2025 Applications of Mathematics

National 5 – Paper 1

Question Paper Finalised Marking Instructions

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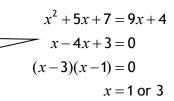
(a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.

(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

This is a transcription error and so the mark is not awarded.

This is no longer a solution of a quadratic equation, so the mark is not awarded.

$$x^2 + 5x + 7 = 9x + 4$$
$$x - 4x + 3 = 0$$
$$x = 1$$

The following example is an exception to the above

This error is not treated as a transcription error, as the candidate deals with the intended quadratic equation. The candidate has been given the benefit of the doubt and all marks awarded.

$$x^2 + 5x + 7 = 9x + 4$$
$$x - 4x + 3 = 0$$
$$(x - 3)(x - 1) = 0$$
$$x = 1 \text{ or } 3$$

(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:

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

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

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

$\dfrac{15}{0\cdot3}$ must be simplified to 50 $\qquad$ $\dfrac{4/5}{3}$ must be simplified to $\dfrac{4}{15}$

$\sqrt{64}$ 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.

Note: Marking from Image (MFI) annotation change from 2025

A double cross-tick is used to indicate correct working which is irrelevant or insufficient to score any marks. In MFI marking instructions prior to 2025 this was shown as $\ddot{u}_2$ or ü2.

From 2025, the double cross-tick will no longer be used in MFI. A cross or omission symbol will be used instead.

Marking Instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			**Method 1** •¹ Process: evidence of common denominator •² Process: add fractions •³ Process: calculate fraction of votes for Alison	•¹ $\dfrac{\ldots}{40}$ or equivalent •² $\left(\dfrac{15}{40} + \dfrac{8}{40} = \right)\dfrac{23}{40}$ •³ $\dfrac{17}{40}$	3
			Method 2 •¹ Process: convert to decimal fractions or percentages •² Process: add decimal fractions or percentages •³ Process: calculate decimal fraction or percentage of votes for Alison	•¹ 0.375, 0.2 or 37.5%, 20% •² 0.575 or 57.5% •³ 0.425 or 42.5%	

Notes:

1. Correct answer without working. $\hspace{4cm}$ award 0/3
2. •² can be implied by •³.
3. The final answer does not need to be in its simplest form.
4. Do not penalise incorrect simplification of final answer.
5. •³ is not available when an improper fraction is calculated for •².

Commonly Observed Responses:

1. $\dfrac{3}{40} + \dfrac{1}{40} = \dfrac{4}{40} \to \dfrac{36}{40}$ $\hspace{3cm}$ award 2/3 ✓✗✓

2. $\dfrac{3}{8} \times \dfrac{1}{5} = \dfrac{3}{40} \to \dfrac{37}{40}$ $\hspace{3cm}$ award 2/3 ✓✗✓

3. $\dfrac{3}{8} \times \dfrac{1}{5} = \dfrac{3}{40}$ $\hspace{4cm}$ award 1/3 ✓✗✗

4. $\dfrac{15}{13} + \dfrac{8}{13} = \dfrac{23}{13} \to$ any final answer $\hspace{1.5cm}$ award 1/3 ✗✓✗

5. $\dfrac{3}{13} + \dfrac{1}{13} = \dfrac{4}{13} \to \dfrac{9}{13}$ $\hspace{3cm}$ award 1/3 ✗✗✓

Question			Generic scheme	Illustrative scheme	Max mark
2.			•¹ Process: calculate the total price for website B	•¹ $(35-10.50=)24.50$	**3**
			•² Process: calculate the total price for website C	•² $(30-7.50+2.80=)25.30$	
			•³ Process/communication: calculate the total price for website A and state conclusion consistent with working	•³ $(21.50+3.49=)24.99$ AND Website B or $(£)24.50$	

Notes:

1. Where a candidate considers only discounts for **both** websites B and C (see COR 3).   award 0/3
2. •³ is only available where a candidate considers all 3 websites.
3. Do not penalise the omission of trailing zeroes.

Commonly Observed Responses:

1. Website B: 24.50 → Website C: 10.30 → 24.99 and Website C   award 2/3 ✓✗✓
2. Website B: 10.50 → Website C: 25.30 → 24.99 and Website B   award 2/3 ✗✓✓
3. Website B: 10.50 → Website C: 10.30 → 24.99 and Website C   award 0/3 ✗✗✗

	Question		Generic scheme	Illustrative scheme	Max mark
3.	(a)		•[1] Strategy/communication: any 4 tasks and times in the correct boxes •[2] Strategy/communication: complete diagram	•[1&2] [diagram with boxes: A 600, D 105, C 1800, H 120, I 180, B 30, F 45, G 240, E 60]	**2**

Notes:
1. If a candidate omits any numbers, all tasks must be correct to be awarded 1/2.
2. If a candidate omits letters, all times must be correct to be awarded 1/2.

Commonly Observed Responses:

	(b)		•[3] Process/communication: state time	•[3] 2700 (seconds)	**1**

Notes:

1. Correct answer without working	award 1/1

Commonly Observed Responses:

1. 45 minutes	award 1/1 ✓
2. 45	award 0/1 ✗

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		$\bullet^1$ Process: determine the median	$\bullet^1$ 26.5	**2**
			$\bullet^2$ Process: find the upper and lower quartiles	$\bullet^2$ $(Q_1 =)23, (Q_3 =)34$	

Notes:

Ordered list: 21, 22, 24, 25, 28, 32, 36, 37.

1. The answers for (a) can be inferred from the boxplot if **not stated**.
2. If the numbers are unordered, only $\bullet^2$ is available, see COR 2.
3. If **one** number is missed from or added to an **unordered** list, $\bullet^1$ and $\bullet^2$ are not available.
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 candidate's list.
5. If **more than one** number is missed from or added to an **ordered** list, $\bullet^1$ and $\bullet^2$ are not available.

Commonly Observed Responses:

1.
  21 22 24 25 28 32 36 37
      23   26.5   34   award 2/2 ✓✓

2. From unordered list: median = 28.5 and quartiles of 29 and 32.   award 1/2 ✗✓

	(b)		$\bullet^3$ Communication: mark end points correctly	$\bullet^3$ end points at 21 and 37	**2**
			$\bullet^4$ Communication: mark Q_1, Q_2, Q_3 and draw box plot	$\bullet^4$ box showing Q_1, Q_2, Q_3	

Notes:

1. The answers for (a) can be inferred from the boxplot if not stated.
2. If the candidate constructs a dot plot.   award 0/2
3. $\bullet^4$ is not available for candidates who only mark the five figure summary using dots or crosses.
4. $\bullet^4$ cannot be awarded if more than 5 values are marked.
5. $\bullet^{3\&4}$ are still available when the calculated value of Q_2 does not lie between the calculated values of Q_1 and Q_3.

Commonly Observed Responses:

	(c)		$\bullet^5$ Process: calculate interquartile range	$\bullet^5$ $(34-23 =)11$	**1**

Notes:

1. $\bullet^5$ must be consistent with quartiles from $\bullet^2$.

Commonly Observed Responses:

1. IQR = 11, SIQR = 5.5   award 1/1 ✓
2. $11 \rightarrow 5.5$ award 0/1 ✗

	Question		Generic scheme	Illustrative scheme	Max mark
4.	(d)		$\bullet^6$ Communication: comment regarding consistency	$\bullet^6$ eg The number of minutes Lewis took to drive to work was more consistent	1

Notes:

1. Answer must be consistent with answer to (c).
2. Comments **must** refer to the context as well as Lewis and/or Harris.
3. For award of $\bullet^6$

   Accept eg
   a) Lewis's times were more consistent.
   b) The journey times for Lewis are less varied.
   c) Harris's journey times are more spread out.
   d) Harris's times are more varied.
   e) Lewis's **drive** was more consistent.
   f) Lewis's minutes were more consistent.
   g) Harris's IQR was higher, so his number of minutes was less consistent.
   h) The data for Harris's times is more varied.

   Do not accept eg
   i) **"On average"** contained in any statement.
   j) The **range** of Lewis's journey times is more consistent.
   k) Harris's **interquartile range** is more varied.
   l) Lewis's **driving** was more consistent.
   m) Harris's IQR was higher.
   n) Harris's data is more varied.

Commonly Observed Responses:

	(e)		$\bullet^7$ Communication: 4 points plotted correctly	$\bullet^7$ evidence	2
			$\bullet^8$ Communication: remaining 4 points plotted correctly	$\bullet^8$ evidence	

Notes:

Depart	7:32	7:36	7:40	7:45	7:50	8:02	8:04	8:10
Journey	22	21	25	24	28	32	36	37

1. If a candidate constructs a line graph, $\bullet^7$ and $\bullet^8$ are still available.
2. If a candidate constructs a bar graph award 0/2.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
4.	(f)		•^{9} Strategy: draw consistent line of best fit	•^{9} evidence	**1**

Notes:

1. The line of best fit must be straight and have a positive gradient.
2. •^{9} is not available if the line of best fit goes through the origin.
3. •^{9} is not available if there are no points below the line of best fit.
4. •^{9} is not available if there are no points above the line of best fit.
5. •^{9} is not available if a line graph or bar graph are plotted.
6. The line of best fit should be drawn so that it extends across the full range of plotted data.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
	(g)		•^{10} Strategy/communication: calculate journey time at 7:55am consistent with line of best fit	•^{10} answer consistent with line of best fit	**1**

Notes:

1. When the time falls between 2 divisions, accept either number or any value in between.
2. •^{10} is still available for a candidate who draws a line graph for •^{9}.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
5.			**Method 1** $\bullet^1$ Process: calculate maths score as a percentage $\bullet^2$ Communication: state conclusion	$\bullet^1 \left(\dfrac{32}{40} \times 100 = \right)80$ $\bullet^2$ maths	**2**
			Method 2 $\bullet^1$ Process: calculate 78% of 40 $\bullet^2$ Communication: state conclusion	$\bullet^1 \left(0.78 \times 40 = \right)31.2$ $\bullet^2$ maths	
			Method 3 $\bullet^1$ Process: calculate both scores as a decimal fraction or a fraction with common denominator $\bullet^2$ Communication: state conclusion	$\bullet^1$ 0.78 and 0.8 or $\dfrac{7.8}{10}$ and $\dfrac{8}{10}$ or equivalent $\bullet^2$ maths	

Notes:

1. If $\bullet^1$ is not awarded, $\bullet^2$ is only available where there is evidence of where $\bullet^1$ came from.

2. $\bullet^1$ and $\bullet^2$ are available to candidates who compare 22% and $\dfrac{8}{40}$.

Commonly Observed Responses:

1. 80%, maths with no working   award 2/2 ✓✓

Question			Generic scheme	Illustrative scheme	Max mark
6.			$\bullet^1$ Process: calculate commission	$\bullet^1$ $\left(3\% \text{ of } \left(96\,000 - 58\,000\right) =\right)1140$	**2**
			$\bullet^2$ Process: calculate gross wage	$\bullet^2$ $\left(1870 + 1140 =\right)\left(£\right)3010$	

Notes:

1. Correct answer without working   award 2/2
2. $\bullet^2$ is only available for adding 1870 to a previously calculated commission.
3. Where the final answer is not a whole number $\bullet^2$ is only available where final answer is rounded or truncated to 2 decimal places.

Commonly Observed Responses:

1. $\left(3\% \text{ of } 96\,000 =\right)2880 \rightarrow 4750$ award 1/2 ✗✓

2. $\left(3\% \text{ of } 58\,000 =\right)1740 \rightarrow 3610$ award 1/2 ✗✓

3. $\left(3\% \text{ of } 1870 =\right)56 \cdot 1 \rightarrow 1926 \cdot 10$ award 1/2 ✗✓

	Question		Generic scheme	Illustrative scheme	Max mark
7.	(a)		$\bullet^1$ Process: calculate area of semicircle	$\bullet^1$ $\left(\dfrac{1}{2} \times 3.14 \times 10^2 = \right) 157$	**2**
			$\bullet^2$ Process: calculate total area	$\bullet^2$ $(240 + 157 =) 397$ (m^2)	

Notes:

1. Correct answer without working. award 0/2
2. $\bullet^{1\&2}$ are not available when candidate does not use πr^2, with the exception of COR 1.
3. $\bullet^2$ is only available for adding 240 onto a previously calculated area.

Commonly Observed Responses:

1. $15.7 + 240 = 255.7$ award 1/2 ✗✓
2. $314 + 240 = 554$ award 1/2 ✗✓

	Question		Generic scheme	Illustrative scheme	Max mark
	(b)		$\bullet^3$ Process: calculate number of bags	$\bullet^3$ $(81 \div 5 = 16.2 \rightarrow) 17$	**2**
			$\bullet^4$ Process: calculate total cost	$\bullet^4$ $(17 \times 8 =) 136$	

Notes:

1. Correct answer without working. award 0/2
2. $\bullet^3$ is available for an incomplete calculation eg $81 \div 5 = 16$ or $16... \rightarrow 17$.
3. $\bullet^4$ is only available for multiplying a calculated value by 8.
4. Where 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. Ignore errors in division calculations after the decimal point or in remainder.

Commonly Observed Responses:

1. $81 \div 5 = 17 \rightarrow 17 \times 8 = 136$ award 2/2 ✓✓
2. $81 \div 5 = 16 \rightarrow 16 \times 8 = 128$ award 1/2 ✗✓
3. $16.2 \times 8 = 129.60$ award 1/2 ✗✓
4. $81 \times 8 = 648$ award 0/2 ✗✗

Question			Generic scheme	Illustrative scheme	Max mark
8.	(a)		$\bullet^1$ Strategy/process: know to find total number of combinations	$\bullet^1$ evidence of 40	**3**
			$\bullet^2$ Process: find the number of combinations where spinner B is greater than spinner A	$\bullet^2$ 10 or evidence of 10	
			$\bullet^3$ Communication: state probability of winning	$\bullet^3$ $\dfrac{10}{40}$ or $\dfrac{1}{4}$ or 25% or 0.25	

Notes:

1. The combinations need not be listed for the award of $\bullet^1$ and $\bullet^2$.
2. $\bullet^2$ is still available when the number of winning combinations is consistent with the candidates answer to $\bullet^1$ eg if a row is missed from the table.
3. Where the answer is incorrect, $\bullet^3$ can only be awarded if the numerator **and** denominator are consistent with the combinations indicated.
4. The final answer **does not** need to be in its simplest form.
5. $\bullet^3$ is not available where a candidate gives their answer as both a fraction and a ratio, see COR3.
6. For $\bullet^3$
   a) Accept
      - 10 out of 40
      - 10 in 40
   b) Do not accept
      - 10:40
      - 10 to 40
      - 10 – 40

Commonly Observed Responses:

1. $\dfrac{10}{40}$ with no other working — award 3/3 ✓✓✓

2. $\dfrac{1}{4}$ or 25% or 0.25 with no other working — award 0/3 ✗✗✗

3. $\dfrac{10}{40} \rightarrow 10:40$ — award 2/3 ✓✓✗

4. $\dfrac{25}{40}$ with appropriate working — award 2/3 ✓✗✓

5. $\dfrac{15}{40}$ with appropriate working — award 2/3 ✓✗✓

6. $\dfrac{30}{40}$ with appropriate working — award 2/3 ✓✗✓

	Question		Generic scheme	Illustrative scheme	Max mark
8.	(b)		**Method 1** $\bullet^4$ Process: calculate expected frequency of winning $\bullet^5$ Process: calculate total expected winnings $\bullet^6$ Communication: conclusion consistent with working	$\bullet^4$ $(0.15 \times 80 =)12$ $\bullet^5$ $(12 \times 5 = \pounds)60$ $\bullet^6$ more	**3**
			Method 2 $\bullet^4$ Process: calculate number of wins $\bullet^5$ Process: calculate probability as a decimal $\bullet^6$ Communication: conclusion consistent with working	$\bullet^4$ $(70 \div 5 =)14$ $\bullet^5$ 0.175 $\bullet^6$ more	
			Method 3 $\bullet^4$ Process: calculate number of wins $\bullet^5$ Process: calculate expected frequency of winning $\bullet^6$ Communication: conclusion consistent with working	$\bullet^4$ $(70 \div 5 =)14$ $\bullet^5$ $(0.15 \times 80 =)12$ $\bullet^6$ more	

Notes:

1. Where $\bullet^5$ is not attempted, $\bullet^6$ is unavailable.

Commonly Observed Responses:

1. "more" without working   award 0/3 ✗✗✗

Question			Generic scheme	Illustrative scheme	Max mark
9.			$\bullet^1$ Process: calculate the number of animals per share	$\bullet^1$ $(180 \div 5 =) 36$	**2**
			$\bullet^2$ Process: calculate the total number of animals	$\bullet^2$ $(36 \times 20 =) 720$	

Notes:

1. Correct answer without working. award 0/2

Commonly Observed Responses:

1. $\dfrac{20}{5} \times 180 = 720$ award 2/2 ✓✓

2. $324, 252, 144 \rightarrow 720,$ with no other working award 2/2 ✓✓

3. $45 \times 20 = 900$ award 1/2 ✗✓

4. $20 \times 20 = 400$ award 1/2 ✗✓

5. $60 \times 20 = 1200$ award 1/2 ✗✓

6. $90 \times 20 = 1800$ award 1/2 ✗✓

7. $20 \rightarrow 80 + 140 + (180 + 80) = 480$ award 1/2 ✗✓

8. $45 \rightarrow 180 + 315 + (180 + 180) = 855$ award 1/2 ✗✓

9. $(20 \times 20) + 180 \rightarrow 580$ award 0/2 ✗✗

[END OF MARKING INSTRUCTIONS]