National
Qualifications
2026

2026 Applications of Mathematics

National 5 Paper 1

Question Paper Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by Qualifications Scotland appointed markers when marking external course assessments.

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General marking principles for National 5 Applications of Mathematics

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

For each question, the marking instructions are generally in two sections:

generic scheme — this indicates why each mark is awarded
illustrative scheme — this covers methods which are commonly seen throughout the marking

In general, you should use the illustrative scheme. Only use the generic scheme where a candidate has used a method not covered in the illustrative scheme.

(a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.

(b) If you are uncertain how to assess a specific candidate response because it is not covered by the general marking principles or the detailed marking instructions, you must seek guidance from your team leader.

(c) One mark is available for each ○. There are no half marks.

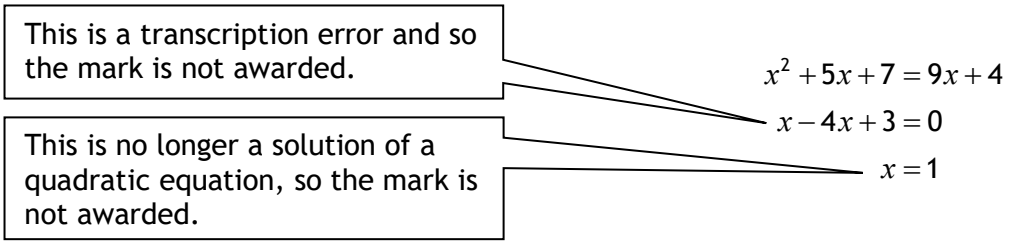
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(e) Only award full marks where the solution contains appropriate working. A correct answer with no working receives no mark, unless specifically mentioned in the marking instructions.

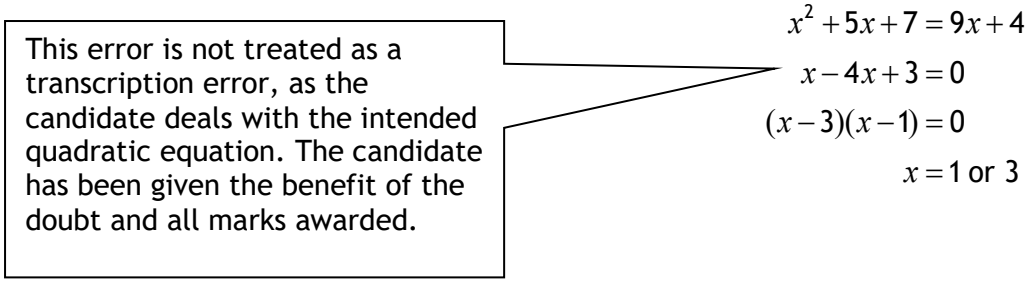
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(g) If an error is trivial, casual or insignificant, for example $6 \times 6 = 12$, candidates lose the opportunity to gain a mark, except for instances such as the second example in point (h) below.

(h) If a candidate makes a transcription error (question paper to script or within script), they lose the opportunity to gain the next process mark, for example



The following example is an exception to the above



(i) **Horizontal/vertical marking**
If a question results in two pairs of solutions, apply the following technique, but only if indicated in the detailed marking instructions for the question.

Example:

	$\bullet^5$	$\bullet^6$
$\bullet^5$	$x=2$	$x=-4$
$\bullet^6$	$y=5$	$y=-7$

Horizontal: $\bullet^5$ $x=2$ and $x=-4$ Vertical: $\bullet^5$ $x=2$ and $y=5$
$\bullet^6$ $y=5$ and $y=-7$ $\bullet^6$ $x=-4$ and $y=-7$

You must choose whichever method benefits the candidate, **not** a combination of both.

(j) In final answers, candidates should simplify numerical values as far as possible unless specifically mentioned in the detailed marking instruction. For example

$\frac{15}{12}$ must be simplified to $\frac{5}{4}$ or $1\frac{1}{4}$ $\frac{43}{1}$ must be simplified to 43

$\frac{15}{0{\cdot}3}$ must be simplified to 50 $\frac{4/5}{3}$ must be simplified to $\frac{4}{15}$

$\sqrt{64}$ must be simplified to 8*

*The square root of perfect squares up to and including 144 must be known.

(k) Commonly Observed Responses (COR) are shown in the marking instructions to help mark common and/or non-routine solutions. CORs may also be used as a guide when marking similar non-routine candidate responses.

(l) Do not penalise candidates for any of the following, unless specifically mentioned in the detailed marking instructions:

- working subsequent to a correct answer
- correct working in the wrong part of a question
- legitimate variations in numerical answers/algebraic expressions, for example angles in degrees rounded to nearest degree
- omission of units
- bad form (bad form only becomes bad form if subsequent working is correct), for example

  $(x^3+2x^2+3x+2)(2x+1)$ written as

  $(x^3+2x^2+3x+2)\times 2x+1$

  $=2x^4+5x^3+8x^2+7x+2$

  gains full credit

- repeated error within a question, but not between questions or papers

(m) In any 'Show that…' question, where candidates have to arrive at a required result, the last mark is not awarded as a follow-through from a previous error, unless specified in the detailed marking instructions.

(n) You must check all working carefully, even where a fundamental misunderstanding is apparent early in a candidate's response. You may still be able to award marks later in the question so you must refer continually to the marking instructions. The appearance of the correct answer does not necessarily indicate that you can award all the available marks to a candidate.

(o) You should mark legible scored-out working that has not been replaced. However, if the scored-out working has been replaced, you must only mark the replacement working.

(p) If candidates make multiple attempts using the same strategy and do not identify their final answer, mark all attempts and award the lowest mark. If candidates try different valid strategies, apply the above rule to attempts within each strategy and then award the highest mark.

For example:

Strategy 1 attempt 1 is worth 3 marks.	Strategy 2 attempt 1 is worth 1 mark.
Strategy 1 attempt 2 is worth 4 marks.	Strategy 2 attempt 2 is worth 5 marks.
From the attempts using strategy 1, the resultant mark would be 3.	From the attempts using strategy 2, the resultant mark would be 1.

In this case, award 3 marks.

Marking Instructions for each question

Question	Generic scheme	Illustrative scheme	Max mark
1.	•[1] Strategy/communication: mark one pressure correctly on scale •[2] Communication: mark other pressure on scale and conclusion consistent with working	•[1] 8.2 or 112 •[2] 112 or 8.2 and not safe	**2**

Notes:

1. Where a candidate has marked no pressures on the diagram. award 0/2
2. •[2] is not available where a candidate has marked more than two pressures.
3. Full marks can only be awarded if there are two pressures marked on the diagram.
4. Do not penalise incorrect attempts at a numerical conversion subsequent to two correct pressures marked on scale and a correct conclusion. See COR1.

Commonly Observed Responses:

1. 8.2 and 112 both marked correctly→Not safe because 112=7.4 award 2/2 ✓✓

Question			Generic scheme	Illustrative scheme	Max mark
2.			$\bullet^1$ Process: evidence of common denominator $\bullet^2$ Process: calculate numerators and add fractions $\bullet^3$ Process: calculate fraction of sheep who have not yet had their dose of vitamin	$\bullet^1$ $\frac{\ldots}{21}$ or equivalent $\bullet^2$ $\left(\frac{3}{21}+\frac{14}{21}=\right)\frac{17}{21}$ $\bullet^3$ $\frac{4}{21}$	**3**

Notes:

1. Correct answer without working. award 0/3
2. The final answer does not need to be in its simplest form.
3. Do not penalise incorrect simplification of final answer.
4. $\bullet^3$ is not available when an improper fraction is calculated for $\bullet^2$, with the exception of COR1.

Commonly Observed Responses:

1. $\frac{\ldots}{21}\rightarrow\left(\frac{6}{7}+\frac{1}{3}=\right)\frac{25}{21}\rightarrow\frac{4}{21}$ award 3/3 ✓✓✓
2. $\frac{\ldots}{21}\rightarrow\frac{1}{21}+\frac{2}{21}=\frac{3}{21}\rightarrow\frac{18}{21}$ or $\frac{6}{7}$ award 2/3 ✓×✓
3. $\left(\frac{1}{7}\times\frac{2}{3}=\right)\frac{\ldots}{21}\rightarrow\frac{2}{21}\rightarrow\frac{19}{21}$ award 2/3 ✓×✓
4. $\frac{\ldots}{10}\rightarrow\frac{3}{10}+\frac{14}{10}=\frac{17}{10}\rightarrow$ any final answer award 1/3 ×✓×
5. $\frac{\ldots}{10}\rightarrow\frac{2}{10}+\frac{1}{10}=\frac{3}{10}\rightarrow\frac{7}{10}$ award 1/3 ××✓

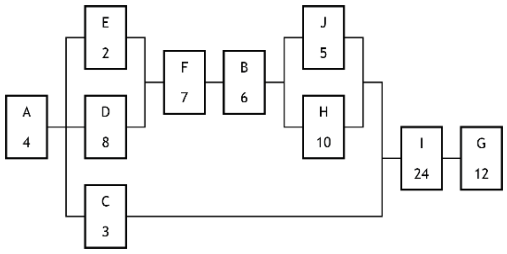
Question			Generic scheme	Illustrative scheme	Max Mark
3.			$\bullet^1$ Process: calculate how much Helen will save each month $\bullet^2$ Process/communication: calculate the minimum number of months and round appropriately	$\bullet^1$ $(20\% \text{ of } 350 =) 70$ $\bullet^2$ $(1250 \div 70 = 17.8... =) 18$ (months)	**2**

Notes:

1. Correct answer without working award 0/2
2. $\bullet^2$ is still available where the working for the division is incomplete eg $1250 \div 70 = 17 \cdot ...$ (or just 17) $\rightarrow 18$.
3. $\bullet^2$ can be awarded where the working shows $18 \times 70 = 1260$ followed by a final answer of 18.
4. $\bullet^2$ is not available where the candidate's answer to $\bullet^1$ is a factor of 1250.
5. Ignore errors in calculations after the decimal point or in remainder.
6. Where a candidate uses a strategy involving repeated addition or subtraction of 70, $\bullet^2$ can only be awarded where all calculations are correct.
7. Ignore omitted or incorrect units.

Commonly Observed Responses:

1. $70 \rightarrow 1250 \div 70 = 18$ award 2/2 ✓✓
2. $350 \rightarrow (1250 \div 350 =) 4$ award 1/2 ✗✓

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		•[1] Strategy/communication: any 5 task letters and times in the correct boxes •[2] Strategy/communication: complete diagram	•[1&2] 	**2**
Notes: 1. C is **not** interchangeable with D or E. 2. D and E are interchangeable. 3. H and J are interchangeable. 4. If a candidate omits all times, all task letters must be correct to be awarded 1/2. 5. If a candidate omits all task letters, all times must be correct to be awarded 1/2.					
Commonly Observed Responses:					
	(b)		•[3] Process/communication: state minimum time	•[3] 71 (hours)	**1**
Notes: 1. Correct answer without working. award 1/1 2. Ignore omitted or incorrect units.					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ Process: determine the median $\bullet^2$ Process: determine the upper and lower quartiles	$\bullet^1$ 17.5 $\bullet^2$ 10, 26	**2**

Notes:

Ordered list: 7, 9, 10, 14, 17, 18, 21, 26, 27, 31

1. The answers for (a) can be inferred from the boxplot.
2. If obtaining median and quartiles from the original unordered list, only $\bullet^2$ is available, see COR3.
3. If one number is missed from or added to an **unordered** list. award 0/2
4. If one number is missed from or added to an **ordered** list:
   - $\bullet^1$ is not available,
   - $\bullet^2$ is only available when all three quartiles are consistent with the candidate's list.
5. If **more than one** number is missed from or added to any list. award 0/2
6. Do not penalise incorrect labelling of 17.5, 10 or 26, eg a candidate who says LQ = 26 or UQ = 10.

Commonly Observed Responses:

1. 7 9 10 14 17 18 21 26 27 31 with no labels award 2/2 ✓✓
   10 17.5 26
2. 7, 10, 17.5, 26, 31 award 2/2 ✓✓
3. 24.5, 27, 7 (from an unordered list) award 1/2 ×✓

Question			Generic scheme	Illustrative scheme	Max mark
5.	(b)		$\bullet^3$ Communication: mark end points correctly $\bullet^4$ Communication: mark Q_1, Q_2, Q_3 and draw box plot	$\bullet^3$ end points at 7 and 31 $\bullet^4$ box showing Q_1, Q_2, Q_3	**2**
Notes: 1. The answers for (a) can be inferred from the boxplot. 2. If the candidate constructs a dot plot. award 0/2 3. When a point falls between 2 divisions, accept a mark at any value in between the divisions. 4. $\bullet^{3\&4}$ are still available when the calculated value of Q_2 does not lie between the calculated values of Q_1 and Q_3. 5. $\bullet^4$ is not available if: a. more than 5 values are marked. b. the five-figure summary is marked using only dots or crosses.					
Commonly Observed Responses: 1. In Part (a): 17.5, 7, 31 Followed by in part (b): correct boxplot drawn using 7, 10, 17.5, 26, 31 For part (a), award 1/2 ✓× For part (b), award 2/2 ✓✓					
	(c)		$\bullet^5$ Process: calculate interquartile range	$\bullet^5$ $(26-10=)16$	**1**
Notes: 1. $\bullet^5$ must be consistent with previous working.					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
6.			•[1] Process: convert to consistent units •[2] Process/communication: express gradient as a fraction, **and** write in its simplest form	•[1] 1.8 (m) **or** 1200 (cm) •[2] $\left(\frac{180}{1200}=\right)\frac{3}{20}$	**2**

Notes:

1. Correct answer without working. award 2/2
2. •[2] is not available when an attempt is made to further simplify a fraction already in its simplest form eg $\frac{3}{20}=\frac{1}{4}$.
3. •[2] is not available where a candidate only gives their gradient as a decimal or a percentage.

Commonly Observed Responses:

1. 180 and 120 $\rightarrow\left(\frac{180}{120}=\right)\frac{3}{2}$ award 1/2 ×✓
2. 180 and 120 $\rightarrow\left(\frac{120}{180}=\right)\frac{2}{3}$ award 0/2 ××
3. 180 and 12 $\rightarrow\left(\frac{180}{12}=\right)15$ award 1/2 ×✓
4. 180 and 12 $\rightarrow\left(\frac{180}{12}=\right)\frac{15}{1}$ award 0/2 ××
5. 180 and 12 $\rightarrow\left(\frac{12}{180}=\right)\frac{1}{15}$ award 0/2 ××

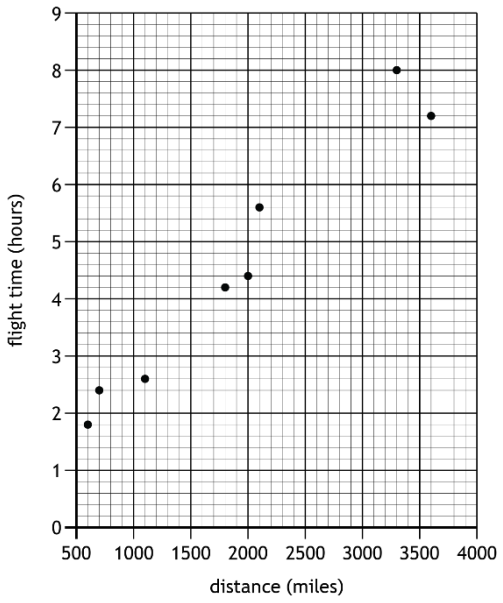
Question			Generic scheme	Illustrative scheme	Max mark
7.			$\bullet^1$ Process: calculate commission $\bullet^2$ Process: calculate gross pay	$\bullet^1$ $(5\%$ of $16000 =)800$ $\bullet^2$ (1765 + 800 =) (£)2565	**2**

Notes:

1. Correct answer without working. award 2/2
2. $\bullet^2$ is only available for adding 1765 to a previously calculated commission.
3. Where the final answer is not a whole number, $\bullet^2$ is only available where the final answer is rounded or truncated to 2 decimal places.

Commonly Observed Responses:

1. $(5\%$ of $56000 =)2800 \rightarrow 4565$ award 1/2 ×✓
2. $(5\%$ of $40000 =)2000 \rightarrow 3765$ award 1/2 ×✓
3. $(5\%$ of $1765 =)88.25 \rightarrow 1853.25$ award 1/2 ×✓

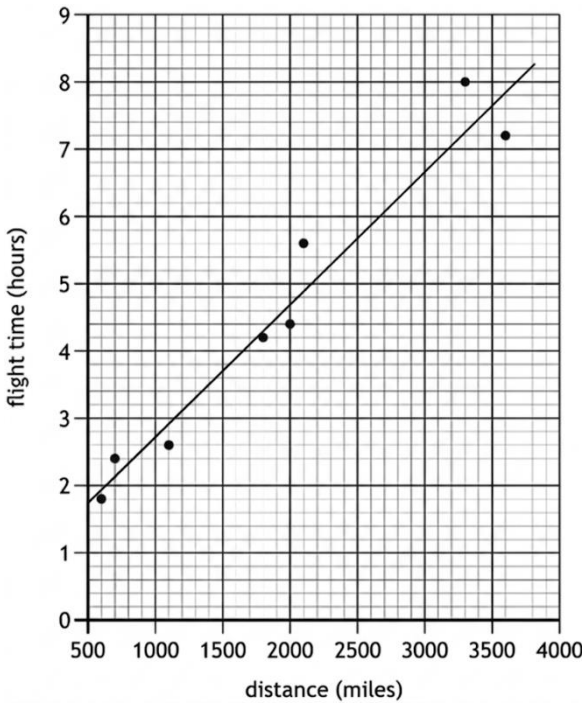
Question			Generic scheme	Illustrative scheme	Max mark
8.	(a)		$\bullet^1$ Communication: any 4 points plotted correctly $\bullet^2$ Communication: remaining 4 points plotted correctly	$\bullet^{1\&2}$ 	**2**

Notes:

Distance (miles)	600	700	1100	1800	2000	2100	3300	3600
Flight time (hours)	1.8	2.4	2.6	4.2	4.4	5.6	8.0	7.2

1. $\bullet^1$ and $\bullet^2$ are still available if a candidate constructs a line graph.
2. $\bullet^2$ is not available where a candidate plots an extra point (with the exception of any point connected to 3.4 hours and part (c)).
3. If a candidate constructs a bar graph. award 0/2

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
8.	(b)		$\bullet^3$ Strategy: draw consistent line of best fit	$\bullet^3$ 	**1**

Notes:

1. The line of best fit must be straight and have a positive gradient.
2. $\bullet^3$ is not available if the line of best fit goes through the origin or the x-axis.
3. $\bullet^3$ is not available if there are no points below the line of best fit.
4. $\bullet^3$ is not available if there are no points above the line of best fit.
5. $\bullet^3$ is not available if a line graph or bar graph are plotted.
6. $\bullet^3$ is not available if the line of best fit does not extend across the full range of plotted distances eg 600 and 3600.

Commonly Observed Responses:

	(c)		$\bullet^4$ Strategy/communication: state estimated distance for 3.4 hours consistent with line of best fit	$\bullet^4$ eg 1400 (miles)	**1**

Notes:

1. When the distance falls between 2 divisions, accept either number or any value in between.
2. $\bullet^4$ is still available for a candidate who draws a line graph for $\bullet^3$.
3. $\bullet^4$ is not available where no attempt has been made to draw a line of best fit.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
9.			•[1] Process: convert time to seconds •[2] Process/communication: calculate flow rate as a decimal	•[1] 90 •[2] $\left(54 \div 90 =\right) 0.6$ (m^3/s)	**2**

Notes:

1. Correct answer without working. award 2/2
2. •[2] is not available to a candidate who leaves their answer as a fraction.

Commonly Observed Responses:

1. $1.5 \rightarrow \left(54 \div 1.5 =\right) 36$ leading to $\left(36 \div 60 =\right) 0.6$ award 2/2 ✓✓
2. $1.5 \rightarrow (54 \div 1.5 =) 36$ award 1/2 ×✓
3. $90 \rightarrow (54 \div 90 =) 0.6^3$ award 1/2 ✓×

Question			Generic scheme	Illustrative scheme	Max mark
10.			•[1] Strategy/process: calculate cost for a suitable scaling •[2] Process: calculate the cost of 1 kg	•[1] eg 1 g = (£)0.0096 50 g = (£)0.48 100 g = (£)0.96 •[2] (£)9.60	**2**

Notes:

1. Correct answer without working. award 0/2
2. •[1] can only be awarded for calculating the cost for **any** weight that is a factor or multiple of 1000 g.
3. Where •[1] is not awarded, •[2] is only available if it is clear from working which weight is linked with the cost in •[1].
4. •[2] may be awarded for adding an incorrect **calculated** cost for 100 grams to (£)8.64, see COR1.
5. Where the final answer is not a whole number, •[2] is only available where the final answer is rounded or truncated to 2 decimal places.

Commonly Observed Responses:

1. $100\text{ g} = 0.43 \rightarrow (8.64 + 0.43 = £)9.07$ award 1/2 ×✓
2. 900 g = (£)8.64 → no further valid working award 0/2 ××
3. 4.32 or 43.2(0) with or without working award 0/2 ××

Question	Generic scheme	Illustrative scheme	Max mark
11.	**Method 1**		**3**
	$\bullet^1$ Strategy/communication: identify and label all the possible combinations	$\bullet^1$ eg 1 2 3 4 5 6 T (or 1) H (or 2)	
	$\bullet^2$ Process: identify all winning combinations	$\bullet^2$ eg 1 2 3 4 5 6 T (or 1) ✓ ✓ H (or 2) ✓ ✓ ✓	
	$\bullet^3$ Communication: state probability of winning	$\bullet^3$ $\frac{5}{12}$	
	Method 2		
	$\bullet^1$ Strategy/communication: identify and label fraction of winning combinations for Tails and Heads	$\bullet^1$ $\frac{2}{6}$ labelled with '1.', 'T' or 'Tails' **and** $\frac{3}{6}$ labelled with '2.', 'H' or 'Heads'	
	$\bullet^2$ Strategy/communication: identify the four fractions that need to be combined	$\bullet^2$ $\frac{2}{6}$ with $\frac{1}{2}$ **and** $\frac{3}{6}$ with $\frac{1}{2}$	
	$\bullet^3$ Process: state probability of winning	$\bullet^3$ $\left(\frac{2}{6}\times\frac{1}{2}+\frac{3}{6}\times\frac{1}{2}=\right)\frac{5}{12}$	

Notes:

1. $\frac{5}{12}$ with no other working. award 0/3 ×××
2. Where a 6×6 table is used. award 0/3 ×××
3. The final answer does not need to be in its simplest form.
4. $\bullet^1$ is only available with appropriate labelling ('T'/'H', 'Tails'/'Heads', '1.'/'2.'). Where labels are omitted, $\bullet^2$ is still available. See CORs 4 and 5.
5. For $\bullet^3$:
   a) Accept: 5 out of 12 5 in 12
   b) Do not accept: 5:12 5 to 12 5-12
6. $\bullet^3$ is not available where a candidate gives their answer as **both** a fraction and a ratio, see COR1.
7. In method 1, $\bullet^2$ can be awarded for listing the 5 winning combinations (eg Tails 3&6, Heads 1,3&5). See CORs 2&3.
8. In method 1, $\bullet^1$ may be implied by $\bullet^3$. See COR2.

Question	Generic scheme	Illustrative scheme	Max mark

11. (continued)

Commonly Observed Responses:

1. $\frac{5}{12}$ and 5 : 12 both stated (following appropriate working) — award 2/3 ✓✓×

2. Tails 3, 6
   Heads 1, 3, 5 leading to $\frac{5}{12}$ — award 3/3 ✓✓✓

3. Tails 3, 6
   Heads 1, 3, 5 with no further valid working — award 1/3 ×✓×

4. Insufficient labelling for $\bullet^1$ leading to correct answer (method 1)

1	2	3	4	5	6

→

1	2	3	4	5	6
		✓			✓
✓		✓		✓	

→ $\frac{5}{12}$

award 2/3 ×✓✓

5. Insufficient labelling for $\bullet^1$ leading to correct answer (method 2)

   $\frac{2}{6}$ and $\frac{3}{6}$ with no labelling → $\frac{2}{6}$ with $\frac{1}{2}$ and $\frac{3}{6}$ with $\frac{1}{2}$ → $\frac{5}{12}$

   award 2/3 ×✓✓

6. Tails: $\frac{2}{6}$
   Heads: $\frac{3}{6}$
   → $\frac{2}{6}+\frac{1}{2}=\ldots$ and $\frac{3}{6}+\frac{1}{2}=\ldots$ → any answer

   award 2/3 ✓✓×

Question			Generic scheme	Illustrative scheme	Max mark
12.			$\bullet^1$ Process: calculate the arc length of the quarter circle $\bullet^2$ Process: calculate the length of the fence	$\bullet^1$ 15.7 $\bullet^2$ $(15.7+10+10+10+9=)54.7$ (m)	**2**

Notes:

1. Correct answer without working. award 0/2
2. Where candidate uses πr^2. award 0/2
3. $\bullet^2$ is only available for adding 39 to a previously calculated arc length.

Commonly Observed Responses:

1. $3.14\times5=15.7\rightarrow54.7$ award 2/2 ✓✓
2. $(3.14\times20=)62.8\rightarrow101.8$ award 1/2 ×✓
3. $(3.14\times20\div2=)31.4\rightarrow70.4$ award 1/2 ×✓
4. $(3.14\times10\div4=)7.85\rightarrow46.85$ award 1/2 ×✓
5. $(3.14\times5\div4=)3.925\rightarrow42.925$ award 1/2 ×✓

Question			Generic scheme	Illustrative scheme	Max mark
13.			**Method 1: comparing proportions** •1 Strategy/communication: state fraction for 'dislike' in one survey •2 Strategy/process: express both 'dislike' fractions in comparable form •3 Communication: state conclusion consistent with working	•1 $\frac{60}{360}$ **or** $\frac{70}{480}$ **or** equivalent •2 eg $\frac{8}{48}$ **and** $\frac{7}{48}$ **or** 0.16(66…) **and** 0.14(58…) •3 'yes' **or** 'decreased'	**3**
			Method 2: comparing number of people •1 Strategy/communication: state fraction of 'dislike' in first survey •2 Process: calculate fraction of 480 •3 Communication: state conclusion consistent with working	•1 $\frac{60}{360}$ **or** equivalent •2 $(480 \div 6 =) 80$ •3 'yes' **or** 'decreased', with evidence of comparing with 70	
			Method 3: comparing angles •1 Strategy/communication: state fraction of 'dislike' in second survey or calculate the angle per person •2 Process: calculate angle for 'dislike' in second survey •3 Communication: state conclusion consistent with working	•1 $\frac{70}{480}$ or $(360 \div 480 =) 0.75(^\circ)$ •2 $(0.75 \times 70 =) 52.5(^\circ)$ •3 'yes' or 'decreased' with evidence of comparing with $60(^\circ)$	

Notes:

1. 'Yes' or 'decreased' with no working. award 0/3
2. In all methods, •1 can still be awarded when additional fractions are also stated.
3. •1 can be implied by •2 in all methods.
4. Where candidate selects the incorrect angle from the pie chart, •3 is still available.
5. •3 can be awarded where the candidate states a calculated decrease, eg 10 (in method 2) or 7.5 (in method 3).
6. •3 can only be awarded where the candidate makes a conclusion based on comparing 'like with like'.

Commonly Observed Responses:

1. $70 \rightarrow 70$ (people) and $60(^\circ) \rightarrow$ 'Yes' or 'decreased' or '10 fewer' award 0/3 ✗✗✗

Special case:

2. $480 \div 70$ **and** $360 \div 60 \rightarrow 6.8(57\ldots)$ **and** $6 \rightarrow$ 'Yes' or 'decreased' award 3/3 ✓✓✓
3. $480 \div 70$ **and** $360 \div 60 \rightarrow 6.8(57\ldots)$ **and** $6 \rightarrow$ No conclusion award 2/3 ✓✓✗

[END OF MARKING INSTRUCTIONS]

National Qualifications 2026

2026 Applications of Mathematics

National 5 – Paper 2

Question Paper Finalised Marking Instructions

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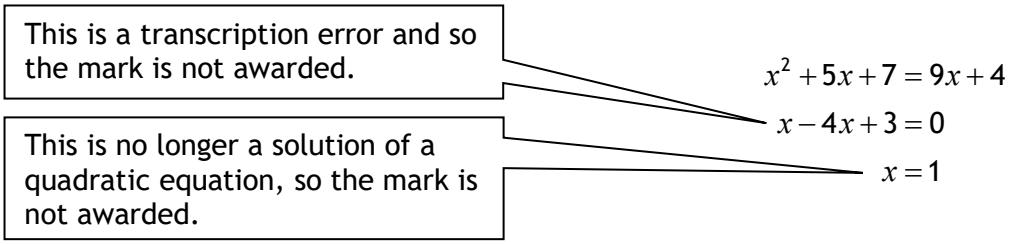
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(e) Only award full marks where the solution contains appropriate working. A correct answer with no working receives no mark, unless specifically mentioned in the marking instructions.

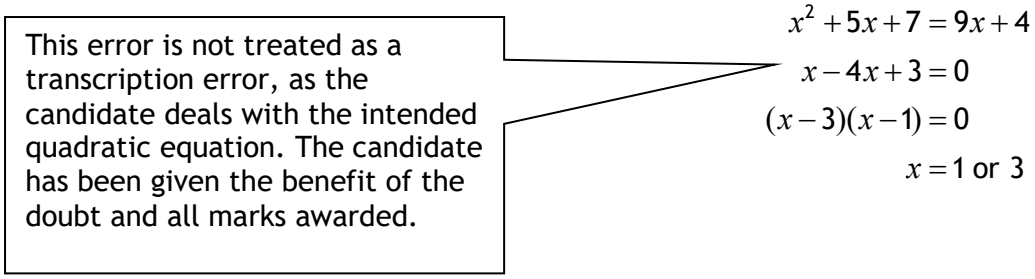
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(g) If an error is trivial, casual or insignificant, for example $6 \times 6 = 12$, candidates lose the opportunity to gain a mark, except for instances such as the second example in point (h) below.

(h) If a candidate makes a transcription error (question paper to script or within script), they lose the opportunity to gain the next process mark, for example



The following example is an exception to the above



(i) **Horizontal/vertical marking**
If a question results in two pairs of solutions, apply the following technique, but only if indicated in the detailed marking instructions for the question.

Example:

	$\bullet^5$	$\bullet^6$
$\bullet^5$	$x=2$	$x=-4$
$\bullet^6$	$y=5$	$y=-7$

Horizontal: $\bullet^5$ $x=2$ and $x=-4$ Vertical: $\bullet^5$ $x=2$ and $y=5$
$\bullet^6$ $y=5$ and $y=-7$ $\bullet^6$ $x=-4$ and $y=-7$

You must choose whichever method benefits the candidate, **not** a combination of both.

(j) In final answers, candidates should simplify numerical values as far as possible unless specifically mentioned in the detailed marking instruction. For example

$\frac{15}{12}$ must be simplified to $\frac{5}{4}$ or $1\frac{1}{4}$ $\frac{43}{1}$ must be simplified to 43

$\frac{15}{0{\cdot}3}$ must be simplified to 50 $\frac{4/5}{3}$ must be simplified to $\frac{4}{15}$

$\sqrt{64}$ must be simplified to 8*

*The square root of perfect squares up to and including 144 must be known.

(k) Commonly Observed Responses (COR) are shown in the marking instructions to help mark common and/or non-routine solutions. CORs may also be used as a guide when marking similar non-routine candidate responses.

(l) Do not penalise candidates for any of the following, unless specifically mentioned in the detailed marking instructions:

1. working subsequent to a correct answer
2. correct working in the wrong part of a question
3. legitimate variations in numerical answers/algebraic expressions, for example angles in degrees rounded to nearest degree
4. omission of units
5. bad form (bad form only becomes bad form if subsequent working is correct), for example

   $(x^3+2x^2+3x+2)(2x+1)$ written as

   $(x^3+2x^2+3x+2)\times 2x+1$

   $=2x^4+5x^3+8x^2+7x+2$

   gains full credit

6. repeated error within a question, but not between questions or papers

(m) In any 'Show that…' question, where candidates have to arrive at a required result, the last mark is not awarded as a follow-through from a previous error, unless specified in the detailed marking instructions.

(n) You must check all working carefully, even where a fundamental misunderstanding is apparent early in a candidate's response. You may still be able to award marks later in the question so you must refer continually to the marking instructions. The appearance of the correct answer does not necessarily indicate that you can award all the available marks to a candidate.

(o) You should mark legible scored-out working that has not been replaced. However, if the scored-out working has been replaced, you must only mark the replacement working.

(p) If candidates make multiple attempts using the same strategy and do not identify their final answer, mark all attempts and award the lowest mark. If candidates try different valid strategies, apply the above rule to attempts within each strategy and then award the highest mark.

For example:

Strategy 1 attempt 1 is worth 3 marks.	Strategy 2 attempt 1 is worth 1 mark.
Strategy 1 attempt 2 is worth 4 marks.	Strategy 2 attempt 2 is worth 5 marks.
From the attempts using strategy 1, the resultant mark would be 3.	From the attempts using strategy 2, the resultant mark would be 1.

In this case, award 3 marks.

Marking Instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			$\bullet^1$ Strategy: know how to calculate 36% increase for 1 year	$\bullet^1$ evidence of $\times 1.36$ or equivalent	**4**
			$\bullet^2$ Strategy: know how to repeat increase for 3 years	$\bullet^2$ evidence of 1.36^3 or equivalent	
			$\bullet^3$ Strategy/process: know to multiply by 750 and calculate population after 3 years	$\bullet^3$ $(750\times 1.36^3 =)\ 1886.592\ldots$	
			$\bullet^4$ Process/communication: round to 2 significant figures	$\bullet^4$ 1900	

Notes:

1. **Both** 1886(.592…) **and** 1900 stated without working. award 4/4
2. **Only** 1900 stated without working. award 0/4
3. $\bullet^1$ can be awarded for $(36\%\text{ of } 750 =)\ 270$ if and only if the candidate subsequently adds to 750. See COR8.
4. $\bullet^3$ is not available where a candidate adds 750 to their previously calculated population after 3 years.
5. For the award of $\bullet^3$, the method used must involve a calculation involving 750, and a power of a **multiplier** (or equivalent).
6. For the award of $\bullet^3$, a candidate using a year-by-year method must work to a minimum of 3 significant figures (rounded or truncated).
7. $\bullet^3$ can be implied by $\bullet^4$ if and only if all calculations are shown, see CORs 1&2.

Commonly Observed Responses:

1. $\times 1.36 \rightarrow 1.36^3 \rightarrow 750\times 1.36^3$ with no unrounded answer $\rightarrow 1900$ award 4/4 ✓✓✓✓
2. $\times 1.36 \rightarrow 1.36^3 \rightarrow 750\times 1.36^3$ with no unrounded answer $\rightarrow 1800$ award 3/4 ✓✓✓×
3. $\times 1.36 \rightarrow 1.36^3 \rightarrow 1886(.592\ldots) \rightarrow 1900.0(0\ldots.)$ award 3/4 ✓✓✓×
4. $\div 1.36 \rightarrow 1.36^3 \rightarrow \left(750\div 1.36^3 =\right) 298(.15\ldots) \rightarrow 300$ award 3/4 ×✓✓✓
5. $\times 0.64 \rightarrow 0.64^3 \rightarrow \left(750\times 0.64^3 =\right) 196(.608) \rightarrow 200$ award 3/4 ×✓✓✓
6. $\times 36 \rightarrow 36^3 \rightarrow \left(750\times 36^3 =\right) 34\ 992\ 000 \rightarrow 35\ 000\ 000$ award 3/4 ×✓✓✓
7. $\times 0.36 \rightarrow 0.36\times 3 \rightarrow \left(750+270\times 3 =\right) 1560 \rightarrow 1600$ award 2/4 ✓××✓
8. $\left(36\%\text{ of } 750 =\right) 270 \rightarrow \left(270\times 3 =\right) 810 \rightarrow \left(750+810 =\right) 1560 \rightarrow 1600$ award 2/4 ✓××✓
9. $\times 1.36 \rightarrow 750^3 \left(\times 1.36\right) \rightarrow \left(750^3\times 1.36 =\right) 573\ 750\ 000 \rightarrow 570\ 000\ 000$ award 2/4 ✓××✓
10. $\times 1.36 \rightarrow$ no attempt at mark 2 $\rightarrow \left(750\times 1.36 =\right) 1020 \rightarrow 1000$ award 2/4 ✓××✓

Question	Generic scheme	Illustrative scheme	Max mark
2.	•[1] Process: calculate area of semi-circle •[2] Process: calculate area to be painted	•[1] 0.1145… •[2] $(1.98\times 0.76-0\cdot 11\ldots=)1\cdot 39\ldots(\text{m}^2)$	**2**

Notes:

1. Correct answer without working. award 0/2
2. Where candidate uses πd or a volume formula. award 0/2
3. Accept variations in π to at least 2 decimal places.
4. Answers to calculations must be rounded or truncated correctly to at least 1 decimal place.
5. •[2] is only available for subtracting a previously calculated area from 1.5….
6. •[2] is not available when the calculated area of the semicircle is more than 1.5048.

Commonly Observed Responses:

1. $\pi\times 0.27^2\div 2=0.1145\ldots\rightarrow(1.5048+0.1145\ldots=)1.619\ldots$ award 1/2 ✓×
2. $\pi\times 0.27^2=0.229\ldots\rightarrow(1.5048-0.229\ldots=)1.27\ldots$ award 1/2 ×✓
3. $\pi\times 0.54^2\div 2=0.458\ldots\rightarrow(1.5048-0.458\ldots=)1.04\ldots$ award 1/2 ×✓

Question			Generic scheme	Illustrative scheme	Max mark
3.	(a)		$\bullet^1$ Strategy/process: calculate amount taxed at 8% $\bullet^2$ Process: calculate annual National Insurance	$\bullet^1$ $(42\ 000-12\ 584=)29\ 416$ $\bullet^2$ $(29416\times0.08=£)2353.28$	**2**

Notes:

1. Correct answer without working. award 2/2
2. If 42000 is not used in any calculation. award 0/2
3. When the final answer is not a whole number, $\bullet^2$ is only available where the final answer is rounded or truncated to 2 decimal places.
4. $\bullet^2$ is not available if either 50284 or 2% is used to calculate the National Insurance.
5. $\bullet^2$ is not available where a candidate:
   - adds their calculated National Insurance to any other value.
   - subtracts their calculated National Insurance from any value other than 42000.
6. Do not penalise $\bullet^2$ for a candidate who goes on to subtract a National Insurance calculation from 42000.

Commonly Observed Responses:

1. $29416\rightarrow(92\%\text{ of }29416=)27062.72$ leading to 2353.28 award 2/2 ✓✓
2. $29416\rightarrow(92\%\text{ of }29416=)27062.72$ with no NI value stated award 1/2 ✓×
3. no attempt to subtract $\rightarrow(8\%\text{ of }42000=)3360$ award 1/2 ×✓
4. $(50284-42000=)8284\rightarrow(8\%\text{ of }8284=)662.72$ award 0/2 ××

	(b)		$\bullet^3$ Process: calculate annual pension contribution $\bullet^4$ Process: calculate annual net pay	$\bullet^3$ $(0.112\times42000=)4704$ $\bullet^4$ $(42000-2353.28-4787.12-4704=)$ (£) 30155.60	**2**

Notes:

1. Correct answer without working. award 2/2
2. $\bullet^3$ is only available for 4704 or $(0.888\times42000=)37296$.
3. $\bullet^3$ may be implied by $\bullet^4$.
4. When the final answer is not a whole number, $\bullet^4$ is only available where the final answer is rounded or truncated to 2 decimal places.
5. $\bullet^4$ can only be awarded for a subtraction of three values from 42000 (these must be a calculated National Insurance, 4787.12 and a calculated pension).

Commonly Observed Responses:

1. From COR3 in (a): $4704\rightarrow(42000-(3360+4787.12+4704)=£)29148.88$ award 2/2 ✓✓
2. $(42000-(4704+4787.12)=£)32508.88$ award 1/2 ✓×

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		$\bullet^1$ Process: calculate amount of euros received $\bullet^2$ Process: calculate remaining euros $\bullet^3$ Process: convert euros into Turkish lira	$\bullet^1$ $(840\times1.15=)966$ $\bullet^2$ $(966-820=)146$ $\bullet^3$ $(146\div1.15\times44=)5586.08$ **or** 5586.09	**3**

Notes:

1. Correct answer without working. award 3/3
2. Intermediate working may be rounded or truncated to a whole number or any number of decimal places.
3. When the final answer is not a whole number, $\bullet^3$ is only available where the final answer is rounded or truncated to the nearest whole number, 1 decimal place or 2 decimal places.
4. Be aware that a valid strategy may lead to a range of acceptable answers between 5544 and 5588.
5. $\bullet^2$ and $\bullet^3$ are not available if the candidate calculates a negative answer at $\bullet^2$.
6. Do not penalise the wrong units in the final answer.

Commonly Observed Responses:

1. $966\rightarrow146\rightarrow146\div1.15=126.95$ or 126.96 leading to 5585.8(0) or 5586.24 award 3/3 ✓✓✓
2. $966\rightarrow146\rightarrow146\div1.15=126.956$ or 126.957 leading to 5586.06 or 5586.11 award 3/3 ✓✓✓
3. $966\rightarrow146\rightarrow(146\times44=)6424$ award 2/3 ✓✓×
4. $966\rightarrow(966-205=)761\rightarrow29116(\cdot\ldots)$ award 2/3 ✓×✓

Question			Generic scheme	Illustrative scheme	Max mark
4	(b)		**Method 1** •⁴ Process: calculate duration of flight in hours •⁵ Process: convert duration to hours and minutes and add on •⁶ Process/communication: calculate local time in Barcelona when flight landed	•⁴ $(1680 \div 600 =) 2.8$ (hours) •⁵ 4:18 (pm) •⁶ 5:18 pm or 17:18	**3**
			Method 2 •⁴ Process: calculate duration of flight in hours •⁵ Process: calculate local time in Barcelona when flight left •⁶ Process/communication: convert duration to hours and minutes and add on	•⁴ $(1680 \div 600 =) 2.8$ (hours) •⁵ 2:30 (pm) •⁶ 5:18 pm or 17:18	
			Method 3 •⁴ Process: calculate duration of flight in hours •⁵ Process: interpret time zone by adjusting duration of flight •⁶ Process/communication: convert duration to hours and minutes and add on	•⁴ $(1680 \div 600 =) 2.8$ (hours) •⁵ 3.8 (hours) or 3 hours 48 minutes •⁶ 5:18 pm or 17:18	

Notes:

1. Correct answer without working. award 3/3
2. For the award of •⁶:
   - accept 05:18 pm or 17:18 pm.
   - do not accept 5:18, 05:18 or 5 hours 18 minutes.
3. •⁵ in method 1 and •⁶ in method 2 are not available when the time of flight is calculated to be a whole number of hours.

Commonly Observed Responses for method 1:

1. $2.8 \rightarrow (1:30 + 2 \text{ hours } 80 \text{ minutes} =) 4:50 \rightarrow 5:50 \text{ pm}$ award 2/3 ✓×✓
2. $2.8 \rightarrow (1:30 + 2 \text{ hours } 8 \text{ minutes} =) 3:38 \rightarrow 4:38 \text{ pm}$ award 2/3 ✓×✓
3. $2.8 \rightarrow (1:30 + 2 \text{ hours } 40 \text{ minutes} =) 4:10 \rightarrow 5:10 \text{ pm}$ award 2/3 ✓×✓
4. $2.8 \rightarrow (1:30 + 3 \text{ hours} =) 4:30 \rightarrow 5:30 \text{ pm}$ award 2/3 ✓×✓

Question			Generic scheme	Illustrative scheme	Max mark
4.	(c)	(i)	$\bullet^7$ Process: calculate scale distances $\bullet^8$ Process/communication: measure bearing from Glasgow $\bullet^9$ Process/communication: draw length from Glasgow, measure bearing, and draw correct length from Barcelona	$\bullet^7$ 5.6 (cm) and 7.5 (cm) $\bullet^8$ bearing of $161°(\pm 1°)$ from Glasgow $\bullet^9$ 5.6 (cm) $(\pm 0.1$ cm) drawn **and** bearing of $82°(\pm 1°)$ **and** and 7.5 cm $(\pm 0.1$ cm) drawn from Barcelona	**3**
Notes: 1. $\bullet^7$ can be implied by drawing 2 lines of the correct length. 2. $\bullet^9$ is not available for a candidate who draws 2 lines from Glasgow. 3. Bearing for both legs must be $\pm 1°$ relative to the **original** North line. 4. For the award of $\bullet^8$ and $\bullet^9$, labels are not required.					
Commonly Observed Responses:					
		(ii)	$\bullet^{10}$ Process/communication: state three-figure bearing consistent with diagram $\bullet^{11}$ Process/communication: state distance back to Glasgow consistent with diagram	$\bullet^{10}$ 294(°) $\bullet^{11}$ 3060 (km)	**2**
Notes: 1. $\bullet^{10}$ is only available for a **three**-figure bearing. 2. $\bullet^{10}$ and $\bullet^{11}$ are not available where a candidate has drawn both lines from Glasgow in (c)(i). 3. It is not necessary to actually draw the third leg of the journey. 4. $\bullet^{10}$ and $\bullet^{11}$ are only available for distances and bearings measured from the end of the candidate's second line to Glasgow.					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ Process: interpret time-and-a-half	$\bullet^1$ 7.5 (hours) or 42.5 (hours) or (£)21 or (£)105	**3**
			$\bullet^2$ Process: calculate total pay for option 1 or option 2	$\bullet^2$ $(\ldots + 490 = £)\ 595$ **or** $(40 \times 14 \times 1.1 =)\ 616$	
			$\bullet^3$ Process/communication: calculate total pay for other option **and** state consistent conclusion	$\bullet^3$ 616 or 595, option 2	

Notes:

1. 'option 2' without working. award 0/3
2. $\bullet^1$ can be implied by appearance of 595 for option 1.
3. $\bullet^3$ is not available when a candidate obtains a final answer of 560 or 840 for option 1. See CORs 1&2.
4. When the final answer is not a whole number, $\bullet^3$ is only available where the final answer is rounded or truncated to 2 decimal places.
5. Do not penalise a candidate who says 'option B' instead of 'option 2'.

Commonly Observed Responses:

In both COR1 and COR2, $\bullet^2$ is awarded for calculating 616.

1. $(21 \times 40 =)\ 840$ for option 1 and 616 for option 2 $\rightarrow$ any conclusion award 2/3 ✓✓×
2. 560 for option 1 and 616 for option 2 $\rightarrow$ any conclusion award 1/3 ×✓×
3. 840 with no further working award 1/3 ✓××

Question			Generic scheme	Illustrative scheme	Max mark
5.	(b)		•^{4} Process: calculate total cost for shop A •^{5} Process: calculate total cost for shop B •^{6} Process/communication: calculate total cost for shop C **and** state conclusion consistent with working	•^{4} 800 •^{5} 918 •^{6} 900 **and** 'shop A' or '800'	**3**

Notes:

1. Where a candidate only considers shop C. award 0/3
2. •^{4} and •^{6} are not available where a candidate only calculates the amount saved (400) for shop A (see COR2).
3. •^{5} and •^{6} are not available where a candidate only calculates the discount (162) for shop B (see COR3).
4. •^{6} is only available where a candidate considers all 3 shops.
5. Do not penalise the omission of trailing zeroes.
6. Do not penalise a candidate who says 'shop 1' instead of 'shop A'.

Commonly Observed Responses:

1. Shop A: 600 $\rightarrow$ Shop B: 918 $\rightarrow$ 900 and Shop A award 2/3 ×✓✓
2. Shop A: 400 $\rightarrow$ Shop B: 918 $\rightarrow$ 900 and Shop A award 1/3 ×✓×
3. Shop A: 800 $\rightarrow$ Shop B: 162 $\rightarrow$ 900 and Shop B award 1/3 ✓××
4. Shop A: 400 $\rightarrow$ Shop B: 162 $\rightarrow$ any answer award 0/3 ×××

Question			Generic scheme	Illustrative scheme	Max mark
5.	(c)		•[7] Process: multiply by 4 or divide by 6 •[8] Process: calculate the time for 6 workers	•[7] $(15\times 4=)60$ or $(15\div 6=)2.5$ •[8] 10 (hours)	**2**

Notes:

1. Where a candidate uses direct proportion (see CORs 4&5). award 0/2
2. Correct answer without working. award 0/2
3. •[7] is not available for a candidate who writes both $(15\div 4=)3.75$ and $(15\div 6=)2.5$, unless only 2.5 is used in further calculations.

Commonly Observed Responses:

1. $\frac{4}{6}\times 15\rightarrow 10$ award 2/2 ✓✓
2. $6\div 4=1.5\rightarrow 15\div 1.5=10$ award 2/2 ✓✓
3. $(15\div 6=)2.5\rightarrow(15-2.5-2.5=)10$ award 2/2 ✓✓
4. $(15\div 4=)3.75\rightarrow(3.75\times 6=)22.5$ award 0/2 ××
5. $(15\times 6=)90\rightarrow(90\div 4=)22.5$ award 0/2 ××

Question			Generic scheme	Illustrative scheme	Max mark
5.	(d)		$\bullet^9$ Process: calculate profit $\bullet^{10}$ Process: calculate percentage profit	$\bullet^9$ $(3800-2300-672=)\ 828$ $\bullet^{10}$ $27.86\ldots(\%)$	**2**

Notes:

1. Correct answer without working. award 0/2
2. Accept answers rounded or truncated to at least 2 significant figures.
3. $\bullet^{10}$ is only available for a calculation of the form $\frac{\text{calculated profit}}{2972}\times 100$.
4. For $\bullet^{10}$, multiplication by 100 can be implied by the answer.

Commonly Observed Responses:

1. $\left(\frac{3800}{2972}\times 100=\right)127.86\ldots$, leading to $(127.86-100=)\ 27.86\ldots$ award 2/2 ✓✓
2. $\left(\frac{3800}{2972}\times 100=\right)127.86$ award 1/2 ×✓
3. $828\rightarrow\left(\frac{828}{3800}\times 100=\right)21.789\ldots$ award 1/2 ✓×
4. $100-\left(\frac{2972}{3800}\times 100\right)\rightarrow 21.789\ldots$ award 1/2 ✓×
5. 3800 and $2972\rightarrow\left(\frac{2972}{3800}\times 100=\right)78.21\ldots$ award 0/2 ××

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		•[1] Process: calculate 4.8% of 25 •[2] Process/communication: state both limits •[3] Process/communication: identify which bags are not suitable	•[1] 1.2 •[2] 23.8 and 26.2 stated explicitly •[3] 20.1, 23.7, 26.5, 29.9 (kg)	**3**

Notes:

For reference, this is the original list with the unsuitable weights indicated:

24.7	25.8	**29.9**	24.6	**23.7**
26.5	26.0	24.4	**20.1**	25.9

1. Correct answer without working. award 0/3
2. •[1] can be implied by •[2].
3. •[3] is not available if only one limit has been calculated.
4. •[3] can be awarded where the weights have been marked on the list.
5. Ignore any attempts by a candidate to state the number of unsuitable bags as a fraction or percentage.

Commonly Observed Responses:

1. 4.8 → 20.2 and 29.8 → 20.1, 29.9 award 2/3 ×✓✓
2. 1.2 → no limits stated → 20.1, 23.7, 26.5, 29.9 award 2/3 ✓×✓
3. 12 → 13 and 37 → no unsuitable values award 1/3 ×✓×
4. no value stated → no limits stated → 20.1, 23.7, 26.5, 29.9 award 0/3 ×××

Question			Generic scheme	Illustrative scheme	Max mark
6.	(b)		**Method 1** •4 Process: calculate mean •5 Process: calculate $(x-\bar{x})^2$ •6 Process/strategy: calculate $\sum(x-\bar{x})^2$ and substitute into formula •7 Process: calculate standard deviation **Method 2** •4 Process: calculate mean •5 Process: calculate $\sum x$ and $\sum x^2$ •6 Strategy: substitute into formula •7 Process: calculate standard deviation	•4 29 •5 36, 121, 1, 1, 9, 121, 81 •6 $\sqrt{\frac{370}{7-1}}$ •7 $\left(\sqrt{61.66\ldots}=\right)7.85\ldots$ •4 29 stated explicitly •5 203, 6257 •6 $\sqrt{\frac{6257-\frac{203^2}{7}}{7-1}}$ •7 $\left(\sqrt{61.66\ldots}=\right)7.85\ldots$	**4**

Notes:

1. 29 and 7.85… with no other working. award 1/4 ✓×××
2. 7.85… with no other working. award 0/4 ××××
3. Answers to intermediate calculations must be rounded or truncated correctly to at least 1 decimal place.
4. For •7, accept 8.
5. For •6, do not penalise a square root sign that does not extend to the denominator, see CORs 1&2.
6. For •7, ignore incorrect rounding subsequent to a correct answer.
7. •7 can only be awarded for a calculation involving at least 2 steps including a division followed by a square root.

Commonly Observed Responses:

1. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \frac{\sqrt{370}}{6} \rightarrow 7.85\ldots$ award 4/4 ✓✓✓✓
2. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \frac{\sqrt{370}}{6} \rightarrow 3.20\ldots$ award 3/4 ✓✓✓×
3. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \sqrt{\frac{370}{6}} \rightarrow \sqrt{7.85\ldots}$ award 3/4 ✓✓✓×
4. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \sqrt{\frac{370}{7}} \rightarrow 7.27\ldots$ award 3/4 ✓✓×✓
5. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \sqrt{\frac{370}{29-1}} \rightarrow 3.63\ldots$ award 3/4 ✓✓×✓
6. $29 \rightarrow 36,\ 121,\ 1,\ 1,\ 9,\ 121,\ 81 \rightarrow \frac{370}{6} \rightarrow 61.66\ldots$ award 2/4 ✓✓××

Question			Generic scheme	Illustrative scheme	Max mark
6.	(c)		•[8] Communication: comment regarding mean •[9] Communication: comment regarding standard deviation	•[8] eg on average more spades were sold •[9] eg the number of hose pipes sold was more varied	**2**

Notes:

For reference: of question 6(b) is correct, the statistics should be:

	mean	**s.d.**
Spades	29	7·85…
Hose pipes	18	13

1. Comments must be consistent with answer to part (b).
2. Comments **must** refer to the context of the question, as well as hose pipes and/or spades.
3. For the award of •[8]:
   Accept eg
   a) On average fewer hose pipes were sold.
   b) On average more spades were sold because the mean was higher.
   c) The average number of sales of hosepipes are lower.
   d) The average number of hosepipes is lower.
   e) Hosepipes have lower average sales.
   f) On average the spades were bought more.
   g) On average the sales of spades was **better**.

   Do not accept eg
   h) The **mean** number of spades sold was higher.
   i) On average spades are higher.
   j) Fewer hose pipes were sold.
   k) On average spades sell more quickly.
   l) Spade sales are higher.

4. For the award of •[9]:
   Accept eg
   a) The number of spades sold was more consistent.
   b) The number of spades was more consistent.
   c) The number of spades was more consistent because the standard deviation is lower.
   d) Spades have less varied sales.
   e) The sales of hosepipes were more spread out.
   f) There is less variation in the sales of spades.
   g) The spread of the sales was higher for hosepipes.
   h) The amount of spades was more consistent.
   i) The data for sales of hosepipes is less consistent.

   Do not accept eg
   j) Spades sold were more consistent
   k) **On average** the number of spades sold was more consistent.
   l) The **numbers** for spades are less varied.
   m) The **standard deviation** for spades is less varied.
   n) Spades are less spread out.
   o) The **data** for hosepipes is less consistent.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
6.	(d)		$\bullet^{10}$ Process: calculate the total price $\bullet^{11}$ Process: calculate the deposit $\bullet^{12}$ Process: calculate cost of 1 monthly instalment	$\bullet^{10}\ (900\times 1.18 =)\ 1062$ $\bullet^{11}\ (1062\div 5 =) 212.4(0)$ $\bullet^{12}((1062-212.40-160)\div 10 = £)68.96$	**3**

Notes:

1. Correct answer without working. award 3/3
2. For $\bullet^{10}$ and $\bullet^{11}$ do not penalise a candidate who omits any trailing zeroes.
3. $\bullet^{11}$ is only available for dividing a **calculated** value for $\bullet^{10}$ by 5.
4. Where a candidate divides their **calculated** total price by <u>both</u> 5 and 10, $\bullet^{11}$ is still available but $\bullet^{12}$ is not available.
5. $\bullet^{11}$ can be implied by a candidate who states $(1062-212.40=)\ 849.6(0)$ or $(1062-212.40-160=)$ 689.6(0).
6. $\bullet^{12}$ can only be awarded for a calculation involving subtracting a calculated deposit, subtracting 160, followed by a division by 10.
7. When the final answer is not a whole number, $\bullet^{12}$ is only available where the final answer is rounded or truncated to 2 decimal places.

Commonly Observed Responses:

1. $1062 \rightarrow (900\div 5=)180 \rightarrow ((1062-180-160)\div 10=)72.20$ award 2/3 ✓×✓
2. $1062 \rightarrow 212.40 \rightarrow ((1062-212.40+160)\div 10=)100.96$ award 2/3 ✓✓×
3. no attempt at $\bullet^{10} \rightarrow (900\div 5=)180 \rightarrow ((900-180-160)\div 10=)56$ award 1/3 ××✓

Question			Generic scheme	Illustrative scheme	Max mark
7.	(a)		$\bullet^1$ Process: calculate one share $\bullet^2$ Process: calculate the total number of club members	$\bullet^1$ $(102 \div 3 =)\, 34$ $\bullet^2$ $(34 \times 8 =)\, 272$ **or** $(34 + 34 \times 4 + 102 =)\, 272$	**2**

Notes:

1. Correct answer without working. award 2/2
2. $\bullet^1$ cannot be awarded if the candidate has also calculated $102 \div 4$ and/or $102 \div 8$ unless only 34 is used in further calculations.
3. When the final answer is not a whole number, $\bullet^2$ is only available where the final answer is rounded or truncated the nearest whole number.
4. $\bullet^2$ may be awarded for $(102 \div 8 =)\, 12.75$ multiplied by 3. See CORs 4&5.
5. Where the candidate attempts COR3 or COR4, $\bullet^2$ is not available if any other CORs are also attempted.

Commonly Observed Responses:

1. $\frac{8}{3} \times 102 \rightarrow 272$ award 2/2 ✓✓
2. $34, 102, 136$ with no other working $\rightarrow 272$ award 2/2 ✓✓
3. $102 \div 4$ in working $\rightarrow (102 \div 4 \times 8 =)\, 204$ award 1/2 ×✓
4. $102 \div 8$ in working $\rightarrow (102 \div 8 \times 3 =)\, 38 \cdot 25$ rounded to 38 award 1/2 ×✓
5. $102 \div 8$ in working $\rightarrow (102 \div 8 \times 3 =)\, 38 \cdot 25$ award 0/2 ××
6. $102 \div 8$ in working $\rightarrow (102 \div 8 \times 4 =)\, 51$ award 0/2 ××
7. $102 \div 8$ in working $\rightarrow (102 \div 8 \times 1 =)\, 12.75$ award 0/2 ××
8. no attempt at mark 1 $\rightarrow (102 \times 8 =)\, 816$ award 0/2 ××
9. 102 with or without working award 0/2 ××

Question			Generic scheme	Illustrative scheme	Max mark
7.	(b)		$\bullet^3$ Process: calculate volume of cone	$\bullet^3$ $\left(\frac{1}{3}\times\pi\times3.5^2\times4=\right)51.31\ldots$	**3**
			$\bullet^4$ Process: calculate volume of sphere	$\bullet^4$ $\left(\frac{4}{3}\times\pi\times3.5^3=\right)179.594\ldots$	
			$\bullet^5$ Process/communication: calculate the total volume **and** state units	$\bullet^5$ 230.91… **cm³**	

Notes:

1. Correct answer without working. award 0/3
2. BE AWARE: 51.31… can also be calculated from an invalid method
   eg $\frac{4}{3}\times\pi\times3.5^2=51.31\ldots$ Do not award $\bullet^3$ for this.
3. $\bullet^3$ and $\bullet^4$ are only available for a calculation involving a fraction, a power and π.
4. $\bullet^3$ and $\bullet^4$ cannot be awarded to a candidate who takes the square root of a correct volume.
5. $\bullet^5$ is only available for an addition involving two calculated values, with units stated.
6. Where a candidate uses a decimal approximation for $\frac{4}{3}$ or $\frac{1}{3}$, this should be correct to at least 2 decimal places.
7. Accept variations in π to at least 2 decimal places.
8. Do not penalise a candidate who rounds or truncates to the nearest whole number or any number of decimal places throughout.

Commonly Observed Responses:

1. use of 3.14 leading to: Cone: $51.28\ldots\rightarrow$ Sphere: $179.50\ldots\rightarrow230.7\ldots$ cm^3 award 3/3 ✓✓✓
2. Cone: $51.31\ldots\rightarrow\left(V=\frac{4}{3}\pi r^2=\right)51.31\ldots\rightarrow102.6\ldots$ cm^3 award 2/3 ✓×✓
3. $h=11$ leading to Cone: $141.10\ldots\rightarrow$ Sphere: $179.594\ldots\rightarrow320.69\ldots$ cm^3 award 2/3 ×✓✓
4. $h=7.5$ leading to Cone: $96.21\ldots\rightarrow$ Sphere: $179.594\ldots\rightarrow275.8\ldots$ cm^3 award 2/3 ×✓✓
5. $h=7$ leading to Cone: $89.7\ldots\rightarrow$ Sphere: $179.594\ldots\rightarrow269.3\ldots$ cm^3 award 2/3 ×✓✓
6. $h=5.5$ leading to Cone: $70.55\ldots\rightarrow$ Sphere: $179.594\ldots\rightarrow250.1\ldots$ cm^3 award 2/3 ×✓✓

Question			Generic scheme	Illustrative scheme	Max mark
7.	(c)		$\bullet^6$ Strategy/communication: substitute into Pythagoras' Theorem	$\bullet^6$ eg $274^2 - 270^2$ **or** $270^2 + x^2 = 274^2$	**4**
			$\bullet^7$ Process: calculate height or height^2	$\bullet^7$ 46.647… **or** 2176	
			$\bullet^8$ Strategy/communication: substitute into Pythagoras' Theorem	$\bullet^8$ $160^2 + (46.647\ldots)^2$	
			$\bullet^9$ Process/communication: calculate distance left to flag	$\bullet^9$ 166.66… (m)	

Notes:

1. Correct answer without working. award 0/4
2. Do not penalise a candidate who truncates or rounds to the nearest whole number throughout.
3. $\bullet^6$ can be implied by $\bullet^7$.
4. If a candidate writes $270^2 - 274^2$ leading to 46.64… ; $\bullet^6$ is not available but $\bullet^7$ can be awarded.
5. $\bullet^7$ is only available for a calculation involving Pythagoras where one length is 274.
6. $\bullet^8$ is only available for $160^2 + (\text{calculated height})^2$ using the calculated height from $\bullet^7$.
7. $\bullet^8$ is not available if there has been no previous attempt at Pythagoras.
8. $\bullet^9$ is only available for a calculation involving Pythagoras where one length is 160.
9. $\bullet^9$ is not available where the candidate attempts any further calculation subsequent to a completed second Pythagoras calculation.

Commonly Observed Responses:

1. $274^2 + 270^2 \rightarrow 384.67\ldots$ **or** $147976 \rightarrow 160^2 + (384.67\ldots)^2 \rightarrow 416.62\ldots$ award 3/4 ×✓✓✓
2. $274^2 - 270^2 \rightarrow 46.647\ldots$ **or** $2176 \rightarrow 160^2 - (46.647\ldots)^2 \rightarrow 153.049\ldots$ award 3/4 ✓✓×✓

Question			Generic scheme	Illustrative scheme	Max mark
7.	(d)		$\bullet^{10}$ Process: calculate the number of boxes along the length and breadth of the container for one arrangement $\bullet^{11}$ Process: calculate the number of boxes along the length and breadth of the container for the other arrangement $\bullet^{12}$ Process/communication: round appropriately, calculate the total number of boxes in each arrangement	$\bullet^{10\&11}$ $(52 \div 12.9 =)4 \cdot \ldots$ $(65 \div 17.2 =)3 \cdot \ldots$ **and** $(52 \div 17.2 =)3 \cdot \ldots$ $(65 \div 12.9 =)5 \cdot \ldots$ $(40 \div 4.3 = 9)$ $\bullet^{12}$ $(4 \times 3 \times 9 =)108$ $(3 \times 5 \times 9 =)135$	**3**

Notes:

1. Correct answer without working. award 0/3
2. Where a candidate only considers volume. award 0/3
3. BE AWARE: 108 and 135 can also be calculated using an invalid method, see COR2. In any such cases, $\bullet^{10}$ or $\bullet^{11}$ are not available.
4. Rounding is not required for $\bullet^{10}$ and $\bullet^{11}$. Where a candidate does not round down to the nearest whole number, this is penalised in $\bullet^{12}$. See COR1.
5. $\bullet^{10}$ and $\bullet^{11}$ can only be awarded for a strategy involving division.
6. $\bullet^{11}$ can only be awarded for one of the specific combinations shown in the illustrative scheme, with the exception of COR2 and COR3.
7. $\bullet^{12}$ cannot be awarded where:
   - the candidate only considers 1 distinct arrangement. See CORs 4&5.
   - the candidate considers more than 2 distinct arrangements.
8. Where $\bullet^{10}$ and/or $\bullet^{11}$ are not awarded, $\bullet^{12}$ is still available for rounding in both arrangements appropriately, and calculating the number of boxes in both arrangements.
9. In $\bullet^{12}$ where a candidate calculates $(4 \times 3 =)12$ and $(3 \times 5 =)15$, it is not necessary to explicitly calculate 108, however 135 must be explicitly stated.

Question	Generic scheme	Illustrative scheme	Max mark
7. (d) (continued)			

Commonly Observed Responses:

1. Rounding up instead of down:

   $(52 \div 12.9 = 4{\cdot}\ldots \rightarrow) 5$

   $(65 \div 17.2 = 3{\cdot}\ldots \rightarrow) 4$

   or → other option correct → $(40 \div 4.3 = 10)$ $(5 \times 4 \times 10 =) 200$ award 2/3 ✓✓×

   $(52 \div 17.2 = 3{\cdot}\ldots \rightarrow) 4$

   $(65 \div 12.9 = 5{\cdot}\ldots \rightarrow) 6$

   $(4 \times 6 \times 10 =) 240$

2. Matching 40 and 12.9 in both arrangements:

   $(52 \div 4.3 =) 12{\cdot}\ldots$

   $(65 \div 17.2 =) 3{\cdot}\ldots$

   or → other option correct → $(40 \div 12.9 = 3)$ $(12 \times 3 \times 3 =) 108$ award 2/3 ×✓✓

   $(52 \div 17.2 =) 3{\cdot}\ldots$

   $(65 \div 4.3 =) 15{\cdot}\ldots$

   $(3 \times 15 \times 3 =) 135$

3. Matching 40 and 17.2 in both arrangements:

   $(52 \div 12.9 =) 4{\cdot}\ldots$

   $(65 \div 4.3 =) 15{\cdot}\ldots$

   or → other option correct → $(40 \div 17.2 = 2)$ $(4 \times 15 \times 2 =) 120$ award 2/3 ×✓✓

   $(52 \div 4.3 =) 12{\cdot}\ldots$

   $(4 \times 15 \times 2 =) 120$

   $(65 \div 12.9 =) 5{\cdot}\ldots$

4. If only $4 \times 3 \times 9 = 108$ is calculated — award 1/3 ✓××

5. If only $3 \times 5 \times 9 = 135$ is calculated — award 1/3 ✓××

[END OF MARKING INSTRUCTIONS]