Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving 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.

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Marking Scheme –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	E
No of categories	2	3	4	5	6
5 mark scales	0, 5	0, 2, 5	0, 1, 2, 5	0, 2, 3, 4, 5	
10 mark scales	0, 10	0, 5, 10	0, 3, 5, 10	0, 3, 5, 6, 10	
15 mark scales	0, 15	0, 7, 15	0, 5, 10, 15	0, 3, 6, 9, 15	
20 mark scales	0, 20	0, 10, 20	0, 7, 13, 20	0, 5, 10, 15, 20	
25 mark scales	0, 25	0, 12, 25	0, 8, 17, 25	0, 6, 12, 19, 25	0, 5, 10, 15, 20, 25

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

E-scales (six categories)

- response of no substantial merit
- response with some merit
- response almost half-right
- response more than half-right
- almost correct response
- correct response

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 also be awarded.
Thus, for example, in *scale 10C*, 9 marks may be awarded.

Summary of mark allocations and scales to be applied

Section A

Question 1

(a)	5C
(b)(i)	5C
(b)(ii)	15C

Question 2

(a) (i)+(ii)	10C
(b)(i)+(ii)+(iii)+(iv)	15D

Question 3

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

Question 4

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

Question 5

(a)+(b)+(c)	10D
(d)	10C
(e)	5C

Question 6

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

Question 7

(a)	15D
(b)+ (c)	10C

Question 8

(a)	10C
(b)(i)	10C
(b)(ii)	5C

Section B

Question 9

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

Question 10

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

Palette of annotations available to examiners

Symbol	Name	Meaning in the body of the work	Meaning when used in the right margin
✓	Tick	Work of relevance	The work presented in the body of the script merits full credit
✗	Cross	Incorrect work (distinct from an error)	The work presented in the body of the script merits 0 credit
#	Hash	Rounding error Unit error Arithmetic error Misreading	
	Horizontal wavy	Error	
✓l	Tick L		The work presented in the body of the script merits low partial credit
✓m	Tick M		The work presented in the body of the script merits mid partial credit
✓h	Tick H		The work presented in the body of the script merits high partial credit
[	Left Bracket		Another version of this solution is presented elsewhere and is worth equal or higher credit
	Vertical wavy	No work on this page (portion of the page)	
	Oversimplify	The candidate has oversimplified the work	

Note: It may be necessary to use a combination of 2 symbols in the right margin to clearly show your judgement of the work in the body of the script:

✓ # must be used to signify that Full Credit – 1 is merited by the work presented

[✓m Signifies that the work in the body of the script is worth mid partial credit but another effort at the work has been awarded this or higher credit

Note: Where work of substance is presented in the body of the script, the annotation on the right margin should reflect a combination of annotations in the work

e.g. In a **C scale** where # and  and  appear in the body of the work then  should be placed in the right margin.

In the case of a **D scale** with the same level of annotation then  should be placed in the right margin.

A  in the body of the work may sometimes be used indicate where a portion of the work presented has value and has merited one of the levels of credit described in the marking scheme.
The level of credit is them indicated in the right margin.

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.

Model solutions and detailed marking notes		
Q1	**Model Solutions 25 marks**	**Marking Notes**
(a)	30 ÷ 2=15 15 – 12·50 = **€2·50**	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Any work of relevance *High Partial Credit:* Use of 15
(b) (i)	164 – 117 = **€47**	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Use of 164 or 117 *High Partial Credit:* 164 – 117
(b) (ii)	117 – 5 =112 112 ÷ 2 = **€56**	**Scale 15C (0, 5, 10, 15)** *Low Partial Credit:* Any work of relevance Use of 117 58·50 *High Partial Credit:* 112

<table>
<tr><th>Q2</th><th>Model Solutions 25 marks</th><th>Marking Notes</th></tr>
<tr><td>(a)
(i)

(a)
(ii)</td><td>$\frac{1}{10}$

$\frac{3}{10}$</td><td>Scale 10C (0, 3, 5, 10)
Low Partial Credit:
Any work of relevance in either part

High Partial Credit:
One part correct</td></tr>
<tr><td>(b)
(i)

(b)
(ii)

(b)
(iii)

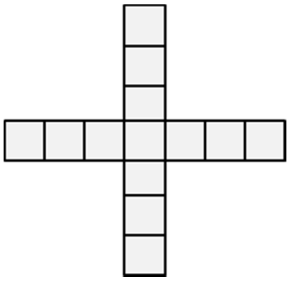
(b)
(iv)</td><td><table><tr><th></th><th>Car</th><th>Bus</th><th>Walk</th><th>Total</th></tr><tr><td>Boy</td><td>22</td><td>18</td><td>14</td><td>54</td></tr><tr><td>Girl</td><td>25</td><td>23</td><td>18</td><td>66</td></tr></table>
$\frac{14}{120}$

$\frac{66}{120}$

$18 + 23 = 41$ $\frac{41}{120}$</td><td>Scale 15D (0, 3, 6, 9, 15)
Low Partial Credit:
Work of relevance in any part

Mid Partial Credit:
Table correct
2 correct probabilities from candidates table
1 correct table entry and 1 correct probability

High Partial Credit:
Table and 2 probabilities
3 correct probabilities from candidates table</td></tr>
</table>

<table>
<tr><th>Q3</th><th>Model Solutions 25 marks</th><th>Marking Notes</th></tr>
<tr><td>(a)</td><td>  </td><td>Scale 5C (0, 1, 2, 5)
Low Partial Credit:
Any work of relevance

High Partial Credit:
Substantially correct e.g. not more than 2 squares missing or misplaced</td></tr>
<tr><td>(b)</td><td><table><tr><th></th><th>Number of Squares</th></tr><tr><td>Pattern 1</td><td>1</td></tr><tr><td>Pattern 2</td><td>5</td></tr><tr><td>Pattern 3</td><td>9</td></tr><tr><td>Pattern 4</td><td>13</td></tr><tr><td>Pattern 5</td><td>17</td></tr><tr><td>Pattern 6</td><td>21</td></tr></table></td><td>Scale 5C (0, 1, 2, 5)
Low Partial Credit:
One correct or consistent entry

High Partial Credit:
3 correct or consistent entries</td></tr>
<tr><td>(c)</td><td>33</td><td>Scale 5C (0, 1, 2, 5)
Low Partial Credit:
Any work of relevance
Use of 4

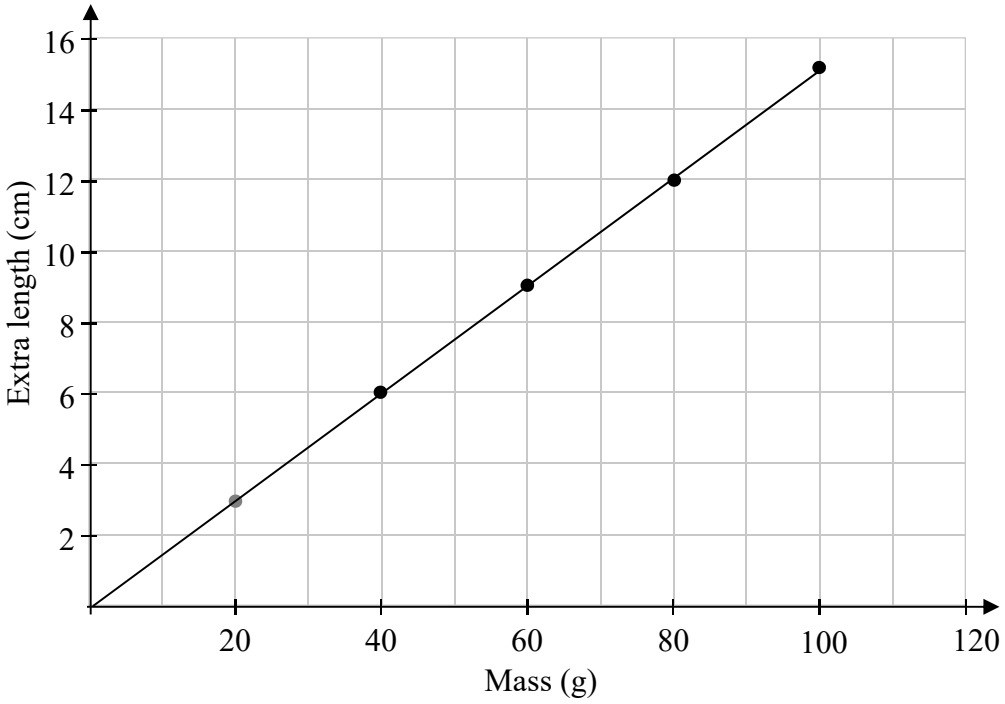
High Partial Credit:
List including 33 but 33 not identified</td></tr>
<tr><td>(d)</td><td>Pattern 26</td><td>Scale 10C (0, 3, 5, 10)
Low Partial Credit:
Any work of relevance e.g. listing
Use of 4

High Partial Credit:
List including pattern 26 but not identified</td></tr>
</table>

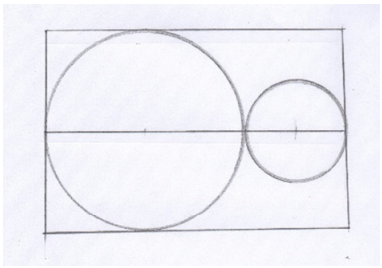
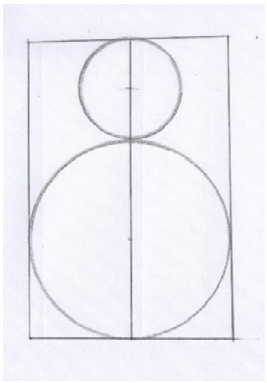
Q4	Model Solutions 25 marks	Marking Notes
(a)	$3 + 2 = 5$ **John:** $\frac{150\times3}{5} = €90$ **Mary:** $\frac{150\times2}{5} = €60$	**Scale 5D (0, 2, 3, 4, 5)** *Low Partial Credit:* 3 + 2 **or** 5 *Mid Partial credit:* $\frac{150}{5}$ *High Partial credit:* 90 **or** 60
(b)	$26 - 20 = 6$ $\frac{6 \times 100}{20}$ $= 30\%$	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* 26 – 20 **or** 6 ×100 *High Partial Credit:* $\frac{6}{20}$
(c)	$50 - (5 \times 2) = 40$ points 40 ÷ 5 = 8 Wins 17 games – 5 drawn games = 12 games 12 – 8 = 4 losses	**Scale 10D (0, 3, 5, 6, 10)** *Low Partial Credit:* 5×2 40 **or** 50 – 10 **or** 12 17 – 5 *Mid Partial credit:* 40 ÷ 5 17 – 5 = 12 *High Partial credit:* 8

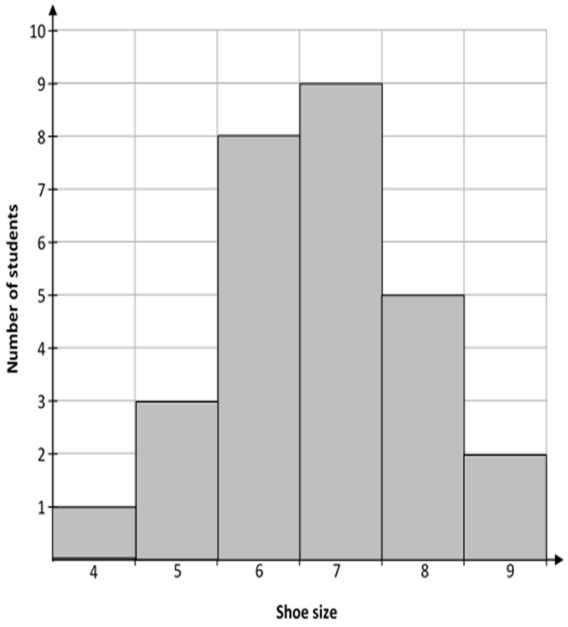
Q5	Model Solutions 25 marks	Marking Notes
(a) **(b)** **(c)**	1 hour 4.45 Half an hour	**Scale 10D (0, 3, 5, 6, 10)** *Low Partial Credit:* Work of relevance in any part or on the graph *Mid Partial Credit:* 1 part correct *High Partial Credit:* 2 parts correct **Note**: Tolerance of $\pm$ 5 mins for **(b)** and **(c)**
(d)	$350 - 230 = 120$ km	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* 1 correct/relevant distance given or indicated on graph *High Partial Credit:* 2 correct/relevant distances given or indicated on graph **Note**: Tolerance of $\pm$ 10 km
(e)	Distance $=$ 350 km Time $=$ 6 hours Speed $= \frac{350}{6} = 58{\cdot}3$ $=$ 58 km/h	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Distance *or* time found *High Partial Credit:* Distance *and* time found

Q6	Model Solutions 25 marks	Marking Notes
(a)	$x^2 = 90^2 + 200^2$ $= 48100$ $x = \sqrt{48100}$ $= 219{\cdot}3$ $= 219$ cm	**Scale 15C (0, 5, 10, 15)** *Low Partial Credit:* Any relevant indication of Pythagoras *High Partial Credit:* $x^2 = 90^2 + 200^2$
(b)	$\frac{11}{20}$ Reason: Any valid reason e.g. comparison of fraction or decimal equivalent values	**Scale 5C (0, 1, 2, 5)** *Low Partial credit:* 1 fraction converted to decimal *High partial credit:* Answer but no reason / invalid reason 3 fractions converted to decimal form 3 fractions rewritten as twentieths
(c)	$2\,500\,000 \times 0{\cdot}0013 = €3250$	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Any work of merit *High partial Credit:* $2\,500\,000 \times 0{\cdot}0013$

Q7	Model Solutions 25 marks	Marking Notes
(a)		**Scale 15D (0, 3, 6, 9, 15)** *Low Partial Credit:* 1 point correctly plotted *Mid Partial Credit:* 2 points correctly plotted *High Partial Credit:* Points plotted but no line drawn Correct line with (0, 0) omitted
(b) **(c)**	7·5 cm 67 g	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* Any relevant work on graph Any relevant work in either section *High Partial Credit:* 1 correct answer **Note**: Tolerance of $\pm$ 0·5 cm for **(b)** Tolerance of $\pm$ 3 grams for **(c)**

Q8	Model Solutions 25 marks	Marking Notes
(a)	$V = 10 \times 10 \times 6{\cdot}5$ $= 650\ cm^3$	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* Some substitution into relevant volume formula or area of side formula *High Partial Credit:* $10 \times 10 \times 6{\cdot}5$ and stops.
(b) (i)	[Rectangle]: $9 \times 12 = 108$ [Triangle]: $\frac{1}{2} \times 6 \times 9 = 27$ $108 + 27 = 135\ m^2$ Or [Rectangle]: $9 \times 18 = 162$ [Triangle]: $\frac{1}{2} \times 6 \times 9 = 27$ $162 - 27 = 135\ m^2$	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* Work of relevance for area of rectangle or triangle 1 new relevant side found *High Partial Credit:* 1 correct area (rectangle or triangle) $18 \times 9 = 162$
(b) (ii)	$\frac{135}{20} = 6{\cdot}75$ => 7 bags	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Identifies 135 (or answer from (i)) *High partial credit:* $\frac{135}{20}$ **or** $6{\cdot}75$ and stops

Q9	Model Solutions 45 marks	Marking Notes
(a)	$12 \times 8 = 96$ cm^2	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Work of relevance *High Partial Credit:* 12×8
(b)	r = 4 $\pi \times 4^2 = [50{\cdot}26]$ $= 50$ cm^2	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* Work of relevance involving π 4 *High Partial Credit:* $\pi \times 4^2$
(c)	Area of t: $\frac{50}{4} = 12{\cdot}5$ $96 - (50 + 12{\cdot}5) = 33{\cdot}5$ cm^2	**Scale 15D (0, 3, 6, 9, 15)** *Low Partial Credit:* Use of previous answers *Mid Partial Credit:* Area of t found *High Partial Credit:* $96 - (50 + 12{\cdot}5)$ or similar with equivalent candidate values (all 3)
(d)	 **or** 	**Scale 15D (0, 3, 6, 9, 15)** *Low Partial Credit:* Any relevant shape drawn *Mid Partial Credit:* Any relevant shape drawn to size *High Partial Credit:* 2 shapes correctly drawn and located 3 shapes correctly drawn **Note**: Accept any correct rotation of the image (e.g. as shown)

10	Model Solutions 55marks	Marking Notes
(a) (i)		**Scale 10D (0, 3, 5, 6, 10)** *Low Partial Credit:* Any relevant 'bar' drawn Relevant point on graph e.g.(4, 1) *Mid Partial Credit:* 2 correct bars drawn 5 correct points plotted *High Partial Credit:* 4 correct bars drawn Fully correct and joined line plot drawn
(a) (ii)	7	**Scale 5B (0, 2, 5)** *Mid Partial Credit:* 9
(b) (i)	84 + 96 + 60 = 240 360 – 240 = 120	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* Effort at addition of some of the given angles Mention of 360 *High Partial Credit:* 240 **o**r 84 + 96 + 60
(b) (ii)	$\frac{96}{360} = \frac{x}{30}$ $x = \frac{96 \times 30}{360}$ = 8 boys **Or** $\frac{360}{30} = 12$ $\frac{96}{12} = 8$	**Scale 5C (0, 1, 2, 5)** *Low Partial Credit:* Some use of 96 *High Partial Credit* $\frac{96}{360}$ **or** $\frac{360}{30}$

(c) **(i)**	14 | **7** **9** 15 | **0** **3** **6** **7** **7** **8** **9** 16 | **0** **1** **2** **2** **3** **7** **7** **8** 17 | **0** **2** **2** **4**	**Scale 10C (0, 3, 5, 10)** *Low Partial Credit:* 1 correct entry *High Partial Credit:* 11 correct entries **Note**: list may be unordered and still receive full marks
(c) **(ii)**	161 cm	**Scale 5C (0, 1, 2, 5)** *Low Partial credit:* Works out mean correctly Gives their 11th number *High Partial Credit:* Full ordered list written Accept correct answer without work
(c) **(iii)**	174 – 147 = 27	**Scale 10C (0, 3, 5, 10)** *Low Partial credit:* 174 or 147 identified *High Partial Credit:* 174 and 147 identified

Marcanna breise as ucht freagairt trí Ghaeilge

(Bonus marks for answering through Irish)

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

Déantar an cinneadh agus an ríomhaireacht faoin marc bónais i gcás gach páipéir ar leithligh.

Is é 5% an gnáthráta agus is é 300 iomlán na marcanna don pháipéar. Mar sin, bain úsáid as an ngnáthráta 5% i gcás iarrthóirí a ghnóthaíonn 225 marc nó níos lú, e.g. 198 marc $\times$ 5% = 9·9 $\Rightarrow$ bónas = 9 marc.

Má ghnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle [300 – bunmharc] $\times$ 15%, agus an marc bónais sin a shlánú **síos**. In ionad an ríomhaireacht sin a dhéanamh, is féidir úsáid a bhaint as an tábla thíos.

Bunmharc	Marc Bónais
226	11
227 – 233	10
234 – 240	9
241 – 246	8
247 – 253	7
254 – 260	6
261 – 266	5
267 – 273	4
274 – 280	3
281 – 286	2
287 – 293	1
294 – 300	0