Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2017

Marking Scheme

Mathematics

Foundation 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.

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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	B	C	D
No of categories	3	4	5
5-mark scale	0, 2, 5	0, 2, 3, 5	
10-mark scale	0, 4, 10	0, 4, 7, 10	0, 3, 5, 7, 10
15-mark scale		0, 5, 10, 15	0, 4, 8, 12, 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)

Summary of mark allocations and scales to be applied

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*. 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*.

Question 1 (25)

(a)(i)-(iii)	15C
(b)	10C

Question 2 (20)

(a)	15C
(b)	5B

Question 3 (5)

5C

Question 4 (15)

(a)	5C
(b)	10C

Question 5 (20)

(a) – (c)	10C
(d)	10C

Question 6 (25)

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

Question 7 (25)

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

Question 8 (10)

10C

Question 9 (15)

(a)	10C
(b)	5C

Question 10 (10)

10C

Question 11 (30)

(a)	10B
(b)	10D
(c)	10C

Question 12 (20)

(a)	10C
(b)	10C

Question 13 (40)

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

Question 14 (10)

10C

Question 15 (30)

(a)(i)	10C
(a)(ii)	5C
(b)(i)&(ii)	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 – 25 Marks	Marking Notes
(a)	(i) 160 (ii) 110 (iii) $4{\cdot}2$ **or** $4\frac{1}{5}$ **or** $\frac{21}{5}$	**Scale 15C (0, 5, 10, 15)** Accept correct answers without supporting work *Low Partial Credit* • 1 part correct *High Partial Credit* • 2 parts correct
(b)	(i) 1 3 6 7 (ii) *Any combination of 3 of the given digits beginning with 6 or 7, for example* 617.	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • In (i): any 2 of the given digits in increasing order; or 1 in the first box • In (ii): any incorrect three digit number > 600; or 6 or 7 in the first box *High Partial Credit* • 1 part correct

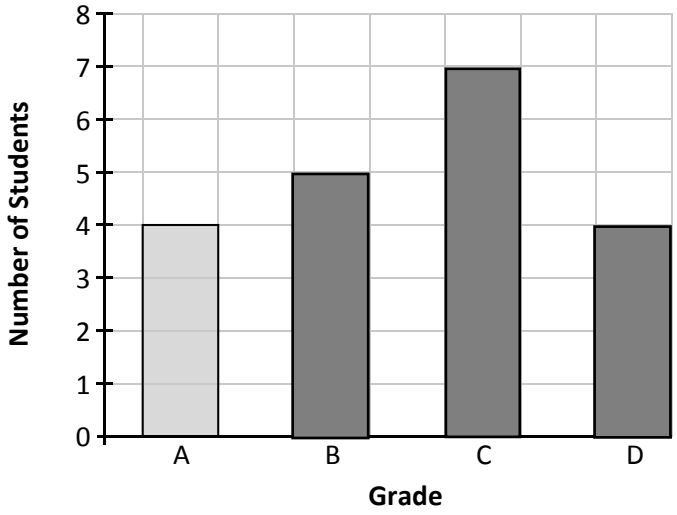
Q2	Model Solution – 20 Marks	Marking Notes
(a)	5 girls play Hockey only 3 girls play both Camogie and Hockey 16 girls play Camogie or Hockey or both	**Scale 15C (0, 5, 10, 15)** *Low Partial Credit* • 1 entry correct • 8 for Box 2 • 16 for Box 3 • 6 or 19 or 22 for Box 4 *High Partial Credit* • 2 entries correct
(b)	$\frac{8}{22}$ **or** $\frac{4}{11}$	**Scale 5B (0, 2, 5)** *Partial Credit* • 8 or 11 or 22 appears *Full Credit – 1* • Correct probability not expressed as a fraction (i.e. 0.36 or more accurate)

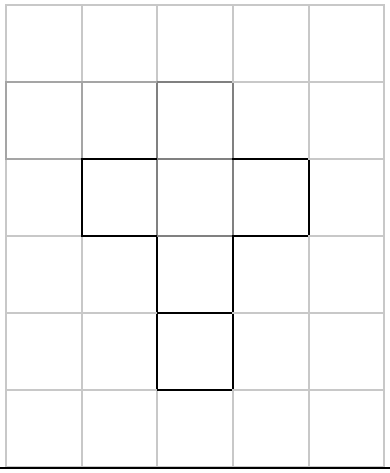
Q3	Model Solution – 5 Marks	Marking Notes
(a) & (b)	(a) $S = \{T, A, B, L, E\}$ (b) $T = \{7, 9, 11\}$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit* • 1 element correct in either set *High Partial Credit* • 1 part correct

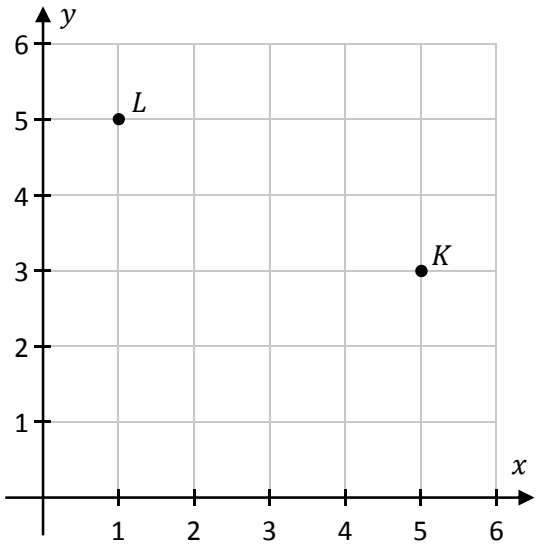
Q4	Model Solution – 15 Marks	Marking Notes
(a)	$4(2) + 3(7)$ $= \quad 8 + 21$ $= \quad 29$	**Scale 5C (0, 2, 3, 5)** Accept correct answer without supporting work *Low Partial Credit* • 1 correct substitution indicated • 8 **or** 16 **or** 21 **or** 34 **or** 77 **or** 79 without supporting work. *High Partial Credit* • 4(2) + 3(7) • 4(7) + 3(2) = 34 *Full Credit –1* • 8+21
(b)	$2x = 14 + 4$ $2x = 18$ $x = 9$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • Substitutes an incorrect value for *x* • Shows understanding of solving equations (for example: 2x = 14 – 4) *High Partial Credit* • $2x = 18$ • Transposition error, finished correctly *Full Credit – 1* • $\frac{18}{2}$ *Full Credit* • 2(9) – 4 = 14

Q5	Model Solution – 20 Marks	Marking Notes
(a) – (c)	(a) 5 (b) E (c) 7	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 part correct • 9 for (b) *High Partial Credit* • 2 parts correct
(d)	$\frac{5+7+6+7+9}{5}=\frac{34}{5}$ **or** $6{\cdot}8$ **or** $6\frac{4}{5}$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 5 or 7 or 34 without supporting work • Any indication of counting the scores *High Partial Credit* • 34 x 5 = 170 **or** 170 without supporting work • 26.8 without supporting work • $\frac{5+7+6+7+9}{5}$

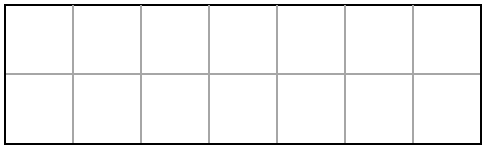
Q6	Model Solution – 25 Marks	Marking Notes
(a)	$100-80=20$	**Scale 5B (0, 2, 5)** *Partial Credit* • Indicates subtraction
(b)	$80\times €0{\cdot}75=€60$	**Scale 5B (0, 2, 5)** Accept correct answer without supporting work *Partial Credit* • Indicates addition of 0.75 and 0.75
(c)	$€60-€50=€10$	**Scale 5B (0, 2, 5)** *Partial Credit* • Indicates subtraction
(d)	$\frac{10}{50}\times 100=20\%$ **OR** $\frac{60}{50}$ x 100 = 120% 120 – 100 = 20%	**Scale 10B (0, 4, 10)** Accept correct answer without supporting work Accept correct answer without % sign (20) *Partial Credit* • Two of the relevant numbers correctly used

Q7	Model Solution – 25 Marks	Marking Notes
(a)	$4 \times 5 = 20$	**Scale 5B (0, 2, 5)** Accept answer consistent with table in (b) Accept correct answer without supporting work *Partial Credit* • 4 or 5 or 7 without supporting work
(b)	A B C D 4 5 7 4	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 entry correct *High Partial Credit* • 3 entries correct
(c)		**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 bar correct, **or** correct number from table indicated *High Partial Credit* • 2 bars correct

Q8	Model Solution – 10 Marks	Marking Notes
	Any valid net of a cube that contains the two given squares and has edges of length 2 cm. 	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • Partial drawing of one more face *High Partial Credit* • Incorrect net with 6 faces indicated *Full Credit − 1* • Correct net of a cube with edge other than 2cm

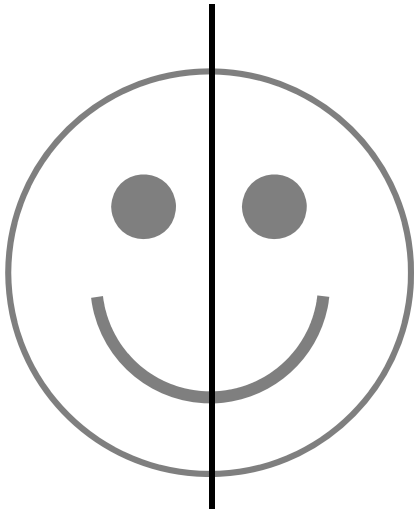
Q9	Model Solution – 15 Marks	Marking Notes
(a)		**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 **or** 3 **or** 5 indicated on the diagram *High Partial Credit* • 1 point correct **or** both points plotted with coordinates reversed *Full Credit – 1* • Correctly plotted points with incorrect or omitted labels
(b)	$\left(\frac{5+1}{2}, \frac{3+5}{2}\right)$ $= \left(\frac{6}{2}, \frac{8}{2}\right)$ $= (3, 4)$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit* • Correct midpoint formula • Correct substitution into distance or slope formula • 3 or 4 correct without supporting work *High Partial Credit* • Midpoint formula correctly filled in • Reverses co-ordinates of all entries in midpoint formula • Correct midpoint indicated but co-ordinates not written down

Q10	Model Solution – 10 Marks	Marking Notes
	Square 4 Hexagon 6 Triangle 3	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 entry correct *High Partial Credit* • 2 entries correct

Q11	Model Solution – 30 Marks	Marking Notes
(a)		**Scale 10B (0, 4, 10)** *Partial Credit* • Rectangle with >10 squares
(b)	Length 5 7 Area 10 14	**Scale 10D (0, 3, 5, 7, 10)** *Low Partial Credit* • 1 entry correct *Mid Partial Credit* • 2 entries correct *High Partial Credit* • 3 entries correct
(c)	*Answer*: Linear Pattern. *Reason*: It goes up by the same amount each time *or any other valid explanation*	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • Finds the difference between 2 consecutive terms • 19, without supporting work *High Partial Credit* • Correct answer **or** reason given

Q12	Model Solution – 20 Marks	Marking Notes
(a)	$3w + 9y$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 3 **or** 9 *High Partial Credit* • 3w **or** 9y
(b)	$5a + 10b - 5$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit* • 1 term correct *High Partial Credit* • 2 terms correct

Q13	Model Solution – 40 Marks	Marking Notes
(a)	C A B	**Scale 10C (0, 4, 7, 10)** Accept A for the 3rd box if not used for the 2nd box *Low Partial Credit* • 1 entry correct *High Partial Credit* • 2 entries correct
(b)	$6 + 6 + 6 = 18$ cm	**Scale 5B (0, 2, 5)** *Partial Credit* • 12 or 36 or 216 without supporting work *Full Credit –1* • Correct answer, unit incorrect or omitted
(c)	$180° - (35° + 35°)$ $= \quad 180° - 70°$ $= \quad 110°$	**Scale 10C (0, 4, 7, 10)** Accept correct answer without supporting work Accept correct answer without unit *Low Partial Credit* • Measures angle from the diagram (with a tolerance of ± 5°) • 70 or 145 without supporting work *High Partial Credit* • Indicates 3 angles sum to 180 • 180 − 35 = 145 *Full Credit –1* • 180 – 70
(d)	$y^2 \quad = 20^2 + 15^2$ $y^2 \quad = 400 + 225$ $y^2 \quad = 625$ $y \quad = \sqrt{625}$ $y \quad = 25$ **cm**	**Scale 15C (0, 5, 10, 15)** Accept correct answer without supporting work *Low Partial Credit* • 20^2 or 15^2 • $a^2 = b^2 + c^2$ or equivalent *High Partial Credit* • $\sqrt{20^2 + 15^2}$ • Incorrect squaring but finishes correctly *Full Credit − 1* • Correct answer, unit incorrect or omitted

Q14	Model Solution – 10 Marks	Marking Notes
		**Scale 10C (0 ,4, 7, 10)** Tolerance: ±0.5 cm *Low Partial Credit* • Axis drawn outside of tolerance *High Partial Credit* • Correct axis and 1 or more incorrect axes drawn

Q15	Model Solution – 30 Marks	Marking Notes
(a)(i)	*Triangle constructed correctly, with two construction arcs intersecting at a vertex.*	**Scale 10C (0, 4, 7, 10)** Tolerance: ±0.5cm *Low Partial Credit* • 1 side drawn within tolerance • A triangle drawn without the two construction arcs *High Partial Credit* • 2 correct intersecting construction arcs **and** 1 correct side
(a)(ii)	20 48	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit* • Work of merit in one part, for example: 5 for the actual length of the base **or** 12 for the actual length of the perimeter without supporting work *High Partial Credit* • 1 entry correct • Work of merit in both parts
(b) (i)&(ii)	(i) $\frac{6}{12}$ **or** $\frac{1}{2}$ **or** $0{\cdot}5$ (ii) $\tan^{-1}\left(\frac{1}{2}\right) = 26{\cdot}56\ldots^\circ = 27^\circ$ [nearest degree]	**Scale 15D (0, 4, 8, 12, 15)** *Low Partial Credit* • Work of merit in 1 part *Mid Partial Credit* • (i) correct • Work of merit in both parts *High Partial Credit* • (ii) correct • (i) correct and work of merit in (ii) *Full Credit −1* • Angle in (ii) not rounded or rounded incorrectly, otherwise both parts correct

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