National Qualifications

X844/75/02 Applications of Mathematics Paper 2

Marking Instructions

Please note that these marking instructions have not been standardised based on candidate responses. You may therefore need to agree within your centre how to consistently mark an item if a candidate response is not covered by the marking instructions.

General marking principles for National 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.

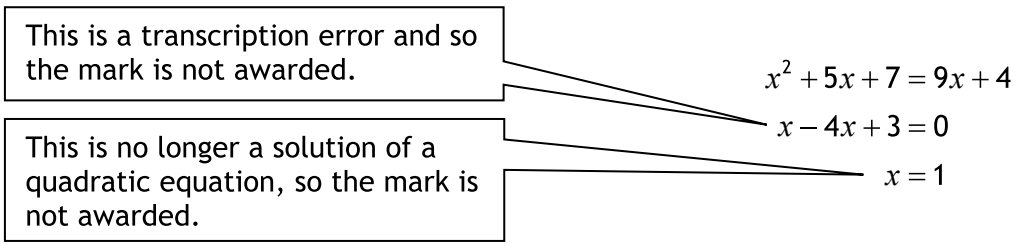
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

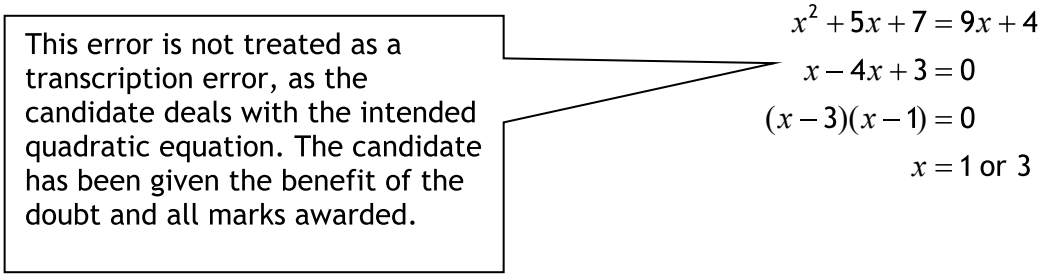
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

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

(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 $\frac{\frac{4}{5}}{3}$ must be simplified to $\frac{4}{15}$

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

*The square root of perfect squares up to and including 100 must be known.

(k) 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

(l) 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.

(m) 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.

(n) 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.

(o) 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.

Detailed marking instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			•[1] Strategy: know how to find percentage increase •[2] Strategy: know how to find percentage increase •[3] Process: calculate money in savings account after 3 years •[4] Process/communication: calculate money in ISA and state conclusion	•[1] 1·025 •[2] $\ldots^3$ •[3] 3230·67 •[4] $1080\times3=3240>3230\cdot67$ so stocks and shares ISA	**4**
2.	(a)		•[1] Strategy: correct substitution in Pythagoras' Theorem •[2] Process: calculate length of hypotenuse •[3] Strategy: know how to calculate number of rolls •[4] Process/Communication: correctly rounded answer •[5] Process: calculate cost	•[1] eg 4^2+2^2 •[2] 4·472… •[3] $\left(6+4\cdot472\ldots\right)\div2$ •[4] 5·236… = 6 sections •[5] $6\times21\cdot40=128\cdot40$	**5**
	(b)		•[6] Strategy: evidence of calculating the area of the rectangle and subtract area of missing triangle •[7] Process: calculate area of grass and state units **Alternative Strategy 1:** •[6] Strategy: evidence of calculating the area of the rectangles and adding area of triangle •[7] Process: calculate area of grass and state units	•[6] $\left(10\times4\right)-\left(0\cdot5\times4\times2\right)$ •[7] $40-4=36\,\text{m}^2$ •[6] $\left(6\times4\right)+\left(4\times2\right)+\left(0\cdot5\times4\times2\right)$ •[7] $24+8+4=36\,\text{m}^2$	**2**

Question			Generic scheme	Illustrative scheme	Max mark
3.			•[1] Process: calculate remaining Canadian dollars •[2] Strategy: know to convert to pounds sterling then to US dollars •[3] Process: calculate number of US dollars	•[1] $900\times1\cdot75-945=630$ •[2] evidence •[3] $630\div1\cdot75=360$ $360\times1\cdot31=471\cdot60$	**3**
4.	(a)		•[1] Process: calculate area of quarter circle •[2] Process: calculate area of one rectangle •[3] Process: calculate total area •[4] Process: calculate volume •[5] Communication: convert to litres	•[1] $\frac{1}{4}\times\pi\times1\cdot4^2=1\cdot539\ldots$ •[2] $1\cdot5\times15=22\cdot5$ or $4\cdot5\times10=45$ •[3] $62\cdot289\ldots$ •[4] $62\cdot289\ldots\times0\cdot05=3\cdot114\ldots$ •[5] $3114\cdot4\ldots$	**5**
	(b)		•[6] Process: calculate the cost of Brand A •[7] Process: calculate the cost of Brand C •[8] Process/communication: calculate cost of Brand B and state cheapest	•[6] $6300\div100=63$ bags $31\times11\cdot99+6\cdot99=378\cdot68$ •[7] $6300\div70=90$ bags $60\times4\cdot79=287\cdot40$ •[8] $6300\div90=70$ bags $70\times5\cdot99=419\cdot30$ Brand C is cheapest	**3**
5.	(a)		•[1] Process: calculate first rate national insurance •[2] Process: calculate second rate national insurance •[3] Process: calculate annual national insurance contributions	•[1] $0\cdot12\times(50\,000-8632)=4964\cdot16$ •[2] $0\cdot02\times(54\,890-50\,000)=97\cdot80$ •[3] $4964\cdot16+97\cdot80=5061\cdot96$	**3**
	(b)		•[4] Process: calculate pension contribution •[5] Process: calculate weekly net salary	•[4] $0\cdot087\times54\,890=4775\cdot43$ •[5] $54\,890-(5061\cdot96+4775\cdot43+8204\cdot37)$ $=36\,848\cdot24\div52=708\cdot62$	**2**

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		•[1] Process: calculate time in hours •[2] Process/communication: calculate the time of arrival	•[1] 0·55 •[2] 08:12 + 33 mins = 08:45	**2**
	(b)		•[3] Strategy/process: convert litres to gallons •[4] Strategy/process: •[5] Strategy/process: convert km to miles •[6] Communication: state conclusion consistent with working	•[3] $5 \div 4{\cdot}545 = 1{\cdot}1\ldots$ •[4] $1{\cdot}1\ldots \times 67 = 73{\cdot}7\ldots$ •[5] $73{\cdot}7 \div 1{\cdot}609 = 45{\cdot}8\ldots$ •[6] No, since $45{\cdot}8 < 52$	**4**
7.	(a)		•[1] Strategy: substitute into cylinder formula •[2] Process: calculate volume of juice required •[3] Strategy: know to convert units •[4] Process/communication: calculate number of bottles required	•[1] $V = \pi \times 3{\cdot}5^2 \times 9$ •[2] $346{\cdot}36\ldots \times 26 = 9005{\cdot}375\ldots$ •[3] 9·005… litres or 1750 ml •[4] 5·14…. leading to 6 bottles	**4**
	(b)	(i)	•[5] Process: find area of both pizzas	•[5] 78·53… and 113·09…	**1**
		(ii)	•[6] Strategy: know to divide costs by areas •[7] Process: find price per square inch of first pizza •[8] Process/communication: find price per square inch of second pizza and state conclusion	•[6] Evidence •[7] $4 \div 78{\cdot}5\ldots = 0{\cdot}0509\ldots$ •[8] $5{\cdot}30 \div 113{\cdot}09\ldots = 0{\cdot}0468\ldots$ 12 inch is better value	**3**
	(c)		•[9] Strategy: know how to work out total •[10] Process: calculate the total cost	•[9] Evidence of $2 \times 5{\cdot}20 \times 13$ •[10] 135·20	**2**

<table>
<tr><th colspan="3">Question</th><th>Generic scheme</th><th>Illustrative scheme</th><th>Max mark</th></tr>
<tr><td>8.</td><td>(a)</td><td></td><td>•1 Strategy: know how to calculate minimum price

•2 Process: calculations completed with appropriate rounding</td><td>•1 Evidence

•2 $(38\cdot20+20)\div(24\times10)=0\cdot2425$ leading to $0\cdot25$</td><td>2</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>•3 Process: calculate scale distances

•4 Process/communication: correct bearing measured and correct length drawn

•5 Process/communication: correct bearing measured and correct length drawn</td><td>•3 $140\div40=3{\cdot}5\text{cm}$
$252\div40=6{\cdot}3\text{cm}$

•4 Bearing of $055^\circ(\pm1^\circ)$ measured correctly and $3{\cdot}5$ cm(±0·1 cm) correctly drawn

•5 Bearing of $170^\circ(\pm1)$ measured correctly and $6{\cdot}3$ cm(±0·1 cm) correctly drawn</td><td>3</td></tr>
<tr><td>8.</td><td>(b)</td><td>(ii)</td><td>•6 Process: bearing consistent with diagram

•7 Process: distance consistent with diagram</td><td>•6 evidence

•7 evidence</td><td>2</td></tr>
<tr><td></td><td>(c)</td><td></td><td>•8 Process/communication: calculate lucky dip probability

•9 Strategy/process: find all combinations for two dice

•10 Process: find the number of combinations 9 or more

•11 Process/communication: calculate probability and compare</td><td>•8 $\frac{30}{150}$ (or $0\cdot2$)

•9 Evidence of 36 combinations
<table><tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></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><tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr><tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr></table>•10 10

•11 $\frac{10}{36}$ (or $0\cdot278$)
since $0\cdot2<0\cdot278$ dice game has a better chance</td><td>4</td></tr>
</table>

Question			Generic scheme	Illustrative scheme	Max mark
9.	(a)	(i)	•[1] Process: calculate the mean	•[1] $(39+39+42+41+43+36)\div 6=40$	**1**
		(ii)	•[2] Process: calculate $\left(x-\bar{x}\right)^2$ •[3] Strategy: substitute into formula •[4] Process: calculate standard deviation	•[2] 1, 1, 9, 4, 1, 16 •[3] $\sqrt{32\div 5}$ •[4] 2·529…	**3**
	(b)		•[5] Communication: comment regarding mean •[6] Communication: comment regarding standard deviation	•[5] for example On average, the number of sweets in each packet didn't change with the new machine. •[6] for example The new machine produces packets with a more consistent number of sweets in each packet.	**2**
	(c)		•[7] Strategy: consider three options •[8] Process: find number of boxes for one option •[9] Process/communication: find at least one other option and state maximum	•[7] Evidence •[8] 750 or 875 or 945 •[9] 945	**3**
	(d)		•[10] Strategy: identify that purple will run out first •[11] Process: calculate number of packets	•[10] Evidence •[11] $27500\div 8=3437\cdot 5$ so 3437 packets	**2**

[END OF MARKING INSTRUCTIONS]