2018 Applications of Mathematics

National 5 - Paper 2

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 x 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:

$$
\begin{array}{ccc}
 & \bullet^5 & \bullet^6 \\
\bullet^5 & x = 2 & x = -4 \\
\bullet^6 & y = 5 & y = -7
\end{array}
$$

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

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

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

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

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

Detailed marking instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.	(a)		•¹ Strategy: identify multiplier	•¹ 0·87	4
			•² Strategy: identify power	•² …³	
			•³ Process: calculate value	•³ 921·90(42)	
			•⁴ Communication: round to 2 significant figures	•⁴ 920	

Notes:
1. Correct answer with no working award 4/4
2. Candidates using repeated subtraction must work to a minimum of 3 significant figures, rounded or truncated to gain •³
3. •³ is available for calculations of depreciation if at least 2 years have been considered

Commonly Observed Responses:
1. $1400 - (1400 \times 0·87^3) = 478·0958$ leading to an answer of 480   award 3/4 ✓✓ ✗ ✓
2. $1400 \times 1·13^3 = 2020·06$ leading to an answer of 2000   award 3/4 ✗ ✓ ✓ ✓
3. $1400 \div 1·13^3 = 970·27$ leading to an answer of 970   award 2/4 ✗ ✓ ✗ ✓
4. $1400 - (182 \times 3) = 854$ leading to an answer of 850   award 2/4 ✗ ✗ ✓ ✓
5. $1400 \times 0·87 \times 3 = 3654$ leading to an answer of 3700   award 2/4 ✓ ✗ ✗ ✓
6. $1400 \times 0·87 = 1218$ leading to an answer of 1200   award 2/4 ✓ ✗ ✗ ✓

	(b)		•⁵ Strategy: know how to calculate percentage loss	•⁵ $\dfrac{450}{1400} \times 100$	2
			•⁶ Process: calculate percentage	•⁶ 32(·1…)	
			Alternative Strategy		2
			•⁵ Strategy: know to use trial and improvement	•⁵ evidence	
			•⁶ Process: calculate percentage	•⁶ 32	

Notes:
1. Correct answer with no working award 1/2
2. For $1400 - 950 = 450 = 450$ followed by 32% with no additional working award 1/2
3. Where •⁵ is not awarded •⁶ can be awarded for a calculation of the form $\dfrac{a}{b} \times c$ where a, b and c are a **calculated** loss, 1400, 950 or 100
4. For the alternative strategy, •⁶ can only be awarded for **showing** that the percentage is closer to 32 than 33

Commonly Observed Responses:
1. $\dfrac{950}{1400} \times 100 = 67·857$ award 1/2 ✗ ✓
2. $\dfrac{450}{950} \times 100 = 47·368$ award 1/2 ✗ ✓

Question			Generic scheme	Illustrative scheme	Max mark
2.	(a)		•^{1} Communication: state median	•^{1} $Q_2 = 19$	**2**
			•^{2} Communication: state upper and lower quartiles	•^{2} $Q_1 = 11$ and $Q_3 = 24$	

Notes:
1. If the numbers are unordered •^{2} is still available
2. If one number is missed from an ordered list •^{2} is still available
3. If the answers for part (a) appear in part (b) •^{1} and •^{2} can be awarded

Commonly Observed Responses:

	(b)		•^{3} Communication: correct end points	•^{3} end points at 5 and 34	**2**
			•^{4} Communication: correct box	•^{4} box showing Q_1, Q_2, Q_3	

Notes:
1. If the answers for part (a) appear in part (b) •^{1} and •^{2} can be awarded

Commonly Observed Responses:

3.			•^{1} Strategy: select correct two packages	•^{1} select only B and D	**3**
			•^{2} Process: calculate total cost of one package	•^{2} eg package B $(8{\cdot}95 + 20{\cdot}99) \times 12 + 59{\cdot}99 = 419{\cdot}27$	
			•^{3} Process/communication: calculate total cost of remaining package(s) and state cheapest package	•^{3} eg package D $(7{\cdot}99 + 18{\cdot}99) \times 12 + 109{\cdot}99 = 433{\cdot}75$ **and** package B	

Notes:
1. For candidates who do not add the initial fee leading to costs of Package B-359·28 and Package D-323·76 and conclusion Package D is cheaper award 3/3
2. Where candidates consider more than 2 packages •^{3} is only available where the costs of **all considered** packages are calculated
3. Where •^{2} is lost for an incorrect process, •^{3} can be awarded for repeated incorrect process

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		•¹ Strategy: know how to calculate time	$\bullet^1$ $\dfrac{144}{360} \times 105$	**2**
			•² Process: calculate time in minutes	$\bullet^2$ 42	
			Alternative Strategy		**2**
			•¹ Strategy: know how to calculate time	$\bullet^1$ $105 \div (360 \div 144)$	
			•² Process: calculate time in minutes	$\bullet^2$ 42	

Notes:

1. In the original strategy, where $\bullet^1$ is not awarded, $\bullet^2$ can be awarded for any calculation of the form $\dfrac{a}{b} \times c$ where a, b and c are an angle from the pie chart, 360 and either 105 or 60

2. Rounding or truncation within working must be to at least 3 significant figures

Commonly Observed Responses:

1. $\dfrac{105}{360} = 0\cdot291 \rightarrow 0\cdot291 \times 144 = 41\cdot904$ award 2/2 ✓ ✓

2. $\dfrac{105}{360} = 0\cdot29 \rightarrow 0\cdot29 \times 144 = 41\cdot76$ award 1/2 ✓ ✗

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		•³ Process: convert time from minutes to hours	$\bullet^3$ $\dfrac{21}{60} (= 0\cdot35)$	**2**
			•⁴ Process: calculate distance	$\bullet^4$ $6\cdot6 \times 0\cdot35 = 2\cdot31$	

Notes:

Commonly Observed Responses:

1. $21 \times 6\cdot6 = 138\cdot6$ award 1/2 ✗ ✓
2. $21 \times 60 \times 6\cdot6 = 8316$ award 1/2 ✗ ✓

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ Strategy: know to use inverse proportion	$\bullet^1$ Evidence	**3**
			$\bullet^2$ Process: calculate feed for one sheep	$\bullet^2$ $350 \times 18 = 6300$	
			$\bullet^3$ Strategy/process: calculate the number of days	$\bullet^3$ $6300 \div 450 = 14$	

Notes:
1. Correct answer with no working   award 3/3
2. For an answer of eg "the food lasts 4 days less" award $\bullet^3$
3. If the candidate subtracts 18 to find the number of days, $\bullet^3$ is not available

Commonly Observed Responses:
1. $350 \times 18 \div 100 = 63$ award 2/3 ✓ ✓ ✗
2. $18 \div 350 \times 450 = 23 \cdot 14...$ award 2/3 ✗ ✓ ✓
3. $450 \div (350 \div 18) = 23 \cdot 14...$ award 2/3 ✗ ✓ ✓
4. $18 \div 350 \times 100 = 5 \cdot 14...$ award 1/3 ✗ ✓ ✗
5. $350 \div 18 \times 450 = 8750$ award 1/3 ✗ ✗ ✓
6. $350 \div 18 \times 100 = 1944 \cdot 44...$ award 0/3 ✗ ✗ ✗

	(b)		$\bullet^4$ Strategy/process: substitute into the cylinder formula	$\bullet^4$ $V = \pi \times 1 \cdot 9^2 \times 9 \cdot 7$	**2**
			$\bullet^5$ Process: calculate volume	$\bullet^5$ $110 \cdot 009...\text{m}^3$	

Notes:
1. Correct units must be stated for $\bullet^5$ to be awarded
2. Accept legitimate variations of π
3. For the final answer accept any legitimate rounding or truncation to at least 2 significant figures
4. $\bullet^5$ is only available for a calculation involving π, a power and at least one other number
5. If candidate uses $V = \frac{1}{3}\pi r^2 h$ or $V = \frac{4}{3}\pi r^3$ approximations for the fractions must be given to at least 3 decimal places for $\bullet^5$ to be available

Commonly Observed Responses:
1. $\pi \times 3 \cdot 8^2 \times 9 \cdot 7 = 440 \cdot 03...\text{m}^3$ award 1/2 ✗ ✓
2. $\pi \times 3 \cdot 8 \times 9 \cdot 7 = 115 \cdot 79...\text{m}^3$ award 0/2 ✗ ✗
3. $\pi \times 1 \cdot 9 \times 9 \cdot 7 = 57 \cdot 89...\text{m}^3$ award 0/2 ✗ ✗

Question			Generic scheme	Illustrative scheme	Max mark
6.			•¹ Strategy/process: calculate the value of one share	•¹ $154 \div 7 = 22$	**2**
			•² Strategy/process: calculate total amount paid	•² 330	

Notes:
1. For commonly observed responses illustrated below, 10·26 or 10·27 multiplied by 7,3 or 5 can be awarded •²
2. •¹ cannot be awarded if the candidate has also calculated $154 \div 5$ and/or $154 \div 3$ and/or $154 \div 15$

Commonly Observed Responses:
1. $154 \div 15 \times 7 = 71\cdot866...$ award 1/2 ✗ ✓
2. $154 \div 15 \times 3 = 30\cdot80$ award 1/2 ✗ ✓
3. $154 \div 15 \times 5 = 51\cdot333...$ award 1/2 ✗ ✓

Question			Generic scheme	Illustrative scheme	Max mark
7.			•¹ Strategy/process: convert km to miles	•¹ $650 \div 1 \cdot 609 = 403 \cdot 977\ldots$	**4**
			•² Strategy/process: convert litres to gallons	•² $50 \div 4 \cdot 545 = 11$	
			•³ Strategy/process: calculate total distance possible on a full tank in miles	•³ $47 \times 11 = 517$	
			•⁴ Communication: conclusion based on working	•⁴ Yes (since $404 < 517$)	
			Alternative strategy 1 •¹ Strategy/process: convert litres to gallons	•¹ $50 \div 4 \cdot 545 = 11$	**4**
			•² Strategy/process: calculate total distance possible on a full tank in miles	•² $47 \times 11 = 517$	
			•³ Strategy/process: convert miles to km	•³ $517 \times 1 \cdot 609 = 831 \cdot 853$	
			•⁴ Communication: conclusion based on working	•⁴ Yes (since $650 < 832$)	
			Alternative Strategy 2 •¹ Strategy/process: convert km to miles	•¹ $650 \div 1 \cdot 609 = 403 \cdot 977\ldots$	**4**
			•² Strategy/process: calculate number of gallons required	•² $403 \cdot 977\ldots \div 47 = 8 \cdot 595\ldots$	
			•³ Strategy/process: convert gallons to litres	•³ $8 \cdot 595\ldots \times 4 \cdot 545 = 39 \cdot 065\ldots$	
			•⁴ Communication: conclusion based on working	•⁴ Yes (since $39 < 50$)	
			Alternative Strategy 3 •¹ Strategy/process: convert km to miles	•¹ $650 \div 1 \cdot 609 = 403 \cdot 977\ldots$	**4**
			•² Strategy/process: calculate number of gallons required	•² $403 \cdot 977\ldots \div 47 = 8 \cdot 595\ldots$	
			•³ Strategy/process: convert litres to gallons	•³ $50 \div 4 \cdot 545 = 11$	
			•⁴ Communication: conclusion based on working	•⁴ Yes (since $8 \cdot 595 < 11$)	

Question			Generic scheme	Illustrative scheme	Max mark
7.			Alternative Strategy 4 •^{1} Strategy/process: convert miles per gallon to km per gallon •^{2} Strategy/process: convert litres to gallons •^{3} Strategy/process: calculate total distance possible on a full tank in km •^{4} Communication: conclusion based on working	•^{1} $47 \times 1 \cdot 609 = 75 \cdot 623\ldots$ •^{2} $50 \div 4 \cdot 545 = 11$ •^{3} $11 \times 75 \cdot 623 = 831 \cdot 853$ •^{4} Yes (since $650 < 831 \cdot 853$)	**4**
Notes:					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
8.	(a)		$\bullet^1$ Strategy: know to pick cheapest prices and add cost of frame	$\bullet^1$ evidence	**2**
			$\bullet^2$ Process: find total cost	$\bullet^2$ 2960·39	

Notes:
   1. Where candidate calculates the price for buying all the parts from the same shop, all 5 shops must be calculated correctly and the cost of the frame added to the cheapest
      (Bikes to Go -350·78, Bikevelo -370·34, Velo cycles -405·20, Cycle trax - 410·64
      EP - 350·05 leading to 2991·00)   award 1/2

Commonly Observed Responses:
   1. 319·44 (no frame)   award 1/2 ✗ ✓
   2. 2865·91 (1 wheel and 1 tyre)   award 1/2 ✓ ✗

	(b)		$\bullet^3$ Strategy: know how to calculate finance package	$\bullet^3$ Evidence of attempt to find deposit **and** attempt to find total finance package	**4**
			$\bullet^4$ Process: calculate deposit	$\bullet^4$ 15% of 2991 = 448·65	
			$\bullet^5$ Process: find total finance package	$\bullet^5$ 448·65 + 36 × 76·50 = 3202·65	
			$\bullet^6$ Communication: state extra cost	$\bullet^6$ 3202·65 − 2960·39 = 242·26	

Notes:
   1. If candidate finds 15% of answer to (a), instead of 15% of £2991 then a maximum of 3/4 is available
      eg 36 × 76·50 + 15% of 2960·39 = 3198·06
            3198·06 − 2991 = 207·06

Commonly Observed Responses:
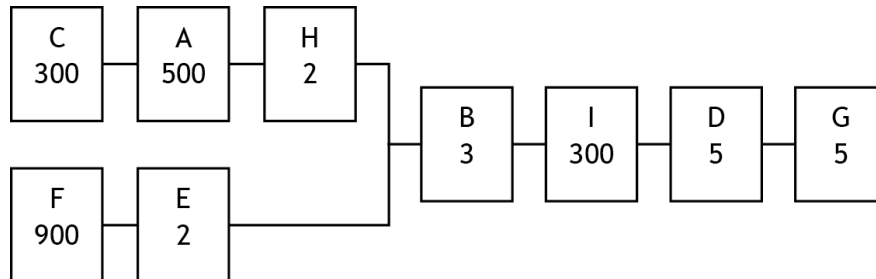
Question			Generic scheme	Illustrative scheme	Max mark
8.	(c)	(i)	•^{7} Process: calculate mean	•^{7} $(61 \cdot 2 + 58 \cdot 3 + 59 \cdot 1 + 58 \cdot 8 + 60 \cdot 4$ $+ 59 \cdot 8) \div 6 = 59 \cdot 6$	**1**

Notes:

Commonly Observed Responses:

		(ii)	•^{8} Process: calculate $\left(x - \bar{x}\right)^2$	•^{8} $2 \cdot 56,\ 1 \cdot 69,\ 0 \cdot 25,\ 0 \cdot 64,\ 0 \cdot 64,\ 0 \cdot 04$	**3**
			•^{9} Strategy/process: substitute into formula	•^{9} $\sqrt{(5 \cdot 82 \div 5)}$	
			•^{10} Process: calculate standard deviation	•^{10} $1 \cdot 078\ldots$	
			Alternative strategy •^{8} Process: calculate $\sum x$ and $\sum x^2$	•^{8} $357 \cdot 6$ and $21318 \cdot 78$	**3**
			•^{9} Strategy/process: substitute into formula	•^{9} $\sqrt{\dfrac{21318 \cdot 78 - \dfrac{357 \cdot 6^2}{6}}{5}}$	
			•^{10} Process: calculate standard deviation	•^{10} $1 \cdot 078\ldots$	

Notes:
1. Accept rounding or truncation to at least one decimal place for final answer
2. •^{10} can only be awarded when a two-step calculation has taken place

Commonly Observed Responses:

	(d)		•^{11} Communication: comment regarding mean	•^{11} eg on average, Scott's top speed is higher on his new bike	**2**
			•^{12} Communication: comment regarding standard deviation	•^{12} eg top speed is more consistent with new bike	

Notes:

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
9.	(a)		$\bullet^1$ Strategy: allocate tasks	$\bullet^1$ all boxes correct	**1**

Notes:

   1. If candidate puts only correct letter and no number in boxes   award 0/1

```
┌──────┐   ┌──────┐   ┌──────┐
│  C   │───│  A   │───│  H   │
│ 300  │   │ 500  │   │  2   │───┐
└──────┘   └──────┘   └──────┘  │  ┌──────┐   ┌──────┐   ┌──────┐   ┌──────┐
                                ├──│  B   │───│  I   │───│  D   │───│  G   │
┌──────┐   ┌──────┐            │  │  3   │   │ 300  │   │  5   │   │  5   │
│  F   │───│  E   │────────────┘  └──────┘   └──────┘   └──────┘   └──────┘
│ 900  │   │  2   │
└──────┘   └──────┘
```

Commonly Observed Responses:

	(b)		$\bullet^2$ Strategy: select critical path	$\bullet^2$ $900 + 2 + 3 + 300 + 5 + 5$	**2**
			$\bullet^3$ Process/communication: state conclusion and time consistent with path chosen	$\bullet^3$ yes, it takes 20 minutes 15 seconds or yes, it takes 20·25 minutes	

Notes:
   1. A numerical comparison is not required eg 20 minutes and 15 seconds < 25 minutes
   2. $\bullet^3$ can only be awarded if a time conversion has been calculated eg seconds to minutes
   3. Conversion to minutes and seconds is not necessary for $\bullet^3$ however if it has been attempted it must be correct

Commonly Observed Responses:
   1. $300 + 500 + 2 + 3 + 300 + 5 + 5 = 1115$, 18 minutes and 35 seconds leading to yes
                                                           award 1/2 ✗ ✓
   2. $900 + 2 + 300 + 500 + 2 + 3 + 300 + 5 + 5 = 2017$, 33 minutes and 37 seconds leading to no
                                                            award 1/2 ✗ ✓

Question			Generic scheme	Illustrative scheme	Max mark
9.	(c)		•⁴ Strategy: knows to and starts to calculate the correct two ways of packing	•⁴ Evidence of the two **correct** ways of packing $240 \div 60 = 4$	**3**
			•⁵ Process: calculate number of boxes for one arrangement	•⁵ $1250 \div 40 = 31 \cdot 25$ $260 \div 15 = 17 \cdot 3...$ $17 \times 31 \times 4 = 2108$ $240 \div 40 = 6$	
			•⁶ Process/Communication: calculate second arrangement and state conclusion	•⁶ $1250 \div 60 = 20 \cdot 83...$ $260 \div 15 = 17 \cdot 3...$ $17 \times 6 \times 20 = 2040$ Maximum – 2108 boxes	

Notes:
1. Where a candidate considers more than two arrangements do not award •⁴
2. Where a candidate only considers one incorrect arrangement •⁵ is still available
3. Where a candidate attempts more than two arrangements •⁶ is only available where **all considered** arrangements have been calculated
4. Where •⁵ is lost for an incorrect process, •⁶ can be awarded for repeated incorrect process

Commonly Observed Responses:
1. $78\,000\,000 \div 36\,000 = 2166 \cdot 666...$ award 0/3 ✗ ✗ ✗

Question			Generic scheme	Illustrative scheme	Max mark
	(d)		•⁷ Process: calculate the number of days and hours	•⁷ $277 \div 24 = 11$ days and 13 hours	**3**
			•⁸ Process: deal with journey time	•⁸ 15ᵗʰ June at 1100	
			•⁹ Process/Communication: know how to deal with time difference and state date and time of arrival	•⁹ 15ᵗʰ June at 0600	
			Alternative Strategy •⁷ Process: calculate the number of days and hours	•⁷ $277 \div 24 = 11$ days and 13 hours	**3**
			•⁸ Process: deal with time difference	•⁸ e.g. $2200 - 5$ hours $= 1700$	
			•⁹ Process/Communication: know how to deal with journey time and state date and time of arrival	•⁹ 15ᵗʰ June at 0600	

Notes:
1. When journey time is given as a whole number of days •⁸ is not available

Commonly Observed Responses:

	Question		Generic scheme	Illustrative scheme	Max mark
10.	(a)	(i)	$\bullet^1$ Strategy/process: know to deal with 0% rate	$\bullet^1$ $42\,000 - 8164 = 33\,836$	**2**
			$\bullet^2$ Process: calculate national insurance	$\bullet^2$ 12% of $33\,836 = 4060\cdot32$	

Notes:

Commonly Observed Responses:
  1. 12% of $42\,000 = 5040$ award 1/2 ✗ ✓

		(ii)	$\bullet^3$ Process: calculate annual net pay	$\bullet^3$ $42\,000 - 5427\cdot96 - 4060\cdot32 - 3360 = 29151\cdot72$	**2**
			$\bullet^4$ Process: calculate monthly net pay	$\bullet^4$ $29151\cdot72 \div 12 = 2429\cdot31$	

Notes:
  1. $\bullet^4$ is only available when the candidate involves $42\,000$ in the calculation of annual net pay

Commonly Observed Responses:
  1. $(42\,000 - (5427\cdot96 + 3360 + 5040)) \div 12 = 2347\cdot67$ award 2/2 ✓ ✓
     (using 5040 from part (a)(i))
  2. $42\,000 \div 12 = 3500$ if given as the final answer   award 1/2 ✗ ✓
  3. $(42\,000 - (5427\cdot96 + 3360)) \div 12 = 2767\cdot67$ award 1/2 ✗ ✓

	(b)		$\bullet^5$ Process: all calculation correct within a valid strategy	$\bullet^5$ $2429\cdot31 - 1714 = 715\cdot31$	**1**

Notes:

Commonly Observed Responses:
  1. $2347\cdot67 - 1714 = 633\cdot67$ award 1/1 ✓
     (using 5040 from part (a)(i))

Question			Generic scheme	Illustrative scheme	Max mark
10.	(c)		•⁶ Process: calculate the monthly cost of the 1 bedroom apartment	•⁶ 1 bed: 804·72	**3**
			•⁷ Process: calculate the monthly cost of the 3 bedroom farmhouse	•⁷ 3 bed: 618·91	
			•⁸ Communication: conclusion consistent with working	•⁸ the 3 bedroom farmhouse is cheapest	
			Alternative strategy •⁶ Process: calculate the annual cost of the 1 bedroom apartment or 3 bedroom farmhouse	•⁶ 9656·64 or 7426·92	**3**
			•⁷ Process: calculate the annual cost of the remaining two	•⁷ 7426·92 or 9656·64 and 8760	
			•⁸ Communication: conclusion consistent with working	•⁸ the 3 bedroom farmhouse is cheapest	
Notes:					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
11.	(a)		$\bullet^1$ Process: calculate area of 2 longer walkways $\bullet^2$ Process: calculate total area	$\bullet^1$ $2 \times 17{\cdot}5 \times 1{\cdot}5 = 52{\cdot}5$ or $2 \times 16 \times 1{\cdot}5 = 48$ $\bullet^2$ $52{\cdot}5 + 8 \times 1{\cdot}5 = 64{\cdot}5$ or $48 + 11 \times 1{\cdot}5 = 64{\cdot}5$	**2**
			Alternative strategy 1 $\bullet^1$ Process: calculate area of shorter walkway $\bullet^2$ Process: calculate total area	$\bullet^1$ $11 \times 1{\cdot}5 = 16{\cdot}5$ or $8 \times 1{\cdot}5 = 12$ $\bullet^2$ $16{\cdot}5 + 2 \times 16 \times 1{\cdot}5 = 64{\cdot}5$ or $12 + 2 \times 17{\cdot}5 \times 1{\cdot}5 = 64{\cdot}5$	**2**
			Alternative strategy 2 $\bullet^1$ Process: calculate total area $\bullet^2$ Process: calculate area of walkway	$\bullet^1$ $17{\cdot}5 \times 11 = 192{\cdot}5$ $\bullet^2$ $192{\cdot}5 - 8 \times 16 = 64{\cdot}5$	**2**

Notes:
1. For candidates who calculate the perimeter award 0/2

Commonly Observed Responses:
1. $2 \times 17{\cdot}5 \times 1{\cdot}5 + 11 \times 1{\cdot}5 = 69$ award 1/2 ✗ ✓
2. $2 \times 16 \times 1{\cdot}5 + 8 \times 1{\cdot}5 = 60$ award 0/2 ✗ ✗

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		$\bullet^3$ Strategy: know how to calculate number of boxes required $\bullet^4$ Process: appropriate rounding and calculate cost	$\bullet^3$ $64{\cdot}5 \times 16 \div 50\ (= 20{\cdot}64)$ $\bullet^4$ $21 \times 71{\cdot}95 = 1510{\cdot}95$	**2**

Notes:
1. An area in (a) of less than or equal to 3·125, leading to a consistent number of tiles and a cost of 71·95   award 1/2
2. Correct answer with no working   award 0/2
3. If there is no evidence of where the number of boxes has come from award 0/2
4. Do not penalise use of £
5. Do not penalise omission of trailing zero

Commonly Observed Responses:
1. $69 \times 16 \div 50\ (= 22{\cdot}08) = 23$ leading to $23 \times 71{\cdot}95 = 1654{\cdot}85$ award 2/2 ✓ ✓
(using 69 from part (a))

Question			Generic scheme	Illustrative scheme	Max mark
11.	(c)		•^{5} Strategy: know how to find the volume	•^{5} evidence of composite volume	**4**
			•^{6} Process: calculate the volume of one part	•^{6} eg $8 \times 0\cdot5 \times 16 = 64$	
			•^{7} Process: calculate volume of remaining part(s) and add	•^{7} eg $\frac{1}{2} \times 12 \times 1\cdot5 \times 8 + 64 = 136$	
			•^{8} Process: convert to litres	•^{8} $136 \times 100 \times 100 \times 100/1000$ $= 136\,000$	
			Alternative Strategy •^{5} Strategy: know how to find the volume	•^{5} evidence of multiplying the area of the cross section by 8	**4**
			•^{6} Process: calculate area of cross section	•^{6} $\frac{1}{2} \times 12 \times 1\cdot5 + 16 \times 0\cdot5 = 17$	
			•^{7} Process: calculate volume	•^{7} $17 \times 8 = 136$	
			•^{8} Process: convert to litres	•^{8} $136 \times 100 \times 100 \times 100/1000$ $= 136\,000$	

Notes:
1. $V = Ah$ is not sufficient evidence for •^{5}
2. •^{6} and •^{7} are not available to candidates who use perimeter in an attempt to find volume
3. In alternative strategy •^{7} can be awarded for multiplying the candidate's calculated area by 8, 16, 2, 0·5, 1·5, 2·5

Commonly Observed Responses:
1. $V = 8 \times 0\cdot5 \times 4 = 16$ award 1/4 ✗ ✓ ✗ ✗
2. $A = 8 \times 0\cdot5 \times 4 = 16$ award 0/4 ✗ ✗ ✗ ✗

[END OF MARKING INSTRUCTIONS]