Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2017

Marking Scheme

Mathematics

Ordinary Level

Note to teachers and students on the use of published marking schemes

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. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

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 all 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 from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

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 their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes 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 in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Contents Page

Paper 1

Paper 2

Paper 1

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 scale	0, 5	0, 2, 5	0, 2, 3, 5	0, 2, 3, 4, 5
10-mark scale		0, 5, 10	0, 3, 7, 10	0, 2, 4, 8, 10
15-mark scale			0, 4, 10, 15	0, 4, 8, 12, 15
20-mark scale				0, 5, 10, 15, 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 (no credit)
- correct response (full credit)

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 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 be awarded. This level of credit is referred to as *Full Credit –1*, and these types of errors are identified with an asterisk (*). Thus, for example, in Scale 10C, *Full Credit –1* of 9 marks may be awarded.

No marks may be awarded other than those on the appropriate scale, and *Full Credit –1*.

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.

Summary of mark allocations and scales to be applied

Question 1 (20)

(a)	5D
(b)	5B
(c)&(d)	10C

Question 2 (25)

(a)	10D
(b)&(c)	5C
(d)	10B

Question 3 (25)

(a)	15D
(b)	10C

Question 4 (35)

(a)(i)&(ii)	15D
(a)(iii)	5B
(b)	10D
(c)	5A

Question 5 (20)

(a)	15C
(b)&(c)	5C

Question 6 (30)

(a)	20D
(b)	10C

Question 7 (15)

(a)&(b)	15D

Question 8 (15)

(a)	5B
(b)	10C

Question 9 (40)

(a)	10B
(b)	10C
(c)	15C
(d)	5C

Question 10 (15)

(a)–(c)	15D

Question 11 (15)

(a)&(b)	15D

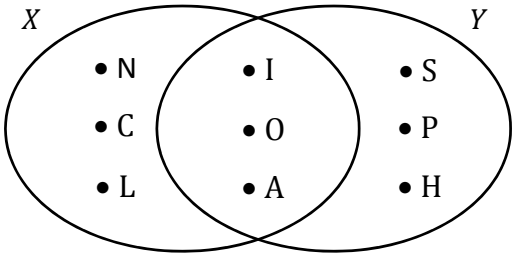
Question 12 (45)

(a)(i)	15D
(a)(ii)	5C
(b)(i)	5B
(b)(ii)	20D

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 – 20 Marks	Marking Notes
(a)	9 $1, 3, 9$ 10 $\mathbf{1, 2, 5, 10}$ 11 $\mathbf{1, 11}$ 12 $\mathbf{1, 2, 3, 4, 6, 12}$	**Scale 5D (0, 2, 3, 4, 5)** Accept correct answer without work *Low Partial Credit* • Any correct factor of 10, 11 or 12 *Mid Partial Credit* • Fully correct factors of 10, 11 or 12 *High Partial Credit* • Fully correct factors of any two of 10, 11 or 12.
(b)	Answer: $\mathbf{11}$ Reason: $\mathbf{11}$ has only two factors. **OR** $\mathbf{9}$, $\mathbf{10}$, and $\mathbf{12}$ have more than two factors. *or any other valid reason*	**Scale 5B (0, 2, 5)** *No Credit* • More than one box ticked, with no reason or incorrect reasoning. *Partial Credit* • 11 ticked, no or incorrect reason • 11 not ticked, shows understanding of prime
(c)&(d)	(c) Any three of $\mathbf{2, 3, 5, 7, 13, 17}$ or $\mathbf{19}$ (d) LCM of three numbers in (c)	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit* • One or two correct primes less than 20 (including 11). • Three correct primes that include 11, if 11 is chosen in (b). • Work of merit in (d), for example: common multiple of chosen values other than LCM *High Partial Credit* • (c) or (d) correct

Q2	Model Solution – 25 Marks	Marking Notes
(a)		**Scale 10D (0, 2, 4, 8, 10)** *Low Partial Credit* • One correctly placed element *Mid Partial Credit* • Four correctly placed elements • Either of the sets, $X \cap Y, X \backslash Y$ or $Y \backslash X$ correct *High Partial Credit* • Seven correctly placed elements • Two of $X \cap Y, X \backslash Y$ or $Y \backslash X$ correct
(b)-(c)	(b) *A set with any two of I, O, and A.* (c) *A subset of X with at most one of I, O, and A.*	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit* • Any correct element in (b) or (c) *High Partial Credit* • (b) or (c) correct
(d)	S2: Letters in X but not in Y. S3: $X \cup Y$	**Scale 10B (0, 5, 10)** *Partial Credit* • One correct answer

Q3	Model Solution – 25 Marks	Marking Notes
(a)	(i) $11 - 6 = 5$ $5 \times 2 = 10$ hours (ii) $95 \div 10 = €9{\cdot}50$ per hour (iii) $0{\cdot}7 \times 95 = 66{\cdot}50$ $95 - 66{\cdot}50 = €28{\cdot}50$ **OR** $0{\cdot}3 \times 95 = €28{\cdot}50$	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answers without work. Accept correct answers without units. *Low Partial Credit* • Work of merit in one part, for example: 11 – 6, 0.70, 30%, 0.3, $95 \div k$ *Mid Partial Credit* • One part correct • Work of merit in three parts *High Partial Credit* • Two parts correct *Full Credit –1* • Apply a * for unnecessary rounding.
(b)	$20 \times 60000 \times 0{\cdot}7 = 840\,000$ $840\,000 = 8{\cdot}4 \times 10^5$	**Scale 10C (0, 3, 7, 10)** Accept correct answer without work. *Low Partial Credit* • Some correct multiplication, for example: $20 \times 60000 = 1200000$ • Shows some understanding of scientific notation, for example: converts 60000 to scientific notation • $20 \times 60000 \times 0.2$ *High Partial Credit* • 840000 • One correct multiplication **and** correctly converts to scientific notation

Q4	Model Solution – 35 Marks	Marking Notes
(a) (i)&(ii)	(i) Day 3 Day 4 Day 5 Day 6 20 25 30 35 (ii) Answer: Linear Reason: It goes up by the same amount each time. *or any other valid reason*	**Scale 15D (0, 4, 8, 12, 15)** Answer consists of 3 parts: the table in (i), the answer in (ii), the reason in (ii). *Low Partial Credit* • Any correct entry in (i) • Completes table correctly using an incorrect first difference. *Mid partial Credit* • 1 part (of the 3) correct *High Partial Credit* • 2 parts (of the 3) correct
(a) (iii)	$10 + 15 + 20 + 25 + 30 + 35 = €135$	**Scale 5B (0, 2, 5)** Accept correct answer without work. Accept correct answer without units. *Partial Credit* • Some calculation involving relevant values from the table
(b)	(i) Day 2 Day 3 Day 5 Day 6 4 8 32 64 (ii) Answer: Exponential Reason: It doubles each time. *or any other valid reason*	**Scale 10D (0, 2, 4, 8, 10)** Answer consists of 3 parts: the table in (i), the answer in (ii), the reason in (ii). *Low Partial Credit* • Any correct entry in (i) *Mid partial Credit* • 1 part (of the 3) correct *High Partial Credit* • 2 parts (of the 3) correct
(c)	Answer: Prize A Reason: It is the largest prize **OR** Answer: Prize C Reason: You don't have to wait to get all the money *or any prize with a valid reason*	**Scale 5A (0, 5)**

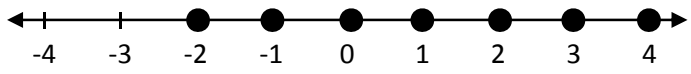
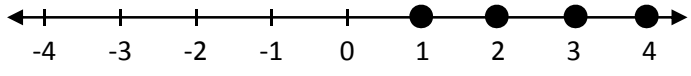
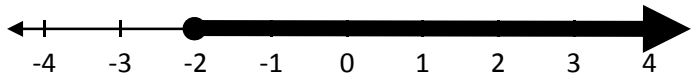
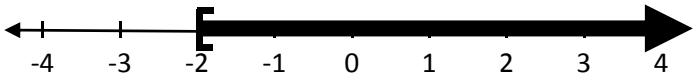
Q5	Model Solution – 20 Marks	Marking Notes
(a) (i)&(ii)	(i) $9:00 - 4 = 5:00$ a.m. (ii) $5:00 + 11:40$ $= 16:40$ **or** $4:40$ p.m. **OR** $9:00 + 11:40 = 20:40$ $20:40 - 4:00 = 16:40$ **or** $4:40$ p.m.	**Scale 15C (0, 4, 10, 15)** Accept correct answer without work Accept correct answers without a.m. or p.m. *Low Partial Credit* • Part (i) correct *High Partial Credit* • Part (ii) correct
(b)&(c)	(b) $756 \div 3 \cdot 6 = €210$ (c) Cost 2 adults = cost 4 children So cost of 6 children = 756 $756 \div 6 =$ R$126 per child ticket **OR** 1 adult and 1 child = $\frac{756}{2} = 378$ So cost 3 children = 378 $378 \div 3 =$ R$126 per child ticket **OR** $\boldsymbol{2x + 2y = 756}$ $\underline{\boldsymbol{x - 2y = 0}}$ $\boldsymbol{3x = 756}$ $x = 252$ and $y = 126$ R$126 per child	**Scale 5C (0, 2, 3, 5)** Accept correct answers without work. Accept correct answers without units. *Low Partial Credit* • Part (b) correct *High Partial Credit* • Part (c) correct

Q6	Model Solution – 30 Marks	Marking Notes
(a) (i)&(ii)	4 5 6 7 10 16 0 1 2 3 6 12 0 7 14 21 42 84	**Scale 20D (0, 5, 10, 15, 20)** *Low Partial Credit* • Any correct entry in table *Mid Partial Credit* • 4 correct entries • **(i)** or **(ii)** correct *High Partial Credit* • **(i)** or **(ii)** fully correct **and** some correct entries in other part *Full Credit –1* • Apply a * for one incorrect entry if the rest is fully correct
(b)	$\mathbf{105 \div 7 = 15}$ $\mathbf{15 + 4 = 19}$ years. **OR** 17 18 19 91 98 105 Answer: 19 years **OR** $\mathbf{7(E - 4) = 105}$ $\Rightarrow \mathbf{7E - 28 = 105}$ $\Rightarrow \mathbf{7E = 105 + 28 = 133}$ $\Rightarrow \mathbf{E = 133 \div 7 = 19}$ years	**Scale 10C (0, 3, 7, 10)** Accept correct answer without work *Low Partial Credit* • Some relevant use of 7 or 4 *High Partial Credit* • Finds Spot's age in years (i.e. 15) • Incorrect use of 7 but correct use of 4

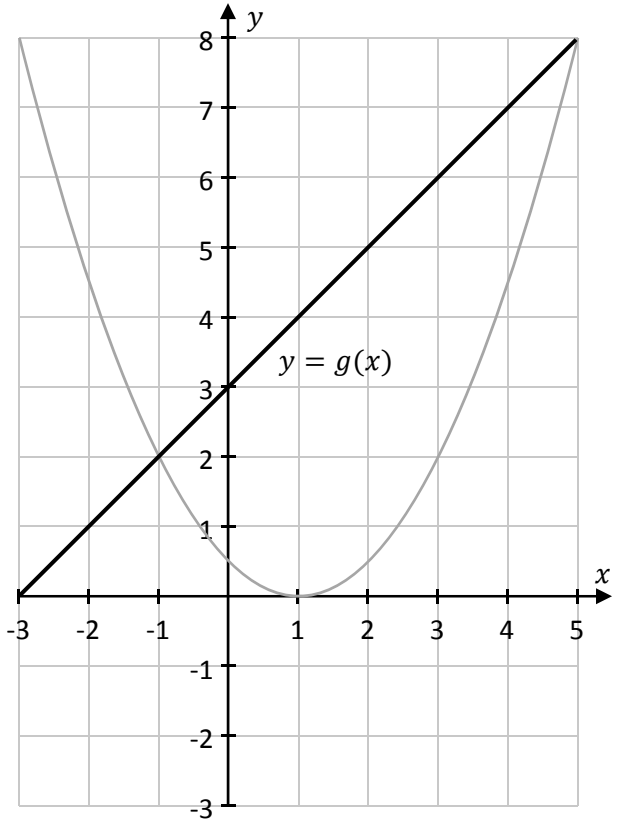
Q7	Model Solution – 15 Marks	Marking Notes
(a)&(b)	(a) Square 4 Hexagon 6 Triangle 3 (b) $\{3, 4, 5, 6\}$	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • One part correct in **(a)** • Any correct element in **(b)** *Mid Partial Credit* • Two parts correct in **(a)** • **(b)** correct *High Partial Credit* • **(a)** fully correct • **(b)** correct **and** one part of **(a)** correct

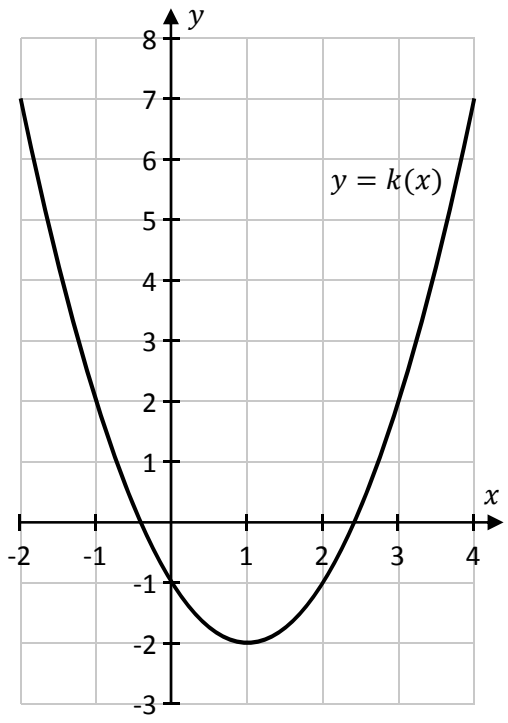
Q8	Model Solution – 15 Marks	Marking Notes
(a)	$\frac{2(4)+1}{3(4)-2} = \frac{8+1}{12-2} = \frac{9}{10}$	**Scale 5B (0, 2, 5)** *Partial Credit* • Fully correct substitution • Correct numerator or correct denominator
(b)	$(w+4)(3w-2)$ $= 3w^2 + 12w - 2w - 8$ $= 3w^2 + 10w - 8$	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit* • One term correct, including sign. *High Partial Credit* • Two terms correct from solution, including signs

Q9	Model Solution – 40 Marks	Marking Notes
(a)	(i) 20 seconds (ii) 40 metres	**Scale 10B (0, 5, 10)** *Partial Credit* • One part correct
(b)	(i) A (ii) $\frac{10}{6} = \frac{5}{3}\ m/s$ $\frac{10}{6} = 1.66\ldots m/s$ (	**Scale 10C (0, 3, 7, 10)** Accept 1.7m/s in (ii). Accept correct answer in (ii) without units. *Low Partial Credit* • Part (i) correct *High Partial Credit* • Part (i) correct and work of merit in part (ii) • Part (ii) correct *Full Credit –1* • Apply a * for $\frac{10}{6}$ in (ii)
(c)	(i) 35 cm (ii) $2\pi r$ $= 2(\pi)(35)$ $= 219.9\ldots$ $=$ 220 cm [nearest cm]	**Scale 15C (0, 4, 10, 15)** *Low Partial Credit* • Part (i) • Work of merit in one part , for example: 70/2, $C = 2\pi r$ *High Partial Credit* • Part (ii) correct • Part (i) correct and work of merit in part (ii) *Full Credit –1* • Apply a * if the answer is not given correct to the nearest cm
(d)	60 m $=$ 6000 cm $6000 \div 220 = 27{\cdot}27\ldots$ i.e. 27 times **OR** 220 cm $= 2{\cdot}2$ m $60 \div 2{\cdot}2 = 27{\cdot}27\ldots$ i.e. 27 times	**Scale 5C (0, 2, 3, 5)** Accept correct answer without work Consider trial and improvement as division using relevant figures *Low Partial Credit* • One correct conversion • Division using relevant figures *High Partial Credit* • Conversion correct **and** sets up division *Full Credit -1* • Apply a * if the answer is not rounded down to the nearest whole number.

Q10	Model Solution – 15 Marks	Marking Notes
(a)–(c)	(a)  (b)  (c)  **OR**  	**Scale 15D (0, 4, 8, 12, 15)** Accept 0 as an element in (b) Accept correct answer without work *Low Partial Credit* • Any correct element in any part *Mid Partial Credit* • One part fully correct *High Partial Credit* • Two parts fully correct *Full Credit – 1* • Apply a * once only if -2 is excluded in (a) and/or (c)

Q11	Model Solution – 15 Marks	Marking Notes
(a)&(b)	(a) $(x+5)\,(x-1)$ (b) $(x+5)(x-1)=0$ $\Rightarrow \quad x+5=0$ **and** $x-1=0$ $\Rightarrow \quad x=-5$ **and** $x=1$	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • Work of merit in one part, for example: finds factors of x^2 or ± 5; or puts answers from (a) = 0 in (b) • Any correct substitution in quadratic formula *Mid Partial Credit* • (a) correct • Fully correct substitution in quadratic formula *High Partial Credit* • (a) correct and work of merit in (b) • (b) correct (2 roots)

Q12	Model Solution – 45 Marks	Marking Notes
(a)(i)		**Scale 15D (0, 4, 8, 12, 15)** Accept a tolerance of $\pm\mathbf{0.2}$ for non integer values. *Low Partial Credit* • Any integer valued point correctly calculated or plotted • Point correctly plotted from candidate's work. • States slope $= 1$ **or** y-intercept $= 3$ *Mid Partial Credit* • States slope $= 1$ **and** y-intercept $= 3$ • Any line passing through $(0, 3)$ **or** with slope of 1 • Two points correctly calculated but plotted incorrectly or not plotted *High Partial Credit* • Correct line but not filling the given domain • End-points correctly plotted but not joined or joined incorrectly
(a)(ii)	$(-1, 2)$ **and** $(5, 8)$	**Scale 5C (0, 2, 3, 5)** Allow use of graph and table to find the coordinates of the points of intersection. *Low Partial Credit* • Points clearly identified on graph • x or y ordinate correct in any one point • One point with coordinates reversed and second point incorrect *High Partial Credit* • One point correct • Co-ordinates reversed for both points (2, -1) **and** (8, 5)

Q12	Model Solution – 45 Marks	Marking Notes
(b)(i)	$k(3) = (3)^2 - 2(3) - 1$ $= 9 - 6 - 1$ $= 2$	**Scale 5B (0, 2, 5)** Accept correct answer without work *Partial Credit* • Any correct substitution • Sets $k(x) = 3$ and some other relevant work.
(b)(ii)		**Scale 20D (0, 5, 10, 15, 20)** Note: If a candidate uses a linear function award *Low Partial Credit* at most. *Low Partial Credit* • Work of merit in calculating any point • Correct shape of graph *Mid Partial Credit* • Two points with integer coordinates correctly calculated and plotted. • All points correctly calculated. *High Partial Credit* • Four points with integer coordinates correctly plotted

Paper 2

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 scale	0, 5	0, 2, 5	0, 2, 3, 5	
10-mark scale		0, 5, 10	0, 4, 7, 10	0, 3, 5, 8, 10
15-mark scale				0, 4, 8, 12, 15
20-mark scale				0, 5, 10, 15, 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 (no credit)
- correct response (full credit)

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 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 be awarded. This level of credit is referred to as *Full Credit –1*, and these types of errors are identified with an asterisk (*). Thus, for example, in Scale 10C, *Full Credit –1* of 9 marks may be awarded.

No marks may be awarded other than those on the appropriate scale, and *Full Credit –1*.

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.

Summary of mark allocations and scales to be applied

Question 1	**(15)**
	15D
Question 2	**(45)**
(a), (b)	15D
(c)	15D
(d)	15D
Question 3	**(40)**
(a)	5C
(b)	20D
(c)	15D
Question 4	**(30)**
(a)(i)	5C
(a)(ii)	5C
(b)(i)	10D
(b)(ii)	10D

Question 5	**(35)**
(a)(i)	10D
(a)(ii), (iii)	10C
(b)(i)	5B
(b)(ii), (iii)	10C
Question 6	**(20)**
(a)	5A
(b)	15D
Question 7	**(15)**
(a)	5B
(b)	10C
Question 8	**(30)**
(a)	5B
(b)	10C
(c)	5B
(d)	10C

Question 9	**(40)**
(a)(i)	5C
(a)(ii), (iii)	15D
(a)(iv), (b)	15D
(c)	5B
Question 10	**(15)**
(a)	5C
(b)	10D
Question 11	**(15)**
(a), (b), (c)	15D

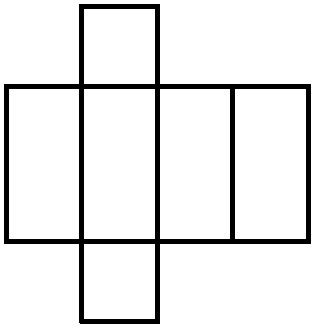
Model Solutions & Marking Notes

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 – 15 Marks	Marking Notes
	4 1 2 0	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer without work *Low Partial Credit* • 1 part correct • Draws an axis of symmetry • Some relevant statement about axial symmetry *Mid Partial Credit* • 2 parts correct *High Partial Credit* • 3 parts correct • Draws correct axes of symmetry for first three parts

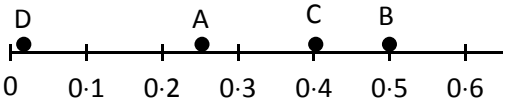
Q2	Model Solution – 45 Marks	Marking Notes
(a), (b)	(a) Length × Breadth $= 50 \times 25$ $= 1250$ m^2 (b) 2×(Length + Breadth) $= 2 \times (50 + 25)$ $= 2 \times 75 \quad = 150$ m	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • Formula for area or perimeter • One calculation relevant to either part • Finds perimeter in (a) • Finds area in (b) *Mid Partial Credit* • (a) correct • Finds perimeter in (a) **and** area in (b) • Work of merit in (a) and (b) *High Partial Credit* • (a) correct, **and** work of merit in (b) • (b) correct *Full Credit –1* • Apply a * for no or incorrect units, the first time it occurs
(c)	*Method 1*: $(20 \times 25) + \left(\frac{1}{2} \times 20 \times 25\right)$ $= 500 + 250$ $= 750$ m^2 **OR** *Method 2*: Total rectangle: $25 \times 50 = 1250$ Unshaded: $(10 \times 25) + \left(\frac{1}{2} \times 20 \times 25\right)$ $= \quad 250 + 250 = 500$ Answer: $1250 - 500 = 750$ m^2 **OR** *Method 3*: Extend rectangle by 10 m at the RHS. Then answer $= \frac{1}{2} \times 60 \times 25 = 750$ m^2	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer with no units *Low Partial Credit* • Some work of merit, for example: Splits into rectangle(s) and triangle, or correct relevant formula *Mid Partial Credit* • Finds one relevant area *High Partial Credit* • Finds two relevant areas • $60 \times 25 = 1500$ *Full Credit –1* • Apply a * if the area of the unshaded region $EBCF$ is found, with supporting work.

Q2	Model Solution – 45 Marks	Marking Notes
(d) (i), (ii)	(i) $c^2 = a^2 + b^2$ $\Rightarrow c^2 = 20^2 + 25^2$ $\Rightarrow c^2 = 400 + 625$ $\Rightarrow c^2 = 1025$ $\Rightarrow c = \sqrt{1025} = 32$ m [nearest m] (ii) $40 + 25 + 20 + 32$ $= 117$ m	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • Work of merit in (i), for example: Theorem of Pythagoras stated correctly, or indicates 20^2 or 25^2 • Work of merit in (ii), for example: Adds two relevant numbers *Mid Partial Credit* • $c^2 = 20^2 + 25^2$ • (ii) correct • Work of merit in both (i) **and** (ii) *High Partial Credit* • (i) correct • (ii) correct **and** work of merit in (i) *Full Credit -1* • Apply a * for incorrect or no rounding. • Apply a * for no or incorrect units, if a * was not applied for these in (a) or (b).

Q3	Model Solution – 40 Marks	Marking Notes
(a)	$l \times b \times h$ $= 3 \times 3 \times 5$ $= 45$ cm^3	**Scale 5C (0, 2, 3, 5)** Accept correct answer without work. *Low Partial Credit* • Correct formula • Finds area of one or more surfaces *High Partial Credit* • 3 × 3 × 5 *Full Credit –1* • Apply a * for no or incorrect units
(b)	 *or any other valid net.*	**Scale 20D (0, 5, 10, 15, 20)** *Low Partial Credit* • 1 correct face, anywhere on grid • Sketch of net of any cuboid with at least 5 correct faces *Mid Partial Credit* • Correct net of cube with sides of 3 cm • 4 correct faces anywhere on grid • 2 or 3 correct faces in correct positions relative to the given face *High Partial Credit* • 4 correct faces in correct positions • Correct net with excess faces *Full Credit –1* • Apply a * to a correct net without using the given face.

Q3	Model Solution – 40 Marks	Marking Notes
(c)	$\pi r^2 h$ $= (\pi)(1\cdot 2)^2(4)$ $= 18$ cm^3 [nearest cm^3]	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer with no units Consider solution as requiring 4 steps: Step 1: Correct formula Step 2: Substitution of r and h into formula Step 3: Calculates r^2 Step 4: Evaluates answer *Low Partial Credit* • 1 step correct • Product of 2 relevant numbers • Uses 2πrh formula and substitutes for r and h • Uses $A = \pi r^2$ and substitutes correctly for r *Mid Partial Credit* • 2 steps correct • Uses 2πrh formula and finishes correctly • $A = 1.44\pi$ *High Partial Credit* • 3 steps correct • Uses $A = \pi r^2$ and finishes correctly. *Full Credit –1* • Apply a * for incorrect rounding

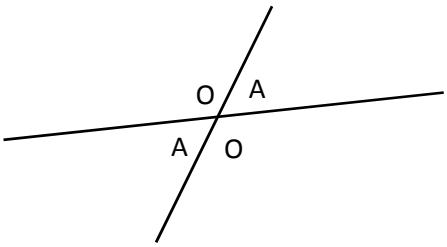
Q4	Model Solution – 30 Marks	Marking Notes
(a)(i)	Grey $90°$ Black $120°$ White $150°$	**Scale 5C (0, 2, 3, 5)** Accept correct answer without unit (degrees) A tolerance of 3˚ applies *Low Partial Credit* • 1 angle correct • 3 angles sum to $360°$ *High Partial Credit* • 2 angles correct • 1 angle measured correctly and all 3 angles summing to 360^o
(a)(ii)	$\frac{90}{360} \times 60 = \frac{1}{4} \times 60 = 15$ times	**Scale 5C (0, 2, 3, 5)** Accept correct answer without work. *Low Partial Credit* • Some work of merit, e.g. indicates $360°$ *High Partial Credit* • One correct relevant calculation, for example $\frac{360}{90} = 4$ *Full credit* -1 • Estimates for either White or Black
(b)(i)	B $\frac{1}{2}$ 50% $0{\cdot}5$ C $\frac{2}{5}$ 40% $0{\cdot}4$ D $\frac{1}{50}$ 2% $0{\cdot}02$	**Scale 10D (0, 3, 5, 8, 10)** Accept percentage without % sign (i.e. 50) *Low Partial Credit* • Work of merit in 1 part *Mid Partial Credit* • 2 parts correct *High Partial Credit* • 3 parts correct *Full Credit –1* • Apply a * if the fraction is not given in its simplest form

Q4	Model Solution – 30 Marks	Marking Notes
(b)(ii)		**Scale 10D (0, 3, 5, 8, 10)** *Low Partial Credit* • 1 correct *Mid Partial Credit* • 2 correct *High Partial Credit* • 3 correct • Points marked correctly but not labelled .

Q5	Model Solution – 35 Marks	Marking Notes
(a)(i)	4 | 7 9 9 5 | 0 6 7 8 6 | 5 7 8 9 9 9 7 | 5 9 Key: 5 | 6 = 56 [kg]	**Scale 10D (0, 3, 5, 8, 10)** Accept diagram with unordered entries. Accept the key without units. Consider solution as comprising 16 entries: 15 entries on the diagram, plus the key. *Low Partial Credit* • 1 correct entry *Mid partial Credit* • 6 correct entries • All entries correct but rewrites the stem for each number *High Partial Credit* • 11 correct entries *Full Credit –1* • Apply a * if just 1 entry in the diagram is omitted or incorrect. (If the key is missing, award at most *High Partial Credit.*)

Q5	Model Solution – 35 Marks	Marking Notes
(a)(ii), (iii)	(ii) Median = $\frac{15+1}{2} = 8$ th entry $\Rightarrow$ Median = 65 kg (iii) $79 - 47 = 32$ kg	**Scale 10C (0, 4, 7, 10)** Accept correct answer without work *Low Partial Credit* • Shows understanding of median, for example: mentions "8th" or "middle" • Shows understanding of range, for example: highlights max or min values • Finds mean or mode correctly *High Partial Credit* • (ii) **or** (iii) correct • Work of merit in both (ii) and (iii) (as covered under *LPC* above) *Full Credit –1* • Apply a * if range given from " 47 to 79 "
(b)(i)	$\frac{927}{15} = \frac{309}{5}$ kg or $61{\cdot}8$ kg	**Scale 5B (0, 2, 5)** Accept correct answer without work *Partial Credit* • Divides 927 by incorrect value • Attempts to add original values
(b)(ii), (iii)	(ii) $\frac{309}{5} - 1 = \frac{304}{5}$ kg or $61{\cdot}8 - 1 = 60{\cdot}8$ kg **OR** $\frac{46+48+48+49+\cdots+74+78}{15}$ $= \frac{912}{15}$ $= \frac{304}{5}$ kg or 60.8kg (iii) $927 - 15 = 912$ kg **OR** $60{\cdot}8 \times 15 = 912$ kg **OR** $46 + 48 + 48 + 49 + \cdots + 74 + 78$ $= 912$ kg	**Scale 10C (0, 4, 7, 10)** Acept correct answers without work *Low Partial Credit* • Work of merit, for example: Subtracts 1 from any of the original weights, or shows understanding of mean *High Partial Credit* • (ii) or (iii) correct

Q6	Model Solution – 20 Marks	Marking Notes
(a)	*Any relevant question giving numerical data*	**Scale 5A (0, 5)** *Full Credit –1* • Apply a * if the question is not about apps or social media
(b)(i), (ii)	(i) 8, **B** 16, **B** 32, **B** 8, **W** 16, **W** 32, **W** 8, **S** 16, **S** 32, **S** (ii) $\mathbf{3 \times 3 \times 2 = 18}$ options **OR** *Lists all of the possibilities and counts them to get* $\mathbf{18}$	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer without work *Low Partial Credit* • 1 correct entry in (i) • 3 entries in (i) with one aspect correct (memory size or colour) • Work of merit in (ii) *Mid Partial Credit* • 3 correct entries in (i) • All 7 entries in (i) with one aspect correct • 3 correct possibilities listed in (ii) *High Partial Credit* • (i) **or** (ii) correct *Full Credit –1* • Apply a * if just 1 entry in (i) is omitted or incorrect. • Apply a * if all possibilities are listed but not counted or counted incorrectly.

Q7	Model Solution – 15 Marks	Marking Notes
(a)(i), (ii)	*Either* A *and either* O*, as below.*  	**Scale 5B (0, 2, 5)** *Partial Credit* • 1 letter correct • 1 or 2 letters correct but with 1 or 2 incorrect
(b)	$\lvert\angle f\rvert = 45°$ $\lvert\angle g\rvert = 25°$ $\lvert\angle h\rvert = 45 + 25 = 70°$ **OR** $\lvert\angle h\rvert = 180 - (180 - (45 + 25))$ $= 180 - (110)$ $= 70°$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • f **or** g correct • Work of merit towards h, for example: some relevant calculation, or indicates $180°$ *High Partial Credit* • h correct • f **and** g correct • f **or** g correct, **and** work of merit towards h

Q8	Model Solution – 30 Marks	Marking Notes
(a)	*Answer*: Isosceles *Reason*: 2 of the angles are the same **OR** The 3 angles aren't equal, but the 3 angles aren't all different *or any other valid reason*	**Scale 5B (0, 2, 5)** *Partial Credit* • Answer correct • Shows understanding of one given type of triangle. • Incorrect answer but correct reason.
(b)	$\|\angle O\| = 180 - (2 \times 55)$ $= 180 - 110$ $= 70°$	**Scale 10C (0, 4, 7, 10)** Accept correct answer without work Accept correct answer without units (degrees) *Low Partial Credit* • Work of merit, for example: Some relevant calculation, or indicates $180°$ *High Partial Credit* • Some relevant calculation involving $180°$
(c)	"Triangles that have the same size angles" **OR** "Triangles whose sides are in proportion" *or any other valid explanation*	**Scale 5B (0, 2, 5)** *Partial Credit* • Work of merit e.g. the two triangles are isosceles.
(d)	$\|BC\| = 2 \times 1{\cdot}3 = 2{\cdot}6$ m **OR** $\frac{\|BC\|}{1{\cdot}3} = \frac{2}{1}$ $\therefore \ \|BC\| = 2 \times 1{\cdot}3 = 2{\cdot}6$ m	**Scale 10C (0, 4, 7, 10)** Accept correct answer without work *Low Partial Credit* • Some work of merit, for example: indicates 2 or $\frac{1}{2}$ *High Partial Credit* • Equates relevant ratios

Q9	Model Solution – 40 Marks	Marking Notes
(a)(i)	$B = (3, 1)$ $H = (8, 5)$	**Scale 5C (0, 2, 3 , 5)** *Low Partial Credit* • 1 ordinate correct *High Partial Credit* • B or H correct • Correct co-ordinates but reversed *Full Credit –1* • Apply a * if B and H are swapped, but otherwise correct
(a) (ii), (iii)	(ii) *B joined to H with a line segment* (iii) *Perpendicular bisector of $[BH]$ constructed on diagram, with construction lines shown*	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • (ii) correct • Work of merit in (iii), for example: arc drawn with centre at B or H *Mid Partial Credit* • (ii) correct **and** work of merit in (iii) • Significant work of merit in (iii), for example: Arcs drawn with centres at both B **and** H, or perpendicular bisector drawn, with no construction lines *High Partial Credit* • (ii) correct **and** significant work of merit in (iii) • (iii) correct

Q9	Model Solution – 40 Marks	Marking Notes
(a) (iv), (b)	(a)(iv) $\left(\frac{3+8}{2}, \frac{1+5}{2}\right)$ $= \left(\frac{11}{2}, \frac{6}{2}\right)$ $= (5\frac{1}{2}, 3)$ (b) $\sqrt{(3-8)^2 + (6-4)^2}$ $= \sqrt{(-5)^2 + (2)^2}$ $= \sqrt{25+4}$ $= \sqrt{29}$ cm	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer without units in (b). In (a)(iv), accept correct answer without work. In (a)(iv) accept a tolerance of ± 0.2 In (b), correct answer without work is considered substantial work (**not** correct). *Low Partial Credit* • Work of merit in one part, for example: Correct formula; or rise or run identified; or distance measured from diagram (allow a tolerance of ± 0.2) *Mid Partial Credit* • Work of merit relevant to **both** parts • Substantial work in 1 part, for example: In (a)(iv): correctly fills in formula, or one co-ordinate correct, or co-ordinates reversed but otherwise correct; In (b): correctly fills in formula, or fills formula incorrectly but finishes correctly, or correct answer without work. *High Partial Credit* • 1 part correct • Substantial work in 1 part **and** work of merit in the other part.
(c)	$180 \div 4 = 45$ km	**Scale 5B (0, 2, 5)** Accept correct answer without work. Accept correct answer without units. *Partial Credit* • $\frac{180}{4}$ or $180 \div 4$ or $\frac{4}{180}$

Q10	Model Solution – 15 Marks	Marking Notes
(a)	Answer: $(0,8)$ Justification: $(0,8)$: $y = 3x + 8$ $8 = 3(0) + 8$ $8 = 8$ True **OR** States *Line cuts y-axis at* $(0,8)$ *or any other valid justification, for example: diagram, or shows that the other 2 points are not on the line*	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit* • Answer correct • Substitution of any given values into equation *High Partial Credit* • Correct answer and some correct substitution into equation • Coordinates reversed with justification • Correct justification with incorrect box ticked
(b)	*Method 1:* $2x + 7 = 5x - 11$ $2x - 5x = -11 - 7$ $-3x = -18$ $x = 6$ $y = 2(6) + 7$ $y = 12 + 7$ $y = 19$ Point = $(6, 19)$ **OR** *Method 2:* $-y = -2x - 7$ $y = 5x - 11$ $0 = 3x - 18$ $18 = 3x$ $6 = x$ $y = 2(6) + 7$ $y = 12 + 7$ $y = 19$ Point = $(6, 19)$	**Scale 10D (0, 3, 5, 8, 10)** Accept correct answer without work. *Low Partial Credit* • Sets up equation in Method 1 • Matches co-efficient of x or multiplies one of the given equations by -1 in Method 2. • Any correct transposition *Mid Partial Credit* • Correct transpositions in Method 1 • Eliminates one variable in Method 2 *High Partial Credit* • Solves for one variable

Q11	Model Solution – 15 Marks	Marking Notes
(a), (b), (c)	(a) $\frac{x}{3}$ (b) $\sin 65° = 0{\cdot}906 \ldots$ $= 0{\cdot}9$ [1 D.P] (c) $\frac{x}{3} = 0{\cdot}9$ $\Rightarrow x = 3 \times 0{\cdot}9 = 2{\cdot}7$ units	**Scale 15D (0, 4, 8, 12, 15)** Accept correct answer without units in (c) *Low Partial Credit* • Work of merit in any part , for example: uses x or 3 in making fraction • Labels 1 side of triangle correctly • States correct relevant trigonometric ratio *Mid Partial Credit* • 1 part correct • Work of merit in 2 parts *High Partial Credit* • 2 parts correct *Full Credit 1* • Apply a * for calculator in the incorrect mode • Apply a * in (b) for incorrect or no rounding.

Marcanna Breise as ucht freagairt trí Ghaeilge

Léiríonn an tábla thíos an méid marcanna breise ba chóir a bhronnadh ar iarrthóirí a ghnóthaíonn níos mó ná 75% d'iomlán na marcanna.

N.B. Ba chóir marcanna de réir an ghnáthráta a bhronnadh ar iarrthóirí nach ngnóthaíonn níos mó ná 75% d'iomlán na marcanna don scrúdú. Ba chóir freisin an marc bónais sin **a shlánú síos**.

Tábla 300 @ 5%
Bain úsáid as an tábla seo i gcás na n-ábhar a bhfuil 300 marc san iomlán ag gabháil leo agus inarb é 5% gnáthráta an bhónais.

Bain úsáid as an ngnáthráta i gcás 225 marc agus faoina bhun sin. Os cionn an mharc sin, féach an tábla thíos.

Bunmharc	Marc Bónais
226	11
227 - 233	10
234 - 240	9
241 - 246	8
247 - 253	7
254 - 260	6

Bunmharc	Marc Bónais
261 - 266	5
267 - 273	4
274 - 280	3
281 - 286	2
287 - 293	1
294 - 300	0