



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2019

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.

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, 2, 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

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*.

Summary of mark allocations and scales to be applied

Question 1 (20)

- (a) 15C
- (b) 5C

Question 2 (20)

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

Question 3 (10)

- (a),(b) 10C

Question 4 (25)

- (a) 10C
- (b), (c) 10D
- (d) 5C

Question 5 (15)

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

Question 6 (20)

- (a), 10C
- (b),(c) 10C

Question 7 (10)

- 10C

Question 8 (15)

- (a), (b) 10D
- (c) 5B

Question 9 (45)

- (a) 10C
- (b) 10C
- (c),(d) 10C
- (e),(f) 15D

Question 10 (30)

- (a),(b) 10C
- (c) 5B
- (d),(e), 10D
- (f) 5B

Question 11 (25)

- (a) 10C
- (b) 5B
- (c),(d) 10D

Question 12 (35)

- (a) 10B
- (b) 10C
- (c),(d) 10D
- (e) 5B

Question 13 (15)

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

Question 14 (10)

- (a) 5C
- (b),(c) 5C

Question 15 (5)

- (a),(b) 5C

Model Solutions & Marking Notes

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.

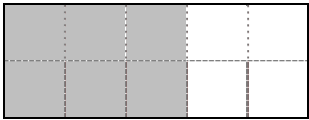
Where the scheme refers to “Some work of merit”, examples are given of the standard acceptable as Some work of merit in that particular part.

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.

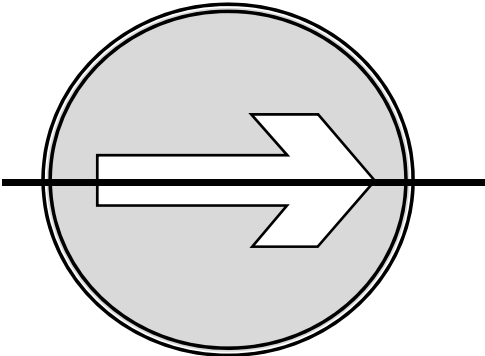
Q1	Model Solution – 20 Marks	Marking Notes
(a)	(i) 329 (ii) 117 (iii) 8	Scale 15C (0, 5, 10, 15) Accept correct answers without supporting work <i>Low Partial Credit</i> • 1 part correct <i>High Partial Credit</i> • 2 parts correct
(b)	(i) 7080 (ii) 30	Scale 5C (0, 2, 3, 5) Accept correct answers without supporting work <i>Low Partial Credit</i> • Some work of merit <i>High Partial Credit</i> • 1 part correct

Q2	Model Solution – 20 Marks	Marking Notes
(a)	$3 \times 60 = 180$	Scale 10B (0, 5, 10) Accept correct answer without supporting work <i>Partial Credit</i> • Some work of merit, for example: mentions 20 or 60
(b)	$77 \div 7 = 11$	Scale 5B (0, 2, 5) Accept correct answer without supporting work <i>Partial Credit</i> • Some work of merit, for example: mentions 7 or 539

Q2	Model Solution – 20 Marks	Marking Notes
(c)	$72 \div 24 = 3$	Scale 5B (0, 2, 5) Accept correct answer without supporting work <i>Partial Credit</i> Some work of merit, for example: mentions 24 or 1728

Q3	Model Solution – 10 Marks	Marking Notes
(a), (b)	(a) A, C (b) 	Scale 10C (0, 4, 7, 10) In (a), accept 1 and 3 instead of A and C <i>Low Partial Credit</i> - Some work of merit in (a) or (b), for example: in (a), 1 entry correct or 1 fraction correctly identified; in (b), 2 squares shaded or writes $\frac{6}{10}$ <i>High Partial Credit</i> (a) or (b) correct - Work of merit in (a) and (b)

Q4	Model Solution – 25 Marks	Marking Notes
(a)	(a) $14:36 - 12:00 = 2\text{hrs } 36\text{mins}$	Scale 10C (0, 4, 7, 10) Accept correct answer without supporting work <i>Low Partial Credit</i> - Some work of merit, for example: work of merit in subtraction; or identifies correct train arrival time of 14:36 <i>High Partial Credit</i> - Hours or minutes correct <i>Full Credit –1</i> Apply a * if the answer is not given in hours and minutes, for example: 2:36

Q4	Model Solution – 25 Marks	Marking Notes
(b), (c)	(b) 14:30 (c) $S = \frac{D}{T} = \frac{250}{2.5} = 100 \text{ [km/hr]}$	Scale 10D (0, 2, 5, 7, 10) Accept correct answers without supporting work Accept correct answers without units. <i>Low Partial Credit</i> - Some work of merit in (b) or (c), for example: in (b), indicates the correct train, or 16:00 in (c), correct formula or 625 without supporting work <i>Mid Partial Credit</i> (b) or (c) correct - Some work of merit in (b) and (c) <i>High Partial Credit</i> (b) or (c) correct, and work of merit in the other part
(d)	(d) 	Scale 5C (0, 2, 3, 5) Tolerance $\pm 0.5\text{cm}$ <i>Low Partial Credit</i> - Horizontal axis outside tolerance - Non-horizontal line through the centre of the circle <i>High Partial Credit</i> - Correct axis and one or more incorrect axes

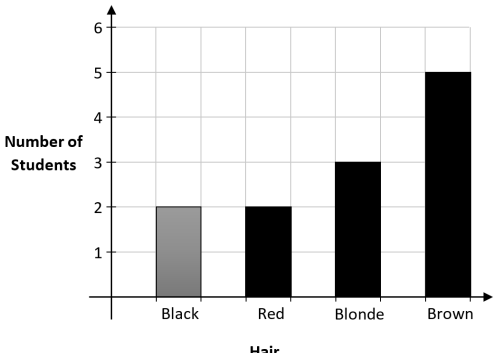
Q5	Model Solution – 15 Marks	Marking Notes
(a)	(i) False (ii) True (iii) False	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 entry correct <i>High Partial Credit</i> 2 entries correct
(b)	Answer: 5 Working Out/ Reason: $\frac{1}{4}$ of 20 is 5	Scale 5B (0, 2, 5) <i>Partial Credit</i> - Correct answer with no/incorrect working out or reason - Some work of merit in working out or reason

Q6	Model Solution – 20 Marks	Marking Notes
(a)	$80 + 40 = 120$ $180 - 120 = 60$	Scale 10C (0, 4, 7, 10) Accept correct answer without supporting work Accept correct answer without units <i>Low Partial Credit</i> - Some work of merit, for example: mentions 180; one relevant operation indicated or carried out <i>High Partial Credit</i> - Indicates 3 angles sum to 180 $180 - 80 = 100$ $180 - 40 = 140$
(b), (c)	(b) As an equilateral triangle has 3 equal angles (c) 70°	Scale 10C (0, 4, 7, 10) Tolerance of $\pm 3^\circ$ in (c) <i>Low Partial Credit</i> (b) correct - Work of merit in (c), for example measures wrong angle (66° or 44°), or 110° (i.e. $180 - 70$) <i>High Partial Credit</i> (b) correct, and work of merit in (c) (c) correct

Q7	Model Solution – 10 Marks	Marking Notes
	Impossible Equal Chance Unlikely Certain	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 entry correct <i>High Partial Credit</i> 2 entries correct

Q8	Model Solution – 15 Marks	Marking Notes
(a), (b)	(a) $6 + 4 + 17 = 27$ $30 - 27 = 3$ (b) $4 + 6 = 10$	Scale 10D (0, 2, 5, 7, 10) Accept correct answers without supporting work <i>Low Partial Credit</i> - Some work of merit in (a) or (b), for example: in (a) 7 or 9 or 10 or 13 or 20 or 21 or 23 or 24 or 26 or 27 without supporting work in (b) 4 or 6 <i>Mid Partial Credit</i> 1 part correct - Some work of merit in (a) and (b) <i>High Partial Credit</i> (a) or (b) correct and work of merit in other part
(c)	7 students cycle to school.	Scale 5B (0, 2, 5) <i>Partial Credit</i> Some work of merit, for example: Mentions 3 or 4

Q9	Model Solution – 45 Marks	Marking Notes						
(a)	<table border="1"> <tr> <td>Red</td><td>Blonde</td><td>Brown</td></tr> <tr> <td>2</td><td>3</td><td>5</td></tr> </table>	Red	Blonde	Brown	2	3	5	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 entry correct and total number of students in the table not 12 <i>High Partial Credit</i> 1 entry correct and total number of students in the table is 12 2 entries correct
Red	Blonde	Brown						
2	3	5						

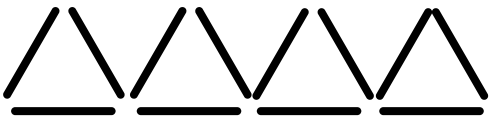
Q9	Model Solution – 45 Marks	Marking Notes										
(b)	 <table><thead><tr><th>Hair</th><th>Number of Students</th></tr></thead><tbody><tr><td>Black</td><td>2</td></tr><tr><td>Red</td><td>2</td></tr><tr><td>Blonde</td><td>3</td></tr><tr><td>Brown</td><td>5</td></tr></tbody></table>	Hair	Number of Students	Black	2	Red	2	Blonde	3	Brown	5	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 bar correct, or correct number from the table indicated <i>High Partial Credit</i> 2 bars correct
Hair	Number of Students											
Black	2											
Red	2											
Blonde	3											
Brown	5											
(c), (d)	(c) Brown (d) $\frac{2}{12}$ or $\frac{1}{6}$	Scale 10C (0, 4, 7, 10) In (c) accept the highest incorrect entry in (a) or the colour with the greatest height in (b) <i>Low Partial Credit</i> - Some work of merit in (d), for example: one aspect (numerator or denominator) correct or 12/2 or 6/1 or 2 given as denominator (c) correct <i>High Partial Credit</i> (c) correct and work of merit in (d) (d) correct										
(e), (f)	(e) $\frac{3}{12} \times 100 = 25$ [%] (f) $\frac{15}{100} \times 20 = 3$	Scale 15D (0, 4, 8, 12, 15) Accept correct answers without supporting work Accept correct answers without units <i>Low Partial Credit</i> - Some work of merit in (e) or (f), for example: shows understanding of percentages or indicates relevant operation or 2 of the relevant numbers correctly used or 3 written in (e) <i>Mid Partial Credit</i> (e) or (f) correct - Some work of merit in (e) and (f) <i>High Partial Credit</i> (e) or (f) correct and work of merit in other part										

Q10	Model Solution – 30 Marks	Marking Notes
(a), (b)	(a) $W = 5 \text{ [cm]}$ $H = 12 \text{ [cm]}$ (b) $\frac{125}{5} \times 12 = 300 \text{ [m]}$	Scale 10C (0, 4, 7, 10) Accept correct answers without units Accept correct answer for (b) without work <i>Low Partial Credit</i> - Some work of merit in (a) or (b), for example: W or H correct in (a); Indicates a correct operation in (b) <i>High Partial Credit</i> (a) or (b) correct - Some work of merit in (a) and (b) <i>Full Credit –1</i> - Apply a * if the values in (a) are not rounded to the nearest cm, allowing a tolerance of less than $\pm 0.5\text{cm}$
(c)	As the height of the jigsaw is rounded to the nearest cm. <i>or some other valid explanation</i>	Scale 5B (0, 2, 5) <i>Partial Credit</i> Some work of merit
(d), (e)	(d) $\text{Area} = 17\text{cm} \times 17\text{cm} = 289 \text{ cm}^2$ (e) $\text{Volume} = 20\text{cm} \times 30\text{cm} \times 7\text{cm} = 4200 \text{ cm}^3$	Scale 10D (0, 2, 5, 7, 10) Accept correct answers without supporting work Apply a * in (d) for $5 \times 5 = 25 \text{ cm}^2$ <i>Low Partial Credit</i> - Some work of merit in (d) or (e), for example: some relevant operation indicated or correct perimeter in (d) <i>Mid Partial Credit</i> (d) or (e) correct - Some work of merit in (d) and (e) <i>High Partial Credit</i> (d) or (e) correct and work of merit in other part <i>Full Credit –1</i> - Apply a * once only, if the units are incorrect or omitted

Q10	Model Solution – 30 Marks	Marking Notes
(f)	$£18 \div 0.89 = €20.22$	Scale 5B (0, 2, 5) Accept correct answer without supporting work Accept correct answer without unit. <i>Partial Credit</i> Some work of merit, for example; Multiplies by 0.89 or gives answer as 16.02 <i>Full Credit –1</i> Apply a * if the answer is not given correct to two decimal places

Q11	Model Solution – 25 Marks	Marking Notes
(a)	Castle = (3,4) Church= (7,2)	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 ordinate correct or 1 point with correct co-ordinates reversed <i>High Partial Credit</i> 1 point correct - Both points with correct co- ordinates reversed
(b)	Shed House	Scale 5B (0, 2, 5) <i>Partial Credit</i> 1 entry correct

Q11	Model Solution – 25 Marks	Marking Notes
(c), (d)	(c) <i>S</i> plotted and labelled correctly (d) Shed or (3,2)	Scale 10D (0, 2, 5, 7, 10) Accept correct answers without supporting work <i>Low Partial Credit</i> - Some work of merit in (c) or (d), for example; in (d) co-ordinates reversed or, (6,5) or house if (c) correct <i>Mid Partial Credit</i> (c) or (d) correct - Some work of merit in (c) and (d) <i>High Partial Credit</i> (c) or (d) correct and work of merit in other part <i>Full Credit –1</i> - Apply a * if the point <i>S</i> is not labelled (as long as it is still clearly the answer to part (c) – if multiple points are plotted with no indication of which is the answer, award at most work of merit to part (c))

Q12	Model Solution – 35 Marks	Marking Notes																					
(a)		Scale 10B (0, 5, 10) <i>Partial Credit</i> Pattern with > 4 triangles																					
(b)	<table border="1"> <thead> <tr> <th>Pattern</th><th>Number of Triangles</th><th>Number of Sticks</th></tr> </thead> <tbody> <tr> <td>1</td><td>1</td><td>3</td></tr> <tr> <td>2</td><td>2</td><td>6</td></tr> <tr> <td>3</td><td>3</td><td>9</td></tr> <tr> <td>4</td><td>4</td><td>12</td></tr> <tr> <td>5</td><td>5</td><td>15</td></tr> <tr> <td><i>n</i></td><td><i>n</i></td><td>$3n$</td></tr> </tbody> </table>	Pattern	Number of Triangles	Number of Sticks	1	1	3	2	2	6	3	3	9	4	4	12	5	5	15	<i>n</i>	<i>n</i>	$3n$	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> 1 entry correct <i>High Partial Credit</i> 4 entries correct
Pattern	Number of Triangles	Number of Sticks																					
1	1	3																					
2	2	6																					
3	3	9																					
4	4	12																					
5	5	15																					
<i>n</i>	<i>n</i>	$3n$																					

Q12	Model Solution – 35 Marks	Marking Notes
(c) (d)	(c) 11 (d) 297	Scale 10D (0, 2, 5, 7,10) Accept correct answers without supporting work <i>Low Partial Credit</i> - Some work of merit in (c) or (d), for example: in (c) 3 or in (d) 3 ,98 or 99 without supporting work <i>Mid Partial Credit</i> (c) or (d) correct - Work of merit in (c) and (d) <i>High Partial Credit</i> (c) or (d) correct and work of merit in other part
(e)	$6^2 + 1$ $36 + 1$ 37	Scale 5B (0, 2, 5) Accept correct answer without supporting work <i>Partial Credit</i> Some work of merit, for example: 13 or 36 or 49 without supporting work

Q13	Model Solution – 15 Marks	Marking Notes
(a)	- Business, Physics and Biology - Music, Physics and Latin <i>or any other correct combination</i>	Scale 10C (0, 4, 7, 10) <i>Low Partial Credit</i> - Some work of merit, for example: A subject from one group combined with a subject from a different group <i>High Partial Credit</i> 1 combination correct
(b),	$4 \times 5 \times 4 = 80$	Scale 5B (0, 2, 5) Accept correct answer without supporting work <i>Partial Credit</i> Some work of merit, for example: Lists one more combination 4 or 5 or 13 or 16 or 20 without supporting work

Q14	Model Solution – 10 Marks	Marking Notes
(a)	(a) $3a + 13b$	Scale 5C (0, 2, 3, 5) <i>Low Partial Credit</i> - Indicates grouping of relevant terms 1 coefficient correct <i>High Partial Credit</i> 1 term correct
(b), (c)	(b) $(e + 4)$ (c) $7n - 11 = 45$ $7n - 11 + 11 = 45 + 11$ $7n = 56$ $n = 8$	Scale 5C (0, 2, 3, 5) Accept correct answers without supporting work Accept $7(8) - 11 = 45$ for correct answer in (c) <i>Low Partial Credit</i> - Some work of merit in (b) or (c), for example: in (b) indicates e or 4, - in (c) substitutes an incorrect value for n or shows understanding of solving equations, for example: $(7n = 45 - 11)$ <i>High Partial Credit</i> (b) or (c) correct - Work of merit in (b) and (c) <i>Full Credit –1</i> (b) correct and $\frac{56}{7}$ for (c)
Q15	Model Solution – 5 Marks	Marking Notes
(a), (b)	(a) $\frac{x}{12}$ (b) $0.7771 = 0.8$	Scale 5C (0, 2, 3, 5) <i>Low Partial Credit</i> - Some work of merit in (a) or (b) (b) correct <i>High Partial Credit</i> (a) correct (b) correct and work of merit in (a) <i>Full Credit –1</i> - Apply a * for incorrect or no rounding in (b) or if calculator is in wrong mode (Sin $51 = 0.6702$ or 0.7181)

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 ghnóthaíonn níos mó ná 75% d'iomlán na marcanna don scrúdú. Ba chóir freisin an marc bónaís 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