National
Qualifications
2026

2026 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 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.

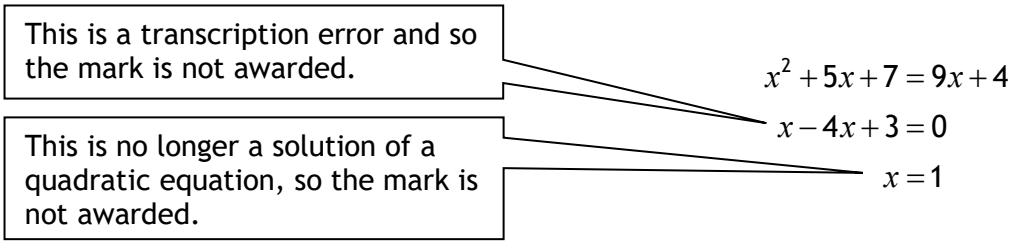
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

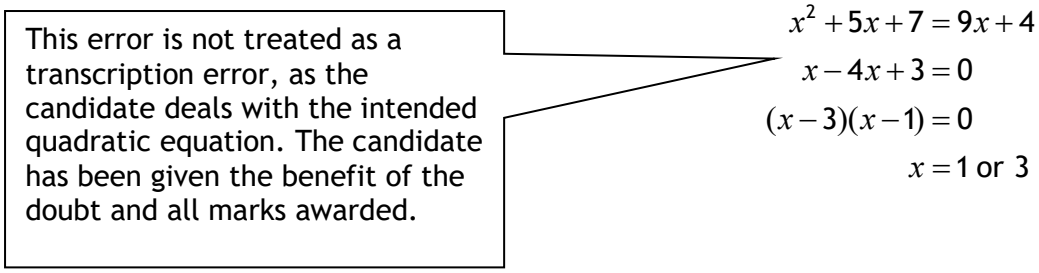
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(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:

	○5	○6
○5	$x=2$	$x=-4$
○6	$y=5$	$y=-7$

Horizontal: ○5 $x=2$ and $x=-4$ ○6 $y=5$ and $y=-7$

Vertical: ○5 $x=2$ and $y=5$ ○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

$\frac{4\frac{}{}5}{3}$ 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.			$\bullet^1$ start to expand	$\bullet^1$ evidence of any three correct terms eg $y^3-3y^2+2y\ldots$	**3**
			$\bullet^2$ complete expansion	$\bullet^2$ $y^3-3y^2+2y+4y^2-12y+8$	
			$\bullet^3$ collect like terms (see Note 3)	$\bullet^3$ $y^3+y^2-10y+8$	

Notes:

1. Correct answer without working. award 3/3
2. Accept:
   (a) $y^3+1y^2-10y+8$ award 3/3
   (b) $y^3+y^2+\left(-10y\right)+8$ award 3/3
3. For the award of $\bullet^3$ the evidence at $\bullet^2$ must include a term in y^3 and at least five terms.
   At least one negative term must be collected with another term.
4. Evidence for $\bullet^1$ and $\bullet^2$ may appear in a grid.
5. For subsequent incorrect working, $\bullet^3$ is not available.

Commonly Observed Responses:

Question	Generic scheme	Illustrative scheme	Max mark
2.	•[1] evidence that $60\% = 180$	•[1] $60\% = 180$	**3**
	•[2] begin valid strategy	•[2] $(10\% =)\frac{180}{6}$ **or** $(1\% =)\frac{180}{60}$ or equivalent	
	•[3] complete calculation within valid strategy	•[3] 300 (miles)	

Notes:

1. Correct answer without working. award 0/3
2. (a) $60\% = 180 \rightarrow 60\%$ of $180 = 108$. award 1/3 ✓××
   (b) 60% of $180 = 108$. award 0/3
3. (a) $60\% = 180 \rightarrow$ 40% of $180 = 72$. award 1/3 ✓××
   (b) 40% of $180 = 72$. award 0/3
4. (a) $60\% = 180 \rightarrow$ 140% of $180 = 252$. award 1/3 ✓××
   (b) 140% of $180 = 252$. award 0/3

Commonly Observed Responses:

1. $\frac{180}{0.6} = 300$ award 3/3
2. (a) $\frac{180}{60} \times 100 = 300$ award 3/3
   (b) $\frac{180}{6} \times 10 = 300$ award 3/3
3. (a) $140\% = 180 \rightarrow 1\% = \frac{180}{140} \rightarrow 128.57\ldots$ award 2/3 ×✓1✓1
   (b) $140\% = 180 \rightarrow 1\% = \frac{180}{140}$ **or** $10\% = \frac{180}{14}$ award 1/3 ×✓1^
4. $40\% = 180 \rightarrow 1\% = 4.5$ or $10\% = 45 \rightarrow 100\% = 450$ award 2/3 ×✓1✓1
5. $60\% = 180 \rightarrow 1\% = \frac{180}{6} = 30 \rightarrow 100\% = 300$ or equivalent award 2/3 ✓✓×

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Question			Generic scheme	Illustrative scheme	Max mark
3.	(a)		$\bullet^1$ calculate median $\bullet^2$ find quartiles $\bullet^3$ calculate IQR	$\bullet^1$ 7 $\bullet^2$ 4 and 15 $\bullet^3$ 11	**3**

Notes:

Ordered list for reference: 2 2 4 5 6 8 14 15 18 20

1. (a) Correct median without working award $\bullet^1$.
   (b) Do not award $\bullet^2$ or $\bullet^3$ for correct IQR **without** evidence of quartiles.
2. Accept quartiles indicated in a list or on a diagram for $\bullet^2$.
3. If consistent IQR is found from an
   (a) ordered list with one missing term or one extra number. award 2/3 ×✓1✓1
   (b) unordered list [median = 3, IQR = 18 − 5 = 13]. award 1/3 ××✓1
4. Where a candidate calculates the range, award marks as follows:
   (a) median = 7, quartiles = 4 and 15, IQR = 20 − 2 = 18. award 2/3 ✓✓×
   (b) median = 7, Q_1 = 2 and Q_3 = 20 (clearly labelled as Q_1 and Q_3)
   → IQR = 20 − 2 = 18. award 2/3 ✓×✓1
   (c) median = 7, IQR = 20 − 2 = 18. award 1/3 ✓××
5. Where a candidate has calculated SIQR= 5.5, $\bullet^3$ can only be awarded where the candidate has explicitly stated "IQR = 11".
   eg (a) median = 7, quartiles = 4 and 15, **IQR = 11**, SIQR = 5.5. award 3/3
   (b) median = 7, quartiles = 4 and 15 → (IQR =) 5.5. award 2/3 ✓✓×
6. Where a candidate has calculated the IQR but stated **SIQR = 11**, $\bullet^3$ is available
   eg median = 7, quartiles = 4 and 15, SIQR =11 award 3/3

Commonly Observed Responses:

1. median = 7, IQR = 16.5 − 3 = 13.5 award 2/3 ✓×✓1

Question			Generic scheme	Illustrative scheme	Max mark
3.	(b)		•[4] valid comment comparing medians. •[5] valid comment comparing interquartile ranges.	•[4] on average, the waiting times in the restaurant are longer. •[5] the waiting times in the cafe are more varied.	**2**

Notes:

1. Answers must be consistent with answers to part (a).
2. Comments must involve reference to **waiting times** and include restaurant and/or café.
   (a) Accept eg On average the waiting times at the restaurant are higher and more consistent.
   (b) Do not accept eg On average the waiting times are higher and more consistent.
3. For the award of •[4]
   (a) Accept eg
   - on average the café waiting times are **shorter/quicker/faster**.
   - **the average** restaurant waiting times are longer.

   (b) Do not accept eg
   - the **median** waiting time in the café is less.
   - the waiting times at the restaurant are longer **(this implies that all waiting times are longer).**
   - on average the restaurant **results/scores/data** are higher.

4. For the award of •[5]
   (a) Accept eg
   - the spread of restaurant waiting times is less.
   - the café waiting times are more varied.

   (b) Do not accept eg
   - the **IQR** of the restaurant waiting times is less.
   - the **range** of the café waiting times is more.
   - **on average** the waiting times in the restaurant are less varied.
   - the **IQR** of the waiting times in the restaurant is more consistent.
   - the restaurant **results/scores/data** are more consistent.

5. Numbers are not required for •[4] and •[5]. However, where they appear they must be consistent with the statement. For answers in parts (a) and (b) award as follows:

   eg (i) (a) median = 7, IQR = 11. award 3/3
   (b) On average **t**he waiting times in the restaurant are longer as $11 < 12$ the waiting times in the cafe are more varied as $5 < 7$. award 0/2
   (ii) (a) median = 7, IQR = 11 . award 3/3
   (b) On average the waiting times in the restaurant are longer as $7 < 5$ the waiting times in the cafe are more varied as $12 < 11$. award 0/2

Commonly Observed Responses:

Question	Generic scheme	Illustrative scheme	Max mark
4.	$\bullet^1$ start to process right hand side	$\bullet^1$ $3x-6+20$	**3**
	$\bullet^2$ re-arrange (collect constants on one side and variables on other side)	$\bullet^2$ $-6<2x$ or $-2x<6$	
	$\bullet^3$ solve for x	$\bullet^3$ $-3<x$ or $x>-3$	

Notes:

1. Correct answer without valid working. award 0/3
   Treat repeated substitution as invalid working.
2. (a) There must be evidence that the candidate has dealt with the negative coefficient of x on the LHS of the inequations by either:
   (i) reversing the direction of the inequality sign at $\bullet^3$.
   eg $x+8<3x-6+20\rightarrow -2x<18\rightarrow x>-9$. award 2/3 ✓×✓1
   or
   (ii) collecting the x terms on the RHS of the inequation at $\bullet^2$.
   eg $x+8<3x-6+20\rightarrow -18<2x\rightarrow -9<x$. award 2/3 ✓×✓1
   (b) Where a candidate requires to do neither of the above, then $\bullet^3$ is not available.
   eg $x+8<3x-6+20\rightarrow 2x<18\rightarrow x<9$. award 1/3 ✓××
3. For subsequent incorrect working, $\bullet^3$ is not available.
   eg (a) $-3<x\rightarrow x<-3$. award 2/3 ✓✓×
   (b) $-3<x\rightarrow x=-3$. award 2/3 ✓✓×

Commonly Observed Responses:

1. $x+8<3x-2+20\rightarrow -2x<10\rightarrow x>-5$ award 2/3 ×✓1✓1
2. (a) $x+8=3x-6+20\rightarrow -2x=6\rightarrow x>-3$ award 3/3
   (b) $x+8=3x-6+20\rightarrow -2x=6\rightarrow x=-3$ award 2/3 ✓✓×

Question	Generic scheme	Illustrative scheme	Max mark
5.	$\bullet^1$ identify strategy **and** find common denominator	$\bullet^1$ $\frac{\cdots}{12}+\frac{\cdots}{12}$ **or** $2\frac{\cdots}{12}+1\frac{\cdots}{12}$	**2**
	$\bullet^2$ consistent answer in simplest form	$\bullet^2$ $\frac{53}{12}$ **or** $4\frac{5}{12}$ (miles)	

Notes:

1. Correct answer without working. award 0/2
2. Do not penalise incorrect conversion of $\frac{53}{12}$ to a mixed number or a decimal fraction.
3. For the award of $\bullet^1$ accept $\left(\frac{11}{4}+\frac{5}{3}\rightarrow\right)\frac{33+20}{12}$.
4. Where a candidate starts by converting to decimal fractions $\bullet^2$ can only be awarded for an exact value:
   (a) $2.75+1.6=4.416$. award 2/2
   (b) $2.75+1.67=4.42$. award 1/2 ✓×
   (c) $2.75+1.66\ldots=4.416\ldots$. award 1/2 ✓×
   (d) $2.75+1.66=4.41$. award 0/2
   (e) $2.75+1.7=4.45$. award 0/2

Commonly Observed Responses:

1. $3\frac{9}{12}+\frac{8}{12}=3\frac{17}{12}$ award 1/2 ✓^
2. $\frac{11}{4}\times\frac{5}{3}=\frac{55}{12}$ award 0/2
3. (a) $\left(\frac{11}{4}+\frac{5}{3}\rightarrow\right)\frac{11+5}{12}\rightarrow 1\frac{1}{3}$ award 1/2 ✓×
   (b) $\left(\frac{11}{4}+\frac{5}{3}\rightarrow\right)\frac{16}{12}\rightarrow 1\frac{1}{3}$ award 0/2

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		**Method 1** •[1] calculate gradient •[2] substitute gradient and a point into $y-b=m(x-a)$ •[3] state equation in terms of F and P **and** in simplest form (remove any brackets and collect constants) **Method 2** •[1] calculate gradient •[2] substitute gradient and a point into $y=mx+c$ •[3] state equation in terms of F and P **and** in simplest form	**Method 1** •[1] $\frac{40}{60}$ or equivalent •[2] $y-54=\frac{40}{60}(x-30)$ **or** $y-94=\frac{40}{60}(x-90)$ •[3] $F=\frac{2}{3}P+34$ **or** $3F=2P+102$ **Method 2** •[1] $\frac{40}{60}$ or equivalent •[2] $54=\frac{40}{60}\times 30+c$ **or** $94=\frac{40}{60}\times 90+c$ •[3] $F=\frac{2}{3}P+34$ **or** $3F=2P+102$	**3**

Question	Generic scheme	Illustrative scheme	Max mark

6. (a) (continued)

Notes:

1. Correct answer without working. award 0/3
2. For an incorrect simplification of a gradient, a mark is not awarded at the point where the simplification occurs eg

   (a) $\frac{40}{60}\left(=\frac{3}{2}\right)\rightarrow 54=\frac{3}{2}\times 30+c\rightarrow F=\frac{3}{2}P+9$. award 2/3 ✓×✓1

   (b) $\frac{40}{60}\rightarrow 54=\frac{40}{60}\times 30+c\rightarrow F=\frac{3}{2}P+9$. award 2/3 ✓✓×

3. For subsequent incorrect working, $\bullet^3$ is not available.
4. For $\bullet^3$ do not penalise a gradient which has been simplified to an integer.

Commonly Observed Responses:

1. (a) $\frac{60}{40}\rightarrow 54=\frac{3}{2}\times 30+c\rightarrow F=\frac{3}{2}P+9$ award 2/3 ×✓1✓1

   (b) $\frac{60}{40}\rightarrow 30=\frac{3}{2}\times 54+c\rightarrow F=\frac{3}{2}P-51$ award 2/3 ×✓1✓1

2. (a) $y-b=m(x+a)\rightarrow y-54=\frac{40}{60}(x+30)\rightarrow F=\frac{2}{3}P+74$ award 2/3 ✓×✓1

   (b) $y-b=m(x+a)\rightarrow y-94=\frac{40}{60}(x+90)\rightarrow F=\frac{2}{3}P+154$ award 2/3 ✓×✓1

	(b)		$\bullet^4$ calculate mark	$\bullet^4$ 56	1

Notes:

1. Consistent answer without working. award 1/1
2. $\bullet^4$ is available for using the candidate's equation from part (a) with an integer gradient **unless** the gradient is ± 1.
3. Disregard use of % symbol.

Commonly Observed Responses:

1. (a) $F=\frac{3}{2}P-51\rightarrow -1.5$ award 1/1 ✓1

   (b) $F=\frac{3}{2}P-51\rightarrow -1.5\rightarrow 1.5$ award 1/1 ✓1

   (c) $F=\frac{3}{2}P-51\rightarrow 1.5$ award 0/1

Question			Generic scheme	Illustrative scheme	Max mark
7.			$\bullet^1$ start process $\bullet^2$ consistent calculation $\bullet^3$ express as a surd in its simplest form	$\bullet^1$ $4^2+(-5)^2+7^2$ $\bullet^2$ $\sqrt{90}$ $\bullet^3$ $3\sqrt{10}$	**3**

Notes:

1. Correct answer without working. award 0/3
2. For the award of $\bullet^1$ accept $4^2+5^2+7^2$.
3. $\bullet^1$ and $\bullet^2$ are not available where a candidate only uses two numbers eg $\sqrt{4^2+(-5)^2}=\sqrt{41}$.
4. $\bullet^3$ is only available where a surd requires to be simplified.
5. $\bullet^3$ is not available for simplification of a perfect square.
6. For incorrect subsequent working $\bullet^3$ is not available.

Commonly Observed Responses:

1. $\sqrt{90}\rightarrow 3\sqrt{10}$ (no other working shown) award 3/3
2. (a) $4^2+-5^2+7^2\rightarrow\sqrt{90}\rightarrow 3\sqrt{10}$ award 3/3
   (b) $4^2-5^2+7^2\rightarrow\sqrt{90}\rightarrow 3\sqrt{10}$ award 1/3 ×××✓1
3. (a) $4^2+(-5)^2+7^2\rightarrow\sqrt{40}\rightarrow 2\sqrt{10}$ award 2/3 ✓××✓1
   (b) $4^2+-5^2+7^2\rightarrow\sqrt{40}\rightarrow 2\sqrt{10}$ award 2/3 ✓××✓1
   (c) $4^2-5^2+7^2\rightarrow\sqrt{40}\rightarrow 2\sqrt{10}$ award 2/3 ×✓1✓1
4. $4^2+(-5)^2+7^2=90$ award 1/3 ✓^^
5. $\sqrt{4+(-5)+7}\rightarrow\sqrt{6}$ award 0/3
6. $\sqrt{4^2+(-5)^2}=\sqrt{41}$ award 0/3

Question			Generic scheme	Illustrative scheme	Max mark
8.			$\bullet^1$ square both sides $\bullet^2$ add $3L$	$\bullet^1$ $P^2 = T - 3L$ $\bullet^2$ $T = P^2 + 3L$	**2**
Notes: 1. Correct answer without working. award 0/2 2. For subsequent incorrect working, $\bullet^2$ is not available.					
Commonly Observed Responses: 1. $P + 3L = \sqrt{T} \rightarrow T = (P + 3L)^2$ award 1/2 ×✓1					

Question			Generic scheme	Illustrative scheme	Max mark
9.			•[1] correct substitution into $y = kx^2$ •[2] solve	•[1] $24 = k \times 2^2$ •[2] 6	**2**

Notes:

1. Correct answer without working. award 2/2
2. For $y = 6x^2$. award 2/2

Commonly Observed Responses:

1. $24 = k \times (-2)^2 \rightarrow 6$ award 2/2
2. $24 = k \times 2^2 \rightarrow 24 = k \times 4 \rightarrow 20$ award 1/2 ✓×
3. $2 = k \times 24^2 \rightarrow \left(2 = k \times 576 \rightarrow\right) \frac{1}{288}$ award 1/2 ×✓1
4. $24 = k \times 2 \rightarrow 12$ award 0/2
5. $y = 24 \times 2^2 \rightarrow 96$ award 0/2

Question			Generic scheme	Illustrative scheme	Max mark
10.			•[1] calculate the size of angle ABO •[2] calculate size of angle COB or angle AOB •[3] calculate size of angles COB, AOB and **reflex** angle AOC	•[1] 27 •[2] COB = 100 **or** AOB = 126 •[3] 100, 126 and 226	**3**

Notes:

1. Correct answer without working. award 0/3
2. Degrees signs not required.
3. Full marks may be awarded for information clearly marked on the diagram.
4. Where information is not marked on the diagram, then working must clearly attach calculation to named angles. The final answer must be clearly indicated.
5. Where a candidate marks a final answer on the diagram but then writes a different answer clearly indicated as angle AOC outwith the diagram, do not award •[3].
6. Disregard incorrect angles which are not on the valid pathway followed by the candidate.
7. For the award of •[3] angle AOC must be reflex.

Commonly Observed Responses:

1. $ABO = 27 \rightarrow COB = 100$ or $AOB = 126 \rightarrow AOC = 226 \rightarrow 134$ award 2/3 ✓✓×
2. $ABO = 77 \rightarrow AOB = 26$ or $COB = 100 \rightarrow AOC = 126$ award 1/3 ×✓×
3. $ABO = 77 \rightarrow AOB = 26$ or $COB = 100 \rightarrow AOC = 126 \rightarrow 234$ award 1/3 ×✓×

Question			Generic scheme	Illustrative scheme	Max mark
11.	(a)		$\bullet^1$ state coordinates	$\bullet^1$ (12, 8, 0)	**1**

Notes:

1. Do not award $\bullet^1$ if brackets are omitted or the answer is stated in component form unless answer is in the form shown in Note 2.
2. For $x=12,\ y=8,\ z=0$. award 1/1

Commonly Observed Responses:

1. (a) 12, 8, 0 award 0/1

   (b) $\begin{pmatrix}12\\8\\0\end{pmatrix}$ award 0/1

	(b)		$\bullet^2$ state coordinates	$\bullet^2$ (12, 5, 4)	**1**

Notes:

1. Part (b) should be marked independently of (a).
2. If brackets are omitted or answer is given in component form in part (a) **and** part (b), $\bullet^2$ can be awarded if **both** sets of coordinates are correct eg
   (i) (a) 12, 8, 0 (b) 12, 5, 4 . award 0/1✗ in part (a) and award 1/1 ✓1 in part (b)
   (ii) (a) 12, 8, 0 (b) 12, 5, 0. award 0/1✗ in part (a) and award 0/1 ✗ in part (b)
3. For $x=12,\ y=5,\ z=4$. award 1/1

Commonly Observed Responses:

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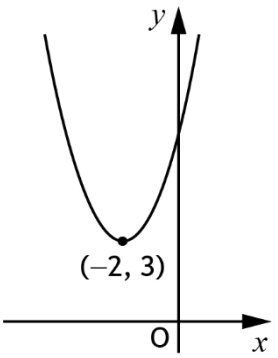
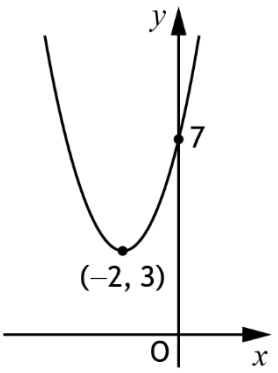
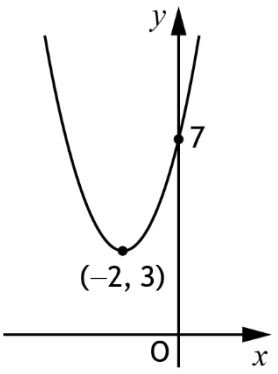
Question	Generic scheme	Illustrative scheme	Max mark
12.	**Method 1** •[1] correct coordinates of turning point •[2] sketch parabola with minimum turning point consistent with •[1] •[3] correct y-intercept shown on sketch	**Method 1** •[1] $(-2,3)$ •[2]  •[3]  	**3**
	Method 2 •[1] correct coordinates of turning point •[2] state correct y-intercept •[3] sketch parabola with minimum turning point and y-intercept consistent with •[1] and •[2]	**Method 2** •[1] $(-2,3)$ •[2] $(0,7)$ **or** 7 •[3]  	

Question	Generic scheme	Illustrative scheme	Max mark
12. (continued)			
Notes: 1. Correct answer without working. award 3/3 2. Where the coordinates of the turning points are not stated elsewhere, then for a sketch of a parabola with minimum turning point $(-2,-3)$, $(2,\pm 3)$ **or** $(\pm 3,\pm 2)$ $\bullet^2$ and $\bullet^3$ are still available. Otherwise $\bullet^3$ is only available where the minimum turning point indicated on the sketch is consistent with that stated elsewhere. 3. In method 1, the sketch of the parabola need not meet or cut the y-axis for the award of $\bullet^2$. 4. $\bullet^3$ is not available if the parabola has a maximum turning point. 5. $\bullet^3$ is not available if the minimum turning point is on the y-axis. 6. Award $\bullet^3$ where the y-intercept is calculated to be at $y=7$ and is plotted on the diagram at $(0,7)$ but is annotated as $(7,0)$. 7. $\bullet^2$ and $\bullet^3$ are not available if the turning point and the y-intercept have the same y-coordinate. 8. $\bullet^1$ is available where a candidate sketches a parabola with a **maximum** turning point of $(-2,3)$ and the coordinates of the turning point are not stated elsewhere.			
Commonly Observed Responses:			

Question			Generic scheme	Illustrative scheme	Max mark
13.			•[1] substitute into $f(x)=5\cos 2x$ •[2] evaluate	•[1] $5\times\cos(2\times 90)$ or equivalent •[2] -5	**2**

Notes:

1. Correct answer without working. award 2/2
2. For subsequent incorrect working •[2] is not available.

Commonly Observed Responses:

1. (a) $90=5\times\cos(2\times 90)\rightarrow 90=-5$ award 2/2
   (b) $90=5\times\cos(2\times 90)\rightarrow 90=-5\rightarrow -95$ award 1/2 ✓×
2. (a) $5\times\cos\times 2\times 90\left(\rightarrow 5\times\cos\times 180\right)\rightarrow -5$ award 2/2
   (b) $5\times\cos\times 2\times 90\rightarrow 5\times\cos 180$ award 1/2 ✓×
   (c) $5\times\cos\times 2\times 90\rightarrow 5\times\cos\times 180$ award 0/2
3. (a) $5\cos 2\times 90$ award 1/2 ✓^
   (b) $5\cos 290=5\cos 180$ award 1/2 ✓^
   (c) $5\cos 290$ award 0/2

Question	Generic scheme	Illustrative scheme	Max mark
14.	•[1] start to factorise (see note 1)	•[1] $(5x\ldots2)(2x\ldots3)$ **or** $5x(2x+3)-2(2x+3)$ **or** $2x(5x-2)+3(5x-2)$	**3**
	•[2] complete factorisation	•[2] $(5x-2)(2x+3)$	
	•[3] solve equation	•[3] $\frac{2}{5}$, $-\frac{3}{2}$	

Notes:

1. For the award of •[1] and •[2], where working is shown, **every** step must be mathematically consistent with the previous step
   eg $10x^2+11x-6 \rightarrow x^2+11x-60 \rightarrow (x-4)(x+15) \rightarrow (5x-2)(2x+3) \rightarrow \frac{2}{5}, -\frac{3}{2}$.
   award 1/3 ××✓
2. Correct answer without working. award 0/3
3. •[3] is only available for **two** non-integer roots
   eg $(10x+1)(x-6) \rightarrow x=-\frac{1}{10}$, $x=6$. award 0/3
4. Where the quadratic formula is used, award 0/3
   (method specified in question: see General Marking Principle (f)).
5. (a) Where the **equation** is multiplied by a scalar, this is mathematically equivalent: all three marks are available (see COR 2(a)).
   (b) Where the **expression** is multiplied by a scalar, this is **not** mathematically equivalent: only •[3] is available (see COR 2(b)).

Commonly Observed Responses:

1. $\frac{(10x-4)}{2}\frac{(10x+15)}{5}\left[\rightarrow (5x-2)(2x+3)\right] \rightarrow \frac{2}{5}, -\frac{3}{2}$ award 3/3
2. (a) $(10x-4)(10x+15)=0\left[\rightarrow (5x-2)(2x+3)=0\right] \rightarrow \frac{2}{5}, -\frac{3}{2}$ award 3/3
   [Equated to 0 (mathematically equivalent)]
   (b) $(10x-4)(10x+15)\left[\rightarrow (5x-2)(2x+3)\right] \rightarrow \frac{2}{5}, -\frac{3}{2}$ award 1/3 ××✓
   [Not equated to 0 (not mathematically equivalent)]
3. $2x(5x-2)3(5x-2) \rightarrow (5x-2)(2x+3) \rightarrow \frac{2}{5}, -\frac{3}{2}$ award 1/3 ××✓

[END OF MARKING INSTRUCTIONS]

National
Qualifications
2026

2026 Mathematics

National 5 Paper 2

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 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.

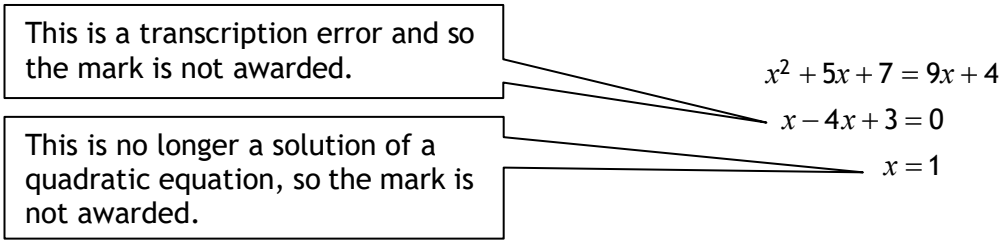
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

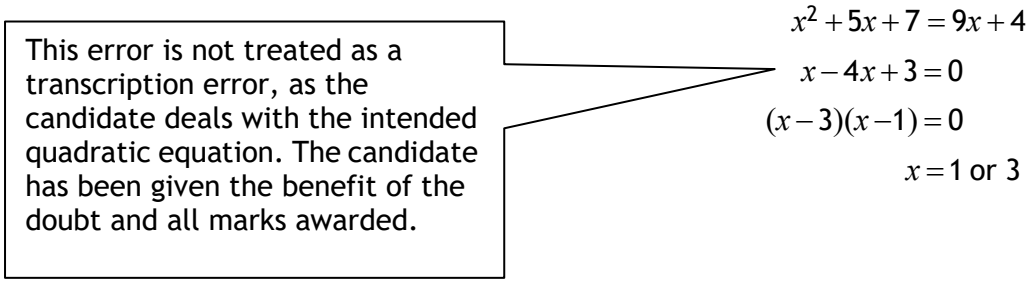
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(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:

	○5	○6
○5	$x = 2$	$x = -4$
○6	$y = 5$	$y = -7$

Horizontal: ○5 $x = 2$ and $x = -4$ Vertical: ○5 $x = 2$ and $y = 5$

○6 $y = 5$ and $y = -7$ ○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

$\frac{15}{0.3}$ 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.			$\bullet^1$ know how to decrease by 28% $\bullet^2$ know how to calculate value $\bullet^3$ evaluate $\bullet^4$ answer correct to 3 significant figures	$\bullet^1$ $\times 0.72$ $\bullet^2$ 22600×0.72^3 $\bullet^3$ 8435(.4048) $\bullet^4$ (£) 8440	**4**

Notes:

1. Correct answer without working. award 4/4
2. For the award of $\bullet^4$ do not accept 8440.00.
3. Where an incorrect percentage is used, the working must be followed through to give the possibility of awarding 3/4
   eg for $22600\times 0.28^3 = 496.1\ldots \rightarrow 496$. award 3/4 ×✓1✓1✓1
4. Where an incorrect power (≥2) is used, the working must be followed through to give the possibility of awarding 3/4
   eg $22600\times 0.72^2 = 11715.84 \rightarrow 11700$. award 3/4 ✓×✓1✓1
5. Where division is used:
   (a) along with 0.72, $\bullet^1$ is not available
   eg $22600\div 0.72^3 = 60549(\ldots) \rightarrow 60500$. award 3/4 ×✓1✓1✓1
   (b) along with an incorrect percentage, $\bullet^1$ and $\bullet^2$ are not available
   eg $22600\div 1.28^3 = 10776.5\ldots \rightarrow 10800$. award 2/4 ××✓1✓1
6. Where intermediate calculations are shown, premature rounding must be to at least 4 significant figures.
7. $\bullet^3$ is not available for subsequent incorrect working (see COR 5).

Commonly Observed Responses:

1. $22600\times 0.72 = 16272 \rightarrow 16300$ award 2/4 ✓××✓1
2. $22600\times 0.72\times 3 = 48816 \rightarrow 48800$ award 2/4 ✓××✓1
3. $22600\times 0.28 = 6328 \rightarrow 22600 - 6328\times 3 = 3616 \rightarrow 3620$ award 1/4 ×××✓1
4. $22600\times 0.28\times 3 = 18984 \rightarrow 19000$ award 1/4 ×××✓1
5. (a) $22600\times 0.72^3 = 22600 - 8435(.4048) \rightarrow 14164(.5952) \rightarrow 14200$ award 3/4 ✓✓×✓1
   (b) $22600\times 0.28^3 = 22600 - 496(.1152) \rightarrow 22103(.8848) \rightarrow 22100$ award 2/4 ×✓1×✓1

Question			Generic scheme	Illustrative scheme	Max mark
2.			•[1] correct substitution into cosine rule •[2] evaluate XY[2] •[3] evaluate XY	•[1] $4^2+5^2-2\times4\times5\times\cos106$ •[2] $52.0\ldots$ •[3] $7.2\ldots$ (cm)	**3**

Notes:

1. Correct answer without working. award 0/3
2. Accept 7 (cm) with working. award 3/3
3. Where the sine rule or area of triangle formula is used. award 0/3
4. Disregard errors due to premature rounding provided there is evidence.
   (a) $4^2+5^2-2\times4\times5\times\cos106\rightarrow4^2+5^2-2\times4\times5\times(-0.28)\rightarrow52.2\rightarrow7.22$ (cm). award 3/3
   (b) $4^2+5^2-2\times4\times5\times\cos106\rightarrow4^2+5^2-2\times4\times5\times(-0.3)\rightarrow53\rightarrow7.28$ (cm). award 3/3
5. Inappropriate use of RAD or GRAD may only be penalised once in Q2, Q7, Q8 or Q10.
   (a) 3.67… **or** 3.7 RAD.
   (b) 6.69… **or** 6.7 GRAD.

Commonly Observed Responses:

1. $\sqrt{4^2+5^2}=6.4\ldots$ (cm) award 1/3 ××✓1
2. $16+25-11.0(2\ldots)=29.97\ldots\rightarrow5.47\ldots$ (cm) award 2/3 ✓××1

Question			Generic scheme	Illustrative scheme	Max mark
3.			**Method 1** •^{1} find linear scale factor •^{2} multiply volume by cube of linear scale factor •^{3} find volume (calculation must involve a power of a linear scale factor) **Method 2** •^{1} find linear scale factor •^{2} divide volume by cube of linear scale factor •^{3} find volume (calculation must involve a power of a linear scale factor)	•^{1} $\frac{8}{12}$ $(=0.66\ldots)$ •^{2} $\left(\frac{8}{12}\right)^3\times 540$ •^{3} 160 (ml) •^{1} $\frac{12}{8}$ $(=1.5)$ •^{2} $540\div\left(\frac{12}{8}\right)^3$ •^{3} 160 (ml)	3

Notes:

1. Correct answer without working. award 0/3
2. •^{3} is not available for subsequent invalid working
   eg $540-160=380\,(\text{ml})$. award 2/3 ✓✓×
3. •^{3} is not available if premature rounding leads to an incorrect answer
   eg $\left(\frac{8}{12}\right)^3\times 540=(0.67)^3\times 540=162(.4\ldots)$. award 2/3 ✓✓×

Commonly Observed Responses:

1. $\left(\frac{8}{12}\right)\times 540=360$ award 1/3 ✓××
2. $\left(\frac{12}{8}\right)^3\times 540=1822.5$ award 2/3 ✓×✓1
3. $\left(\frac{8}{12}\right)^2\times 540=240$ award 2/3 ✓×✓1
4. $\left(\frac{8}{12}\right)\times 540^3=104\,976\,000$ award 1/3 ✓××
5. $\left(\frac{12}{8}\right)^2\times 540=1215$ award 2/3 ✓×✓1

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		•[1] construct equation	•[1] $5c+6p=45$	**1**

Notes:

1. •[1] is not available where a candidate uses alternative variables.
2. Accept $5c+6p=45$ min or $5c+6p=45$ m.
3. If part (a) is not attempted or the answer is incomplete, accept correct answer to part (a) which appears in parts (b) or (c).

Commonly Observed Responses:

	(b)		•[2] construct equation	•[2] $7c+4p=52$	**1**

Notes:

1. Accept use of consistent alternative variables from part (a).
2. Accept $7c+4p=52$ min or $7c+4p=52$ m.
3. If part (b) is not attempted **or** the answer is incomplete, accept correct answer to part (b) which appears in parts (a) **or** (c).

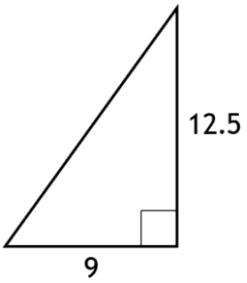
Commonly Observed Responses:

	(c)		•[3] correct scaling	•[3] eg $10c+12p=90$ $21c+12p=156$ **or** $35c+42p=315$ $35c+20p=260$ **or** $20c+24p=180$ $42c+24p=312$	**4**
			•[4] value for c or p	•[4] $c=6$ or $p=2.5$	
			•[5] value for p or c	•[5] $p=2.5$ or $c=6$	
			•[6] calculate final answer	•[6] 80 (minutes)	

Notes:

1. Correct answer without working. award 0/4
2. For a solution obtained by repeated substitution. award 0/4
3. •[6] is not available if either c or p is negative.
4. For the award of •[6] accept 1 hr 20 mins.
5. For the award of •[3] both variables must appear in each equation.

Commonly Observed Responses:

Question	Generic scheme	Illustrative scheme	Max mark
5.	$\bullet^1$ marshal facts and recognise right angled triangle	$\bullet^1$ 	**3**
	$\bullet^2$ consistent Pythagoras statement	$\bullet^2$ 12.5^2+9^2	
	$\bullet^3$ calculate radius	$\bullet^3$ $15.4(02\ldots)$ (cm)	

Notes:

1. Correct answer without working. award 0/3
2. In the absence of a diagram or diagram with no right angle marked, accept 12.5^2+9^2 as evidence for the award of $\bullet^1$ and $\bullet^2$.
3. **BEWARE:** where a diagram is shown, working must be consistent with the diagram; $\bullet^2$ is not available for an incorrect diagram leading to 12.5^2+9^2.
4. Valid trigonometry may used to calculate the length of the radius eg cosine rule.
5. $\bullet^3$ is not available for subsequent invalid working.
6. Accept 15 (cm) with working. award 3/3

Commonly Observed Responses:

1. $12.5^2-9^2 \rightarrow 8.67\ldots$
   (a) working inconsistent with correct diagram — award 2/3 ✓×✓1
   (b) working consistent with candidate's diagram — award 2/3 ×✓1✓1
   (cosine rule may be used to calculate third side)
   (c) no diagram or diagram with no right angle marked — award 1/3 ××✓1
2. $25^2-9^2 \rightarrow 23.32\ldots$ **or** $25^2+9^2 \rightarrow 26.57\ldots$
   (a) working consistent with candidate's diagram — award 2/3 ×✓1✓1
   (cosine rule may be used to calculate third side)
   (b) no diagram or diagram with no right angle marked — award 1/3 ××✓1

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		$\bullet^1$ correct substitution into formula for volume of sphere $\bullet^2$ consistent volume calculation	$\bullet^1$ $\frac{4}{3}\times\pi\times5^3$ $\bullet^2$ $523.59\ldots$ or 524 (cm^3)	2

Notes:

1. Correct answer without working. award 2/2
2. Accept variations in π. eg $\frac{4}{3}\times3.14\times5^3=523.3\ldots$ **or** $523.\dot{3}$. award 2/2
3. $\bullet^2$ is not available for subsequent invalid working.
4. For the award of $\bullet^2$ the calculation must involve a fraction, π and a power
   eg $\pi\times5^3=392.699\ldots$. award 0/2

Commonly Observed Responses:

1. (a) $\frac{4}{3}\times\pi\times5^3=104(.7\ldots)$ award 1/2 ✓×

   (b) $\frac{4}{3}\times\pi\times5^2=104(.7\ldots)$ award 1/2 ×✓1

2. (a) $\frac{4}{3}\times\pi\times10^3=4188(.7\ldots)$ award 1/2 ×✓1

   (b) $\frac{4}{3}\times3.14\times10^3=4186(.6\ldots)$ award 1/2 ×✓1

3. $\frac{4}{3}\times\pi\times5=20(.9\ldots)$ award 0/2

4. $\frac{4}{3}\times\pi\times2.5^3=65(.4\ldots)$ award 1/2 ×✓1

Question			Generic scheme	Illustrative scheme	Max mark
6.	(b)		**Method 1** •[3] start substitution into formula for volume of cone •[4] complete substitution into formula •[5] calculate height **Method 2** •[3] change subject to h •[4] correct substitution into formula •[5] calculate height	•[3] $\frac{1}{3}\times\pi\times6^2\times h$ **or** $\frac{1}{3}\pi r^2h=523.59\ldots$ •[4] $\frac{1}{3}\times\pi\times6^2\times h=523.59\ldots$ •[5] 13.88… **or** 14 (cm) •[3] $(h=)\frac{3V}{\pi r^2}$ **or** $\frac{V}{\frac{1}{3}\pi r^2}$ •[4] $(h=)\frac{3\times523.59\ldots}{\pi\times6^2}$ **or** $\frac{523.59\ldots}{\frac{1}{3}\times\pi\times6^2}$ •[5] 13.88… **or** 14 (cm)	**3**

Notes:

1. For a correct answer without working. award 0/3
2. For an answer obtained by repeated substitution. award 0/3
3. •[5] is only available for:
   - method 1: a calculation involving a fraction, π and a power.
   - method 2: a calculation involving π, a power and division by a product.
4. Alternative method: $\frac{4}{3}\times\pi\times5^3=\frac{1}{3}\times\pi\times6^2\times h\rightarrow h=\frac{\frac{4}{3}\times\pi\times5^3}{\frac{1}{3}\times\pi\times6^2}\left[=\frac{4\times5^3}{6^2}\right]\rightarrow h=\frac{125}{9}$.

Commonly Observed Responses:

1. $(h=)\frac{524}{\frac{1}{3}\times\pi\times6^2}\rightarrow14$ award 3/3
2. $\frac{1}{3}\times\pi\times12^2\times h=523.59\ldots\rightarrow3.47(2\ldots)$ award 2/3 ✓×✓1

Question			Method 1	Illustrative scheme	Max mark
7.			**Method 1** •[1] valid strategy •[2] evaluation •[3] explicit comparison within valid strategy and state conclusion **Method 2** •[1] begin valid strategy •[2] continue valid strategy •[3] explicit comparison within valid strategy and state conclusion **Method 3** •[1] valid strategy •[2] evaluation of $\cos x$ •[3] calculate angle and state conclusion	**Method 1** •[1] 88^2+105^2 and 137^2 •[2] $88^2+105^2=18769$ **and** $137^2=18769$ •[3] $88^2+105^2=137^2$; it is right-angled **Method 2** •[1] $88^2+105^2=18769$ •[2] $\sqrt{18769}=137$ •[3] $\sqrt{88^2+105^2}=137$; it is right-angled **Method 3** •[1] $(\cos x=)\dfrac{88^2+105^2-137^2}{2\times 88\times 105}$ •[2] $(\cos x=)0$ •[3] $(x=)90$; it is right-angled	**3**

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

Notes:

1. $\bullet^1$ and $\bullet^3$ are not available where a candidate starts by stating that $88^2+105^2=137^2$
   eg $88^2+105^2=137^2$ $\bullet^1$ × $\bullet^3$ ×
   $18769=18769$ $\bullet^2$ ✓
   so it is right-angled. award 1/3 ×✓×
2. $\bullet^3$ is not available where a candidate starts by stating that IF $88^2+105^2=137^2$ unless explicit comparison is demonstrated
   eg IF $88^2+105^2=137^2$ $\bullet^1$ ✓ $\bullet^3$ ×
   $18769=18769$ $\bullet^2$ ✓
   so it is right-angled. award 2/3 ✓✓×
3. For the award of $\bullet^3$:
   (a) accept $88^2+105^2=137^2$ as evidence of explicit comparison unless candidate has started with this statement (see Notes 1 and 2).
   (b) accept 18769 = 18769 as evidence of explicit comparison where the two separate calculations each lead to 18769.
   (c) do NOT accept statement "$c^2=a^2+b^2$ so it is right-angled" unless c, a and b have been labelled on diagram or assigned to sides, and statement is consistent with labelling.
4. Inappropriate use of RAD or GRAD should only be penalised once in Q2, Q7, Q8 or Q10.
   (a) 1.57…, it is not right-angled (RAD).
   (b) 100, it is not right-angled (GRAD).

Commonly Observed Responses:

1. (a) $(\cos x=)\dfrac{88^2+137^2-105^2}{2\times88\times137}\rightarrow(\cos x=)\dfrac{88}{137}\rightarrow 50.033\ldots\rightarrow$ not right angled
   award 2/3 ×✓1✓1

   (b) $(\cos x=)\dfrac{105^2+137^2-88^2}{2\times105\times137}\rightarrow(\cos x=)\dfrac{105}{137}\rightarrow 39.966\ldots\rightarrow$ not right angled
   award 2/3 ×✓1✓1

Question			Generic scheme	Illustrative scheme	Max mark
8.			$\bullet^1$ rearrange equation $\bullet^2$ find first value of x $\bullet^3$ find second value of x	$\bullet^1$ $\tan x° = \frac{1}{5}$ or 0.2 $\bullet^2$ $x = 11.3(09\ldots)$ $\bullet^3$ $x = 191.3(09\ldots)$	**3**

Notes:

1. Correct answers
   (a) without working. award 1/3 ^^✓
   (b) by repeated substitution. award 1/3 ××✓
2. Accept 11 and 191 with valid working.
3. Degree signs are not required.
4. $\bullet^2$ and $\bullet^3$ are only available where angles are obtained using a valid trigonometric calculation.
5. Inappropriate use of RAD or GRAD should only be penalised once in Q2, Q7, Q8 or Q10.
   (a) 0.197…, 180.197… (RAD).
   (b) 12.56…, 192.566… (GRAD).
6. Where more than two final values are stated, $\bullet^3$ is not available
   eg 11, 169 and 191. award 2/3 ✓✓×

Commonly Observed Responses:

1. $\tan x° = -\frac{1}{5} \rightarrow 168.7,\ 348.7$ award 2/3 ×✓1✓1

2. $\tan x° = -\frac{1}{5} \rightarrow 11.3,\ 191.3$ award 0/3

Question			Generic scheme	Illustrative scheme	Max mark
9.			$\bullet^1$ start to divide fractions	$\bullet^1$ $\dfrac{x^2-81}{5}\times\dfrac{2}{x+9}$	**3**
			$\bullet^2$ factorise	$\bullet^2$ $\dfrac{(x-9)(x+9)}{\ldots}\ldots$	
			$\bullet^3$ multiply and simplify	$\bullet^3$ $\dfrac{2(x-9)}{5}$	

Notes:

1. Correct answer without working. award 0/3
2. $\bullet^2$ and $\bullet^3$ are not available if there is no evidence of factorising
   eg $\dfrac{x^{\cancel{2}}-\cancel{81}}{5}\times\dfrac{2}{\cancel{x+9}}\left[=\dfrac{x-9}{5}\times\dfrac{2}{1}\right]=\dfrac{2(x-9)}{5}$ award 1/3 ✓××
3. $\bullet^3$ is not available for subsequent invalid working.
   eg $\dfrac{(x+9)(x-9)}{5}\times\dfrac{2}{x+9}=\dfrac{2(x-9)}{5}=\dfrac{2x-9}{5}$ award 2/3 ✓✓×

Commonly Observed Responses:

1. $\dfrac{(x+9)(x-9)}{5}\times\dfrac{2}{x+9}\left[=\dfrac{2(x-9)}{5}\right]=\dfrac{2x-18}{5}$ award 3/3
2. $\dfrac{2\left(x^2-81\right)}{5(x+9)}$ **or** $\dfrac{2x^2-162}{5x+45}$ award 1/3 ✓^^
3. $(x+9)(x-9)$ alone award 0/3

Question			Generic scheme	Illustrative scheme	Max mark
10.			**Method 1** •[1] find angle •[2] substitute into area of a triangle formula •[3] substitute into sector formula •[4] know how to calculate area of a segment •[5] calculate area of segment **and state correct units** **Method 2** •[1] find angle •[2] substitute into area of a triangle formula •[3] know how to calculate area of **all** segments •[4] know how to calculate area of a segment •[5] calculate area of segment **and state correct units**	**Method 1** •[1] 72 •[2] $\frac{1}{2}\times 11\times 11\times \sin 72 \ (=57.5\ldots)$ •[3] $\frac{72}{360}\times \pi \times 11^2$ **or** $\frac{1}{5}\times \pi \times 11^2 \ (=76.0\ldots)$ •[4] $\frac{1}{5}\pi r^2 - \frac{1}{2}ab\sin C$ •[5] 18.48… **or** 18.5 cm^2 **Method 2** •[1] 72 •[2] $\frac{1}{2}\times 11\times 11\times \sin 72 \ (=57.5\ldots)$ •[3] $\pi r^2 - 5\times \frac{1}{2}ab\sin C$ •[4] $\frac{\pi\times 11^2 - 5\times\left(\frac{1}{2}\times 11\times 11\times \sin 72\right)}{5}$ •[5] 18.48… or 18.5 cm^2	**5**

Question	Generic scheme	Illustrative scheme	Max mark

10. (continued)

Notes:

1. Correct answer without working. award 0/5
2. Accept variations in π.
3. Disregard errors due to premature rounding provided there is evidence.
4. $\bullet^4$ and $\bullet^5$ are only available for:
   - Method 1: calculating the sum or difference of the **area** of a sector and the **area** of a triangle, where the area of a triangle is calculated using trigonometry.
   - Method 2: calculating the sum or difference of the **area** of a circle and the **area** of a pentagon, where the area of a triangle is calculated using trigonometry.

   See CORs 5 and 6.
5. $\bullet^2$ is available for using $A = \frac{1}{2}bh$ where h is calculated following a valid trigonometric method.
6. Inappropriate use of RAD or GRAD should only be penalised once in Q2, Q7, Q8 or Q10.
   (a) 15.356..., 60.67... (RAD).
   (b) 54.74..., 21.28... (GRAD).
7. For the award of $\bullet^2$ accept an incorrect **acute** angle substituted into the area of a triangle formula eg $\frac{1}{2}\times 11\times 11\times \sin 60$.

Commonly Observed Responses:

1. $\pi\times 11^2 - 5\times\frac{1}{2}\times 11\times 11\times\sin 72 \rightarrow 380.13... - 287.69... \rightarrow 92.43...$ cm^2 award 4/5 ✓✓✓×✓1

2. $\pi\times 11^2 - \frac{1}{2}\times 11\times 11\times\sin 72 \rightarrow 380.13... - 57.53... \rightarrow 322.59...$ cm^2 award 3/5 ✓✓××✓1

3. (a) $\frac{5\times 11\times 11\times\sin 72 - \pi\times 11^2}{5} \rightarrow \frac{575.38... - 380.13...}{5} \rightarrow 39.05...$ cm^2 award 3/5 ✓××✓1✓1

   (b) $\frac{\pi\times 11^2 - 5\times 11\times 11\times\sin 72}{5} \rightarrow \frac{380.13... - 575.38...}{5} \rightarrow \pm 39.05...$ cm^2 award 3/5 ✓×✓✓1×

4. (a) $\frac{1}{5}\times\pi\times 22 - \frac{1}{2}\times 11\times 11\times\sin 72 \rightarrow 13.82... - 57.5... \rightarrow \pm 43.7...$ cm^2 award 2/5 ✓✓×××

   (b) $\frac{\pi\times 22 - 5\times\left(\frac{1}{2}\times 11\times 11\times\sin 72\right)}{5} \rightarrow \frac{69.11... - 287.69...}{5} \rightarrow \pm 43.7...$ cm^2 award 2/5 ✓✓×××

5. $\pi\times 22 - \frac{1}{2}\times 11\times 11\times\sin 72 \rightarrow 69.11... - 57.53... \rightarrow 11.58...$ cm^2 award 2/5 ✓✓×××

6. (a) $\frac{\frac{4}{3}\times\pi\times 11^3 - 5\times\frac{1}{2}\times 11\times 11\times\sin 72}{5} \rightarrow \frac{5575.27... - 287.69...}{5} \rightarrow 1057.5...$ cm^2

   award 2/5 ✓✓×××

   (b) $\frac{\frac{4}{3}\times\pi\times 11^2 - 5\times\frac{1}{2}\times 11\times 11\times\sin 72}{5} \rightarrow \frac{506.84... - 287.69...}{5} \rightarrow 43.8...$ cm^2

   award 2/5 ✓✓×××

Question	Generic scheme	Illustrative scheme	Max mark
11.	•[1] start to simplify denominator	•[1] $\frac{a^{17}}{27\ldots}$ **or** $\frac{a^{17}}{\ldots a^{12}}$	**3**
	•[2] simplify denominator	•[2] $\frac{a^{17}}{27a^{12}}$	
	•[3] complete simplification	•[3] $\frac{a^5}{27}$ **or** $\frac{1}{27}a^5$	

Notes:

1. Correct answer without working. award 0/3
2. •[3] is not available for subsequent incorrect working
   eg $\frac{a^{17}}{27a^{12}} \rightarrow \frac{a^5}{27} \rightarrow \frac{1}{27a^5}$. award 2/3 ✓✓×
3. For the award of •[3] do not accept a decimal approximation
   eg $\frac{a^{17}}{3a^{12}} \rightarrow 0.33a^5$ $\frac{a^{17}}{3a^{12}} \rightarrow 0.33a^5$. award 1/3 ✓××

Commonly Observed Responses:

1. $\frac{a^{17}}{3a^{12}} \rightarrow \frac{a^5}{3}$ **or** $\frac{1}{3}a^5$ award 2/3 ✓×✓1
2. $\frac{a^{17}}{27a^7} \rightarrow \frac{a^{10}}{27}$ **or** $\frac{1}{27}a^{10}$ award 2/3 ✓×✓1
3. $\frac{a^{17}}{3a^7} \rightarrow \frac{a^{10}}{3}$ **or** $\frac{1}{3}a^{10}$ award 1/3 ××✓1
4. $\frac{a^{17}}{3a^{12}} \rightarrow 3a^5$ award 1/3 ✓××

Question			Generic scheme	Illustrative scheme	Max mark
12.			**Method 1** •1 factorises •2 express in simplest form **Method 2** •1 valid substitution •2 express in simplest form	**Method 1** •1 $\cos x\left(\sin^2 x+\cos^2 x\right)$ •2 $\cos x$ **Method 2** •1 $\cos x\left(1-\cos^2 x\right)+\cos^3 x$ •2 $\cos x$	2

Notes:

1. Correct answer without working. award 0/2
2. Do not penalise omission of degrees sign.
3. Accept $\left(\sin x\right)^2$ and $\left(\cos x\right)^2$ but not $\sin x^2$ and $\cos x^2$.
4. •1 is not available if there are no variables eg
   (a) $\cos\left(\cos^2+\sin^2\right)=\cos x$. award 2/2
   (b) $\cos\left(\cos^2+\sin^2\right)=\cos$. award 1/2 ×✓1
   (c) $\cos\left(\cos^2+\sin^2\right)$. award 0/2
5. •1 is not available if the candidate simply states $\cos^2 x+\sin^2 x=1$ then proceeds no further.
6. •2 is not available if there is subsequent invalid working.
7. Alternative acceptable strategy:
   •1 $\left(\frac{a}{h}\right)\left(\left(\frac{o}{h}\right)^2+\left(\frac{a}{h}\right)^2\right)$
   •2 $\left(\frac{a}{h}\right)=\cos x$ award 2/2

Commonly Observed Responses:

1. $\cos x\times 1-\cos^2 x+\cos^3 x\rightarrow\cos x-\cos^3 x+\cos^3 x\rightarrow\cos x$ award 0/2

Question			Generic scheme	Illustrative scheme	Max mark
13.	(a)		$\bullet^1$ correct expression	$\bullet^1$ $2x+6$	**1**
Notes: 1. $\bullet^1$ is available If solution to part (a) appears in parts (b) or (c). 2. Accept $x+x+6$ **or** $6+2x$. 3. Accept $A=(2x+6)(\ldots\ldots)$ **or** $(2x+6)(\ldots\ldots)$.					
Commonly Observed Responses:					
	(b)		$\bullet^2$ find expression for area of extension and expand pair of brackets $\bullet^3$ construct equation and rearrange into required form	$\bullet^2$ $(2x+6)(x+2)=2x^2+4x+6x+12$ $\bullet^3$ $2x^2+10x+12=17$ $\Rightarrow 2x^2+10x-5=0$	**2**
Notes: 1. $\bullet^2$ and $\bullet^3$ are available if solution to part (b) appears in parts (a) or (c). 2. For the award of $\bullet^2$ accept a correct expansion of a pair of brackets, one of which **must** be $(x+2)$.					
Commonly Observed Responses: 1. $2x+6\times x+2=2x^2+10x+12\rightarrow 2x^2+10x+12=17\Rightarrow 2x^2+10x-5=0$ award 1/2 ×✓1 2. $2x^2+10x+12=17\rightarrow 2x^2+10x-5=0$ (with no prior evidence) award 0/2					

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Question			Generic scheme	Illustrative scheme	Max mark
13.	(c)		$\bullet^4$ correct substitution into quadratic formula $\bullet^5$ evaluate discriminant $\bullet^6$ solve for x $\bullet^7$ select correct value of x, stated to 2 decimal places	$\bullet^4$ $\dfrac{-10\pm\sqrt{10^2-4\times2\times(-5)}}{2\times2}$ $\bullet^5$ 140 (stated or implied by $\bullet^6$) $\bullet^6$ 0.458… **and** −5.458… $\bullet^7$ 0.46 (m)	**4**

Notes:

1. Correct answer without working. award 0/4
2. For a solution obtained by repeated substitution. award 0/4
3. $\bullet^4$, $\bullet^5$, $\bullet^6$ and $\bullet^7$ are available If solution to (c) appears in part (a) or (b). However, if a different value for x is stated in part (c) then $\bullet^7$ is not available. (General Marking Principle (l) should not be applied in this special case).
4. $\bullet^4$ and $\bullet^5$ are available for $\dfrac{-5\pm\sqrt{35}}{2}$.
5. Where b^2-4ac is calculated incorrectly, $\bullet^6$ is only available if $b^2-4ac>0$.
6. For: (a) $\dfrac{-10+\sqrt{10^2-4\times2\times(-5)}}{2\times2}\rightarrow0.46$. award 4/4
   (with explicit justification of why second root has not been calculated eg 2nd substitution leads to a negative solution)

   (b) $\dfrac{-10+\sqrt{10^2-4\times2\times(-5)}}{2\times2}\rightarrow0.46$. award 1/4 ×✓××

   c) $\dfrac{-10+\sqrt{10^2-4\times2\times(-5)}}{2\times2}$. award 0/4
7. $\bullet^7$ is not available if:
   - there is subsequent invalid working
   - premature rounding leads to an incorrect answer

Question	Generic scheme	Illustrative scheme	Max mark

13. (c) (continued)

Commonly Observed Responses:

1. $\left(b^2-4ac=\right)140$ award 1/4 ×✓××

2. (a) $\dfrac{-10\pm\sqrt{10^2-4\times2\times(-5)}}{2\times2}\rightarrow\dfrac{-10\pm\sqrt{60}}{2\times2}\rightarrow -0.563\ldots$ **or** $-4.436\ldots$ award 2/4 ✓×✓1×

   (b) $\dfrac{-10\pm\sqrt{10^2-4\times2\times5}}{2\times2}\left(\rightarrow\dfrac{-10\pm\sqrt{60}}{2\times2}\right)\rightarrow -0.563\ldots$ **or** $-4.436\ldots$ award 2/4 ×✓1✓1×

3. (a) $-10\pm\dfrac{\sqrt{10^2-4\times2\times(-5)}}{2\times2}\rightarrow-10\pm\dfrac{\sqrt{140}}{2\times2}\rightarrow 0.458\ldots$ **or** $-5.458\ldots\rightarrow 0.46$ award 4/4

   (b) $-10\pm\dfrac{\sqrt{10^2-4\times2\times(-5)}}{2\times2}\rightarrow-10\pm\dfrac{\sqrt{140}}{2\times2}\rightarrow -7.041\ldots$ **or** $-12.958\ldots$ award 2/4 ×✓✓1×

4. $\dfrac{-10\pm\sqrt{10^2-4\times2\times5}}{2\times2}\rightarrow\dfrac{-10\pm\sqrt{140}}{2\times2}\left(\rightarrow-10\pm\dfrac{\sqrt{140}}{2\times2}\right)\rightarrow -7.041\ldots$ **or** $-12.958\ldots$

   award 0/4

[END OF MARKING INSTRUCTIONS]