



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving 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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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2017

Model Solutions and Marking Scheme

Mathematics

Foundation Level

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, 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) + (b)	10C
(c) (i)+(ii)	15D

Question 2

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

Question 3

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

Question 4

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

Question 5

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

Question 6

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

Question 7

(a) + (b) + (c)	15D
(d)	5B
(e)	5B

Question 8

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

Section B

Question 9

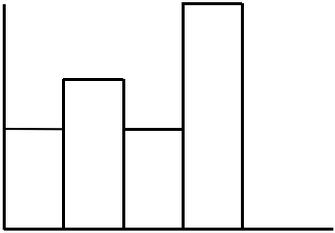
(a)(i) + (ii) + (iii)	20D
(a)((iv)+(v))	15D
(b)(i)	5B
(b)(ii)	10D

Question 10

(a)	10B
(b)	10C
(c)	10C
(d+ (e)	10C
(f)	5B
(g)	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.

Q1	Model Solutions 25 marks	Marking Notes
(a)	64	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance in either part <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> One part correct
(b)	240	
(c) (i)	$22 \times 14 = 308 \text{ m}^2$	<p>Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance in either part <p><i>Mid Partial Credit:</i></p> <ul style="list-style-type: none"> Work of relevance in both parts <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> One part correct
(c) (ii)	$308 - 240 = 68 \text{ m}^2$	

Q2	Model Solutions 25 marks	Marking Notes										
(a)	$\frac{118}{11} = 10.72 \approx 10.7$	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> Sum or count completed 										
(b)	$12 - 9 = 3$	<p>Scale 5B (0, 2, 5) <i>Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance 										
(c)	<table border="1"> <tr> <td>Age (in years)</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> </tr> <tr> <td>Number of children</td> <td>2</td> <td>3</td> <td>2</td> <td>4</td> </tr> </table> 	Age (in years)	9	10	11	12	Number of children	2	3	2	4	<p>Scale 10D(0, 2, 5, 8, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance in either part One correct entry <p><i>Mid Partial Credit:</i></p> <ul style="list-style-type: none"> 2 or more correct entries in table 1 relevant bar on correctly labelled graph <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> One part correct
Age (in years)	9	10	11	12								
Number of children	2	3	2	4								

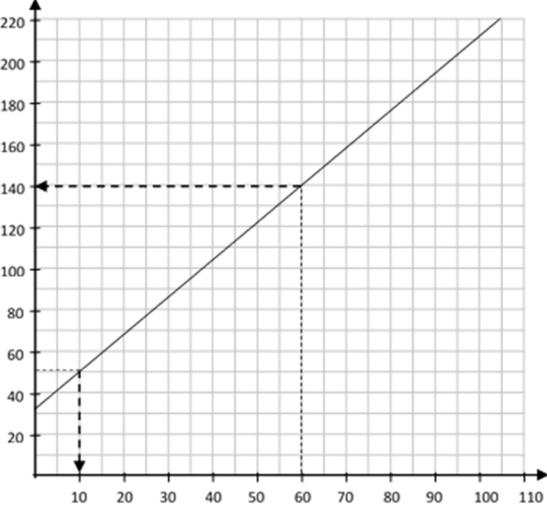
Q3	Model Solutions 25 marks	Marking Notes
(a)	$\frac{26000 \times 20}{100} = \text{€ } 5200$	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> $\frac{26000 \times 20}{100}$ 26000×0.2
(b)	$5200 - 3300 = \text{€ } 1900$	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> Gross tax – 3300
(c)	$1900 + 1040 + 723 = 3663$ $26\,000 - 3663 = \text{€ } 22\,337$	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> Net tax + PRSI + USC or 3663

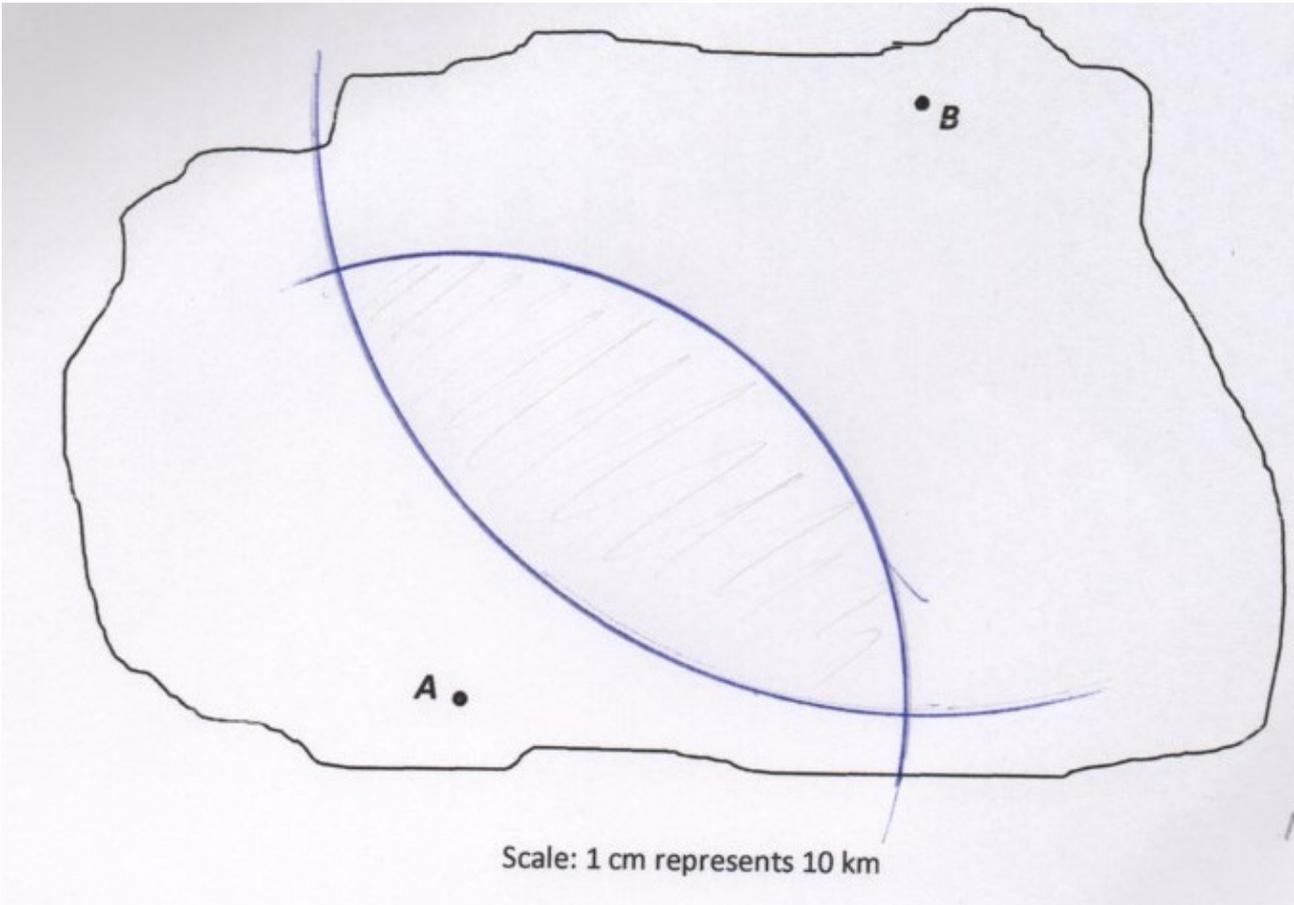
Q4	Model Solutions 25 marks	Marking Notes
(a)	$55 + 15 = 70$ mins (= 1h 10 min) $1:45 + 70$ mins (or + 1h 10 min) = 2:55 p.m.	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial credit:</i></p> <ul style="list-style-type: none"> 2:40 with work shown and stops
(b)	$\frac{135}{75} = 1.8$ hours = 1h 48 min	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Links speed distance and time correctly <p><i>High Partial credit:</i></p> <ul style="list-style-type: none"> $\frac{135}{75}$ Leaves answer as hours or mins
(c)	$\frac{135 \times 3}{5} = 81$ km	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Some work with $\frac{3}{5}$ <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> $\frac{135 \times 3}{5}$

Q5	Model Solutions 25 marks	Marking Notes
<p>(a) (i)</p> <p>(a) (ii)</p>	$\pi r^2 = \pi(3)^2 = 28.27\dots = \mathbf{28.3 \text{ cm}^2}$ $6 \times 6 = 36$ $36 - 28.3 = \mathbf{7.7 \text{ cm}^2}$	<p>Scale 10D (0, 2, 5, 8,10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>Mid Partial Credit:</i></p> <ul style="list-style-type: none"> Work of relevance in both parts <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> One part correct
<p>(b) (i)</p>	$\pi r^2 h = \pi(50)^2(205)$ $= 1610066 \text{ (cm}^3\text{)}$ $= \mathbf{1610 \text{ litres}}$	<p>Scale 10D (0, 2, 5, 8,10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance Volume Formula <p><i>Mid Partial Credit:</i></p> <ul style="list-style-type: none"> Formula fully substituted <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> Answer in cm^3
<p>(b) (ii)</p>	$1610 \times 59 = 94990 \text{ cent} = (\mathbf{€949.90})$ $= \mathbf{€950}$	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> Any work of relevance <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> Answer in cent

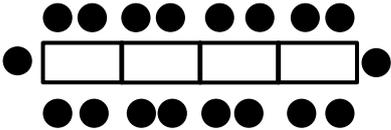
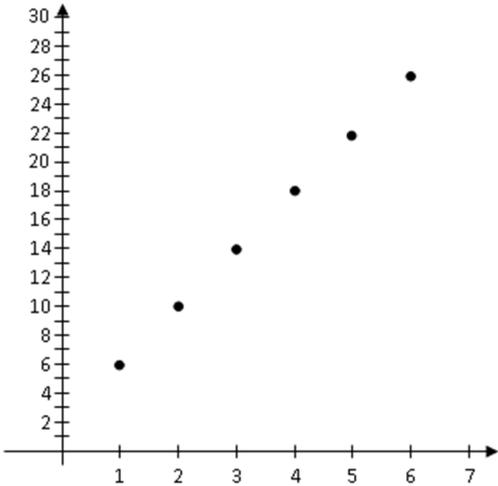
Q6	Model Solutions 25 marks	Marking Notes
(a) (i)	$360 - (126 + 72 + 54) = \mathbf{108}$	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • 360 • Indication of addition of angles <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • 3 angles added
(a) (ii)	$\frac{72 \times 240}{360} = \mathbf{48 \text{ people}}$	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Indication of 72 or 360 or 240 <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • $\frac{72 \times 240}{360}$
(a) (iii)	$\frac{54 \times 100}{360} = \mathbf{15\%}$	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Indication of 54 or 360 or 100 <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • $\frac{54 \times 100}{360}$
(b)	$(49 - 3) \div 2 = 23$ $23 - 5 = \mathbf{18}$ <p>Or</p> $49 - 10 = 39$ $(39 - 3) \div 2 = \mathbf{18}$	<p>Scale 5C (0, 2, 3, 5) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • <i>Work of relevance</i> <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • 23 • 39 • 36

Q7	Model Solutions 25 marks	Marking Notes
(a)	$\frac{3}{10}$	<p>Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Work of relevance in any part <p><i>Mid Partial Credit:</i></p> <ul style="list-style-type: none"> • One part correct <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • Two parts correct
(b)	$\frac{6}{10}$	
(c)	$\frac{4}{10}$	
(d)	<p>Answer: No Reason: $P(\text{Even}) = \frac{6}{10}$; $P(\text{Odd}) = \frac{4}{10}$ (or similar)</p>	<p>Scale 5B (0, 2, 5) <i>Partial Credit:</i></p> <ul style="list-style-type: none"> • Answer correct but no reason given • 4 odd numbers • 6 even numbers
(e)	$\frac{1}{9}$	<p>Scale 5B (0, 2, 5) <i>Partial Credit:</i></p> <ul style="list-style-type: none"> • 2 • 1 • 9

Q8	Model Solutions 25 marks	Marking Notes
<p>(a) (i) (a) (ii)</p>	 <p>(i) 140°F</p> <p>(ii) 10°C</p>	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Indication of use of graph <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • One correct conversion
<p>(a) (iii)</p>	$\frac{5(212-32)}{9} = \left[\frac{5 \times 180}{9} \right] = 100$ <p style="text-align: center;">100 = 100</p>	<p>Scale 5B (0, 2, 5) <i>Partial Credit:</i></p> <ul style="list-style-type: none"> • 212 in formula and stops
<p>(b)</p>	<p>Scale: 60 km = 6 cm; 80 km = 8 cm Arc: ± 0.2 cm</p> <p>DIAGRAM on next page</p>	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Any arc drawn • 10 cm or 8 cm line drawn • An area on AB axis <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • One correct arc drawn



Q9	Model Solutions 50 marks	Marking Notes
(a) (i) (a) (ii) (a) (iii)	$ OX = 8 \times 2.5 = 20 \text{ m}$ $ OB = \sqrt{8^2 + 6^2} = 10 \text{ m}$ Area = $\frac{1}{2} \times 8 \times 6 = 24 \text{ m}^2$	Scale 20D (0, 5, 10, 15, 20) <i>Low Partial Credit:</i> <ul style="list-style-type: none"> • Work of relevance in any part <i>Mid Partial Credit:</i> <ul style="list-style-type: none"> • One part correct <i>High Partial Credit:</i> <ul style="list-style-type: none"> • Two parts correct
(a) (iv) (a) (v)	$24 \times (2.5)^2 = 150 \text{ m}^2$ $150 - 24 = 126 \text{ m}^2$	Scale 15D (0, 4, 7, 11, 15) <i>Low Partial Credit:</i> <ul style="list-style-type: none"> • Use of area of <i>OAB</i> • Use of 2.5 <i>Mid Partial Credit:</i> <ul style="list-style-type: none"> • (Area <i>OXY</i> – Area <i>OAB</i>) formulated <i>High Partial Credit:</i> <ul style="list-style-type: none"> • One part correct
(b) (i)	8.5×10^{-3}	Scale 5B (0, 2, 5) <i>Partial Credit:</i> <ul style="list-style-type: none"> • Effort at scientific notation
(b) (ii)	No Reason: $0.0085 \times 500 = 4.25 \text{ cm}$ $4.25 > 4$	Scale 10D (0, 2, 5, 8, 10) <i>Low Partial Credit:</i> <ul style="list-style-type: none"> • Answer but no reason <i>Mid Partial Credit:</i> <ul style="list-style-type: none"> • $\times 500$ <i>High Partial Credit:</i> <ul style="list-style-type: none"> • 4.25 cm but no reason

Q10	Model Solutions 50 marks	Marking Notes														
(a)		<p>Scale 10B (0, 5, 10) <i>Partial Credit:</i></p> <ul style="list-style-type: none"> • Relevant drawing but incomplete or incorrect 														
(b)	<table border="1"> <thead> <tr> <th>Number of Tables</th> <th>Number of Chairs</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>6</td> </tr> <tr> <td>2</td> <td>10</td> </tr> <tr> <td>3</td> <td>14</td> </tr> <tr> <td>4</td> <td>18</td> </tr> <tr> <td>5</td> <td>22</td> </tr> <tr> <td>6</td> <td>26</td> </tr> </tbody> </table>	Number of Tables	Number of Chairs	1	6	2	10	3	14	4	18	5	22	6	26	<p>Scale 10C(0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Shows recognition of pattern • One correct entry into table <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • 3 correct new entries
Number of Tables	Number of Chairs															
1	6															
2	10															
3	14															
4	18															
5	22															
6	26															
(c)		<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • 1 correct plot from table <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • 4 correct plots 														
(d)	<p style="text-align: center;">42 chairs</p>	<p>Scale 10C (0, 3, 7, 10) <i>Low Partial Credit:</i></p> <ul style="list-style-type: none"> • Work of relevance in either part <p><i>High Partial Credit:</i></p> <ul style="list-style-type: none"> • One part correct 														
(e)	<p style="text-align: center;">13 tables</p>															

(f)	126 chairs	Scale 5B (0, 2, 5) <i>Partial credit:</i> <ul style="list-style-type: none"> • 30 • Indication of relevant addition
(g)	Number of chairs = 4 times number of tables + 2	Scale 5B (0, 2, 5) <i>Partial credit:</i> <ul style="list-style-type: none"> • $\times 4$ • $+ 2$

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. $198 \text{ marc} \times 5\% = 9.9 \Rightarrow$ bónas = 9 marc.

Má ghnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle $[300 - \text{bunmharc}] \times 15\%$, 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

