



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2020

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, 3, 4, 5		
10 mark scales	0, 10	0, 5, 10	0, 4, 8, 10	0, 3, 5, 8, 10	
15 mark scales	0, 15	0, 7, 15	0, 5, 10, 15	0, 4, 7, 11, 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)(i)	10C
(a)(i)	5C
(b)	10C

Question 2

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

Question 3

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

Question 4

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

Question 5

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

Question 6

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

Question 7

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

Question 8

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

Section B

Question 9

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

Question 10

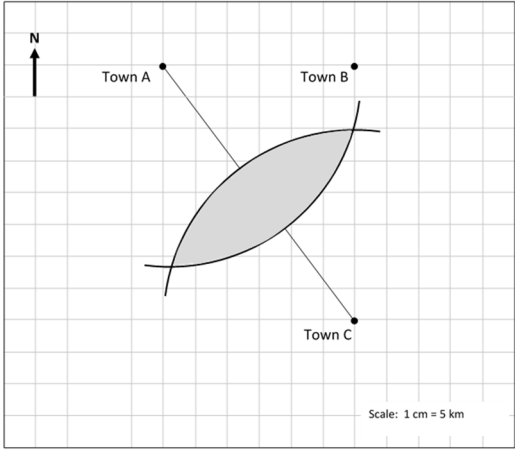
(a)(i)+(ii)+(iii)	15D
(b)(i)	10C
(b)(ii)	10C
(c)(i)	5C
(c)(ii)	10C

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) (i)	Costs: $2500 + 1000 + 500 + 400 = \text{€}4400$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Any work of relevance e.g. indication of addition of 2 or more of the relevant costs <i>High Partial Credit:</i> 2500 + 1000 + 500 + 400 written or implied but not calculated or incorrectly calculated
(a) (ii)	Total income needed: $4400 + 5000 = \text{€}9400$ No. of tickets: $9400 \div 10 = \mathbf{940}$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Answer from part (a)(i) written <i>High Partial Credit:</i> 440 or 500 with or without work Answer from part (a)(i) $\div 10$ but calculation not completed
(b)	Oil A: $15 \cdot 50 \div 2 = \mathbf{\text{€}7.75}$ Oil B: $4 \cdot 49 \times 2 = 8.98 - 15\% = \mathbf{\text{€}7.63}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Finds cost per litre of Oil A only Finds cost per litre of Oil B (excluding reduction) <i>High Partial Credit:</i> Finds cost per litre of Oil B (including reduction) Finds cost per litre of Oil A and Oil B (excluding reduction)

Q2	Model Solutions 25 marks	Marking Notes
(a)	$30 + 30 + 20 + 20 + 20 + 30 + 20 + 30$ $= 200$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Any work of relevance (e.g. 2 sides added) <i>High Partial Credit:</i> All dimensions correct, but adding not completed 6 or 7 correct dimensions added correctly
(b)	$30 \times 30 + 20 \times 20 + 30 \times 20 =$ $900 + 400 + 600 =$ 1900	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Any work of relevance (e.g. one area found) 900 or 600 or 400 <i>High Partial Credit:</i> 3 areas worked out correctly but not added 2 correct areas added
(c)	$50 \times 50 = 2500$ $\frac{1900 \times 100}{2500} = 76\%$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Any work of relevance e.g. finds area of square <i>High Partial Credit:</i> Forms correct fraction $\frac{1900}{2500}$

Q3	Model Solutions	25 marks	Marking Notes																				
(a)	<table><tr><td></td><td>Boys</td><td>Girls</td><td>Total</td></tr><tr><td>French</td><td>11</td><td>4</td><td>15</td></tr><tr><td>German</td><td>2</td><td>6</td><td>8</td></tr><tr><td>Spanish</td><td>3</td><td>4</td><td>7</td></tr><tr><td>Total</td><td>16</td><td>14</td><td>30</td></tr></table>			Boys	Girls	Total	French	11	4	15	German	2	6	8	Spanish	3	4	7	Total	16	14	30	Scale 15C (0, 5, 10, 15) <i>Low Partial Credit:</i> Any relevant calculation Any correct entry <i>High Partial Credit:</i> At least 3 correct or consistent entries
	Boys	Girls	Total																				
French	11	4	15																				
German	2	6	8																				
Spanish	3	4	7																				
Total	16	14	30																				
(b) (i)	$\frac{7}{30}$		Scale 5B (0, 2, 5) <i>Partial Credit:</i> Any work of merit e.g. correct denominator/ correct numerator as part of a fraction																				
(b) (ii)	$\frac{4}{14}$		Scale 5B (0, 2, 5) <i>Partial Credit:</i> Any work of merit e.g. correct denominator / correct numerator as part of a fraction																				

Q4	Model Solutions 25 marks	Marking Notes
(a)	(i) $8 \times 5 = 40$ (ii) $\sqrt{30^2 + 40^2} = 50$ <i>or</i> $\sqrt{6^2 + 8^2} = 10$ $10 \times 5 = 50$	Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i> $\times 5$ 8 Effort at formulating Pythagoras <i>Mid partial Credit:</i> 40 or 40 km $\sqrt{6^2 + 8^2} = 10$ (scale not used) <i>High Partial credit:</i> $\sqrt{30^2 + 40^2}$ and stops Both answers correct but no work shown Note: Must show evidence of Pythagoras for full credit.
(b)		Scale 10C (0, 4, 8, 10) Accept tolerance of $\pm$ one box <i>Low Partial Credit:</i> Any drawing of relevance <i>High Partial Credit:</i> 1 correct arc drawn

Q5	Model Solutions 25 marks	Marking Notes
(a)	Wt. of half tank water: $11 - 7 = 4$ kg Wt. of full tank of water: $4 \times 2 = 8$ kg Wt. of tank: $11 - 8 = \mathbf{3}$ kg	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> $11 - 7 = 4$ and stops <i>High Partial Credit:</i> Finds 8 kg and stops
(b) (i) (ii) (iii)	$2 \times 4 = \mathbf{8}$ cm $\mathbf{60^\circ}$ $k^2 = 16$ $1.5 \times 16 = \mathbf{24}$ cm ²	Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i> Work of relevance in any part <i>Mid Partial Credit:</i> 1 part correct <i>High Partial Credit:</i> 2 parts correct

Q6	Model Solutions 25 marks	Marking Notes
(a) (i)	$\frac{4}{3} \times \pi \times 5^3 = 523.59$ $= \mathbf{524}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Correct formula <i>High Partial Credit:</i> Correct formula fully substituted
(a) (ii)	$4 \times \pi \times 5^2 = 314.15$ $= \mathbf{314}$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Correct formula <i>High Partial Credit:</i> Correct formula fully substituted
(b)	$r = 3.5 \text{ cm}$ $\pi \times 3.5^2 \times 11 = 423$ $600 - 423 = \mathbf{177}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Any work of merit Use of $600 - x$ 3.5 <i>High partial Credit:</i> Correct answer without work 423 and stops

Q7	Model Solutions 25 marks	Marking Notes
(a) (i)	$\frac{635 \times 20}{100} = \text{€}127$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Some use of 20% or 635 <i>High Partial Credit:</i> Correct fraction but not completed
(a) (ii)	$127 - 62 = \text{€}65$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Use of answer to part (a)(i) Use of 62 <i>High Partial Credit:</i> Use of answer to (a)(i) and 62
(a) (iii)	$65 + 11.50 + 18.80 = 95.30$ $635 - 95.30 = \text{€}539.70$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Any relevant addition of elements Any subtraction from 635 <i>High Partial Credit:</i> Finds total deductions Subtracts 2 of the 3 elements correctly from gross pay
(b)	$\frac{533.40}{635} \times 100 = 84\%$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Any relevant percentage work Incorrect use of 533.40 and 635 <i>High Partial Credit:</i> $\frac{533.40}{635}$

Q8	Model Solutions	25 marks	Marking Notes										
(a) (i)	<table><tr><td>Distance</td><td>0-5</td><td>5-10</td><td>10-15</td><td>15-20</td></tr><tr><td>students</td><td>200</td><td>160</td><td>90</td><td>50</td></tr></table>	Distance	0-5	5-10	10-15	15-20	students	200	160	90	50		Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> 1 correct or consistent entry <i>High Partial Credit:</i> 2 correct or consistent entries
Distance	0-5	5-10	10-15	15-20									
students	200	160	90	50									
(a) (ii)		500	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Any relevant work with some table entries <i>High Partial Credit:</i> One number omitted from total										
(a) (iii)	$160 + 90 = 250$ $\frac{250}{500} = \frac{1}{2}$		Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> 160 90 <i>High Partial Credit:</i> 250										
(b)	<table><tr><td>1</td><td>5</td><td>6</td><td>7</td><td>14</td><td>15</td><td>16</td></tr></table>	1	5	6	7	14	15	16		Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Any relevant work on median or range 1 correct entry in box <i>High Partial Credit:</i> 2 correct or consistent answers			
1	5	6	7	14	15	16							

Q9	Model Solutions 50 marks	Marking Notes
(a)	$20 - 6 = 14$ $44 - (14 + 14) = 16$ (Laura's age now) In 6 years: $16 + 6 = \mathbf{22}$ Or $44 + 18 = 62$ $62 - 2(20) = \mathbf{22}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> 14 16 18 62 $44 - x$ (where $x \neq 28$) <i>High Partial Credit:</i> Laura's age now = 16 Note: Accept 22 as answer without work
(b)	$5 \times 3 \times 2 = \mathbf{30}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> $5 + 3 + 2$ 5×3 3×2 <i>High Partial Credit:</i> $5 \times 3 \times 2$ and stops
(c)	$9:50 - 7:20 = 2\text{h } 30\text{ mins (2.5 hours)}$ $\frac{210}{2.5} = \mathbf{84}$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> Relevant use of either 9:50 or 7:20 $210 \div x$ where $x \neq 2.5$ or 2.3 <i>High Partial Credit:</i> 2.3 used instead of 2.5 and finishes correctly $\frac{210}{2.5}$

(d) (i)	Semicircle: $r = 10$; $\pi \times 10 = 31.4 \approx 31\text{m}$ $130 - 20 + 31 = \mathbf{141}$	Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i> 10 $2\pi r$ $2\pi 20$ <i>Mid Partial Credit:</i> 62 or 31 $130 - 20$ <i>High Partial Credit:</i> $130 - 20 + 31$ and stops $130 - 20 +$ (candidates semi- circular distance) and finishes correctly $130 - 20 + 62$
(d) (ii)	$\sqrt{130^2 - 120^2} = \mathbf{50\text{ m}}$	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Reference to Pythagoras <i>High partial credit:</i> $\sqrt{130^2 - 120^2}$ and stops Incorrect use of 130 and 120 in Pythagoras

Q 10	Model Solutions	50 marks	Marking Notes																													
(a)																																
(i)	450		Scale 15D (0, 4, 7, 11, 15)																													
(ii)	12		Low Partial Credit: Work of relevance in any part																													
(iii)	$\frac{450}{12} = 37.5$		Mid Partial Credit: One part correct																													
			High Partial Credit: Two parts correct or with answers consistent with previous work																													
			Note: Review graph for indication of answer in (a)(i) and / or (a)(ii)																													
(b)																																
(i)	<table><tr><td>Time (days)</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Amount of fuel (litres)</td><td>800</td><td>700</td><td>600</td><td>500</td><td>400</td><td>300</td><td>200</td><td>100</td><td>0</td></tr></table>												Time (days)	0	1	2	3	4	5	6	7	8	Amount of fuel (litres)	800	700	600	500	400	300	200	100	0
Time (days)	0	1	2	3	4	5	6	7	8																							
Amount of fuel (litres)	800	700	600	500	400	300	200	100	0																							
	Scale 10C (0, 4, 8, 10)																															
	Low Partial Credit: One correct or consistent entry																															
	High Partial Credit: Four correct or consistent entries																															
(b)																																
(ii)																																
	Scale 10C (0, 4, 8, 10)																															
	Low Partial Credit: One correct plot from candidates table																															
	High Partial Credit: Four correct plots from candidates table (un-joined or joined)																															

(c) (i)	8 16 24 32 12 24 36 24	Scale 5C (0, 3, 4, 5) <i>Low Partial Credit:</i> Any work of relevance <i>High Partial Credit</i> Two relevant patterns used
(c) (ii)	$\frac{738}{123} \times 100 = 600$ VAT: $738 - 600 = \text{€}138$	Scale 10C (0, 4, 8, 10) <i>Low Partial Credit:</i> 23% of 738 = 169.74 123% written <i>High Partial Credit:</i> $\begin{array}{r} 738 \\ \hline 123 \end{array}$

