



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2016

Marking Scheme

Mathematics

Higher 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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Paper 1

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, 4, 5	0, 2, 3, 4, 5
10-mark scale		0, 4, 10	0, 3, 8, 10	0, 2, 4, 8, 10
15-mark scale			0, 5, 12, 15	0, 4, 9, 13, 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*. 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*.

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.

Summary of mark allocations and scales to be applied

Question 1 (30)

- (a)(i) 10B
- (a)(ii) 5C
- (b)(i)–(iii) 15C

Question 2 (20)

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

Question 3 (10)

10C

Question 4 (5)

5D

Question 5 (25)

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

Question 6 (20)

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

Question 7 (15)

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

Question 8 (30)

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

Question 9 (20)

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

Question 10 (15)

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

Question 11 (25)

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

Question 12 (25)

- (a)E1&E2 15D
- (a)E3 5D
- (b) 5A

Question 13 (15)

15D

Question 14 (45)

- (a) 15D
- (b) 15C
- (c)(i)&(ii) 15D

Model Solutions & Marking Notes

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.

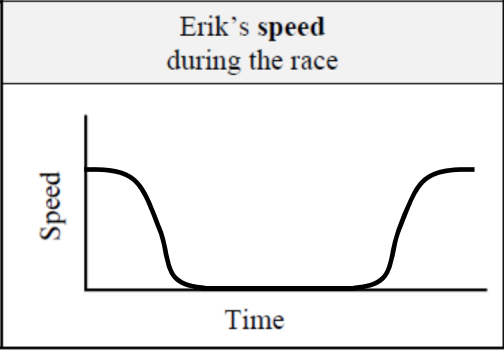
Q1	Model Solution – 30 Marks	Marking Notes
(a)(i)	$17 \times 1.06 = \text{€}18.02$ <p style="text-align: center;">OR</p> $6\% = \text{€}1.02$ $106\% = \text{€}17 + \text{€}1.02$ $= \text{€}18.02$	<p>Scale 10B (0, 4, 10)</p> <p>Accept correct answer without work.</p> <p>Accept answer without € sign.</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Shows understanding of percentages e.g. $0.06, \frac{3}{50}, 94\%$ Finds increase (i.e. 1.02) <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Subtracts $\text{€}1.02$ (i.e. finds decrease instead of increase)
(a)(ii)	$\frac{18.02 - 17}{18.02} \times 100$ $= \frac{1.02}{18.02} \times 100$ $= 5.66\dots$ $= 5.7\% [1 \text{ DP}]$ <p style="text-align: center;">OR</p> $100 - \left(\frac{17}{18.02} \times 100 \right)$ $= 5.7\% [1 \text{ DP}]$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>No Credit</i></p> <ul style="list-style-type: none"> Answer of 6% with no supporting work <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> One relevant operation, e.g. $17/18.02, 18.02 - 17$, etc. One relevant operation with $\text{€}17$ as the base price, e.g. $18.02/17$, etc. <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> $1.02/18.02$ $(17/18.02) \times 100$ Finds reduction as a percentage of $\text{€}17$ (i.e. answer of 6%) with supporting work
(b)	<p>(i) $(5 + 4) \times (2 + 3) = 45$</p> <p>(ii) $5 + 4 \times (2 + 3) = 25$</p> <p>(iii) $(5 + 4) \times 2 + 3 = 21$</p>	<p>Scale 15C (0, 5, 12, 15)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> One part correct Calculations that imply correct brackets in one part, e.g. $9 \times 5 = 45$ in (i) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Two parts correct

Q2	Model Solution – 20 Marks	Marking Notes
(a)	<p>(i) $\frac{0.20}{20} = \frac{1}{100}$</p> <p>(ii) $\frac{0.5}{200} = \frac{1}{400}$</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • One conversion correct e.g. €20 = 2000c • Makes fraction with relevant numbers e.g. 20/20 or 0.5/2 <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • One part correct • Both conversions correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answer as a percentage or a decimal
(b)(i)	<p>Brand A is cheaper.</p> <p>Brand A: $3.60/2 = \text{€}1.80$ per litre Brand B: $1.50/0.75 = \text{€}2.00$ per litre</p> <p style="text-align: center;">OR</p> <p>Brand A: $3.60/8 = \text{€}0.45$ per 250ml Brand B: $1.50/3 = \text{€}0.50$ per 250ml</p> <p style="text-align: center;">OR</p> <p>Brand A: $(3.60/8) \times 3 = \text{€}1.35$ per 750ml</p> <p style="text-align: center;">OR</p> <p>Brand B: $(1.50/3) \times 8 = \text{€}4$ per 2 litre</p> <p style="text-align: center;">OR</p> <p>Brand A: $2/3.60 = 0.55\dots$ litre per € Brand B: $0.75/1.50 = 0.5$ litre per €</p>	<p>Scale 10B (0, 4, 10)</p> <p>Accept cost per same amount for both brands, e.g. per 250 ml, per 2 litres, etc. This may require only 1 conversion (A or B).</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • One relevant calculation • Some correct conversion • Correct answer with no work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Working out fully correct, but no statement or incorrect statement

Q2	Model Solution – 20 Marks	Marking Notes
(b)(ii)	<p>Lowest price = €9.60</p> <p>$3 \times A = €10.80$</p> <p>$(2 \times A) + (2 \times B) = €10.20$</p> <p>$(1 \times A) + (4 \times B) = €9.60$</p> <p>$7 \times B = €10.50$</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept answer without € sign.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Price of one combination worked out (not necessarily ≥ 5 litres) • Uses price per litre from b(i) • States: 1 Brand A and 4 Brand B <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Price of two correct combinations worked out • Correct answer with no other work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • €9.60 given as answer, and the price of one other relevant combination found • Price of all four combinations worked out, lowest not identified

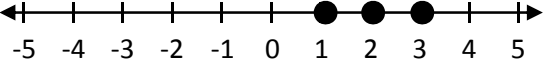
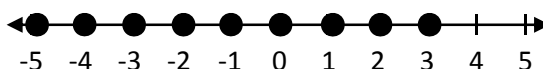
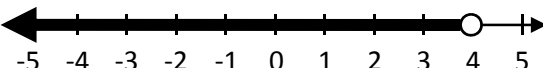
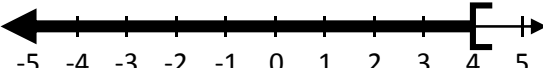
Q3	Model Solution – 10 Marks	Marking Notes
		<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer without work.</p> <p>Treat solution as requiring three steps:</p> <p>Step 1: Finds $\#(P \cap Q)$</p> <p>Step 2: Splits value in the ratio 2 : 1</p> <p>Step 3: Fill in the Venn diagram ($\#U$ must equal 25, and [6] must be correct)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Relevant work in any step • 1 step correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Any 2 steps correct (excluding case where $\#(P \setminus Q) = 2$ and $\#(Q \setminus P) = 1$)

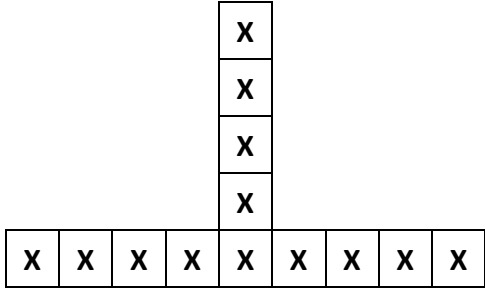
Q4	Model Solution – 5 Marks	Marking Notes
	<ol style="list-style-type: none"> 1. Always true 2. Sometimes true 3. Always true 4. Never true 5. Sometimes true 	<p>Scale 5D (0, 2, 3, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Relevant work on a Venn diagram • 1 correct <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • 2 correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 4 correct

Q5	Model Solution – 25 Marks	Marking Notes
(a)	<p>(i) $\frac{\text{Distance}}{\text{Time}} = \frac{300}{60} = 5 \text{ m/s}$</p> <p>(ii) $\frac{\text{Distance}}{\text{Time}} = \frac{100}{40} = \frac{5}{2}$ or 2.5 m/s</p>	<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer without units.</p> <p>In (i) accept $\frac{300}{60}$ or similar (i.e. unsimplified)</p> <p>In (ii) accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • A correct relevant formula • Correct distance or time for either (i) or (ii) • Relevant work on graph <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • (i) or (ii) correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • (i) correct and answer not fully simplified in (ii)
(b)	<p>1. Claire</p> <p>2. Bill</p> <p>3. Dee</p>	<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer without work.</p> <p><i>No Credit</i></p> <ul style="list-style-type: none"> • Same answer in all 3 boxes <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • 1 part correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 2 parts correct
(c)	<p style="text-align: center;">Erik's speed during the race</p> 	<p>Scale 5B (0, 2, 5)</p> <p>Accept correct answer without work.</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • 1 section of graph correct (speed decreasing or speed = 0 or speed increasing) • Graph touches the time axis when Erik has stopped • Indicates an understanding of speed on the given distance/time graph

Q6	Model Solution – 20 Marks	Marking Notes
(a)	<p style="text-align: center;">$3\cdot14, \pi, \frac{22}{7}, \sqrt{10}$</p> <p style="text-align: center;">OR</p> <p style="text-align: center;">$3\cdot14, 3\cdot141\dots, 3\cdot142\dots, 3\cdot16\dots$</p>	<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer without work. Accept correct answer in decimal form (as long as values are distinguishable).</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Any two consecutive numbers in the correct increasing order. A relevant approximation of any one of the numbers. <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Three numbers in increasing order with supporting work. Numbers not ordered, but π and $\frac{22}{7}$ to at least 3 decimal places and $\sqrt{10}$ to at least 2 decimal places. <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Numbers in decreasing order.
(b)	<p>$\sqrt{10}$: Irrational</p> <p>It cannot be written as a fraction using only integers or It goes on forever without repeating as a decimal or any other equivalent reason</p> <p>$3\cdot14$: Rational</p> <p>It can be written as a fraction using only integers [e.g. $\frac{314}{100}$] or It doesn't go on forever without repeating as a decimal or any other equivalent reason</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept "It can/cannot be written as a fraction" or "It does/doesn't go on forever as a decimal", as appropriate.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> 1 part (tick or reason) correct Defines a rational or irrational number Both correctly identified but no reason or incorrect reasons given <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> 1 tick and corresponding reason correct

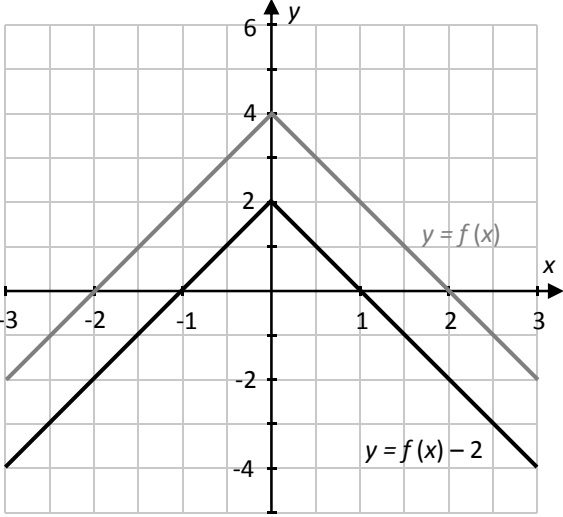
Q6	Model Solution – 20 Marks	Marking Notes
(c)	<p>Answer: 101</p> <p>Justification: $3 \cdot 14 \times 10^2 = 314$, so power = 2 \Rightarrow 2+1 = 3 digits or any other valid justification</p>	<p>Scale 5B (0, 2, 5)</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • Correct answer (i.e. 101) • Relevant example • Shows understanding of scientific notation

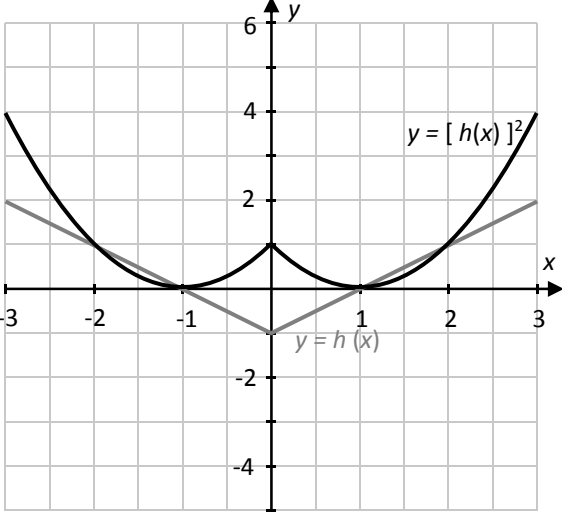
Q7	Model Solution – 15 Marks	Marking Notes
(a)	$\frac{2(2x+4)}{6} - \frac{3(5x-7)}{6} = 5$ $\Rightarrow \frac{4x+8-15x+21}{6} = 5$ $\Rightarrow \frac{-11x+29}{6} = 5$ $\Rightarrow -11x + 29 = 30$ $\Rightarrow -11x = 1$ $\Rightarrow x = -\frac{1}{11} \text{ or equivalent}$	<p>Scale 10D (0, 2, 4, 8, 10)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Any work of merit, e.g. 3(2), 6 (or any multiple of 6), 2(2x+4), 3(5x-7) <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • $\frac{2(2x+4)-3(5x-7)}{6} = 5$ • $\frac{2(2x+4)}{6} - \frac{3(5x-7)}{6} = 5$ • $\frac{6(2x+4)}{3} - \frac{6(5x-7)}{2} = 6(5)$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Correct linear equation without fractions and with brackets distributed. • $4x + 8 - 15x + 21 = 30$, or equivalent. • Correct answer without work.
(b)	<p>(i)</p>  <p>(ii)</p>  <p>(iii)</p>  <p style="text-align: center;">OR</p> 	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept 0 as an element in (i). Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • One graph correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two graphs correct <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • 4 included in one or more solutions, otherwise all parts fully correct

Q8	Model Solution – 30 Marks	Marking Notes																
(a)		<p>Scale 10B (0, 4, 10)</p> <p>Accept diagram with boxes, or X s, or both.</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • Similar shape to previous stages, as long as the sequence is increasing 																
(b)	<p>$N = 4 + 3 S$</p> <p style="text-align: center;">OR</p> <table border="1" data-bbox="435 725 778 1128"> <thead> <tr> <th>Stage(S)</th> <th>Number(N)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>$4 + 0(3)$</td> </tr> <tr> <td>1</td> <td>$4 + 1(3)$</td> </tr> <tr> <td>2</td> <td>$4 + 2(3)$</td> </tr> <tr> <td>3</td> <td>$4 + 3(3)$</td> </tr> <tr> <td>.</td> <td>.</td> </tr> <tr> <td>.</td> <td>.</td> </tr> <tr> <td>S</td> <td>$4 + 3(S)$</td> </tr> </tbody> </table> <p>$N = 4 + 3 S$</p>	Stage(S)	Number(N)	0	$4 + 0(3)$	1	$4 + 1(3)$	2	$4 + 2(3)$	3	$4 + 3(3)$	S	$4 + 3(S)$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Number of Xs written down for any stage from 0 to 3 or beyond. • Identifies common difference • Identifies the first term • Any linear graph or formula, or mentions 'linear' • Relevant formula, e.g. $T_n = a + (n - 1)d$, or $y = mx + c$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Starts with $T_1 = 4$, finishes correctly (i.e. $N = 1 + 3 S$, or equivalent) • $y = 1 + 3x$ • Formula in the correct form with either the constant term or the coefficient of S correct i.e. $N = 4 + pS$ or $N = q + 3S$ <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Swaps N and S (i.e. $S = 4 + 3 N$) • Uses different variables, without defining them e.g. $y = 4 + 3x$ • $4 + 3S$
Stage(S)	Number(N)																	
0	$4 + 0(3)$																	
1	$4 + 1(3)$																	
2	$4 + 2(3)$																	
3	$4 + 3(3)$																	
.	.																	
.	.																	
S	$4 + 3(S)$																	

Q8	Model Solution – 30 Marks	Marking Notes
(c)	$4 + 3k = 130$ $3k = 126$ $k = 42$	<p>Scale 10B (0, 4, 10)</p> <p>Accept correct answer without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • Some attempt at trial and error • Extends sequence towards 130 • Substitutes values into formula • Sets answer from (b) equal to 130
(d)	<p>(i) <i>Any configuration where the number of Xs is 1, 3, and 5, respectively.</i></p> <p>(ii) $p + 6$</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Any 3 terms of a linear sequence with common difference of 2 • Any one stage correct in (i) • Indicates that the first difference is 2 • Work of merit in (ii) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • (i) or (ii) correct (patterns must be drawn in (i) for it to be taken as correct)

Q9	Model Solution – 20 Marks	Marking Notes
(a)	(i) 3^2 (ii) 3^0 (iii) $3^{3/2}$ (iv) $3^{-1/3}$	Scale 10D (0, 2, 4, 8, 10) Accept correct answer without work. <i>Low Partial Credit</i> <ul style="list-style-type: none"> Any work of merit e.g. $3\sqrt{3}$, $3^{\frac{1}{3}}$, 3×3, $3^{\frac{2}{3}}$ 1 part correct <i>Mid Partial Credit</i> <ul style="list-style-type: none"> 2 parts correct <i>High Partial Credit</i> <ul style="list-style-type: none"> 3 parts correct
(b)	$16n^4$	Scale 5B (0, 2, 5) Accept correct answer without work <i>Partial Credit</i> <ul style="list-style-type: none"> Any work of merit e.g. n^4, ± 16, $(-2n)(-2n)$ or -2^4
(c)	$x = -1$ and $\sqrt{x^2} = 1$ <i>or any other negative value of x, with the corresponding value of $\sqrt{x^2} = x$.</i>	Scale 5B (0, 2, 5) Accept a description in place of an example, e.g. "if x is a negative number, then $\sqrt{x^2}$ is the positive of that" <i>Partial Credit</i> <ul style="list-style-type: none"> $x =$ any negative value and no work or incorrect work on $\sqrt{x^2}$ $x =$ any non-negative value and $\sqrt{x^2} =$ the same non-negative value

Q10	Model Solution – 15 Marks	Marking Notes																								
(a)	<p>(i)</p> <table border="1" data-bbox="359 228 874 398"> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>$f(x)$</td> <td>-2</td> <td>0</td> <td>2</td> <td>4</td> <td>2</td> <td>0</td> <td>-2</td> </tr> <tr> <td>$f(x) - 2$</td> <td>-4</td> <td>-2</td> <td>0</td> <td>2</td> <td>0</td> <td>-2</td> <td>-4</td> </tr> </table> <p>(ii)</p> 	x	-3	-2	-1	0	1	2	3	$f(x)$	-2	0	2	4	2	0	-2	$f(x) - 2$	-4	-2	0	2	0	-2	-4	<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer (i.e. table and graph fully correct) without work.</p> <p>Treat solution as requiring three steps:</p> <p>Step 1. Completing $f(x)$ row</p> <p>Step 2. Completing $f(x) - 2$ row</p> <p>Step 3. Plotting the graph of $f(x) - 2$</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • 4 values of $f(x)$ filled in correctly • 1 correct value for $f(x) - 2$ • Graph in correct shape without work • One step correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two steps correct • Correct graph (as per solution) without work <p><i>Full Credit -1</i></p> <ul style="list-style-type: none"> • All correct except one value from table or graph • Table and graph fully correct for $f(x) + k$, where $k \neq -2$
x	-3	-2	-1	0	1	2	3																			
$f(x)$	-2	0	2	4	2	0	-2																			
$f(x) - 2$	-4	-2	0	2	0	-2	-4																			

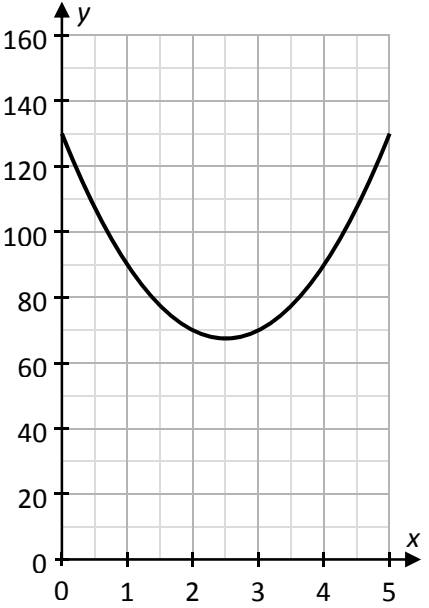
Q10	Model Solution – 15 Marks	Marking Notes																
(b)	<p>(i)</p> <table border="1" data-bbox="359 228 874 344"> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>$h(x)$</td> <td>2</td> <td>1</td> <td>0</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> </table> <p>(ii)</p> 	x	-3	-2	-1	0	1	2	3	$h(x)$	2	1	0	-1	0	1	2	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer (i.e. table and graph fully correct) without work.</p> <p>No credit for graph from work of no merit</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • 4 values of $h(x)$ filled in correctly • 1 correct value for $[h(x)]^2$ calculated <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 4 values of $[h(x)]^2$ calculated, for the given x values • 4 points correctly plotted and joined, as per solution • All 7 points correctly plotted as per solution, but not joined or joined incorrectly <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • All correct except one value from table or graph
x	-3	-2	-1	0	1	2	3											
$h(x)$	2	1	0	-1	0	1	2											

Q11	Model Solution – 25 Marks	Marking Notes						
(a)(i)	$(x + 5)(x + 5)$ $= x^2 + 5x + 5x + 25$ $= x^2 + 10x + 25$ <p style="text-align: center;">OR</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">x</td> <td style="border: 1px solid black; padding: 5px;">x^2</td> <td style="border: 1px solid black; padding: 5px;">$5x$</td> </tr> <tr> <td style="padding: 0 10px;">$+5$</td> <td style="border: 1px solid black; padding: 5px;">$5x$</td> <td style="border: 1px solid black; padding: 5px;">25</td> </tr> </table> $x^2 + 10x + 25$	x	x^2	$5x$	$+5$	$5x$	25	<p>Scale 5B (0, 2, 5)</p> <p>Accept correct answer without work.</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Any correct relevant multiplication $x(x + 5) + 5(x + 5)$ or grid set up properly Shows understanding of distribution <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> $x^2 + 5x + 5x + 25$ or grid filled in correctly
x	x^2	$5x$						
$+5$	$5x$	25						
(a)(ii)	$x^2 + 10x + 25 - (x^2 - 10x + 25)$ $= x^2 + 10x + 25 - x^2 + 10x - 25$ $= 20x$ $= 4(5x)$ <p style="text-align: center;">OR</p> $(x + 5 + x - 5)(x + 5 - (x - 5))$ $= (2x)(10)$ $= 20x, \text{ which is divisible by 4.}$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Oversimplification because of incorrect work in (a)(i) merits <i>Low Partial Credit</i> at most</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Any correct relevant multiplication Substitutes some value for x and shows the result is divisible by 4 Indicates or shows understanding of difference of 2 squares $2x$ or 10 calculated correctly <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> All terms correctly multiplied, including signs $(2x)(10)$ <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Failure to make final statement Getting to the line $20x$. 						
(b)(i)	$(5x)^2 - (7n)^2$ $= (5x + 7n)(5x - 7n)$ <p style="text-align: center;">OR</p> $(-5x - 7n)(7n - 5x)$	<p>Scale 10C (0, 3, 8, 10)</p> <p>Accept correct answer without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Indicates or shows understanding of difference of 2 squares $5x$ or $7n$ appears 5 and 7 appear <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Correct, other than sign errors $(5x)^2 - (7n)^2$ $5x + 7n$ or $5x - 7n$ 						

Q11	Model Solution – 25 Marks	Marking Notes									
(b)(ii)	$(2x + 3)(x - 6)$ <p style="text-align: center;">OR</p> <p>Guide Number = $2 \times (-18) = -36$</p> $2x^2 - 12x + 3x - 18$ $= 2x(x - 6) + 3(x - 6)$ $= (2x + 3)(x - 6)$ <p style="text-align: center;">OR</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">$2x$</td> <td style="text-align: center;">$+3$</td> </tr> <tr> <td style="text-align: center;">x</td> <td style="border: 1px solid black; padding: 5px;">$2x^2$</td> <td style="border: 1px solid black; padding: 5px;">$3x$</td> </tr> <tr> <td style="text-align: center;">-6</td> <td style="border: 1px solid black; padding: 5px;">$-12x$</td> <td style="border: 1px solid black; padding: 5px;">-18</td> </tr> </table> $(2x + 3)(x - 6)$		$2x$	$+3$	x	$2x^2$	$3x$	-6	$-12x$	-18	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work.</p> <p><i>No Credit</i></p> <ul style="list-style-type: none"> • () () <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Some work of merit, e.g. factorises $2x^2$ or 18 or finds / factorises 36 • Any correct substitution into the quadratic formula <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $2x(x - 6) + 3(x - 6)$ • $x(2x + 3) - 6(2x + 3)$ • Answer given multiplies out to give two correct terms (including signs) • Solves correctly $2x^2 - 9x - 18 = 0$ (i.e. $x = 6$ and $x = -\frac{3}{2}$)
	$2x$	$+3$									
x	$2x^2$	$3x$									
-6	$-12x$	-18									

Q12	Model Solution – 25 Marks	Marking Notes
(a) E1&E2	E1: $y + 5 = 19$ $y = 14$ E2: $2y^2 + 1 = 19$ $2y^2 = 18$ $y^2 = 9$ $y = 3$ [as $y > 0$]	Scale 15D (0, 4, 9, 13, 15) Accept correct answers without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> Sets up one equation <i>Mid Partial Credit</i> <ul style="list-style-type: none"> Sets up two equations Solves E1 <i>High Partial Credit</i> <ul style="list-style-type: none"> Solves E2 Solves E1 and work of merit in solving E2 (must make at least one correct transposition)
(a) E3	E3: $2y^2 + 1 = y + 5$ $2y^2 - y - 4 = 0$ $y = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-4)}}{2(2)}$ $= \frac{1 \pm \sqrt{33}}{4}$ $= 1.686\dots$ [as $y > 0$] $= 1.69$ [2 DP]	Scale 5D (0, 2, 3, 4, 5) Accept “1.69” verified in both relevant expressions or subbed into E3 Consider solution as requiring 4 steps: Step 1. Sets up the equation with LHS = 0 Step 2. Writes down the quadratic formula or identifies $a, b,$ and c Step 3. Correct substitution into the quadratic formula Step 4. Evaluates to 2 decimal places <i>Low Partial Credit</i> <ul style="list-style-type: none"> 1 step correct <i>Mid Partial Credit</i> <ul style="list-style-type: none"> 2 steps correct <i>High Partial Credit</i> <ul style="list-style-type: none"> 3 steps correct (assume steps 1 and 2 are done if step 3 is correct) <i>Full Credit –1</i> <ul style="list-style-type: none"> Answer left in surd form, i.e. $\frac{1 \pm \sqrt{33}}{4}$, or rounded incorrectly
(b)	If 1st bag = 19 kg, then $y = 14$ so 3rd bag $\neq 19$ kg or any other valid explanation	Scale 5A(0, 5) Accept: “All three y values are different”, “If two weights are the same, the other must be different”, etc.

Q13	Model Solution – 15 Marks	Marking Notes
	$\text{Area } ABC = 12a^2$ $\Rightarrow \frac{1}{2}(6a) \cdot AC = 12a^2$ $\Rightarrow AC = 4a$ Area of square $= BC ^2$ $= AB ^2 + AC ^2 \quad [\text{Pyth Thm}]$ $= (6a)^2 + (4a)^2$ $= 36a^2 + 16a^2$ $= 52a^2$	<p>Scale 15D (0, 4, 9, 13, 15)</p> <p>Accept correct answer without work. Treat solution as requiring four steps:</p> <p>Step 1. Formula for the area of a triangle Step 2. Finding AC Step 3. Substitution into Pythagoras' Thm Step 4. Finish to find the area of BDEC</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • 1 step correct • Relevant formula: Pythagoras Theorem, area of a square, area of a rectangle <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • 2 steps correct (if Step 2 is done then assume Step 1 is also done) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 3 steps correct (if Step 3 is done then assume Step 1 & Step 2 are also done)

Q14	Model Solution – 45 Marks	Marking Notes
(a)		<p>Scale 15D (0, 4, 9, 13, 15)</p> <p>Accept correct graph without work.</p> <p>Award a linear graph at most <i>Low Partial Credit</i>.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Some work of merit, e.g. some correct substitution for x in $h(x)$. <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> $h(x)$ evaluated correctly for any three values of $x \in \{0,1,2,3,4,5\}$ (Accept points shown on the graph) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> 6 points on the graph of $h(x)$ plotted correctly. 5 points on the graph of $h(x)$ plotted and joined correctly <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Curve with a flat bottom, otherwise correct
(b)	<p>(i) 130 cm</p> <p>(ii) 67.5 cm</p> <p>(iii) 2.5 hours</p>	<p>Scale 15C (0, 5, 12, 15)</p> <p>Accept correct answers without work.</p> <p>Accept answers taken from either the graph or the function</p> <p>In (ii), tolerance of ± 3 units on y-axis, but not in next box up or down.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> 1 part correct Relevant line on graph (either a vertical line from the lowest point or a horizontal line from the lowest point) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> 2 parts correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Unit(s) incorrect or omitted, otherwise fully correct

Q14	Model Solution – 45 Marks	Marking Notes
(c) (i)&(ii)	<p>Method 1</p> <p><i>Part (i)</i> (0, 180): $a(0)^2 + b(0) + c = 180 \quad [E1]$ $\Rightarrow c = 180$</p> <p><i>Part (ii)</i> (3, 0): $a(3)^2 + b(3) + 180 = 0 \quad [E2]$ $\Rightarrow 9a + 3b = -180$ $\Rightarrow 3a + b = -60$</p> <p>(6, 180): $a(6)^2 + b(6) + 180 = 180 \quad [E3]$ $\Rightarrow 36a + 6b = 0$ $\Rightarrow 6a + b = 0$</p> <p>E3 – E2: $\Rightarrow 3a = 60$ $\Rightarrow a = 20$</p> <p>E2: $b = -60 - 3(20)$ $\Rightarrow b = -120$</p> <p style="text-align: center;">OR</p> <p>Method 2</p> <p>Quadratic has 2 roots at $x = 3$ $\Rightarrow g(x) = a(x - 3)^2$ $= a(x^2 - 6x + 9)$ $= ax^2 - 6ax + 9a$</p> <p>(0, 180): $a(0)^2 - 6a(0) + 9a = 180$ $\Rightarrow a = 20$ $\Rightarrow g(x) = 20x^2 - 120x + 180$</p> <p>i.e. $a = 20, b = -120, c = 180$</p> <p style="text-align: center;">OR</p>	<p>15D (0, 4, 9, 13, 15)</p> <p>Accept correct answers without work.</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Work of merit, e.g. identifies (0,180), (3,0), or (6,180); relevant substitution in $g(x)$; relates c to y-intercept; attempt at relevant shifting of graph; <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Finds $c = 180$ • Finds E1 and E2 and E3 • Finds $a = 20$ • $(x - 3)^2$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Finds c and E2 and E3 • $20(x - 3)^2$ • Finds a or b, having found c

Q14	Model Solution – 45 Marks	Marking Notes
(c) (i)&(ii) cntd	<p>Method 3</p> <p>The shifted quadratic graph through (0,0) and (3,180) is of the form $y = ax^2$</p> $\Rightarrow a(3)^2 = 180$ $\Rightarrow a = 20$ <p>Shift quadratic 3 units back to the right:</p> $\Rightarrow g(x) = 20(x - 3)^2$ $= 20(x^2 - 6x + 9)$ $= 20x^2 - 120x + 180$ <p>i.e. $a = 20, b = -120, c = 180$</p>	See previous page.

Paper 2

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	B	C	D
No of categories	3	4	5
5-mark scale	0, 3, 5	0, 2, 4, 5	
10-mark scale		0, 5, 7, 10	0, 4, 6, 8, 10
15-mark scale		0, 6, 10, 15	0, 6, 9, 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*. 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*.

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.

Summary of mark allocations and scales to be applied

Question 1 (15)

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

Question 2 (40)

- (a) 15C
- (b) 5B
- (c) 5B
- (d) 10D
- (e) 5C

Question 3 (50)

- (a) 5C
- (b) 5B
- (c) 10C
- (d) 10C
- (e) 5C
- (f) 15C

Question 4 (45)

- (a) 10C
- (b) 15D
- (c) 5B
- (d) 10C
- (e) 5B

Question 5 (15)

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

Question 6 (10)

10D

Question 7 (15)

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

Question 8 (25)

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

Question 9 (20)

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

Question 10 (15)

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

Question 11 (15)

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

Question 12 (35)

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

Model Solutions & Marking Notes

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 Solution – 15 Marks	Marking Notes
(a)	$x = 6$ $y = 2 + 9 = 11$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answers without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • One correct value • Indication that the median is the middle number (when ranked) • Indication that the range is the difference between the highest and lowest numbers
(b)	$b = 16$ <p>Sum: $64 + a + c = 6 \times 18 = 108$</p> $\Rightarrow a + c = 44$ <p>And $c - a = 30$</p> $\Rightarrow 2c = 74$ $\Rightarrow c = 37$ $\Rightarrow a = 7$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication of understanding of the median in this context • Indication of the sum of the numbers • Indication that the range is the difference between the highest and lowest numbers • Values of c and a with $c - a = 30$ <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • One correct value <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two correct values • b correct and work towards a and c

Q2	Model Solution – 40 Marks	Marking Notes															
(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 20px; height: 20px;">2</td> <td style="width: 20px; height: 20px;">3</td> <td style="width: 20px; height: 20px; background-color: #cccccc;"></td> <td style="width: 20px; height: 20px;">5</td> <td style="width: 20px; height: 20px;">6</td> </tr> <tr> <td style="width: 20px; height: 20px;">3</td> <td style="width: 20px; height: 20px;">4</td> <td style="width: 20px; height: 20px;">5</td> <td style="width: 20px; height: 20px;">6</td> <td style="width: 20px; height: 20px;">7</td> </tr> <tr> <td style="width: 20px; height: 20px;">4</td> <td style="width: 20px; height: 20px; background-color: #cccccc;"></td> <td style="width: 20px; height: 20px;">6</td> <td style="width: 20px; height: 20px;">7</td> <td style="width: 20px; height: 20px;">8</td> </tr> </table>	2	3		5	6	3	4	5	6	7	4		6	7	8	<p>Scale 15C (0, 6, 10, 15)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Three correct values <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Nine correct values <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Twelve correct values and one incorrect value in the table
2	3		5	6													
3	4	5	6	7													
4		6	7	8													
(b)	$\frac{1}{15}$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • Fraction with 15 as denominator • Indication of 3 on A and 5 on B 															
(c)	$\frac{3}{15} \times 320 = 64$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work</p> <p>Accept an interval centred on 64</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • Fraction with 15 as denominator • $\frac{3}{15}$ or equivalent • Indication of multiplication by 320 • Indication of 1,1 and 2,2 and 3,3, or of 3 															
(d)	$320 - 74 = 246$ $246 - 110 = 136$ $136 \div 8 = 17$ <p style="text-align: center;">OR</p> <p>Let x = number who got €8 back.</p> <p>€ in: 320</p> <p>€ out: $74 + 8x$</p> <p>Profit: $320 - (74 + 8x) = 110$</p> $8x = 136$ $x = 17$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • One relevant operation e.g. $320 - 74$ or $74 + 110$ or $320 - 110$ <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Two relevant operations e.g. $246 - 110$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 136 • $\frac{210-74}{8}$ or equivalent 															

Q2	Model Solution – 40 Marks	Marking Notes																												
(e)	<p>Answer: Paul is not correct.</p> <table border="1" data-bbox="359 286 794 519"> <tr> <td></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> </tr> </table> <p>P(getting money back) before change: $\frac{4}{15} = \frac{24}{90}$ or 0.2666...</p> <p>P(getting money back) after change: $\frac{5}{18} = \frac{25}{90}$ or 0.2777... > $\frac{4}{15}$</p>		1	2	3	4	5	6	1	2	3	4	5	6	7	2	3	4	5	6	7	8	3	4	5	6	7	8	9	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept the two-way table with (1, 1), (1, 2), etc. filled in</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct answer with no justification • New table with at least 10 correct entries • $\frac{4}{15}$ • $\frac{5}{18}$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Any two of the <i>Low Partial</i> bullet points <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Correct for €1 or €8 (i.e. misreading) • Table correct and comparable probabilities correct, no conclusion or incorrect conclusion
	1	2	3	4	5	6																								
1	2	3	4	5	6	7																								
2	3	4	5	6	7	8																								
3	4	5	6	7	8	9																								

Q3	Model Solution – 50 Marks	Marking Notes																		
(a)	Median: 26% Upper Quartile: 36.5%	Scale 5C (0, 2, 4, 5) Accept correct answer without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Indication of understanding of the median or upper quartile <i>High Partial Credit</i> <ul style="list-style-type: none"> • One correct value <i>Full Credit – 1</i> <ul style="list-style-type: none"> • Value(s) for 2005 (20.5%, 33.5%) 																		
(b)	In one quarter of the countries, less than 19.5% of the members of parliament were female in 2015, <i>or equivalent</i> .	Scale 5B (0, 3, 5) <i>Partial Credit</i> <ul style="list-style-type: none"> • Indication of one quarter or three quarters 																		
(c)	<table border="1" data-bbox="328 831 815 1043"> <thead> <tr> <th></th> <th>0–9</th> <th>10–19</th> <th>20–29</th> <th>30–39</th> <th>40–49</th> </tr> </thead> <tbody> <tr> <th>2005</th> <td>2</td> <td>10</td> <td>8</td> <td>7</td> <td>1</td> </tr> <tr> <th>2015</th> <td>0</td> <td>7</td> <td>10</td> <td>8</td> <td>3</td> </tr> </tbody> </table>		0–9	10–19	20–29	30–39	40–49	2005	2	10	8	7	1	2015	0	7	10	8	3	Scale 10C (0, 5, 7, 10) <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Four correct values <i>High Partial Credit</i> <ul style="list-style-type: none"> • Eight correct values <i>Full Credit – 1</i> <ul style="list-style-type: none"> • Tallies or relative frequencies in percentage, fraction, or decimal form
	0–9	10–19	20–29	30–39	40–49															
2005	2	10	8	7	1															
2015	0	7	10	8	3															

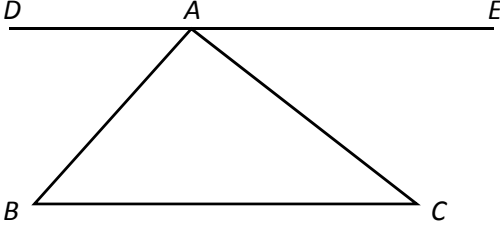
Q3	Model Solution – 50 Marks	Marking Notes
(d)	$\frac{2(4\cdot5)+10(14\cdot5)+8(24\cdot5)+7(34\cdot5)+1(44\cdot5)}{28}$ $= \frac{636}{28}$ $= 22\cdot71\dots$ $= 22\cdot7\% \text{ [1 DP]}$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication of division by 28 • One correct mid-interval value • Numerator with consistent incorrect mid-interval values <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Consistent incorrect mid-interval values and finished correctly • $2(4\cdot5)+10(14\cdot5)+8(24\cdot5)+7(34\cdot5)+1(44\cdot5)$ • 636
(e)	<p>(i) The mid-interval values assumes every value in a given interval is the same, e.g. everyone in 10–19 is 14·5. The actual values in this interval are not all 14·5.</p> <p>(ii) $\frac{27-26\cdot86}{26\cdot86} \times 100$</p> $= \frac{0\cdot14}{26\cdot86} \times 100$ $= 0\cdot521\dots$ $= 0\cdot52\% \text{ [2 DP]}$	<p>Scale 5C (0, 2, 4, 5)</p> <p>In (ii), correct answer without work is counted as work of merit (not correct)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Work of merit in (ii), e.g. $27 - 26\cdot86$, or correct denominator, or multiplication by 100, or correct answer with no supporting work • Correct explanation in (i) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $\frac{0\cdot14}{26\cdot86}$ or $100\cdot52$ • Correct explanation in (i) and work of merit in (ii)

Q4	Model Solution – 45 Marks	Marking Notes
(a)	A: (–1, 3) B: (5, 3) C: (–1, 8)	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • One point correct • All three points with co-ordinates reversed, but otherwise correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two points correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answers in incorrect boxes, otherwise correct
(b)	AB: $y = 3$ AC: $x = -1$ BC: $m = -\frac{5}{6}$ Eqn: $y - 3 = -\frac{5}{6}(x - 5)$ or $5x + 6y - 43 = 0$	<p>Scale 15D (0, 6, 9, 12, 15)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula for slope or equation of a line • Equation of AB or AC correct <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Equation of AB and AC correct • Equation of BC correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Equation of AB and AC correct and slope for BC correct • Equation of BC correct and AB or AC correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answers in incorrect boxes, otherwise correct • $y = -\frac{5}{6}x + c$, where $c \neq 7\frac{1}{6}$ is between 7.1 and 7.2 (inclusive), with no supporting work

Q4	Model Solution – 45 Marks	Marking Notes
(c)	$\tan (\angle ABC) = \frac{\text{opposite}}{\text{adjacent}}$ $= \frac{5}{6}$ $\Rightarrow \angle ABC = \tan^{-1}\left(\frac{5}{6}\right)$ $= 39.81^\circ \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $ BC = \sqrt{5^2 + 6^2}$ $= \sqrt{61}$ $\Rightarrow \angle ABC = \sin^{-1}\left(\frac{5}{\sqrt{61}}\right)$ $= \cos^{-1}\left(\frac{6}{\sqrt{61}}\right)$ $= 39.81^\circ \text{ [2 DP]}$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer in degrees without degree symbol</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Any correct trigonometric ratio $\tan (\angle ABC) = \frac{5}{6}$ or similar $\angle ABC = \tan^{-1}\left(\frac{5}{6}\right)$ or similar Correct answer without work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Calculator in incorrect mode, otherwise correct $\angle ACB$ correctly found: 50.19°
(d)	<p>(i) $BC = \sqrt{5^2 + 6^2}$ $= \sqrt{61}$</p> <p>(ii) Diameter $= \sqrt{61}$</p> $\Rightarrow \text{Radius} = \frac{\sqrt{61}}{2}$ $\Rightarrow \text{Area} = \pi \left(\frac{\sqrt{61}}{2}\right)^2$ $= \frac{61\pi}{4}$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Some correct use of a relevant formula – Pythagoras’ Theorem, distance formula, area formula, mid-point formula Error in (i) but answer divided by 2 <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Radius $= \frac{\sqrt{61}}{2}$ Error in (i) but (ii) correct (i) correct, and answer of 61π or 30.5π or equivalent in (ii) <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> (i) correct, and answer of $\pi \left(\frac{\sqrt{61}}{2}\right)^2$ in (ii) Answer in (ii) not in terms of π, otherwise correct BC not in surd form in (i), finished correctly

Q4	Model Solution – 45 Marks	Marking Notes
(e)	$m = \frac{6}{5}$ $\text{Eqn: } y - 3 = \frac{6}{5}(x - (-1))$ <p>or</p> $6x - 5y + 21 = 0$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Reference to relevant property of perpendicular lines – e.g. invert and change the sign, or the product of the slopes is -1 Indication that “perpendicular” means that the lines make an angle of 90° (including on diagram) Correct formula for equation of a line with some relevant substitution $m = \frac{6}{5}$

Q5	Model Solution – 15 Marks	Marking Notes
(a)	<p>No</p> $5(3) + 3(-5) + 6 = 6 \text{ (not 0)}$ <p><i>or any other valid justification involving calculation</i></p>	<p>Scale 5B (0, 3, 5)</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Correct answer with no justification Some correct substitution into line equation <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Correct substitution with no or incorrect conclusion (i.e. doesn't write “no” or equivalent)
(b)	<p>Sub E2 into E1:</p> $3x + 2(-2x + 5) = 7$ $\Rightarrow 3x - 4x + 10 = 7$ $\Rightarrow x = 3$ $\Rightarrow y = -2(3) + 5$ $\Rightarrow y = -1$ <p>Answer: (3, -1)</p> <p style="text-align: center;">OR</p> <p>E1: $3x + 2y = 7$</p> <p>-2E2: $-4x - 2y = -10$</p> $\Rightarrow x = 3$ $\Rightarrow y = -2(3) + 5$ $\Rightarrow y = -1$ <p>Answer: (3, -1)</p>	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct graphical solution</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Some work of merit in solving the simultaneous equations E2 or E1 rearranged Attempt at graphical solution $-2x + 5$ substituted into E1 Attempt at trial and improvement <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> One value correct with supporting work Fully complete with one error x and y correct without supporting work <p><i>Full Credit</i></p> <ul style="list-style-type: none"> x and y correct and fully justified (i.e. subbed into both equations)

Q6	Model Solution – 10 Marks	Marking Notes
	<p>Step 1: <i>Diagram:</i></p>  <p><i>Given:</i> Triangle ABC.</p> <p><i>To Prove:</i> $\angle ABC + \angle BAC + \angle ACB = 180^\circ$</p> <p><i>Construction:</i> Draw line DE through A parallel to BC</p>	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Diagram <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Two steps correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Three steps correct with no reason given
	<p>Step 2: <i>Proof:</i></p> <p>$\angle ABC = \angle DAB$ Alternate angles</p> <p>$\angle ACB = \angle EAC$ Alternate angles</p>	
	<p>Step 3:</p> <p>$\angle DAE = 180^\circ$ Straight angle</p> <p>$\Rightarrow \angle DAB + \angle BAC + \angle EAC = 180^\circ$ Protractor axiom</p>	
	<p>Step 4:</p> <p>$\Rightarrow \angle ABC + \angle BAC + \angle ACB = 180^\circ$</p>	

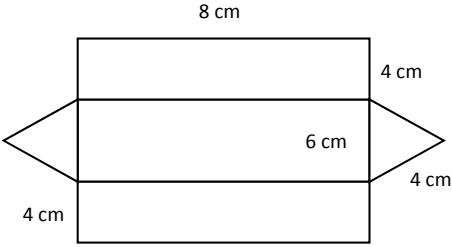
Q7	Model Solution – 15 Marks	Marking Notes
(a)	$x = 180 - 100 = 80$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work <i>Partial Credit</i></p> <ul style="list-style-type: none"> • Indication that the opposite angles in a cyclic quadrilateral add to 180°
(b)	$y = 180 - \left(\frac{100}{2}\right) - \left(\frac{80}{2}\right)$ $\Rightarrow y = 90$ <p style="text-align: center;">OR</p> $y = 180 - \left(\frac{180-100}{2}\right) - \left(\frac{180-80}{2}\right)$ $\Rightarrow y = 90$ <p style="text-align: center;">OR</p> <p>Draw the diagonal AC Consider $\triangle ACD$ and $\triangle ACB$ $AD = AB$ [given] $CD = CB$ [given] $AC = AC$ [common side] $\Rightarrow \triangle ACD$ is congruent to $\triangle ACB$ [S.S.S.] $\Rightarrow \angle ADC = \angle ABC$ [corresponding angles] But $\angle ADC + \angle ABC = 180^\circ$ [opposite angles in cyclic quadrilateral] $\Rightarrow y + y = 180^\circ$ $\Rightarrow y = 90^\circ$</p>	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept: “$y + y = 180 \Rightarrow y = 90$” or similar for <i>Full Credit</i></p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication in (b) that the opposite angles in a cyclic quadrilateral add to 180° • Indication that the sum of the angles in a quadrilateral is 360° • Indication that in an isosceles triangle the angles opposite the equal sides are equal • A diagonal drawn • Indication of congruent triangles <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $y + y = 180$ or similar • $y = 90$ with no working out

Q8	Model Solution – 25 Marks	Marking Notes
(a)	(i) 2.72° [2 DP] OR $2 + \frac{43}{60} + \frac{5}{60^2} = 2.72^\circ$ [2 DP] (ii) $3^\circ 8' 24''$ OR $0.14 \times 60 = 8.4'$ $0.4 \times 60 = 24''$ $3.14^\circ = 3^\circ 8' 24''$	Scale 5C (0, 2, 4, 5) Accept correct answers without work Accept correct answer in (a)(i) without degree symbol <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Indication of the relationship between degrees/minutes/seconds <i>High Partial Credit</i> <ul style="list-style-type: none"> • One part correct <i>Full Credit –1</i> <ul style="list-style-type: none"> • Rounding error in (i), otherwise correct
(b)	$\cos A = \sin A$ $\Rightarrow \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\text{opposite}}{\text{hypotenuse}}$ $\Rightarrow \text{adjacent} = \text{opposite}$	Scale 10C (0, 5, 7, 10) <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Any correct trigonometric ratio • Indication of the properties of an isosceles triangle <i>High Partial Credit</i> <ul style="list-style-type: none"> • $A = 45^\circ$ • $\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\text{opposite}}{\text{hypotenuse}}$, with no conclusion
(c)	$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$ $= \frac{7}{25}$ $\Rightarrow A = \sin^{-1}\left(\frac{7}{25}\right)$ $= 16.3^\circ$ [1 DP] OR $A = \cos^{-1}\left(\frac{24}{25}\right)$ $= 16.3^\circ$ [1 DP] OR $A = \tan^{-1}\left(\frac{7}{24}\right)$ $= 16.3^\circ$ [1 DP]	Scale 10C (0, 5, 7, 10) Accept correct answer without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Correct diagram drawn • Indication that the smallest angle is opposite the smallest side • Any correct trigonometric ratio <i>High Partial Credit</i> <ul style="list-style-type: none"> • $\sin A = \frac{7}{25}$ or similar • $A = \sin^{-1}\left(\frac{7}{25}\right)$ or similar • Other angle found: 73.7° <i>Full Credit –1</i> <ul style="list-style-type: none"> • Correct answer without units

Q9	Model Solution – 20 Marks	Marking Notes
(a)	T.S.A. = $(6 \times 1^2) + (6 \times 2^2) - (2 \times 1^2)$ = 28 [square units] OR T.S.A. = $(6 \times 2^2) + (4 \times 1^2)$ = 28 [square units]	Scale 5C (0, 2, 4, 5) Accept correct answer without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Correct formula: $A = l \times w$ • Correct formula : S.A. = $6 \times l^2$ or similar • (6×1^2) or (6×2^2) or (4×1^2) • 23 or 5 <i>High Partial Credit</i> <ul style="list-style-type: none"> • 30 or 29 [square units] • 23 and 5
(b) (i)&(ii)	(i) $\sqrt{2^2 + 2^2}$ = $\sqrt{8}$ or $2\sqrt{2}$ [units] (ii) $\sqrt{\sqrt{8}^2 + 3^2}$ = $\sqrt{17}$ [units]	Scale 10C (0, 5, 7, 10) Accept correct answers without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Work of merit in either part, e.g. some correct use of Pythagoras' theorem, base redrawn as right-angled with at least one measurement shown, relevant right angle marked on diagram with at least one measurement shown <i>High Partial Credit</i> <ul style="list-style-type: none"> • (i) or (ii) correct <i>Full Credit – 1</i> <ul style="list-style-type: none"> • Not in surd form, otherwise correct
(b)(iii)	Let required length = x $\frac{x}{\sqrt{17}} = \frac{2}{3}$ $\Rightarrow x = \frac{2\sqrt{17}}{3} \text{ or } 2.748\dots$	Scale 5C (0, 2, 4, 5) Accept correct answer without work <i>Low Partial Credit</i> <ul style="list-style-type: none"> • Indication of similar triangles • One correct ratio <i>High Partial Credit</i> <ul style="list-style-type: none"> • $\frac{x}{\sqrt{17}} = \frac{2}{3}$ <i>Full Credit – 1</i> <ul style="list-style-type: none"> • Length of BC inside smaller cube correctly found, i.e. $\frac{\sqrt{17}}{3}$

Q10	Model Solution – 15 Marks	Marking Notes
(a)	$7y = 7 + y + 7 + y$ $5y = 14$ $y = \frac{14}{5} \text{ or } 2.8$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula: Area = $l \times w$ • Correct formula: Perimeter = $2l + 2w$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $7y = 7 + y + 7 + y$ or similar
(b)	$xy = x + y + x + y$ $xy - 2y = 2x$ $y(x - 2) = 2x$ $y = \frac{2x}{x-2} \text{ or } \frac{-2x}{2-x}$	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Area or perimeter found in terms of x and y (i.e. xy or $x + y + x + y$ or similar) • $xy = x + y + x + y$ or similar <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • All terms including y on LHS, all other terms on RHS (or vice versa) • All terms including x on LHS, all other terms on RHS (or vice versa) • Correct answer without work <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Correctly finds x in terms of y

Q11	Model Solution – 15 Marks	Marking Notes																		
(a)	<table border="1" data-bbox="424 293 807 707"> <thead> <tr> <th>Radius (cm)</th> <th>Height (cm)</th> <th>Volume (cm³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>K</td> <td>πK</td> </tr> <tr> <td>2</td> <td>K</td> <td>$4 \pi K$</td> </tr> <tr> <td>3</td> <td>K</td> <td>$9 \pi K$</td> </tr> <tr> <td>4</td> <td>K</td> <td>$16 \pi K$</td> </tr> <tr> <td>5</td> <td>K</td> <td>$25 \pi K$</td> </tr> </tbody> </table>	Radius (cm)	Height (cm)	Volume (cm ³)	1	K	πK	2	K	$4 \pi K$	3	K	$9 \pi K$	4	K	$16 \pi K$	5	K	$25 \pi K$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula: $V = \pi r^2 h$ • 1 correct volume <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • 2 correct volumes <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 3 correct volumes <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Not in required form, otherwise correct
Radius (cm)	Height (cm)	Volume (cm ³)																		
1	K	πK																		
2	K	$4 \pi K$																		
3	K	$9 \pi K$																		
4	K	$16 \pi K$																		
5	K	$25 \pi K$																		
(b)	<p><i>Ans:</i> The sequence is quadratic.</p> <p><i>Jus:</i> 1st diff: $3 \pi K, 5 \pi K, 7 \pi K, 9 \pi K$ 2nd diff: All the same ($2 \pi K$)</p> <p style="text-align: center;">OR</p> <p>The formula for the volumes has an r^2 in it and no other variables (as h is fixed)</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct answer with no justification • Indication of first difference or second difference • $1^2, 2^2, 3^2 \dots$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • First differences found and stated not linear or exponential • Second difference found with no or incorrect conclusion 																		

Q12	Model Solution – 35 Marks	Marking Notes
(a)	<p>Valid net constructed, including supporting work for at least one of the triangles (e.g. construction lines drawn, or the measure of at least one angle in the triangle, or the perpendicular height of the triangle, calculated). May be laid out in any valid configuration, for example:</p> 	<p>Scale 15D (0, 6, 9, 12, 15) Tolerance: $\pm 0.1\text{cm}$ Tolerance: $\pm 2^\circ$ if angle calculated</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Rough sketch drawn with five relevant shapes correctly joined • One triangle correctly constructed with construction lines shown • One rectangle correctly constructed • One angle in triangle calculated: 41.4° or 97.2° • Perpendicular height of triangle found: 2.6 cm (with 6 cm as base) <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • One triangle and one rectangle constructed (in correct net formation), with supporting work for the triangle <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Four faces constructed (in correct net formation) with supporting work for at least 1 triangle • Fully correct net constructed with no supporting work for the triangles <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Net fully correct, but with at least one interior line missing

Q12	Model Solution – 35 Marks	Marking Notes
(b)(i)	<p>Drop a line from the apex perpendicular to the base. In the right-angled triangle:</p> $\cos 70^\circ = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\Rightarrow \cos 70^\circ = \frac{3.5}{x}$ $\Rightarrow x = \frac{3.5}{\cos 70^\circ}$ $= 10.23 \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $\frac{x}{\sin 70^\circ} = \frac{7}{\sin 40^\circ}$ $\Rightarrow x = \frac{7 \sin 70^\circ}{\sin 40^\circ}$ $= 10.23 \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $\tan 70^\circ = \frac{h}{3.5} \Rightarrow h = 9.6162\dots$ $x^2 = 3.5^2 + 9.6162^2$ $= 104.7213024$ $\Rightarrow x = 10.23 \text{ [2 DP]}$	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Any correct trigonometric ratio Some correct use of Pythagoras' Theorem $\cos 70^\circ = \frac{x}{3.5}$ and finished correctly 40° or 20° or 3.5 $\sin 70^\circ = \frac{7}{x}$ or similar and finishes correctly <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> $\cos 70^\circ = \frac{3.5}{x}$ or similar $x = \frac{7 \sin 70^\circ}{\sin 40^\circ}$ $x^2 = 3.5^2 + 9.6162^2 = 104.7213024$ Correct answer without work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Calculator in incorrect mode, otherwise correct

Q12	Model Solution – 35 Marks	Marking Notes
(b)(ii)	<p>A: $7 \times 12 = 84 \text{ cm}^2$</p> <p>B: $12 \times 10 \cdot 23 = 123 \text{ cm}^2$ [nearest cm^2]</p> <p>C: Let h be the perpendicular height of this face. Then: $h^2 + 3 \cdot 5^2 = 10 \cdot 23^2$ $\Rightarrow h^2 = 104 \cdot 6529 - 12 \cdot 25$ $\Rightarrow h = \sqrt{92 \cdot 4029}$ $= 9 \cdot 6126 \dots$</p> <p>\Rightarrow Area $= \frac{1}{2} \times 7 \times 9 \cdot 6126 \dots$ $= 34$ [nearest cm^2]</p> <p style="text-align: center;">OR</p> <p>Let h be the perpendicular height of this face. Then: $\tan 70^\circ = \frac{\text{opposite}}{\text{adjacent}}$</p> <p>$\Rightarrow \tan 70^\circ = \frac{h}{3 \cdot 5}$</p> <p>$\Rightarrow h = 3 \cdot 5 \tan 70^\circ$ $= 9 \cdot 6161 \dots$</p> <p>\Rightarrow Area $= \frac{1}{2} \times 7 \times 9 \cdot 6161 \dots$ $= 34$ [nearest cm^2]</p>	<p>Scale 15D (0, 6, 9, 12, 15)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct relevant formula, e.g. $\text{area} = l \times w$ or $\frac{1}{2}$ (base \times perpendicular height) or Pythagoras' Thm or $\frac{1}{2} ab \sin C$ • $x = 10 \cdot 23$ • Area of A or B correct <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Area of A and B correct • Area of C correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Area of A and B correct and $h = 9 \cdot 6126 \dots$ • Area of C correct and areas of A or B correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answers in incorrect boxes, otherwise correct

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 bóonais 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