National Qualifications 2024

2024 Mathematics

National 5 – Paper 1

Question Paper 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.

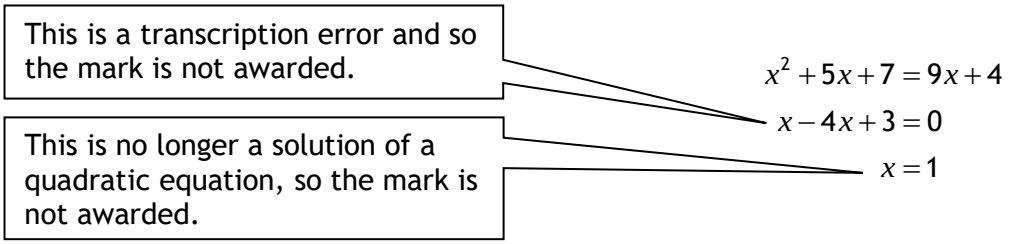
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

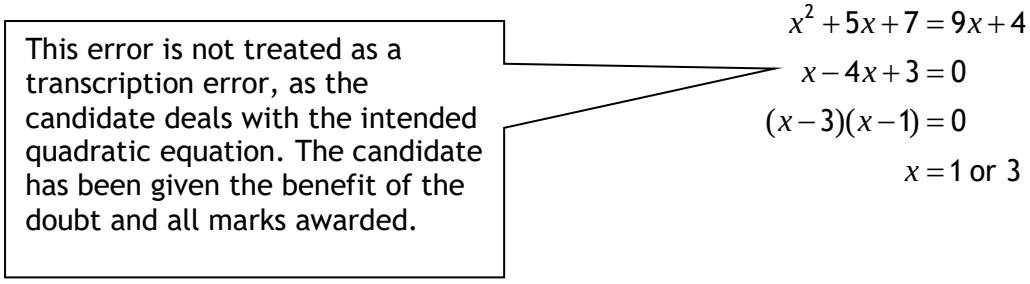
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(g) If an error is trivial, casual or insignificant, for example 6 × 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:

	$\bigcirc^5$	$\bigcirc^6$
$\bigcirc^5$	$x=2$	$x=-4$
$\bigcirc^6$	$y=5$	$y=-7$

Horizontal: $\bigcirc^5$ $x=2$ and $x=-4$ $\quad$ $\bigcirc^6$ $y=5$ and $y=-7$

Vertical: $\bigcirc^5$ $x=2$ and $y=5$ $\quad$ $\bigcirc^6$ $x=-4$ 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 $1\frac{1}{4}$ $\quad$ $\frac{43}{1}$ must be simplified to 43

$\frac{15}{0{\cdot}3}$ must be simplified to 50 $\quad$ $\frac{4\frac{}{}5}{3}$ 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.	$\bullet^1$ identify common denominator	$\bullet^1$ $3\frac{\cdots}{12}-1\frac{\cdots}{12}$ or $\frac{\cdots}{12}-\frac{\cdots}{12}$	**2**
	$\bullet^2$ consistent answer	$\bullet^2$ $2\frac{5}{12}$ or $\frac{29}{12}$	

Notes:

1. Correct answer without working — award 0/2

2. Do not penalise incorrect conversion of $\frac{29}{12}$ to a mixed number.

3. Treat $2\left(\frac{8}{12}-\frac{3}{12}\right)=2\left(\frac{5}{12}\right)$ as bad form — award 2/2
   However, see COR 2.

Commonly Observed Responses:

1. $\frac{11}{3}\times\frac{5}{4}=\frac{55}{12}$ — award 0/2

2. $2\left(\frac{8}{12}-\frac{3}{12}\right)=2\left(\frac{5}{12}\right)=\frac{10}{12}=\frac{5}{6}$ — award 1/2 ✓×

Question	Generic scheme	Illustrative scheme	Max mark
2.	•1 substitute into $f(x)$ •2 evaluate $f(x)$	•1 $(7+3)^2$ or equivalent •2 100	**2**

Notes:

1. Correct answer without working — award 2/2

2. For subsequent incorrect working •2 is not available.
   eg $f(7)=(7+3)^2 \rightarrow f(7)=100 \rightarrow f=\frac{100}{7}$ — award 1/2 ✓×

Commonly Observed Responses:

1. $(7+3)(7+3)=49+21+21+9=100$ — award 2/2

2. $(7+3)^2=49+9=58$ (no working necessary) — award 1/2 ✓×

3. $(7+3)(7-3)=40$ — award 1/2 ×✓1

4. (a) $7+3^2=100$ (bad form) — award 2/2
   (b) $7+3^2=16$ — award 0/2

5. (a) $7=(7+3)^2 \rightarrow 7=100$ — award 2/2
   (b) $7=(7+3)^2 \rightarrow 7=100 \rightarrow 93$ — award 1/2 ✓×
   (c) $7=(7+3)^2 \rightarrow 7=100 \rightarrow \frac{100}{7}$ — award 1/2 ✓×

Question			Generic scheme	Illustrative scheme	Max mark
3.			$\bullet^1$ start to expand	$\bullet^1$ evidence of any 3 correct terms eg $x^3-4x^2+5x\ldots$	**3**
			$\bullet^2$ complete expansion	$\bullet^2$ $x^3-4x^2+5x+x^2-4x+5$	
			$\bullet^3$ collect like terms (see Note 3)	$\bullet^3$ x^3-3x^2+x+5	

Notes:

1. Correct answer without working award 3/3

2. Accept:
   (a) x^3-3x^2+1x+5 award 3/3
   (b) x^3+-3x^2+1x+5 award 3/3

3. For the award of $\bullet^3$ the evidence at $\bullet^2$ must include a term in x^3. 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
4.	$\bullet^1$ calculate $3\mathbf{a}$	$\bullet^1$ $\begin{pmatrix} 9 \\ 12 \\ -3 \end{pmatrix}$	**2**
	$\bullet^2$ solution	$\bullet^2$ $\begin{pmatrix} 14 \\ 15 \\ -1 \end{pmatrix}$	

Notes:

1. Correct answer without working — award 2/2

2. Do not award $\bullet^2$ if
   (a) brackets are omitted from the answer
   (omission of brackets should only be penalised once in Qu4, or Qu12(b) or Q12 (c))
   (b) the answer is given in coordinate form.

3. For subsequent invalid working $\bullet^2$ is not available.

   eg (a) $\begin{pmatrix} 14 \\ 15 \\ -1 \end{pmatrix} \rightarrow 14+15-1=28$ — award 1/2 ✓✗

   (b) $\begin{pmatrix} 14 \\ 15 \\ -1 \end{pmatrix} \rightarrow \sqrt{14^2+15^2+(-1)^2} = \sqrt{422}$ — award 1/2 ✓✗

Commonly Observed Responses:

1. $\begin{pmatrix} 9 \\ 12 \\ 3 \end{pmatrix} + \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 14 \\ 15 \\ 5 \end{pmatrix}$ — award 1/2 ×✓1

2. (a) $\begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix} + \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \\ 1 \end{pmatrix} \rightarrow \begin{pmatrix} 24 \\ 21 \\ 3 \end{pmatrix}$ $\left[3(\mathbf{a}+\mathbf{b})\right]$ — award 1/2 ×✓1

   (b) $\begin{pmatrix} 9 \\ 12 \\ -3 \end{pmatrix} + \begin{pmatrix} 15 \\ 9 \\ 6 \end{pmatrix} = \begin{pmatrix} 24 \\ 21 \\ 3 \end{pmatrix}$ $\left[3\mathbf{a}+3\mathbf{b}\right]$ — award 1/2 ✓×

3. $\begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix} + \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \\ 1 \end{pmatrix}$ $\left[\mathbf{a}+\mathbf{b}\right]$ — award 0/2

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ correct median $\bullet^2$ find quartiles $\bullet^3$ calculate IQR	$\bullet^1$ 200 $\bullet^2$ 160, 230 $\bullet^3$ 70	**3**

Notes:

1. (a) Correct median without working award $\bullet^1$.
   (b) Correct IQR 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. Where a candidate calculates the range, award marks as follows:
   (a) median = 200, quartiles = 160 and 230, IQR = 240 − 155 = 85 — award 2/3 ✓✓×
   (b) median = 200, Q_1 = 155 and Q_3 = 240 (**clearly** labelled as $\mathbf{Q_1}$ and $\mathbf{Q_3}$)
   → IQR = 240 − 155 = 85 — award 2/3 ✓×✓1
   (c) median = 200, IQR = 240 − 155 = 85 — award 1/3 ✓××

4. Where a candidate has calculated SIQR = 35, $\bullet^3$ can only be awarded where the candidate has **explicitly** stated "IQR = 70" eg
   (a) median = 200, quartiles = 160 and 230, **IQR = 70**, SIQR = 35 — award 3/3
   (b) median = 200, quartiles = 160 and 230 → (IQR =) 35 — award 2/3 ✓✓×

5. Where a candidate has calculated the IQR, but stated SIQR = 70, $\bullet^3$ is available
   eg median = 200, quartiles = 160 and 230**, SIQR** = 70 — award 3/3

Commonly Observed Responses:

1. median = 200, IQR = 235 − 157.5 = 77.5(0) — award 2/3 ✓×✓1

Question			Generic scheme	Illustrative scheme	Max mark
5.	(b)		•^{4} valid comment comparing medians •^{5} valid comment comparing IQRs	•^{4} On average, the prices are lower on the website. •^{5} The prices in the shop are more consistent.	**2**

Notes:

1. Answers must be consistent with answers to part (a).

2. Comments must clearly distinguish between the **prices** in the **shop** and on the **website** (or equivalent). Accept **"on display"** as evidence of the shop.
   (a) Accept eg On average the **prices** on the **website** are lower and less consistent.
   (b) Do not accept eg On average the prices are lower and less consistent.

3. For the award of •^{4}
   (a) Accept eg
   - On average the **prices** in the shop are more.

   (b) Do not accept eg
   - The **median** price in the shop is higher.
   - The **prices** on the website are less (this implies that all prices are less).
   - On average the **results/scores/data** in the shop are more.

4. For the award of •^{5}
   (a) Accept eg
   - The **spread** of prices is **more** on the **website**.
   - The prices in the **shop** are **less varied**.

   (b) Do not accept eg
   - The **IQR** in the shop is less.
   - The **range** of prices on the website is more.
   - **On average** the prices on the website are more varied.
   - The **IQR of the prices** in the shop is more consistent.
   - The **results/scores/data** in the shop are more consistent.

5. Numbers are not required for marks •^{4} and •^{5}. However, where they appear they must be consistent with the statement.

   eg (i) for answers in parts (a) and (b) award as follows:
   (a) median = 200, IQR = 230 − 160 = 70 — award 3/3
   (b) On average the prices are lower on the website as 70 < 73.
   The prices in the shop are more consistent as 200 > 195. — award 0/2 ××

   (ii) for answers in parts (a) and (b) award as follows:
   (a) median = 200, IQR = 230 – 160 = 70 — award 3/3
   (b) On average the prices are lower on the website as 200 < 195.
   The prices in the shop are more consistent as 70 > 73. — award 0/2 ××

Commonly Observed Responses:

For answers in parts (a) and (b) award as follows:
1. (a) median = 200, IQR = 230 − 160 = 70 — award 3/3
   (b) On average the prices in the **second shop** were lower
   The prices in the **first shop** were less varied — award 0/2 ××

Question			Generic scheme	Illustrative scheme	Max mark
6.			$\bullet^1$ simplify surd $\bullet^2$ complete simplification	$\bullet^1$ $5\sqrt{3}$ $\bullet^2$ $4\sqrt{3}$	**2**

Notes:

1. Correct answer without working — award 0/2

2. For subsequent incorrect working $\bullet^2$ is not available.

Commonly Observed Responses:

1. (a) $5\sqrt{3}-\sqrt{3}=5$ — award 1/2 ✓×
   (b) $\sqrt{25}\sqrt{3}-\sqrt{3}=\sqrt{25}=5$ — award 0/2

2. (a) $\sqrt{72}=6\sqrt{2}$ — award 1/2 ✓1×
   (b) $\sqrt{72}=3\sqrt{8}$ — award 0/2

Question	Generic scheme	Illustrative scheme	Max mark
7.	**Method 1** $\bullet^1$ correct scaling $\bullet^2$ value for p $\bullet^3$ value for r **Method 2** $\bullet^1$ correct scaling $\bullet^2$ value for r $\bullet^3$ value for p	**Method 1** $\bullet^1$ $4p-14r=22$ $21p+14r=28$ $\bullet^2$ $p=2$ $\bullet^3$ $r=-1$ **Method 2** $\bullet^1$ $6p-21r=33$ $6p+4r=8$ $\bullet^2$ $r=-1$ $\bullet^3$ $p=2$	**3**

Notes:

1. Correct answers without working — award 0/3
2. For a solution obtained by repeated substitution — award 0/3
3. Following an earlier error
   (a) accept rounded answers given to at least 1 decimal place.
   (b) for $\bullet^3$ do not penalise incorrect conversion of a fraction to a mixed number or decimal.
4. Where candidate uses separate scaling to obtain each variable, award $\bullet^1$ if either is correct. See CORs 1 to 4.

Commonly Observed Responses:

1. $4p-14r=\mathbf{20}$ (incorrect scaling) $21p+14r=28$ $p=\frac{48}{25}$ $\bullet^3$ ×
   $6p-21r=33$ (correct scaling) $6p+4r=8$ $\bullet^1$ ✓ $r=-1$ $\bullet^2$ ✓
   award 2/3 ✓✓×

2. $4p-14r=\mathbf{20}$ (incorrect scaling) $21p+14r=28$ $p=\frac{\mathbf{8}}{\mathbf{17}}$ $\bullet^3$ ×
   $6p-21r=33$ (correct scaling) $6p+4r=8$ $\bullet^1$ ✓ $r=-1$ $\bullet^2$ ✓
   award 2/3 ✓✓×

3. $4p-14r=\mathbf{20}$ (incorrect scaling) $21p+14r=28$ $p=\frac{48}{25}$ $\bullet^3$ ×
   $6p-21r=33$ (correct scaling) $6p+4r=8$ $\bullet^1$ ✓ $r=-\frac{\mathbf{41}}{\mathbf{17}}$ $\bullet^2$ ×
   award 1/3 ✓××

4. $4p-14r=\mathbf{20}$ (incorrect scaling) $21p+14r=28$ $p=\frac{\mathbf{8}}{\mathbf{17}}$ $\bullet^3$ ×
   $6p-21r=33$ (incorrect scaling) $6p-4r=8$ $\bullet^1$ × $r=-\frac{\mathbf{25}}{\mathbf{17}}$ $\bullet^2$ ✓1
   award 1/3 ×✓1×

Question			Generic scheme	Illustrative scheme	Max mark
8.	(a)		• [1] state value of a	• [1] 7	**1**
Notes: 1. For $y = 7\cos\ldots x$ award 1/1 ✓ 2. For 7, −7 award 0/1 ×					
Commonly Observed Responses:					
	(b)		• [2] state value of b	• [2] 2	**1**
Notes: 1. For $y = \ldots\cos 2x$ award 1/1 ✓ 2. For $a = 2$ in (a) and $b = 7$ in (b) award 0/1 in (a) × and award 1/1 in (b) ✓1					
Commonly Observed Responses:					

Question			Generic scheme	Illustrative scheme	Max mark
9.	(a)		**Method 1** •[1] find gradient •[2] substitute gradient and a point into $y-b=m(x-a)$ •[3] state equation in terms of D and T in simplest form (remove brackets and collect constants) **Method 2** •[1] find gradient •[2] substitute gradient and a point into $y=mx+c$ •[3] state equation in terms of D and T in simplest form (remove brackets and collect constants)	•[1] -2 •[2] $y-26=-2(x-3)$ or $y-12=-2(x-10)$ •[3] $D=-2T+32$ or equivalent •[1] -2 •[2] $26=-2\times3+c$ or $12=-2\times10+c$ •[3] $D=-2T+32$ or equivalent	**3**

Notes:

1. Correct answer without working — award 0/3
2. (a) For the award of •[1] accept $-\frac{14}{7}$. However see Note 3(a).

   (b) BEWARE •[1] is not available for $\frac{26-12}{3-10}=\frac{-14}{7}=-2$ or $\frac{12-26}{10-3}=\frac{14}{-7}=-2$
3. For an incorrect simplification of a gradient, a mark is not awarded at the point where the error occurs eg

   (a) $-\frac{14}{7}=2\rightarrow 26=2\times3+c\rightarrow D=2T+20$ — award 2/3 ×✓1✓1

   (b) $-\frac{14}{7}\rightarrow 26=2\times3+c\rightarrow D=2T+20$ — award 2/3 ✓×✓1

   (c) $-\frac{14}{7}\rightarrow 26=-\frac{14}{7}\times3+c\rightarrow D=2T+20$ — award 2/3 ✓✓×

Commonly Observed Responses:

Working must be shown

1. $y=-2x+32$ — award 2/3 ✓✓✓2
2. $D=-\frac{2}{1}T+32$ — award 2/3 ✓✓✓2
3. $-\frac{7}{14}\rightarrow y-26=-\frac{7}{14}(x-3)\rightarrow D=-\frac{1}{2}T+27.5$ — award 2/3 ×✓1✓1
4. $\frac{7}{14}\rightarrow y-26=\frac{7}{14}(x-3)\rightarrow D=\frac{1}{2}T+24.5$ — award 2/3 ×✓1✓1

Question			Generic scheme	Illustrative scheme	Max mark
9.	(b)		$\bullet^4$ calculate distance remaining	$\underline{\underline{\bullet^4}}$ 18 (km)	**1**

Notes:

1. Consistent answer without working award 1/1

2. $\underline{\underline{\bullet^4}}$ is not available if the gradient is ± 1.

Commonly Observed Responses:

No working necessary

1. $D = 2T - 8$ in part (a) leading to $2 \times 7 - 8 = 6$ (km) award 1/1✓1

2. (a) $D = -2T - 8$ in part (a) leading to $-2 \times 7 - 8 = -22$ (km) award 1/1✓1

   (b) $D = -2T - 8$ in part (a) leading to $-2 \times 7 - 8 = -22 \rightarrow 22$ (km) award 1/1✓1

   (c) $D = -2T - 8$ in part (a) leading to $-2 \times 7 - 8 = 22$ (km) award 0/1 ×

Question			Generic scheme	Illustrative scheme	Max mark
10.			•[1] calculate size of angle OFD •[2] calculate size of angle BOD or FED •[3] calculate size of angle BCD	•[1] 55 •[2] BOD = 110 or FED = 20 •[3] 70	**3**

Notes:

1. Correct answer without working — award 0/3
2. Degree signs are not required
3. Full marks may be awarded for information marked on the diagram.
4. For the award of •[2] accept BAG = 20
5. Where information is not marked on the diagram then working must clearly attach calculations to **named** angles. The final answer must be **clearly** indicated.
6. Where a candidate marks an answer on the diagram but then writes a different answer outwith the diagram, award marks for the angles indicated on the diagram.
7. Disregard incorrect angles which are not on the valid pathway followed by the candidate.
8. For the award of •[3] BCD must be less than 90.
9. Where angle BOD is assumed, •[3] is not available.
   eg BOD = 140 → BCD = 40 — award 0/3

Commonly Observed Responses:

1. OFD = 55 → FOD = 55 → BOD = 125 → BCD = 55 — award 2/3 ✓×✓1
2. OFD = 55 → FOD (= FDO) = 62.5 → BOD = 117.5 → BCD = 62.5 — award 2/3 ✓×✓1
3. (a) OFD = FDO = FOD = 60 → BOD = 120 → BCD = 60 — award 1/3 ×✓2✓1
   (b) OFD = FDO = FOD = 60 → FED = 30 → BCD = 60 — award 1/3 ×✓2✓1
4. (a) FDE = 27.5 → FDO = OFD = 62.5 → BOD = 125 → BCD = 55 — award 2/3 ×✓1✓1
   (b) OFD = 55, FDE = 27.5 → FDO = 62.5 → BOD = 125 → BCD = 55 — award 2/3 ✓×✓1
5. (a) FED = 27.5 → BCD = 62.5 — award 1/3 ××✓1
   (b) OFD = 55, FED = 27.5 → BCD = 62.5 — award 2/3 ✓×✓1

Question	Generic scheme	Illustrative scheme	Max mark
11.	$\bullet^1$ isolate term in y or divide throughout by 4	$\bullet^1$ eg $4y=-x+24$ or $x-24=-4y$ or $\frac{1}{4}x+y-\frac{24}{4}=0$	**2**
	$\bullet^2$ state gradient explicitly	$\bullet^2$ $-\frac{1}{4}$ or -0.25	

Notes:

1. Correct answer without working — award 2/2

2. For the award of $\bullet^2$:

   (a) accept $\frac{-1}{4}$ or $\frac{1}{-4}$

   (b) do **not** accept $x=-\frac{1}{4}$ or $y=-\frac{1}{4}$

   (c) do not penalise incorrect or no simplification of constant term

   eg (i) $4y=-x+24\rightarrow y=-\frac{1}{4}x+8\rightarrow -\frac{1}{4}$ — award 2/2

   (ii) $4y=-x+24\rightarrow y=-\frac{1}{4}x+24\rightarrow -\frac{1}{4}$ — award 2/2

3. Where gradient formula is used with two points which
   (a) lie on the line $x+4y-24=0$,
      (i) award $\bullet^1$ for correct substitution into gradient formula.
      (ii) award $\bullet^2$ for correct calculation of gradient.
   (b) do not lie on the line $x+4y-24=0$ — award 0/2

Commonly Observed Responses:

1. $-\frac{1}{4}x$ or $-0.25x$ — award 1/2 ✓×

Question			Generic scheme	Illustrative scheme	Max mark
12.	(a)		$\bullet^1$ correct bracket with square $\bullet^2$ complete process consistently	$\bullet^1$ $(x-3)^2\ldots$ $\bullet^2$ $(x-3)^2-1$	**2**

Notes:

1. Correct answer without working — award 2/2

2. Answer for $\bullet^2$ must be consistent with $\bullet^1$
   eg (a) $(x+3)^2-1$ — award 1/2 ×✓1
   (b) $(x\pm 6)^2-28$ — award 1/2 ×✓1
   (c) $(x\pm 6)^2-1$ — award 0/2

Commonly Observed Responses:

No working necessary.

1. Award 2/2 for (a) $(x-3)^2+-1$ or $(x-3)^2+(-1)$
   (b) $(x-3)(x-3)-1$

2. Award 1/2 ×✓1 for (a) $(x^2\pm 3)-1$
   (b) $(x^2\pm 3)^2-1$
   (c) $(x\pm 3x)^2-1$
   (d) $(x^2\pm 3x)^2-1$

	(b)		$\bullet^3$ state coordinates of turning point	$\bullet^3(3,-1)$	**1**

Notes:

1. Answer must be consistent with (a) unless candidate uses method in note 2.

2. Accept correct answer obtained by factorising, finding roots and using symmetry.
   ie $x^2-6x+8=0\rightarrow(x-2)(x-4)=0\rightarrow x=2,4\rightarrow x=3$ (x coordinate of turning point) $\rightarrow y=-1$

3. Coordinates of turning point may appear on diagram or **clearly** labelled in part (c).

4. Accept $x=3, y=-1$.

5. $\bullet^3$ is not available where brackets are omitted, unless answer is in the form shown in note 4 or omission of brackets has already been penalised in Qu4.

Commonly Observed Responses:

Question			Generic scheme	Illustrative scheme	Max mark
12.	(c)		$\bullet^4$ find x coordinate $\bullet^5$ find y coordinate	$\bullet^4$ $(6,\ldots)$ $\bullet^5$ $(\ldots,8)$	2

Notes:

1. Correct answer or answer consistent with part (b) without working — award 2/2

2. Do not award $\bullet^4$ if:
   (a) the x-coordinate in (b) and (c) are the same. However, see Note 3.
   (b) the x-coordinate is less than the x-coordinate of the turning point.

3. For the award of $\bullet^4$ answer must be consistent with part (b) unless there is evidence of an alternative valid strategy in part (c)
   eg finding roots and using symmetry: $x^2-6x+8=0\rightarrow(x-2)(x-4)=0\rightarrow x=2,4\rightarrow x_Q=6$

4. Do not award $\bullet^5$ if the y-coordinate in (b) and (c) are the same unless there is evidence of an alternative valid strategy in part (c)
   eg $y_Q=0^2-6\times0+8=8$

5. $\bullet^5$ is not available where brackets are omitted, unless answer is in the form shown in note 6 or omission of brackets has already been penalised in Qu4 or Qu12(b).

6. Accept answer in the form $x=\ldots, y=\ldots.$

7. Coordinates of Q may appear on diagram.

Commonly Observed Responses:

1. $(8, 6)$ (coordinates in wrong order but consistent with part (b)) — award 1/2 ×✓1

2. For answers in parts (a), (b) and (c) award as follows:
   (a) $(x-3)^2-1$ — award 2/2 ✓✓
   (b) $(6, 8)$ — award 0/1 ×
   (c) $(12, 8)$ in part (c) (no working) — award 1/2 ✓1×

3. For answers in parts (a), (b) and (c) award as follows:
   (a) $(x-6)^2-28$ — award 1/2 ×✓1
   (b) $(6, 8)$ — award 0/1 ×
   (c) $(12, 80)$ in part (c) (no working) — award 2/2 ✓1✓1

4. For answers in parts (a), (b) and (c) award as follows:
   (a) $(x-6)^2+8$ — award 0/2 ××
   (b) $(6, 8)$ — award 1/1 ✓1
   (c) $y_Q=0^2-6\times0+8=8\rightarrow(6, 8)$ — award 1/2 ×✓

Question	Generic scheme	Illustrative scheme	Max mark
13.	•1 apply $x \times x^{\frac{m}{n}}$ or $x \times x^{-1}$ •2 apply $x \times x^{\frac{m}{n}}$ **and** $x \times x^{-1}$ **and** simplify	•1 $x^{\frac{3}{2}}\ldots$ or $\ldots + x^0$ (or $\ldots + 1$) •2 $x^{\frac{3}{2}} + 1$	**2**

Notes:

1. Correct answer without working — award 2/2

2. Accept $x^{1\frac{1}{2}} + 1$ or $x^{1.5} + 1$ as bad form.

3. Accept $\sqrt{x^3} + 1$.

4. (a) For subsequent incorrect working •2 is not available.
   eg $x^{\frac{3}{2}} + 1 = 2x^{\frac{3}{2}}$ — award 1/2 ✓×
   (b) However, do **not** penalise $x^{\frac{3}{2}} + 1 = \sqrt[3]{x^2} + 1$ — award 2/2

5. Where terms in the brackets have been reduced to one term, •1 is not available for subsequently applying the rule $x \times x^{\frac{m}{n}}$.
   eg $x\left(x^{-\frac{1}{2}}\right) = x^{\frac{1}{2}}$ — award 0/2

Commonly Observed Responses:

1. $x^{\frac{3}{2}} + x^0$ — award 1/2 ✓✓2

2. $x^{\frac{3}{2}} + x = \sqrt[3]{x^2} + x$ — award 1/2 ✓×

3. $x\left(x^{-2}\right) = x^{-1}$ — award 0/2

Question	Generic scheme	Illustrative scheme	Max mark
14.	$\bullet^1$ valid scale factor $\bullet^2$ consistent scaling of AD $\bullet^3$ calculate BD	$\bullet^1$ $\frac{3}{7}$ or $\frac{7}{3}$ $\bullet^2$ 4.5 stated or implied by $\bullet^3$ $\bullet^3$ 6 (cm)	**3**

Notes:

1. Correct answer without working — award 0/3

2. For the award of $\bullet^1$ accept $\frac{10.5}{7}\times 3$ or $\frac{AB}{3}=\frac{10.5}{7}$.

3. For an incorrect calculation of AB leading to a negative length for BD, $\bullet^3$ is not available
   eg $10.5\times\frac{7}{3}=24.5\rightarrow 10.5-24.5=-14$ (cm) — award 1/3 ✓××

4. For a rounded decimal approximation to $\frac{3}{7}$ or $\frac{7}{3}$, $\bullet^2$ is not available
   eg (a) $\frac{3}{7}=0.43\rightarrow 0.43\times 10.5=4.515\rightarrow 10.5-4.515=5.985$ (cm) — award 2/3 ✓×✓1
   (b) $\frac{3}{7}=0.4\rightarrow 0.4\times 10.5=4.2\rightarrow 10.5-4.2=6.3$ (cm) — award 2/3 ✓×✓1

5. $\bullet^3$ is only available for subtracting AB from 10.5 where AB is calculated within a valid strategy and AB is less than 10.5.

6. For the award of $\bullet^2$ disregard mislabelling of AB as BD
   eg $BD=\frac{3}{7}\times 10.5=4.5$ — award 2/3 ✓✓^

7. Where an incorrect scale factor is a unitary fraction, $\bullet^2$ is not available
   eg scale factor = $\frac{1}{4}\rightarrow 10.5\times\frac{1}{4}=2.625\rightarrow 10.5-2.625=7.875$ — award 1/3 ××✓1

Commonly Observed Responses:

1. (a) $10.5\times\frac{7}{3}=24.5\rightarrow 24.5-10.5=14$ (cm) — award 1/3 ✓××

   (b) $10.5\div\frac{7}{3}=4.5\rightarrow 10.5-4.5=6$ (cm) — award 3/3

2. 10.5 − 3 = 7.5 (cm) — award 0/3

[END OF MARKING INSTRUCTIONS]