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CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/51**

Paper 5 Probability & Statistics 1 **May/June 2026**

MARK SCHEME

Maximum Mark: 50

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	More information required
	Accuracy mark awarded zero
	Accuracy mark awarded one
	Independent accuracy mark awarded zero
	Independent accuracy mark awarded one
	Independent accuracy mark awarded two
	Benefit of the doubt
	Blank Page
	Incorrect
Dep	Used to indicate DM0 or DM1

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Annotation	Meaning
DM1	Dependent on the previous M1 mark(s)
FT	Follow through
	Indicate working that is right or wrong
Highlighter	Highlight a key point in the working
ISW	Ignore subsequent work
J	Judgement
JU	Judgement
M0	Method mark awarded zero
M1	Method mark awarded one
M2	Method mark awarded two
MR	Misread
O	Omission or Other solution
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
On-page comment	Allows comments to be entered in speech bubbles on the candidate response.
PE	Judgment made by the PE
Pre	Premature approximation
SC	Special case
SEEN	Indicates that work/page has been seen

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Annotation	Meaning
SF	Error in number of significant figures
	Correct
TE	Transcription error
XP	Correct answer from incorrect working

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Mark Scheme Notes

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated method mark is earned (or implied).

B Mark for a correct result or statement independent of method marks.

DM or **DB** When a part of a question has two or more 'method' steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly, when there are several B marks allocated. The notation DM or DB is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.

FT Implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A or B marks are given for correct work only.

- A or B marks are given for correct work only (not for results obtained from incorrect working) unless follow through is allowed (see abbreviation FT above).
- For a numerical answer, allow the A or B mark if the answer is correct to 3 significant figures or would be correct to 3 significant figures if rounded (1 decimal place for angles in degrees).
- The total number of marks available for each question is shown at the bottom of the Marks column.
- Wrong or missing units in an answer should not result in loss of marks unless the guidance indicates otherwise.
- Square brackets [ ] around text or numbers show extra information not needed for the mark to be awarded.

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Abbreviations

AEF/OE	Any Equivalent Form (of answer is equally acceptable) / Or Equivalent
AG	Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
CAO	Correct Answer Only (emphasising that no 'follow through' from a previous error is allowed)
CWO	Correct Working Only
ISW	Ignore Subsequent Working
SOI	Seen Or Implied
SC	Special Case (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)
WWW	Without Wrong Working
AWRT	Answer Which Rounds To

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Question	Answer	Marks	Guidance
1(a)	x | -1 | 0 | 1 | 2 | 3 | 4 p | $\frac{1}{16}$ | $\frac{3}{16}$ | $\frac{4}{16}$ | $\frac{5}{16}$ | $\frac{1}{16}$ | $\frac{2}{16}$	**B1**	Table with correct x values and at least 1 correct probability. Values need not be in order, lines may not be drawn, may be vertical. x and P(x) may be omitted. Condone any additional x values if probability stated as 0. Top row and 1 correct probability.
		B1	Three **more** correct probabilities correctly linked to the correct x values, need not be in table, accept un-simplified (4 correct probabilities now present).
		B1	6 correct probabilities linked with correct x values, need not be in table. **SCB1** 6 non-zero probabilities (not all 1/6) summing to 1 placed in a probability distribution table with correct x values if **B1** max scored.
		3	

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Question	Answer	Marks	Guidance
1(b)	[E(X) =] $-1\times\frac{1}{16}+\left[0\times\frac{3}{16}\right]+1\times\frac{4}{16}+2\times\frac{5}{16}+3\times\frac{1}{16}+4\times\frac{2}{16}$ $\left[\frac{-1+[0+]4+10+3+8}{16}=\frac{24}{16}=1.5\right]$	**M1**	Accept un-simplified expression. May be calculated in variance. Accept $-\frac{1}{16}+\frac{1}{4}+\frac{5}{8}+\frac{3}{16}+\frac{1}{2}$ OE for the **M** mark. **FT** *their* table with 6 probabilities summing to 1 ($0 < p < 1$). **FT** acceptable at the bold partially evaluated stage.
	[Var(X) =] $[(-1)^2\times]\frac{1}{16}+\left[0\times\frac{3}{16}\right]+[1^2\times]\frac{4}{16}+2^2\times\frac{5}{16}+3^2\times\frac{1}{16}+4^2\times\frac{2}{16}-\left(their\ \frac{24}{16}\right)^2$ $\left[=\frac{[1\times]1+[0\times3]+[1\times]4+4\times5+9[\times1]+16\times2}{16}-\frac{9}{4}\right]$	**M1**	Appropriate variance formula using *their* (E(X))^2 value. **FT** *their* table with 4 or more probabilities ($0 < p < 1$) which need not sum to 1 or with an expression no more evaluated than shown in bold. **FT** acceptable at the bold partially evaluated stage with *their* probabilities. Note: If table is **correct**, **M1** implied by $\left(\frac{66}{16}or\frac{33}{8}or4\frac{1}{8}or4.125\right)-\left(\frac{576}{256}or\frac{9}{4}or2.25or\left(\frac{3}{2}\right)^2\right)$ Or $\left(\frac{1}{16}+\frac{1}{4}+\frac{5}{4}+\frac{9}{16}+2\right)-\left(\frac{3}{2}\right)^2$ OE.
	$=\frac{15}{8}, 1\frac{7}{8}, 1.875$	**A1**	**SCB1** if **M0M1** scored 1.875, OE, CAO.
		3	

Question	Answer	Marks	Guidance
2(a)	[P($A\cup B$) =] $\frac{100}{150}, \frac{2}{3}, 0.667$	**B1**	
		1	

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Question	Answer	Marks	Guidance
2(b)	**EITHER:** **Method 1** $P(M) \times P(B) = \frac{60}{150} \times \frac{70}{150}$, $P(M \cap B) = \frac{28}{150}$	**(M1**	Notation not required.
	$P(M \cap B) = \frac{14}{75}$, 0.1867 $P(M) \times P(B) = \frac{14}{75}$, 0.1867 [As $P(M) \times P(B) = P(M \cap B)$] events M and B are independent	**A1)**	$P(M \cap B)$, $P(M) \times P(B)$ must be identified, evaluated with values in comparable form. Conclusion must be stated.
	OR: **Method 2** $\frac{P(B \cap M)}{P(M)} = \frac{28}{150} \div \frac{60}{150}$ $P(B / M) = \frac{28}{60}$	**(M1**	Notation not required.
	$\frac{P(B \cap M)}{P(M)} = \frac{7}{15}$, 0.4667 $P(B / M) = \frac{7}{15}$, 0.4667 [As $\frac{P(B \cap M)}{P(M)} = P(B / M)$] events M and B are independent	**A1)**	$P(B / M)$, $\frac{P(B \cap M)}{P(M)}$ must be identified, evaluated with values in comparable form. Conclusion must be stated.
	Available marks	**2**	
2(c)	[$P(M \mid A) =$] $\frac{14}{30}$, $\frac{7}{15}$, 0.467	**B1**	
		1	

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Question	Answer	Marks	Guidance
2(d)	[P($M' \cap B'$) =] $\frac{48}{150}$, $\frac{8}{25}$, 0.32[0]	**B1**	
		1	

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Question	Answer	Marks	Guidance
3(a)	Aldeny | Farnlee 7 5 | 0 | 8 8 9 8 8 6 0 | 1 | 1 2 4 5 7 6 2 1 1 | 2 | 0 1 2 4 6 8 7 6 5 | 3 | 1 6 2 | 4 Key: 7|1|4 represents 17 cm for Aldeny and 14 cm for Farnlee	**B1**	Correct stem, ignore extra values (not in reverse, not split). If a split stem-and-leaf plot is used (i.e. stem values are repeated) the remaining **B** marks are available.
		B1	Correct Aldeny labelled on left, leaves in order from right to left and lined up vertically, no commas or other punctuation.
		B1	Correct Farnlee labelled on same diagram, leaves in order from right to left and lined up vertically, no commas or other punctuation. **Penalise each error only once in question.** E.g. commas in both sets of data. Missing or incorrect leaves can be penalised in both cases. If the correct data for Aldeny and Farnlee is transposed, treat as a single error, e.g. penalise in Aldeny and condone in Farnlee. If 2 errors occur in Aldeny and 1 is repeated in Farnlee **B0B0** (or reverse).
		B1	Correct **non-symmetrical** key, for their diagram, need both team names and 'cm' at least once here, or in leaf headings or a suitable title <u>If 2 separate diagram drawn</u> max marks: **B1** if both stems correct, **B1** if Aldeny correct to the left of the stem, **B1** if both keys correct including 'cm' and team name.
		4	

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Question	Answer	Marks	Guidance
3(b)	Median = 21[cm]	**B1**	**Must** be identified, accept Q2.
	[IQR =] 35 – 16	**M1**	$35 \leqslant$ UQ $\leqslant 37 - 10 \leqslant$ LQ $\leqslant 18$. Implied if both quartile values are stated and appropriate. IQR calculated accurately.
	= 19 [cm]	**A1**	WWW. If **M0** scored, **SCB1** for 19 WWW.
		3	
3(c)	Medians very close, so average amount of snow is very similar	**B1**	One comment comparing central tendency and one comment comparing spread.
	Spread of number of cm of snow more for Aldeny	**B1**	Comments must be in context and not simply comparing values of medians etc.
		2	

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Question	Answer	Marks	Guidance
4(a)	**EITHER:** $1-\left(\frac{7}{12}\right)^5$	**(M1**	$1-\left(\frac{7}{12}\right)^k$, for $k = 5$ or 6.
	= 0.932	**A1)**	0.932456 to at least 3 SF.
	OR: **Method 2**		
	$\left(\frac{5}{12}\right)^1 + \left(\frac{5}{12}\right)^1\times\left(\frac{7}{12}\right)^1 + \left(\frac{5}{12}\right)^1\times\left(\frac{7}{12}\right)^2 + \left(\frac{5}{12}\right)^1\times\left(\frac{7}{12}\right)^3 + \left(\frac{5}{12}\right)^1\times\left(\frac{7}{12}\right)^4$ [+ $\left(\frac{5}{12}\right)^1\times\left(\frac{7}{12}\right)^5$]	**(M1**	
	0.932	**A1)**	0.932456 to at least 3 SF.
		2	
4(b)	$8\times\left(\frac{5}{12}\right)^2\times\left(\frac{7}{12}\right)^7$	**M1**	$kp^2(1-p)^7$ or $kp^2(1-p)^8$, $k \geqslant 1$, k an integer $0 < p < 1$. No additional terms, may be in stages.
		B1	$8\times\left(\frac{5}{12}\right)^2\times\left(1-\frac{5}{12}\right)^7$ or $9\times\left(\frac{5}{12}\right)^2\times\left(1-\frac{5}{12}\right)^8$ seen.
	Sum = 0.0319(22)	**A1**	AWRT.
		3	

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Question	Answer	Marks	Guidance
4(c)	**EITHER:** **Method 1**		
	$[P(0, 1, 2) =]{}^{10}C_0\left(\frac{7}{12}\right)^{10} + {}^{10}C_1\left(\frac{7}{12}\right)^{9}\left(\frac{5}{12}\right) + {}^{10}C_2\left(\frac{7}{12}\right)^{8}\left(\frac{5}{12}\right)^{2}$ $[= 0.004562 + 0.03259 + 0.10474]$	**(M1**	One term ${}^{10}C_x\ (p)^x(1-p)^{10-x}$. With $0 < p < 1, x \neq 0$ or 10. **Note** $\sum_{x=0}^{2} {}^{10}C_x\ (p)^x(1-p)^{10-x}$ implies **M1.** With $0 < p < 1, x \neq 0$ or 10, condone p not substituted if stated clearly, e.g. $p = \frac{2}{12}$.
		A1	Correct un-simplified expression. Allow 10 for ${}^{10}C_1$. **Note** $\sum_{x=0}^{2} {}^{10}C_x\left(\frac{5}{12}\right)^{x}\left(\frac{7}{12}\right)^{10-x}$ implies **M1A1.** Condone p not substituted if $p = \frac{5}{12}$ clearly stated.
	$= 0.142$	**B1)**	$0.1415 < p \leqslant 0.142$

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Question	Answer	Marks	Guidance
4(c)	**OR:** **Method 2**		
	[P(0, 1, 2) = 1 – P(3, 4, 5, 6, 7, 8, 9, 10) =] $1-\{{}^{10}C_3\left(\frac{7}{12}\right)^7\left(\frac{5}{12}\right)^3+{}^{10}C_4\left(\frac{7}{12}\right)^6\left(\frac{5}{12}\right)^4+{}^{10}C_5\left(\frac{7}{12}\right)^5\left(\frac{5}{12}\right)^5+{}^{10}C_6\left(\frac{7}{12}\right)^4\left(\frac{5}{12}\right)^6+{}^{10}C_7\left(\frac{7}{12}\right)^3\left(\frac{5}{12}\right)^7+{}^{10}C_8\left(\frac{7}{12}\right)^2\left(\frac{5}{12}\right)^8+{}^{10}C_9\left(\frac{7}{12}\right)^9\left(\frac{5}{12}\right)^1+\left(\frac{5}{12}\right)^{10}\}$	**(M1**	One term ${}^{10}C_x\ (p)^x(1-p)^{10-x}$. With $0<p<1, x\neq 0$ or 10. **Note** $1-\sum_{x=3}^{10}{}^{10}C_x\left(\frac{5}{12}\right)^x\left(\frac{7}{12}\right)^{10-x}$ implies **M1.** With $0<p<1, x\neq 0$ or 10, condone p not substituted if stated clearly, e.g. $p=\frac{2}{12}$.
		A1	Correct un-simplified expression. Allow 10 for ${}^{10}C_{10}$. Condone omission of up to 5 of the middle 6 terms. Condone omission of the last bracket. If **both** brackets omitted in un-simplified expression, allow recovery for final stated calculation of 1 – 0.8581 or final answer WRT to 0.1419. **Note** $1-\sum_{x=3}^{10}{}^{10}C_x\left(\frac{5}{12}\right)^x\left(\frac{7}{12}\right)^{10-x}$ implies **M1A1.** Condone p not substituted if $p=\frac{5}{12}$ clearly stated.
	= 0.142	**B1)**	$0.1415 < p \leqslant 0.142$.
	Available marks	**3**	

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Question	Answer	Marks	Guidance
5(a)	**EITHER:** **Method 1**		
	P(EEE) = $\frac{3}{9}\times\frac{2}{8}\times\frac{1}{7}\left(=\frac{6}{504}\right)$ P(EE_) = $\frac{3}{9}\times\frac{2}{8}\times\frac{6}{7}\times 3\left(=\frac{108}{504}\right)$ P(E_ _) = $\frac{3}{9}\times\frac{6}{8}\times\frac{5}{7}\times 3\left(=\frac{270}{504}\right)$	**(M1**	$\frac{d}{9}\times\frac{e}{8}\times\frac{f}{7}, d<9, e<8, f<7$ seen.
		B1	One identified outcome case correctly evaluated. Accept un-simplified.
		M1	Three correct scenarios added. Un-simplified calculation can identify scenario.
	Probability = $\frac{384}{504}, \frac{16}{21}$	**A1)**	Accept 0.76190… to at least 3SF.
	OR: **Method 2** 1 − P(no Es)		
	$1-\left(\frac{6}{9}\times\frac{5}{8}\times\frac{4}{7}\right)$	**(M1**	$\frac{d}{9}\times\frac{e}{8}\times\frac{f}{7}, d<9, e<8, f<7$ seen.
		B1	$\frac{6}{9}\times\frac{5}{8}\times\frac{4}{7}$ seen.
		M1	$1-\frac{a}{9}\times\frac{b}{8}\times\frac{c}{7}$ $a,b,c\leqslant 6$ seen. or $1-\frac{a}{9}\times\frac{b}{9}\times\frac{c}{9}$ $a,b,c\leqslant 6$.
	$=\frac{384}{504}, \frac{16}{21}$	**A1)**	Accept 0.76190… to at least 3SF.

Question	Answer	Marks	Guidance
5(a)	**OR:** **Method 3** Combinations approach		
	Number of selections with 3 Es = 1 Number of selections with 2 Es = ${}^3C_2 \times {}^6C_1 = 18$ Number of selections with 1E = ${}^3C_1 \times {}^6C_2 = 45$	**(B1**	Either: ${}^3C_2 \times {}^6C_1$ or ${}^3C_1 \times {}^6C_2$ or $3 \times {}^6C_2$ seen linked to the correct scenario, or 3×6 or 3×15 seen linked with the correct identified scenario.
		M1	Three correct scenarios added. Un-simplified calculation can identify scenario.
	[Total number of selections =] ${}^9C_3 = 84$	**M1**	${}^9C_3$ seen used as the denominator of a fraction.
	[Probability =] $\frac{64}{84}, \frac{16}{21}$	**A1)**	Accept 0.76190… to at least 3SF.
	OR: **Method 4** 1 – combinations approach		
	[Number of selections with 0 Es =] ${}^6C_3 = 20$	**(B1**	Only ${}^6C_3$ seen.
	[Total number of selections =] ${}^9C_3 = 84$	**M1**	${}^9C_3$ seen used as the denominator of a fraction.
	$1 - \frac{20}{84}$	**M1**	$1 - \frac{\textit{their } {}^6C_3}{\textit{their} \text{ total number of selections}}$.
	[Probability =] $\frac{64}{84}, \frac{16}{21}$	**A1)**	Accept 0.76190… to at least 3SF.
	Available marks	**4**	

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Question	Answer	Marks	Guidance
5(b)	**EITHER:** **Method 1** Total arrangements with Rs at ends – total arrangements with Rs at ends and Es together		
	$\frac{7!}{3!} - 5!$	**(B1**	$\frac{7!}{3!}$ seen alone (not multiplied/divided).
		M1	$m - 5!$, $m > 120$.
	720	**A1)**	
	OR: **Method 2** Number of ways of arranging TIVS × the number of ways of choosing 3 gaps from 5 ×3		
	4! × $5C_3$ × 3	**B1**	4! × k, where $k \geqslant 1$, and k an integer.
		M1	q × 5C3 × 3, where $q \geqslant 1$, and k an integer.
	720	**A1**	
	Available marks	**3**	

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Question	Answer	Marks	Guidance
5(c)	**EITHER:** **Method 1** R ^ ^ ^ R ^ ^ ^ ^		
	$\frac{7!}{3!}\times 5$	**(B1**	$\frac{7!}{3!}\times i, i \geqslant 1$ where i an integer.
		M1	$\frac{7!}{j!}\times 5,$ where $j = 1,2,3.$
	= 4200	**A1)**	CAO.
	OR: **Method 2**		
	${}^{7}\mathrm{P}_{3} \times \frac{5!}{3!}$	**(B1**	${}^{7}\mathrm{P}_{3} \times k,\ k \geqslant 1$ where k an integer.
		M1	${}^{7}\mathrm{P}_{m} \times \frac{5!}{3!} or\ {}^{7}\mathrm{P}_{m} \times 20,$ where $m = 2,3,4.$ $or\ {}^{7}\mathrm{C}_{3} \times \frac{5!}{3!} or\ {}^{7}\mathrm{C}_{3} \times 20.$
	= 4200	**A1)**	CAO.
	Available marks	**3**	

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Question	Answer	Marks	Guidance
6(a)	$P(2.40 < X < 3.10) = P\left(\frac{2.4-2.74}{0.25} < Z < \frac{3.1-2.74}{0.25}\right)$	**M1**	Substituting 2.74 and 0.25 and **either** 2.4 **or** 3.1 appropriately into one ±standardising formula, not σ^2 or $\sqrt{\sigma}$, no continuity correction. Note $-\frac{0.34}{0.25} or \frac{0.36}{0.25}$ scores **M1** BOD.
	$[= P(-1.36 < Z < 1.44) = \Phi(1.44) + \Phi(1.36) - 1]$ $= 0.9251 + 0.9131 - 1$ Or 0.9251 – 0.0869 Or 0.9131 – 0.0749 Or (0.9251 – 0.5) + (0.9131 – 0.5)	**M1**	Appropriate area Φ, from final process. Must be a probability. There may be small variations in the probability values used – the values here are from the tables. Expect final answer > 0.5. Condone omission of brackets if recovered for *their* values.
	= 0.8382	**A1**	$0.838 \leqslant p < 0.8385$ SOI. If one or both M marks not awarded, **SCB1** for $0.838 \leqslant p < 0.8385$ SOI.
	[Expected number = $0.8382 \times 250 = 209.55$] 209	**B1FT**	Strict **FT** *their* at least 4 figure probability × 250 (Check with calculator). One integer answer, expect 209 or 210. No indication of 'approximation', e.g. ≈,≅, about, 2SF. Condone 3SF probability calculation if more accurate probability seen. We check using the linked 4 figure probability. Condone 4SF complement (e.g. *their* 0.1618) seen as evidence of working to 4SF. **FT** their 4-figure probability, single integer answer.
		4	

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Question	Answer	Marks	Guidance
6(b)	$[\mathrm{P}(X > 3.15) = \mathrm{P}\left(Z > \frac{3.15-\mu}{0.28}\right) = 0.62]$	**B1**	$0.3055 \leqslant z \leqslant 0.3065$ or $-0.3065 \leqslant z \leqslant -0.3055$.
	$\frac{3.15-\mu}{0.28} = -0.306$	**M1**	±standardisation formula with 3.15, 0.28, μ equated to a z-value (not 0.62, 0.38, 0.7257, 0.2743, 0.6179, 0.3821, 0.7324, 1 – *their* z-value). Condone σ^2 or $\sqrt{\sigma}$, no continuity correction.
	$\mu = 3.24$	**A1**	AWRT. Do not award for improper fractions. There must be consistency with signs in the solution.
		3	

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Question	Answer	Marks	Guidance
6(c)	[Mean = $0.62\times 90 =$]55.8, [variance $= 55.8\times 0.38 =$]21.204	**B1**	55.8 and 21.204 seen, allow un-simplified, may be seen in the standardisation formula. ($\sigma = \sqrt{21.204}, 4.604 \leqslant \sigma \leqslant 4.605$) implies correct variance. **Withold mark if variance is clearly identified as standard deviation.** Condone N(55.8, $\sqrt{21.204}$) **if standardisation formula correct** *or* variance/standard deviation correctly stated as well. Accept un-simplified.
	$\mathrm{P}(X > 50) = \mathrm{P}\left(Z > \frac{50.5 - 55.8}{\sqrt{21.204}}\right)$	**M1**	Substituting *their* μ and positive σ into the ± standardising formula (any number for 50.5), allow σ^2 or $\sqrt{\sigma}$.
		M1	Use continuity correction 49.5 or 50.5 in ±standardisation formula. Note: If no standardisation formula seen $\pm\left(\frac{5.3}{\sqrt{21.204}}\right)$ or $\pm\left(\frac{5.3}{4.605}\right)$ scores **M2** BOD.
	[= $\Phi(-1.151) = \Phi(1.151)$] =0.8751	**M1**	Appropriate area Φ, from final process, must be a probability. May be implied by a sketch of the required probability area. Note: **correct** final answer implies this **M1.** Expect final answer > 0.5. If E(X) for 90 calculated, this **M** mark can still be awarded.

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Question	Answer	Marks	Guidance
6(c)	=0.875	**A1**	**Final answer.** Accept $0.875 \leqslant z \leqslant 0.8755$.
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