Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2018

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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Solutions and Marking Scheme

300 marks

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, 2, 3, 5		
10 mark scales	0, 10	0, 5, 10	0, 3, 7, 10	0, 2, 5, 8, 10	
15 mark scales	0, 15	0, 7, 15	0, 5, 10, 15	0, 4, 7, 9, 15	
20 mark scales	0, 20	0, 10, 20	0, 7, 13, 20	0, 5, 11, 16, 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

Summary of mark allocations and scales to be applied

Section A

Question 1

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

Question 2

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

Question 3

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

Question 4

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

Question 5

(a) + (b) + (c)	20D
(d)	5A

Question 6

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

Question 7

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

Question 8

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

Section B

Question 9

(a)(i)	10C
(a)(ii) + (iii) + (iv)	20D
(a)(v)	5B
(b)(i) + (ii) + (iii)	15D

Question 10

(a)(i) + (ii) + (iii)	20D
(b)(i)	5B
(b)(ii) + (iii)	15D
(b)(iv)	5B
(b)(v)	5B

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.

Note: 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.

Rounding and units penalty to be applied only once in each section (a), (b), (c) etc.

Throughout the scheme indicate by use of * where an arithmetic error occurs.

Model solutions and detailed marking notes		
Q1	**Model Solutions 25 marks**	**Marking Notes**
(a)	**15**	**Scale 5B (0, 2, 5)** *Partial Credit:* • Any work of relevance • Indication of counting
(b)	{2+2(3)+4+3(15)+3(6)+7+2(8)+10+12}/15 = 90/15 = **6**	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Use of answer to (**a)** • Indication of adding (2+6 …) *High Partial Credit:* • Relevant sum of total age • Relevant mean division
(c)	12 – 2 = **10**	**Scale 5B (0, 2, 5)** *Partial Credit:* • 12 or 2 written
(d)	$\frac{5 \times 100}{15} = 33\frac{1}{3}\%$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* • 5 or 15 or answer to (**a)** *High Partial Credit:* • Percentage formulated correctly • Calculates % of children aged 7

Q2	Model Solutions 25 marks	Marking Notes
(a) **(i)** **(ii)** **(iii)**	$3 \times 8 =$ **24** cm^2 L = **24** cm W = **14** cm Area = $24 \times 14 =$ **336** cm^2 $336 - 8(24) =$ **144** cm^2 Or $18 \times 8 = 144$	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct
(b)	$\pi r^2 h = \pi(5)^2(15)$ $= 1178{\cdot}09\ cm^3$ Answer: Yes. 1178 > 1000	**Scale 10D (0, 2, 5, 8, 10)** *Low Partial Credit:* • Any work of relevance • Correct formula • Correct answer (Yes) with no supporting work *Mid Partial Credit:* • Volume formula fully substituted *High Partial Credit:* • Volume calculated but no conclusion or incorrect conclusion

Q3	Model Solutions 25 marks	Marking Notes
A		
(i)		

		First Spinner		
		Black	**Grey**	**White**
Second Spinner	**Black**	**Black, Black**	Grey, Black	**White, Black**
	Grey	**Black. Grey**	**Grey, Grey**	**White, Grey**
	White	**Black, White**	**Grey, White**	**White, White**

(ii)	$\frac{3}{9}$ or $\frac{1}{3}$	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part
(iii)	$\frac{2}{9}$	*Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct
(b)		
(i)	3× 2 ×3 = **18**	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Any work of relevance in either part
(ii)	1× 2× 3 **= 6**	*High Partial Credit:* • One part correct • Work of relevance in both parts

Q4	Model Solutions 25 marks	Marking Notes
(a) **(i)**	$F = P(1+i)^t$ = 10000(1 + 0·0325)^3 **= €11007·03** Or $10000 \times 3{\cdot}25\% = 325$ $10325 \times 3{\cdot}25\% = 335{\cdot}56(25)$ $10660{\cdot}56 \times 3{\cdot}25\% = 346{\cdot}47$ **= €11007·03**	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts *High Partial Credit:* • One part correct
(ii)	$\frac{10000 \times 110}{100}$ = €11000 **Fiachra.** Difference: 11007·03 − 11000 **= €7·03**	
(b)	$\frac{150 \times 1}{0{\cdot}916} = 163{\cdot}755$ **= €163·76**	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • $150 \times 0{\cdot}916$ *High Partial Credit:* • $\frac{150}{0{\cdot}916}$

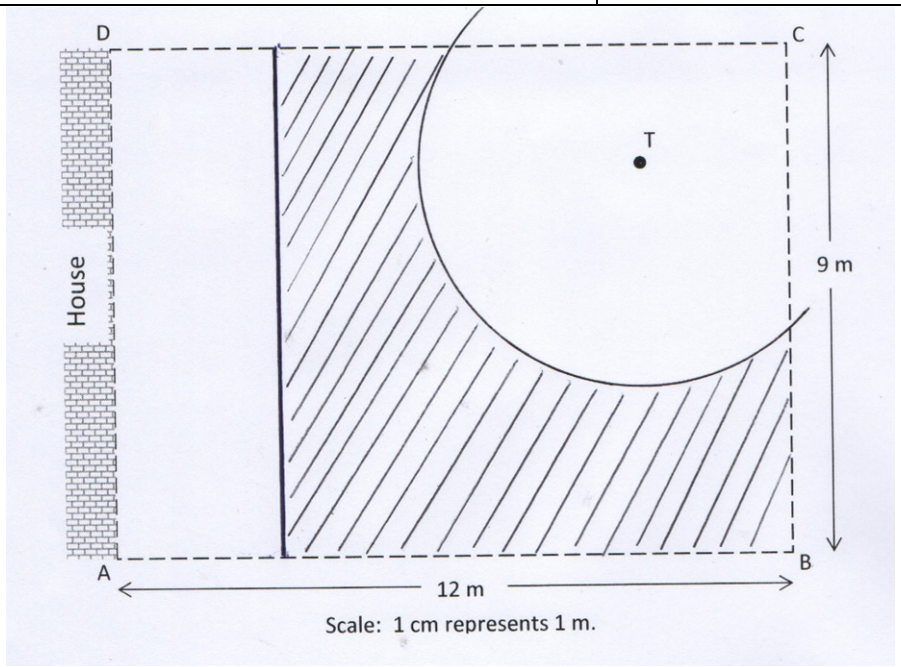
Q5	Model Solutions 25 marks	Marking Notes
(a)	**Shop A:** 200 + 12(25) = **€500**	**Scale 20D (0, 5, 11, 16, 20)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct
(b)	**Shop B:** $\frac{600 \times 20}{100} = 120$ 600-120 = **€480**	
(c)	**Shop C:** 24(22) = **€528**	
(d)	Shop B	**Scale 5A (0, 5)** • Answer relative to candidates previous work

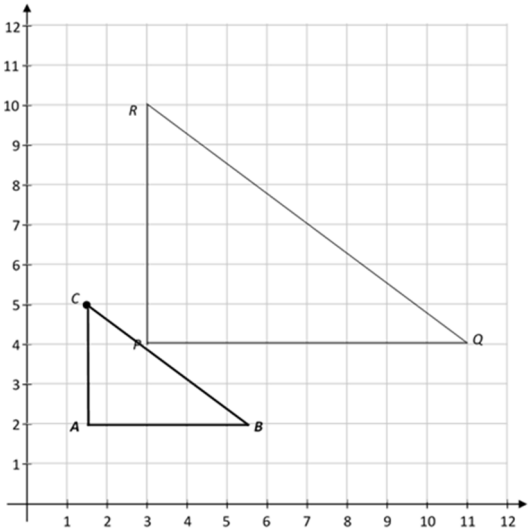
Q6	**Model Solutions 25 marks**	**Marking Notes**
(a) (i)		

Instruction	First Number	Second Number	Third Number
Starting Number	10	11	12
Multiply by 3	10 × 3	**11 × 3**	**12 × 3**
Add 12 to your answer	30 + 12	**33 + 12**	**36 + 12**
Outcome	42	**45**	**48**

(ii)	60 – 12 = 48 48 ÷ 3 = **16**	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts *High Partial Credit:* • One part correct
(b)	4-legged 3-legged 4 (1 stool) 3 (1 stool) **8** (2 stools) 6 (2 stools) 12 (3 stools) **9** (3 stools) 16 (4 stools) 12 (4 stools) 8 + 9 = 17 There are **2** 4-legged stools	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Any correct listing e.g. 4, 8, 12 or 3, 6, 9 • Any relevant Trial + Improvement e.g. 4 + 3, *High Partial Credit:* • 8 **and** 9 identified

Q7	Model Solutions 25 marks	Marking Notes
(a)	0·7 73% $\frac{3}{4}$ $\frac{4}{5}$.	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Any conversion of relevance *High Partial Credit:* • All entries in a single number format
(b) **(i)** **(ii)**	$1{\cdot}343 \times 10^9$ **One thousand three hundred and forty three million** Or **One billion three hundred and forty three million**	**Scale 5C (0, 2, 3, 5)** *Low Partial credit:* • $1{\cdot}343$ • 10^9 • One thousand three hundred and forty three • Any work of relevance in either part *High partial credit:* • One part correct • Work of relevance in both parts
(c) **(i)** **(ii)**	1 + 5 = 6 $\frac{60\times1}{6} = 10$ adults Now 10 + 8 =18 adults and 50 children. Ratio: 18 : 50 or **9 : 25**	**Scale 10D (0, 2, 5, 8, 10)** *Low Partial Credit:* • Any work of relevance in either part • $\frac{60}{x}$, $x \neq 6$ or 1 • 68 • 1 + 5 *Mid Partial Credit:* • Work of relevance in two parts *High Partial Credit:* • One part correct

Q8	Model Solutions 25 marks	Marking Notes
(a) **(a)**		**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Any circle drawn • Line 3 cm from house drawn • Section of relevant area shown *High Partial Credit:* • Any line and correct circle (radius = 4, centre T) drawn • Correct line **and** any circle centre T **and** region indicated
(b) **(i)** **(ii)** **(iii)**	$20 \times 20 = 400$ cm^2 $\pi r^2 = \pi(10)^2 = 314$ cm^2 $\frac{314 \times 100}{400} = 78{\cdot}5\%$	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct

Q9	Model Solutions 50 marks	Marking Notes
(a) **(i)**	 	**Scale 10C (0, 3, 7, 10)** *Low Partial Credit:* • Any work of relevance • A or B correctly plotted *High Partial Credit:* • *A* and B correctly plotted but no triangle drawn
(a) **(ii)** **(iii)** **(iv)**	$\|PR\|$ = 6 $\|AC\|$ = 3 *k* = 6 ÷ 3 = **2** $\|QR\| = \sqrt{6^2 + 8^2}$ = 10 10 ÷ 2 = 5	**Scale 20D (0, 5, 11, 16, 20)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct
(v)	$6 \times (2)^2$ = 24 units^2 Or $\frac{1}{2} \times 6 \times 8$ = 24 units^2	**Scale 5B (0, 2, 5)** *Partial Credit:* • Use of *k* *Full Credit*: • Correct answer without work

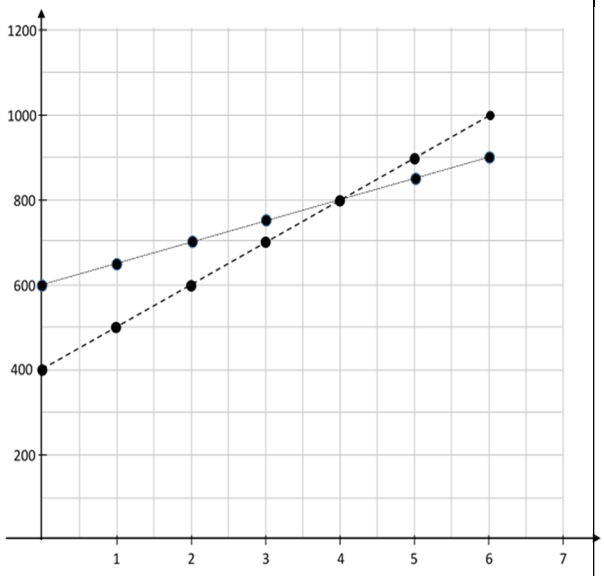
(b) **(i)**	$\frac{251 + 39}{10} = \frac{290}{10} = 29$ 251·32 is **not** divided by 10·3 or similar **ii)** Calculator worked out $251{\cdot}32 + \frac{39{\cdot}14}{10{\cdot}3}$ Should have used brackets on the first two numbers Should have used enter / = on calculator after first two **(iii)** **28·2**	**Scale 15D (0, 4, 7, 9, 15)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct

Q10	Model Solutions 50 marks	Marking Notes
(a) **(i)** **(ii)** **(iii)**	$80 \times \frac{1}{2}$ = **40 km** $\frac{117}{1{\cdot}5}$ = **78 km/h** Total distance: 40 + 117 = 157 Total Time : ½ + 1½ = 2 hours Average Speed: $\frac{157}{2}$ = **78·5 km/h**	**Scale 20D (0, 5, 11, 16, 20)** *Low Partial Credit:* • Any work of relevance in either part *Mid Partial Credit:* • Any work of relevance in two parts • One part correct *High Partial Credit:* • Two parts correct
(b) **(i)**	**€700**	**Scale 5B (0, 2, 5)** *Partial Credit:* • Any work of relevance on graph • 3×100 • 400

(b) (ii)

Table 2	
No. of cars sold per week	Weekly Wage (€)
0	600
1	650
2	**700**
3	**750**
4	**800**
5	**850**
6	**900**

(iii)



No of cars sold per week

Scale 15D (0, 4, 7, 9, 15)
Low Partial Credit:
- One correct entry
- One correct plot

Mid Partial Credit:
- Table correct but no plots

High Partial Credit:
- 5 plots correct from correct table
- All plots correct from incorrect table

(b) (iv)

(4, 800)
4 cars sold per week will give a weekly wage of €800 on both contracts.

Scale 5B (0, 2, 5)
Partial credit:
- Correct coordinates but no or incorrect explanation

(b) (v)

Contract **A**: He would get€ 900 /week on contract A but €850/week on contract B

Scale 5B (0, 2, 5)
Partial credit:
- Correct answer but no explanation