National Qualifications 2019

2019 Mathematics

National 5 - Paper 1 (Non-calculator)

Finalised Marking Instructions

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General marking principles for National 5 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.

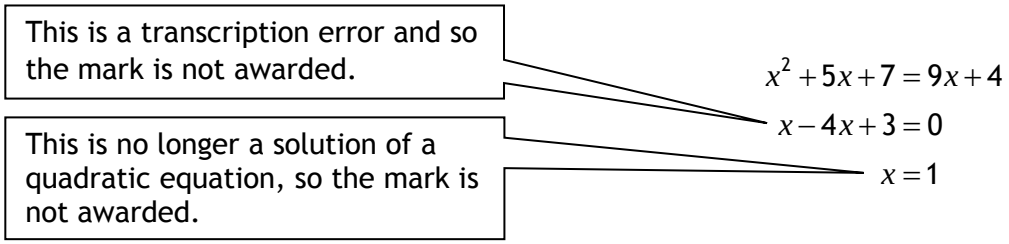
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

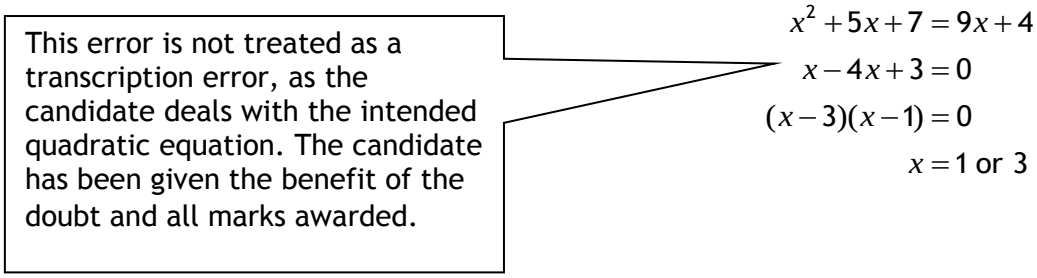
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(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



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) 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] substitute into $5x^3$ •[2] evaluate $5x^3$	•[1] $5(-2)^3$ or equivalent •[2] -40	**2**

Notes:

1. Correct answer without working award 2/2
2. Accept 5×-2^3 for •[1]
3. For subsequent incorrect working, •[2] is not available

Commonly observed responses:

1. -1000 $[(5 \times -2)^3]$ (no working necessary) — award 1/2 ×✓
2. (a) $-2 = 5 \times (-2)^3 \rightarrow -2 = -40$ — award 2/2
   (b) $-2 = 5 \times (-2)^3 \rightarrow -2 = -40 \rightarrow x = -38$ — award 1/2 ✓×
3. $5 \times 2^3 = 40$ — award 0/2
4. $5 \times (-2)^2 = 20$ — award 0/2

Question	Generic scheme	Illustrative scheme	Max mark
2.	$\bullet^1$ start to multiply fractions $\bullet^2$ consistent answer in simplest form	$\bullet^1$ $\frac{3}{8}\times\frac{12}{7}$ $\bullet^2$ $\frac{9}{14}$	**2**

Notes:

1. Correct answer without working — award 0/2
2. $\bullet^2$ is only available where simplifying is required
3. For subsequent incorrect working, $\bullet^2$ is not available
   eg $\frac{3}{8}\times\frac{12}{7}=\frac{9}{14}=1\frac{5}{14}$ — award 1/2 ✓×

Commonly observed responses:

1. $\frac{3}{8}\times\frac{12}{7}=\frac{36}{56}$ — award 1/2 ✓×
2. (a) $\frac{3}{8}\times\frac{7}{12}=\frac{7}{32}$ — award 1/2 ×✓
   (b) $\frac{3}{8}\times\frac{7}{12}=\frac{21}{96}$ — award 0/2

Question	Generic scheme	Illustrative scheme	Max mark
3.	$\bullet^1$ start to expand $\bullet^2$ complete expansion $\bullet^3$ collect like terms (which must include a term in x^3)	$\bullet^1$ evidence of any 3 correct terms eg $2x^3-7x^2-3x$ $\bullet^2$ $2x^3-7x^2-3x+10x^2-35x-15$ $\bullet^3$ $2x^3+3x^2-38x-15$	**3**

Notes:

1. Correct answer without working — award 3/3
2. For subsequent incorrect working, $\bullet^3$ is not available

Commonly observed responses:

Question	Generic scheme	Illustrative scheme	Max mark
4.	**Method 1**	**Method 1**	**3**
	$\bullet^1$ appropriate fraction	$\bullet^1$ $\frac{240}{360}$ or equivalent	
	$\bullet^2$ consistent substitution into appropriate formula	$\bullet^2$ $\frac{240}{360}\times 3{\cdot}14\times 60$	
	$\bullet^3$ calculate length of arc	$\bullet^3$ 125·6 (cm)	
	Method 2	**Method 2**	
	$\bullet^1$ appropriate fraction	$\bullet^1$ $\frac{240}{360}$ or equivalent	
	$\bullet^2$ consistent substitution into appropriate formula	$\bullet^2$ $\frac{240}{360}=\frac{\text{arc}}{3{\cdot}14\times 60}$	
	$\bullet^3$ calculate length of arc	$\bullet^3$ 125·6 (cm)	

Notes:

1. Correct answer without working — award 0/3
2. **BEWARE**
   $\frac{240}{360}\pi r^2=\frac{240}{360}\times 3{\cdot}14\times 30^2\left(=\frac{240}{360}\times 3{\cdot}14\times 30\times 2\right)=125{\cdot}6(\text{cm})$ — award 1/3 ✓××
3. $\frac{120}{360}\times 3{\cdot}14\times 60=62{\cdot}8(\text{cm})$ — award 2/3 ×✓✓

Commonly observed responses:

1. $\frac{240}{360}\times 3{\cdot}14\times 30=62{\cdot}8(\text{cm})$ — award 2/3 ✓×✓
2. $\frac{360}{240}\times 3{\cdot}14\times 60=282{\cdot}6(\text{cm})$ — award 2/3 ×✓✓
3. $\frac{240}{360}\times\pi\times 60$ only — award 1/3 ✓××
4. $3{\cdot}14\times 60=188{\cdot}4(\text{cm})$ — award 0/3
5. $\frac{240}{360}\pi r^2=\frac{240}{360}\times 3{\cdot}14\times 30^2=1884(\text{cm})$ — award 2/3 ✓×✓

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ state median $\bullet^2$ find quartiles $\bullet^3$ calculate SIQR	$\bullet^1$ 5 $\bullet^2$ 3·5 and 8 $\bullet^3$ 2·25	**3**

Notes:

1. (a) Correct median without working — award $\bullet^1$
   (b) Correct SIQR without working, do not award $\bullet^2$ or $\bullet^3$
2. Accept quartiles indicated in the list or on a diagram for $\bullet^2$
3. If 'correct' SIQR is found from an
   (a) ordered list with one missing term or one extra number — award 2/3 ×✓✓
   (b) unordered list $\left[Q_2 = 6,\ \text{SIQR} = \frac{1}{2}(7 - 5 \cdot 5) = 0 \cdot 75 \right]$ — award 1/3 ××✓
4. $\bullet^2$ and $\bullet^3$ are not available for finding $\frac{1}{2}$ of the range ie $\frac{10-3}{2} = 3 \cdot 5$

Commonly observed responses:

1.(a) $Q_2 = 5, Q_1 = 4, Q_3 = 7;\ \text{SIQR} = \frac{1}{2}(7-4) = 1 \cdot 5$ or $\frac{3}{2}$ — award 2/3 ✓×✓

(b) $Q_2 = 5;\ \text{SIQR} = \frac{1}{2}(7-4) = 1 \cdot 5$ — award 1/3 ✓××

Question			Generic scheme	Illustrative scheme	Max mark
5.	(b)		$\bullet^4$ valid comment comparing medians $\bullet^5$ valid comment comparing SIQRs	$\bullet^4$ eg On average, temperatures in Grantford are lower. $\bullet^5$ eg Temperatures in Grantford are less consistent.	**2**

Notes:

1. Answers must be consistent with answers to part (a).
   eg If in part (a) the calculated median is 8 then award $\bullet^4$ for 'on average the temperature is the same in both places' or equivalent.
   If in part (a) the calculated SIQR is 1·5 then award $\bullet^5$ for 'the spread of temperatures is the same in both places' or equivalent.

2. Comments must refer to Grantford and/or Endoch
   (a) Accept eg On average the temperature in Endoch is higher and more consistent
   (b) Do not accept eg On average the temperature is higher and more consistent

3. For the award of $\bullet^4$
   (a) Accept eg
   - On average Grantford is colder
   - In general Endoch is warmer

   (b) Do **not** accept eg
   - The median temperature in Grantford is less
   - The temperature in Endoch is more (this implies that all temperatures are more)
   - On average Endoch's temperature is better

4. For the award of $\bullet^5$
   (a) Accept eg
   - The spread of temperatures is more in Grantford
   - The temperatures in Endoch are less varied

   (b) Do **not** accept eg
   - Grantford's SIQR is more
   - The range of Endoch's temperatures is less
   - On average the temperatures in Grantford are more varied
   - The SIQR of Grantford's temperatures is less consistent

Commonly observed responses:

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		**Method 1** •1 use points $(1{\cdot}5,14)$ and $(3{\cdot}5,8)$ to find gradient •2 substitute gradient and a point into $y-b=m(x-a)$ •3 state equation in terms of F and E in simplest form (remove any brackets and collect constants) **Method 2** •1 use points $(1{\cdot}5,14)$ and $(3{\cdot}5,8)$ to find gradient •2 substitute gradient and a point into $y=mx+c$ •3 state equation in terms of F and E in simplest form	•1 $-\frac{6}{2}$ or equivalent •2 eg $y-8=-\frac{6}{2}(x-3{\cdot}5)$ •3 eg $F=-3E+18{\cdot}5$ •1 $-\frac{6}{2}$ or equivalent •2 eg $8=-\frac{6}{2}\times 3{\cdot}5+c$ •3 eg $F=-3E+18{\cdot}5$	**3**

Notes:

1. Correct answer without working award 0/3
2. •1 is not available for using points other than $(1{\cdot}5,14)$ and $(3{\cdot}5,8)$ to find the gradient
3. Gradient need not be simplified for the award of •2

Commonly observed responses:

Working must be shown.

1. $y=-3x+18{\cdot}5$ award 2/3 ✓✓×
2. $y=-3x$ award 1/3 ✓××
3. $F=-\frac{3}{1}E+18{\cdot}5$ award 2/3 ✓✓×
4. $m=\frac{16-7}{1-4}=-3\rightarrow y-7=-3(x-4)\rightarrow F=-3E+19$ award 2/3 ×✓✓

	(b)		•4 calculate fuel consumption	•4 15·2 (km/l)	**1**

Notes:

1. Consistent answer without working award 1/1, but see Note 2.
2. •4 is not available where an incorrect answer in (a) is followed through to give a negative value in (b).

Commonly observed responses:

Question	Generic scheme	Illustrative scheme	Max mark
7.	**Method 1** •[1] multiply by 2 •[2] divide by h •[3] subtract y **Method 2** •[1] multiply by 2 •[2] expand bracket **and** subtract hy •[3] divide by h	**Method 1** •[1] $2A=h(x+y)$ •[2] $\frac{2A}{h}=x+y$ •[3] $x=\frac{2A}{h}-y$ **Method 2** •[1] $2A=h(x+y)$ •[2] $2A-hy=hx$ •[3] $x=\frac{2A-hy}{h}$	**3**

Notes:

1. Correct answer without working award 0/3
2. Apply Method 2 instructions in cases where bracket is expanded. Candidates may do •[2] followed by •[1]
3. **BEWARE:** check all steps in answer
   eg $A=\frac{1}{2}hx+hy \rightarrow \frac{1}{2}hx=A-hy \rightarrow hx=2A-hy \rightarrow x=\frac{2A-hy}{h}$ award 1/3 ××✓(Method 2)
4. For subsequent incorrect working •[3] is not available
5. Where **final answer** includes × or ÷ sign(s), the maximum award is 2/3
6. Accept a final answer of $x=\frac{A2-hy}{h}$ (working must be shown) as bad form award 3/3

Commonly observed responses:

1. $x=\frac{2a-hy}{h}$ award 3/3
2. $x=\frac{A}{\frac{1}{2}h}-y$ award 2/3 ×✓✓
3. $x=\frac{A-\frac{1}{2}hy}{\frac{1}{2}h}$ award 2/3 ×✓✓

Question			Generic scheme	Illustrative scheme	Max mark
8.	(a)		$\bullet^1$ construct equation	$\bullet^1$ eg $7c+3g=215$	**1**
Notes: 1. Accept $7c+3g=215$ kg as bad form					
	(b)		$\bullet^2$ construct equation	$\bullet^2$ eg $5c+4g=200$	**1**
Notes: 1. Accept $5c+4g=200$ kg as bad form					
	(c)		$\bullet^3$ correct scaling $\bullet^4$ value for c or g $\bullet^5$ value for g or c $\bullet^6$ communicate answer in kilograms	$\bullet^3$ eg $\begin{matrix}28c+12g=860\\15c+12g=600\end{matrix}$ or $\begin{matrix}35c+15g=1075\\35c+28g=1400\end{matrix}$ $\bullet^4$ $c=20$ or $g=25$ $\bullet^5$ $g=25$ or $c=20$ $\bullet^6$ cement $=20$ kg , gravel $=25$ kg	4
Notes: 1. Correct answer without working — award 0/4 2. For a solution obtained by guess and check — award 0/4 3. $\bullet^6$ is not available if either c or g is negative 4. $\bullet^6$ is only available where a candidate calculates values for c **and** g, and a conclusion containing the words 'cement' and 'gravel' along with the correct units in both cases					
Commonly observed responses:					

Question			Generic scheme	Illustrative scheme	Max mark
9.	(a)		•[1] state equation of axis of symmetry	•[1] $x=4$	**1**
Notes: 1. For an answer of 4 or axis of symmetry $=4$ award 0/1					
	(b)	(i)	•[2] state the value of a	•[2] -4	**1**
Notes:					
		(ii)	•[3] state the value of b	•[3] 20	**1**
Notes: 1. For an answer of $y=20-\left(x-4\right)^2$ award 1/1 for (i) and 1/1 for (ii) 2. For answers of (i) 20 **and** (ii) -4 award 0/1 for (i) and 1/1 for (ii) This note only applies where the "correct" answers have been switched 3. Mark (b) independently from (a)					

Question			Generic scheme	Illustrative scheme	Max mark
10.	(a)		$\bullet^1$ correct answer	$\bullet^1$ $\begin{pmatrix}5\\4\end{pmatrix}$	**1**

Notes:

1. Award 0/1 where:
   (a) brackets are omitted from the answer
   (b) the answer is given in coordinate form

2. (a) Treat $\left(\frac{5}{4}\right)$ as bad form — award 1/1

   (b) However, for $\frac{5}{4}$ — award 0/1

Commonly observed responses:

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		$\bullet^2$ valid pathway	$\bullet^2$ $\frac{1}{2}\overrightarrow{PR}+\overrightarrow{RQ}$ or $\frac{1}{2}\begin{pmatrix}6\\-4\end{pmatrix}+\begin{pmatrix}-1\\8\end{pmatrix}$ OR $\frac{1}{2}\overrightarrow{RP}+\overrightarrow{PQ}$ or $\frac{1}{2}\begin{pmatrix}-6\\4\end{pmatrix}+\begin{pmatrix}5\\4\end{pmatrix}$	**2**
			$\bullet^3$ consistent components	$\bullet^3$ $\begin{pmatrix}2\\6\end{pmatrix}$	

Notes:

1. Correct answer without working — award 2/2

2. Do not penalise the omission of brackets or giving the answer in coordinate form if this has already been penalised in part (a)

3. $\overrightarrow{MR}+\overrightarrow{RQ}$ or $\overrightarrow{MP}+\overrightarrow{PQ}$ alone is not enough for the award of $\bullet^2$

4. If candidate's response for (a) is $\overrightarrow{PR}-\overrightarrow{RQ}=\begin{pmatrix}6\\-4\end{pmatrix}-\begin{pmatrix}-1\\8\end{pmatrix}=\begin{pmatrix}7\\-12\end{pmatrix}$ then accept

   (a) $\left[\frac{1}{2}\overrightarrow{PR}-\overrightarrow{RQ}=\right]\frac{1}{2}\begin{pmatrix}6\\-4\end{pmatrix}-\begin{pmatrix}-1\\8\end{pmatrix}=\begin{pmatrix}4\\-10\end{pmatrix}$ — award 2/2

   (b) $\left[\frac{1}{2}\overrightarrow{RP}+\overrightarrow{PQ}=\right]\frac{1}{2}\begin{pmatrix}-6\\4\end{pmatrix}+\begin{pmatrix}7\\-12\end{pmatrix}=\begin{pmatrix}4\\-10\end{pmatrix}$ — award 2/2

   (c) $\left[\frac{1}{2}\overrightarrow{RP}-\overrightarrow{PQ}=\right]\frac{1}{2}\begin{pmatrix}-6\\4\end{pmatrix}-\begin{pmatrix}7\\-12\end{pmatrix}=\begin{pmatrix}-10\\14\end{pmatrix}$ — award 2/2

5. Where there is invalid subsequent working $\bullet^3$ is not available

   eg $\begin{pmatrix}2\\6\end{pmatrix}=\begin{pmatrix}1\\3\end{pmatrix}$ — award 1/2 ✓×

Commonly observed responses:

1. (a) $\frac{1}{2}\begin{pmatrix}6\\-4\end{pmatrix}+\begin{pmatrix}-1\\8\end{pmatrix}=\begin{pmatrix}3\\-4\end{pmatrix}+\begin{pmatrix}-1\\8\end{pmatrix}=\begin{pmatrix}2\\4\end{pmatrix}$ — award 1/2 ✓×

   (b) $\begin{pmatrix}3\\-4\end{pmatrix}+\begin{pmatrix}-1\\8\end{pmatrix}=\begin{pmatrix}2\\4\end{pmatrix}$ — award 0/2

Question			Generic scheme	Illustrative scheme	Max mark
11.			•[1] find angle AOB •[2] find angle FOB or ABO •[3] find angle OFB	•[1] 72 •[2] 108 or 54 •[3] 36	**3**

Notes:

1. Correct answer without relevant working award 0/3.
2. Degrees signs are not required.
3. •[2] is only available where angle AOB is acute.
4. Full marks may be awarded for information marked on the diagram.
5. Do not penalise a candidate who marks the correct answer on the diagram but then writes an incorrect answer outwith the diagram.
6. Accept **clear** working outwith the diagram, but the final answer must be **clearly** indicated.
7. An answer of 360 ÷ 5 = 72 alone is not enough for the award of •[1].
8. Alternative method
   eg •[1] EAB = 108 (interior angle of pentagon)
   •[2] ABO = 54 (OAB = ABO)
   •[3] OFB = 36 (OBF = 90 − ABO; OFB = OBF)

Commonly observed responses:

1. (a) $AOB = 60 \rightarrow FOB = 120 \rightarrow OFB = 30$ award 2/3 ×✓✓
   (b) $FOB = 120 \rightarrow OFB = 30$ award 1/3 ××✓
   (c) $AOB = 90 \rightarrow FOB = 90 \rightarrow OFB = 45$ award 1/3 ××✓

Question	Generic scheme	Illustrative scheme	Max mark
12.	**Method 1**		**3**
	$\bullet^1$ express as equivalent fraction with rational denominator	$\bullet^1$ $\frac{\sqrt{2}\sqrt{40}}{40}$ or $\frac{\sqrt{80}}{40}$	
	$\bullet^2$ express numerator in simplest form	$\bullet^2$ $\frac{4\sqrt{5}}{40}$	
	$\bullet^3$ express in simplest form	$\bullet^3$ $\frac{\sqrt{5}}{10}$	
	Method 2		
	$\bullet^1$ express denominator in simplest form	$\bullet^1$ $\frac{\sqrt{2}}{2\sqrt{10}}$ or $\frac{\ldots}{2\sqrt{10}}$	
	$\bullet^2$ express as equivalent fraction with rational denominator	$\bullet^2$ $\frac{\sqrt{2}\sqrt{10}}{20}$ or $\frac{\sqrt{20}}{20}$	
	$\bullet^3$ express in simplest form	$\bullet^3$ $\frac{\sqrt{5}}{10}$	
	Method 3		
	$\bullet^1$ correct division	$\bullet^1$ $\frac{1}{\sqrt{20}}$	
	$\bullet^2$ express denominator in simplest form	$\bullet^2$ $\frac{1}{2\sqrt{5}}$	
	$\bullet^3$ express as equivalent fraction with rational denominator	$\bullet^3$ $\frac{\sqrt{5}}{10}$	

Notes:

1. Correct answer with no working award 0/3
2. For subsequent incorrect working $\bullet^3$ is not available eg $\frac{\sqrt{5}}{10} = \frac{1}{2}$
3. Method 2: Accept $\frac{1\sqrt{2}}{2\sqrt{10}}$ for the award of $\bullet^1$
4. Candidates may use a mixture of methods

   eg (a) Method 2 then Method 3: $\frac{\sqrt{2}}{2\sqrt{10}} = \frac{1}{2\sqrt{5}} = \frac{\sqrt{5}}{10}$

   (b) Method 3 then Method 2: $\frac{1}{\sqrt{20}} = \frac{\sqrt{20}}{20} = \frac{\sqrt{5}}{10}$

Commonly observed responses:

Question			Generic scheme	Illustrative scheme	Max mark
13.			•1 state x-coordinate •2 state y-coordinate	•1 $(135,\ldots)$ •2 $(\ldots,-3)$	**2**
Notes: 1. For $x=135, y=-3$ award 2/2 2. Award 1/2 where brackets are omitted unless (a) answer in form shown in Note 1 above (b) omission of brackets has already been penalised in Q10 (c) For $(-3, 135)$ award 1/2					
Commonly observed responses:					

Question			Generic scheme	Illustrative scheme	Max mark
14.			**Method 1** •[1] eliminate denominators •[2] rearrange into form $ax=b$ •[3] solve for x **Method 2** •[1] collect algebraic terms and express as a fraction in simplest form •[2] rearrange into form $ax=b$ •[3] solve for x	**Method 1** •[1] $5x-10=6-2x$ or equivalent •[2] $7x=16$ •[3] $x=\frac{16}{7}$ **Method 2** •[1] $\frac{7x-6}{10}=1$ or equivalent •[2] $7x=16$ •[3] $x=\frac{16}{7}$	**3**

Notes:

1. Correct answer without working award 0/3

2. Accept $5x-10=2(3-x)$ for the award of •[1]

3. For the award of •[3] the answer must be a non-integer value

4. Do not award •[3] for a decimal approximation to $\frac{16}{7}$, but do not penalise incorrect conversion to a mixed number or decimal approximation following an answer of $\frac{16}{7}$

Commonly observed responses:

1. $5x-1=6-2x \rightarrow 7x=7 \rightarrow x=1$ award 1/3 ×✓×

Question			Generic scheme	Illustrative scheme	Max mark
15.	(a)		$\bullet^1$ calculate height	$\bullet^1$ $\left(12\times 2-5\times 2^2=\right)\ 4\left(\text{m}\right)$	**1**
	(b)		$\bullet^2$ construct equation $\bullet^3$ rearrange and equate to zero $\bullet^4$ consistent factorisation $\bullet^5$ solve equation and select correct value	$\bullet^2$ $12t-5t^2=-17$ $\bullet^3$ eg $5t^2-12t-17=0$ $\bullet^4$ $\left(5t-17\right)\left(t+1\right)\ \left(=0\right)$ $\bullet^5$ $\left(t=\right)\ \frac{17}{5}\ \left(\text{seconds}\right)$ or equivalent	**4**

Notes:

1. Correct answer without working — award 0/4
2. For a solution obtained by guess and check — award 0/4
3. $\bullet^3$ is available for eg $12t-5t^2+17=0$
4. Do not penalise incorrect conversion of answer to a decimal or mixed number
5. $\bullet^4$ is available for eg $\dfrac{12\pm\sqrt{\left(-12\right)^2-4\times 5\times\left(-17\right)}}{2\times 5}$
6. Where candidate finds two positive roots or two negative roots, then $\bullet^5$ is not available

Commonly observed responses:

1. $12t-5t^2=17$ $\times\bullet^2$
   $5t^2-12t+17=0$ $\checkmark\bullet^3$
   $\left(5t-17\right)\left(t+1\right)=0$ $\times\bullet^4$
   $t=\dfrac{17}{5},-1$
   $t=\dfrac{17}{5}$ $\checkmark\bullet^5$

[END OF MARKING INSTRUCTIONS]