 10D
(c)(i) 5C
(c)(ii) 5C
(c)(iii) 5C

Question 10 (50)
(a)(I) 10D
(a)(ii) 5C
(a)(iii) 10D
(a)(iv) 5C
(a)(v) 10C
(b) 10C</td>
</tr>
</table>

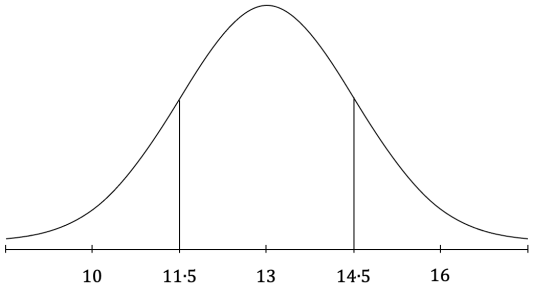
Detailed marking notes

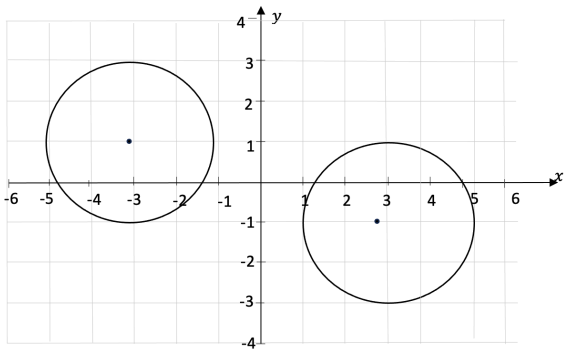
Model Solutions & Marking Notes

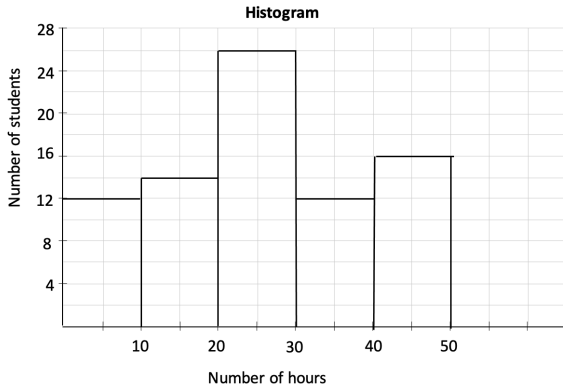
Note: The model solutions for each question are not intended to be exhaustive – there may be other correct solutions. Any Examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his / her Advising Examiner.

Q1	Model Solution –30 Marks	Marking Notes
(a)(i)	$2(0) + y - 4 = 0$ $y = 4$ $y-$ intercept: $Q(0, 4)$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit, for example, substitutes 0 for x. • Some correct transposition. *High Partial Credit* • Writes equation in the form, $y = mx + c$ • $y = 4$ *Full Credit (-1):* • $Q(4, 0)$
(ii)		**Scale 5C (0, 2, 3, 5)** Note: Accept candidates Q from (i) *Low Partial Credit:* • Plots either P or Q with x and y coordinates swapped. *High Partial Credit:* • Either P or Q plotted correctly. *Full Credit (-1):* • Label/s missing
(iii)	$R = (-2, 4)$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Pilot Diagram • Correct coordinates based on an incorrect plot. *High Partial Credit:* • Plots R correctly but incorrect coordinates or coordinates not given.

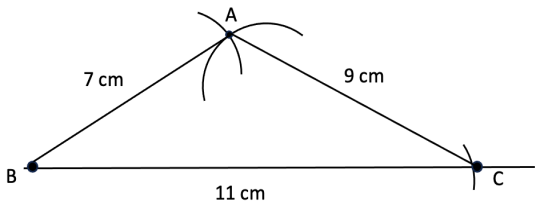
Q1	Model Solution –30 Marks	Marking Notes
(b)	$A(2,0) \rightarrow A'(0,0)$ $B(2,4) \rightarrow B'(0,4)$ $C(-3,3) \rightarrow C'(-5,3)$ $\text{Area} = \frac{1}{2}\lvert(0)(3) - (-5)(4)\rvert$ $= \frac{1}{2}\lvert 20\rvert$ $= 10\ [\text{units}^2]$ **OR** $\text{base} = 4$ $\text{height} = 5$ $\text{Area} = \frac{1}{2} \times 4 \times 5$ $= 10\ [\text{units}^2]$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Correct relevant formula • Translation of any relevant point to $(0,0)$ • Formula with some substitution. • Base or height identified. *High Partial Credit* • Area found from an incorrect translation. • Formula fully substituted.

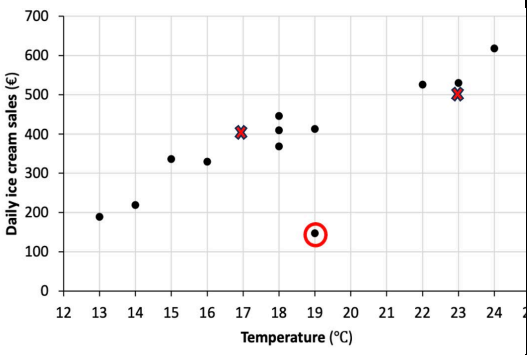
Q2	Model Solution – 30 Marks	Marking Notes
(a)(i)		**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • One correct entry. • States the empirical rule. *High Partial Credit:* • Two correct entries.
(ii)	Proportion ± 1 standard deviation from the mean: 68%	**Scale 5B (0, 2, 5)** *Partial Credit:* • Shows some understanding of the empirical rule • Writes down some probability greater than 0.5
(iii)	Number of runners under 10 minutes: $120 \times 0.025 = 3 \text{ runners}$	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit for example mentions 5% or similar • Multiplies 120 by some probability.
(b)(i)	Number of different arrangements: $8! = 40320$ **OR** $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 40320$	**Scale 5C (0, 2, 3, 5)** **Note**: Accept correct answer without supporting work. *Low Partial Credit:* • Work of merit, for example, some correct terms multiplied. *High Partial Credit:* • All terms listed but not multiplied.
(ii)	Number of possible ways: $8 \times 7 \times 6 = 336$	**Scale 5B (0, 2, 5)** **Note:** Accept correct answer without supporting work. *Partial Credit:* • Terms listed but not multiplied.

Q3	Model Solution – 30 Marks	Marking Notes
(a) **(i)**	$$(x-h)^2+(y-k)^2=r^2$$ $$(x-3)^2+(y+1)^2=4$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Correct formula with some correct or consistent substitution. *High Partial Credit:* • Equation with just one error. *Full Credit (-1):* $(x-3)^2+(y+1)^2=2^2$
(a) **(ii)** **(iii)**	**(ii)** $$\text{Centre}=(-3,1)$$ $$\text{Radius}=2$$ **(iii)**  	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Centre or radius found. • Circle constructed with either correct centre or correct radius. *High Partial Credit:* • Either (ii) or (iii) correct.
(b)	$$m_{radius}=\frac{2-(-2)}{7-4}$$ $$=\frac{2+2}{3}$$ $$=\frac{4}{3}$$ Therefore, $$m_l=-\frac{3}{4}$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Correct relevant formula with some correct substitution. *High Partial Credit:* • Finds the slope of the radius.

Q4	Model Solution – 30 Marks	Marking Notes
(a) **(i) (ii)**	**(i)**  **(ii)** 26	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, for example one correct bar *Mid Partial Credit:* • Three correct bars *High Partial Credit:* • Correct histogram
(b) **(i) (ii)**	**(i)** $$p + 43 + 21 = 80$$ $$p = 80 - 64$$ $$p = 16$$ **(ii)** $$B \backslash A = 30 - 16$$ $$= 14$$ $$q + 14 = 43$$ $$q = 29$$	**Scale 15D (0, 4, 6, 8, 15)** *Low Partial Credit* • Work of merit, for example, states $B \backslash A = p$ in **(i)**, sets up the relevant equation in **(ii)**. *Mid Partial Credit* • Work of merit in **(i) AND (ii)** • **(i) OR (ii)** correct *High Partial Credit* • One part correct and work of merit in the other part
(iii)	$$\frac{21}{80}$$	**Scale 5B (0, 2, 5)** *Partial Credit:* • Either numerator or denominator correct. *Full credit -1:* • Answer not in simplest form.

Q5	Model Solution – 30 Marks	Marking Notes
(a) (i)	$$V = 1 \cdot 8 \times 70 \times 36$$ $$= 4536\ [\text{cm}^3]$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Formula with some substitution. *High Partial Credit:* • Formula fully substituted.
(ii)	$$\text{Mass} = \frac{5000}{4536}$$ $$= 1 \cdot 1\ [\text{g}]$$	**Scale 5B (0, 2, 5)** *Partial Credit:* • Converts 5 kg to grams.
(b) (i) & (ii)	$$V = \frac{4}{3}\pi(1 \cdot 6)^3$$ $$= 17 \cdot 2\ \text{cm}^3$$ $$\text{Number of spheres} = \frac{4536}{17 \cdot 2}$$ $$= 263 \cdot 72 \ldots$$ Therefore, 263 complete spheres.	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, for example correct relevant formula in (I) or expression for number of spheres in (ii) *Mid Partial Credit:* • One part correct • Work of merit in both parts *High Partial Credit:* • One part correct and work of merit in other part *Full Credit (-1):* • Answer as $263 \cdot 72$ or $264 \ldots$
(iii)	$$S.A. = 4\pi(1 \cdot 6)^2$$ $$= 32 \cdot 2\ \text{cm}^2$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit for example correct relevant formula *High Partial Credit:* • Formula fully substituted.

Q6	Model Solution – 30 Marks	Marking Notes
(a)		**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit e.g. a relevant arc constructed. • Pilot Diagram *High Partial Credit:* • Correct triangle without arcs. • Two correct relevant elements of the construction.
(b) (i)	$$\frac{\lvert XV\rvert}{8\cdot 4}=\frac{4}{7}$$ $$\lvert XV\rvert=\frac{4}{7}\times 8\cdot 4$$ $$=4\cdot 8$$ **Or** $$\frac{4}{11}=\frac{x}{x+8\cdot 4}$$ $$11x=4x+33.6$$ $$7x=33\cdot 6$$ $$x=4.8$$ $$\lvert XV\rvert=4\cdot 8$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit, for example, some relevant ratio stated. *High Partial Credit:* • $\frac{\lvert XV\rvert}{8\cdot 4}=\frac{4}{7}$ or equivalent.
(ii)	**(ii)** $\lvert\angle UXV\rvert=\lvert\angle YXZ\rvert$ (Common) $\lvert\angle XUV\rvert=\lvert\angle XYZ\rvert$ (Corresponding) $\lvert\angle XVU\rvert=\lvert\angle XZY\rvert$ (Corresponding)	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, *Mid Partial Credit:* • One equal pair of angles identified *High Partial Credit:* • Two equal pairs of angles identified *Full Credit (-1):* • Reasons ignored

Q7	Model Solution – 50 Marks	Marking Notes
(a) (i)		**Scale 10B (0, 4, 10)** *Partial Credit:* • One point plotted correctly
(ii)	In general, as temperatures increase, the daily ice cream sales increase.	**Scale 5B (0, 4, 10)** *Partial Credit:* • Some reference to a connection between daily temperature and ice cream sales
(iii)	Estimate of correlation coefficient: $0 \cdot 8$	**Scale 5A (0, 5)**
(iv)	Circle outlier. Reason: This point is far removed from the main trend of the data.	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Some work of merit, for example, shows some understanding of outliers. *High Partial Credit* • Outlier circled but incorrect or no reason given.

Q7	Model Solution – 50 Marks	Marking Notes
(b) **(i)**	<table><tr><th>Mean</th><th>Standard Deviation</th></tr><tr><td>€430</td><td>€138 · 98</td></tr></table>	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, some effort at calculating the mean. *High Partial Credit:* • Either mean or standard deviation correct.
(b)(ii)	Decrease The data would be closer together	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit, correct box ticked • Mentions some measure of spread.
(c) **(i) (ii)**	**(i)** $\frac{74}{320} \times 100 = 23\%$ **(ii)** $\frac{1}{\sqrt{320}} \times 100 = 5 \cdot 6\% \text{ (to 1 d.p.)}$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, writes 74 as a fraction of 320. *High Partial Credit:* • Either (i) or (ii) correct.
(iii)	**Calculations:** $0 \cdot 23 - 0 \cdot 056 < p < 0 \cdot 23 + 0 \cdot 056$ $0 \cdot 175 < p < 0 \cdot 287$ **Conclusion:** At the 5% level of significance, the company's claim is rejected, and we conclude that vanilla ice cream is **not** the favourite ice cream of 30% of their customers. **Reason for conclusion:** $0 \cdot 3$ is not in the range, $(0 \cdot 175, 0 \cdot 287)$.	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Any one of H_0, H_1 or confidence interval written. *High Partial Credit* • H_0, H_1 and reference to confidence interval. • Conclusion from correct work not in context.

Q8	Model Solution – 50 Marks	Marking Notes
(a) **(i)**	$$\text{Depth} = 0 \cdot 75 + 1.25$$ $$= 2 \text{ m}$$	**Scale 5B (0, 2, 5)** Accept correct answer without supporting work *Partial Credit:* • Some work of merit, for example writes down one of the relevant measurements
(ii)	$$\text{Area} = 20 \times 0 \cdot 75 + \frac{1}{2} \times 1.25 \times 12$$ $$= 22 \cdot 5 \text{ [m}^2\text{]}$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Some work of merit, for example, some relevant substitution into a correct formula. *High Partial Credit* • One relevant area calculated. • Both formulas substituted correctly.
(iii)	$$V = 22 \cdot 5 \times 10$$ $$= 225 \text{ [m}^3\text{]}$$ Convert to litres: $$\text{Number of litres} = 225 \times 1000$$ $$= 225000 \text{ [litres]}$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Some work of merit High Partial Credit: • Volume correct • One error in volume and finishes correctly.

Q8	Model Solution – 50 Marks	Marking Notes
(b) **(i)** **(ii)**	(i) $0.45^2 = 0.2025[\text{m}^2]$ (ii) $201 \times 110\% = 221.1[\text{m}^2]$ $\frac{221.1}{0.2025}$ 1091.85 1092	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Some work of merit, for example, some correct substitution into a relevant formula. *Mid Partial Credit:* • One area correct • Work of merit in **(i)** and **(ii)** *High Partial Credit:* • Both areas correct.
(c) **(i)**	$\text{V} = \pi r^2 \text{h}$ $V = \pi(22)^2(11)$ $= 5324\pi\ [\text{cm}^3]$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, cylinder formula or some correct substitution without formula. *High Partial Credit* • Formula fully substituted.
(ii)	Volume of bottom cylinder: $V = 3 \times 5324\pi$ $= 15972\pi\ [\text{cm}^3]$ Radius of bottom cylinder: $\pi r^2(50) = 15972\pi$ $r^2 = \frac{15972}{50}$ $= 319 \cdot 44 \ldots$ $r = \sqrt{319 \cdot 44..}$ $= 17.9\ \text{cm}$	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Some work of merit, for example, brings down 5324π from (i). *Mid Partial Credit:* • Finds the volume of the bottom cylinder. *High Partial Credit:* • Fully substituted equation to allow solving for **r** .

Q9	Model Solution – 50 Marks	Marking Notes
(a) (i)	$$P(\text{not hitting}) = 1 - 0 \cdot 2$$ $$= 0 \cdot 8$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, some mention of 1. *High Partial Credit:* • $1 - 0.2$
(ii)	$$P(HMM) = 0 \cdot 2 \times 0 \cdot 8 \times 0 \cdot 8$$ $$= 0 \cdot 128$$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, multiplies two relevant probabilities. *High Partial Credit:* • Finds the probability of ONE miss and TWO hits, for example, $P(HHM)$.
(a)(iii)	$$150(0 \cdot 008) + 100(0 \cdot 096) + 50(0 \cdot 384) + 0(0 \cdot 512)$$ $$= 30$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit, for example, some correct term in $E(\text{score})$ *High Partial Credit* • $E(\text{score})$ correct but not evaluated.
(b) (i)	$$\text{Measure of angle} = \frac{360}{20}$$ $$= 18^0$$ **OR** $$20 \times 18 = 360^0$$ $$= \text{number of degrees in a full angle}$$	**Scale 5B (0, 2, 5)** *Partial Credit:* • Work of merit, for example, some mention of 360^0.

Q9	Model Solution – 50 Marks	Marking Notes
(ii)	Area of large sector: $\pi(107)^2\left(\frac{18}{360}\right) = 1798 \cdot 404 \ldots$ Area of small sector: $\pi(99)^2\left(\frac{18}{360}\right) = 1539 \cdot 537 \ldots$ Area shaded: $1798 \cdot 404 \ldots - 1539 \cdot 537 \ldots = 259[\text{ mm}^2]$	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, for example, finds the area of the sector as a fraction of the area of the dartboard. *Mid Partial Credit* • Finds the area of one of the two relevant sectors. *High Partial Credit* • Finds the area of the two relevant sectors. • One error and finishes correctly
(c) **(i)**	P' $= \{1, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20\}$	**Scale 5C (0, 2, 3, 5)** **12 items required.** *Low Partial Credit:* • 3 correct. *Mid Partial Credit* • 6 correct. *High Partial Credit* • 9 correct.
(ii)	Any **two** of: $a = 3$ and $b = 17$ $a = 7$ and $b = 13$ $a = 17$ and $b = 3$ $a = 13$ and $b = 7$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Any correct a or b *High Partial Credit* • One solution found
(iii)	$M \in P'$ $M_1 = 9$ and $9 \in P'$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Correct answer with no reason or incorrect reason. • Any correct work towards finding the median of either P or P'. *High Partial Credit* • Correct answer and one correct median.

Q10	Model Solution – 50 Marks	Marking Notes
(a)(i)	$\|EB\|^2 + \|BC\|^2 = \|EC\|^2$ $9^2 + \|BC\|^2 = 41^2$ $\|BC\|^2 = 41^2 - 9^2$ $= 1600$ $\|BC\| = 40$ [m]	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit:* • Work of merit, for example, states the theorem of Pythagoras. • Some correct substitution in • $a^2 + b^2 = c^2$ *Mid Partial Credit:* • $a^2 + b^2 = c^2$ fully substituted. *High Partial Credit:* • $a^2 + b^2 = c^2$ fully substituted and one correct transposition. • Correct answer without supporting work.
(a)(ii)	$\cos \angle CEB = \frac{9}{41}$ $\|\angle CEB\| = \cos^{-1}\frac{9}{41}$ $= 77°$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example, uses theorem of Pythagoras to find the length of the third side of triangle CEB. • Demonstrates some understanding of sin, cos, or tan. *High Partial Credit:* • $\cos \angle CEB = \frac{9}{41}$ or equivalent.
(a) **(iii)**	Find $\|\angle DEA\|$: $\|\angle DEA\| = 180^0 - (37^0 + 77^0)$ $= 66^0$ Find $\|AD\|$: $\sin 66^\circ = \frac{\|AD\|}{80}$ $\|AD\| = 80 \times \sin 66^\circ$ $= 73[m]$	**Scale 10D (0, 3, 5, 7, 10)** Note: Accept candidates answer from part (ii). *Low Partial Credit:* • Work of merit, for example, brings down answer from (iv). • Sine rule or relevant trigonometric ratio written. *Mid Partial Credit:* • *Finds* $\|\angle DEA\|$. *High Partial Credit:* • $\|\angle DEA\|$ found correctly and all relevant substitutions into the sine rule formula.

Q10	Model Solution – 50 Marks	Marking Notes
(a) **(iv)**	$\text{Area} = \frac{1}{2} \times 80 \times 41 \times \sin 37^0$ $= 987\ [\text{m}^2]$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • Work of merit, for example some correct substitution into the area formula. *High Partial Credit:* • Area formula fully substituted.
(v)	$\|\text{DC}\|^2 = 80^2 + 41^2 - 2(80)(41)\cos 37^0$ $\|DC\| = 53.3\ \text{m}$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit, for example, some correct substitution in the cosine formula. • Correct relevant formula *High Partial Credit:* • Cosine formula fully substituted.
(b)	$\frac{\sin\theta}{2 \cdot 4} = \frac{\sin 25^0}{1 \cdot 5}$ $\sin\theta = \frac{2 \cdot 4 \times \sin 25^0}{1 \cdot 5}$ $= 0 \cdot 676189 \ldots$ $\theta = \sin^{-1}(0 \cdot 676189 \ldots)$ $= 42.5^0$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Work of merit, for example, sine rule written. *High Partial Credit:* • Correct formula fully substituted. *Full Credit -1:* • Incorrect rounding