



Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Level

In Statistics S2 (WST02) Paper 01A

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

EDEXCEL IAL MATHEMATICS

General Instructions for Marking

1. The total number of marks for the paper is 75.
2. The Edexcel Mathematics mark schemes use the following types of marks:
 - **M** marks: Method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
 - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
 - **B** marks are unconditional accuracy marks (independent of M marks)Marks should not be subdivided.

3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes and can be used if you are using the annotation facility on ePEN:

- bod – benefit of doubt
- ft – follow through
 - the symbol $\checkmark$ will be used for correct ft
- cao – correct answer only
- cso – correct solution only. There must be no errors in this part of the question to obtain this mark
- isw – ignore subsequent working
- awrt – answers which round to
- SC – special case
- oe – or equivalent (and appropriate)
- d... or dep – dependent
- indep – independent
- dp – decimal places
- sf – significant figures
- * – The answer is printed on the paper or ag- answer given
- $\square$ or d... – The second mark is dependent on gaining the first mark

4. All A marks are 'correct answer only' (cao), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.
5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. If you are using the annotation facility on ePEN, indicate this action by 'MR' in the body of the script.
6. If a candidate makes more than one attempt at any question:
 - a) If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
 - b) If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.
7. Ignore wrong working or incorrect statements following a correct answer.

Question Number	Scheme		Marks
1(a)	$X = \text{Defects per 150 cm so } X \sim \text{Po}(7.5)$		
	$\frac{e^{-7.5} \times 7.5^5}{5!}$ or $0.2414 - 0.1321$		M1
	0.10937... awrt 0.109		A1
			(2)
(b)	$Y = \text{Defects per 100 cm so } Y \sim \text{Po}(5)$		
	$[P(Y < 4) =] P(Y \leq 3) = 0.2650$		M1
	$R = \text{number of 100 cm planks with fewer than 4 defects so } R \sim B(6, "0.265")$		M1
	$P(R = 2) = {}^6C_2 \times "0.265"^2 (1 - "0.265")^4$		M1
	$= 0.3074$ awrt 0.307		A1
			(4)
(c)	$T = \text{Defects per 600 cm so } T \sim \text{Po}(30)$		
	$V \sim N(30, 30)$		M1
	$P(T < 28) \approx P\left(Z < \frac{27.5 - "30"}{\sqrt{"30"}} [= -0.46]\right)$		M1 M1
	$[P(Z < -0.46)] = 0.3228$ (calc 0.32403...) awrt 0.323 – awrt 0.324		A1
			(4)
	Notes		Total 10
(a)	M1	For use of $\frac{e^{-\lambda} \times \lambda^5}{5!}$ (for any λ) or use of $P(X \leq 5) - P(X \leq 4)$	
	A1	awrt 0.109	
(b)	M1	For writing or using $P(Y \leq 3)$ (allow any letter) May be implied by 0.265(0)	
	M1	For writing or using $B(6, "0.265")$ ft their 0.265	
	M1	For use of ${}^6C_2 \times p^2(1 - p)^4$ where p is a probability. This calculation implies the previous M1 mark	
	A1	awrt 0.307	
(c)	M1	For writing or using $N(30, 30)$ (May be implied by standardisation)	
	M1	For standardising using 26.5/27/27.5/28/28.5, their mean and their standard deviation	
	M1	For a correct continuity correction (27.5)	
	A1	Allow answers in the range awrt 0.323 – awrt 0.324	

Question Number	Scheme		Marks
2(a)	$F(8) - F(2)$ or $k \times 8^3 - k \times 2^3$		M1
	$k \times 8^3 - k \times 2^3 = \frac{7}{24}$		M1
	$504k = \frac{7}{24} \left[\Rightarrow k = \frac{1}{1728} \right]^*$		A1*
			(3)
(b)	$F(b) = 1$ So $\frac{b^3}{1728} = 1$		M1
	$b = 12$		A1
	$f(x) = \left[\frac{d}{dx} F(x) = \right] \frac{1}{576} x^2$		M1
	$f(x) = \begin{cases} \frac{1}{576} x^2 & 0 \leq x \leq 12 \\ 0 & \text{otherwise} \end{cases}$		A1
			(4)
(c)	[Median =] $\frac{1}{1728} x^3 = \frac{1}{2}$		M1
	$x = \text{awrt } 9.52$		A1
			(2)
(d)	[Mode =]12		B1ft
			(1)
(e)	Negative skew as Median < Mode		B1ft
			(1)
	Notes		Total 11
(a)	M1	For writing or using $F(8) - F(2)$	
	M1	For use $F(8) - F(2) = \frac{7}{24}$	
	A1*	cso Simplifying to a single term on each side leading to the given answer. Answer is given so there can be no incorrect working seen. $504k = \frac{7}{24}$ leading to $k = \frac{1}{1728}$ on its own scores M1M1A0	
(b)	M1	For use of $F(b) = 1$	
	A1	cao	
	M1	For an attempt at $\frac{d}{dx} F(x) \ x^3 \rightarrow x^2$	
	A1	Fully correct pdf including limits. Allow < instead of $\leq$ If $b = 12$ has been found, allow use of b as an upper limit on line 1	
(c)	M1	For setting the cdf = 0.5	
	A1	awrt 9.52 Condone $\sqrt[3]{864}$ oe e.g. $2(\sqrt[3]{108})$	
(d)	B1ft	12 cao Allow ft on their value of b / their upper limit provided $b > 8$	
(e)	B1ft	For a correct (ft) reason and description of skewness which must be consistent with their median and their mode (Allow reference to sketch if shown). Ignore reference to mean if they write e.g. “mean < median < mode” Do not allow comparison of median/mode with mean on its own unless the mean, $E(X) = 9$, seen.	

Question Number	Scheme		Marks
3(a)	A list of all <u>patients</u>		B1
			(1)
(b)	Individual <u>patients</u>		B1
			(1)
(c)	Advantage: e.g. Less time consuming to obtain data and analysis it/less expensive		B1
	Disadvantage: e.g. May not be representative of the entire population		B1
			(2)
(d)(i)	B(3000, 0.003) $\Rightarrow$ Po(9)		M1
	$[P(X < 4) = P(X \leq 3)] = 0.0212$		A1
	$[P(7 < X \leq 10)] = P(X \leq 10) - P(X \leq 7)$		M1
	$= 0.7060 - 0.3239$		
	$= 0.3821$ awrt 0.382		A1
		(4)	
(e)	$[n$ is large and] p is small		B1
			(1)
	Notes		Total 9
(a)	B1	Idea of a list e.g. database/register of all <u>patients</u> . All can be implied but do not allow a partial list e.g. A list of 100 patients. Do not allow a list of patient's opinions	
(b)	B1	Allow patient. Do not allow a patient's opinion	
(c)	B1	A correct advantage of taking a sample. If not labelled, assume the response refers to a sample (rather than a census)	
	B1	A correct disadvantage of taking a sample. If not labelled, assume the response refers to a sample (rather than a census). Condone e.g. 'may not be accurate'	
(d)(i)	M1	For writing or using Po(9)	
	A1	awrt 0.0212 (this implies M1A1) Note: exact binomial gives 0.02109... and scores M0A0	
(ii)	M1	For writing or using $P(X \leq 10) - P(X \leq 7)$ or $P(X = 8) + P(X = 9) + P(X = 10)$	
	A1	awrt 0.382 (this implies M1A1 and this also implies the M1 mark from part (i)) Note: exact binomial gives 0.38262... and scores M1 (for adding correct probabilities) A0	
(e)	B1	A correct explanation. Allow mean $\approx$ variance if $np = 9$ and $npq = 8.97(3)$ are found	

Question Number	Scheme		Marks
4(a)	There are 2 outcomes , faulty (component) or not faulty (component)		B1B1
	There is a fixed number of components (sent to the company for testing)		
	Faults occur independently		
	The probability of a faulty (component) is constant		
			(2)
(b)	$[H_0 : p = 0.2 \quad H_1 : p \neq 0.2]$		
	$[P(X \leq 1) =] 0.0105 \quad \text{or} \quad [P(X \leq 2) =] 0.0442$		M1
	$[P(X \geq 11) = 1 - P(X \leq 10) =] 0.0256 \quad \text{or} \quad [P(X \geq 12) = 1 - P(X \leq 11) =] 0.0095$		M1
	$X \leq 1 \cup X \geq 11$		A1
			(3)
(c)	$[0.0105 + 0.0256 =] 0.0361$		B1ft
			(1)
(d)	4 is not in the CR $[1 < 4 < 11/\text{Do not reject } H_0/\text{Not significant}]$		M1
	Insufficient evidence to reject the company's claim		A1ft
			(2)
(e)	$H_0 : p = 0.2 \quad H_1 : p < 0.2$		B1
	$P(X \leq 2) = \text{awrt } 0.0982 \quad \text{or} \quad \text{CR} \leq 2$		M1
	Reject $H_0/\text{Significant}/2$ is in CR		M1
	Sufficient evidence to suggest that the probability of a faulty electrical component has decreased		A1
			(4)
	Notes		Total 12
(a)	B1	One correct reason in context or two correct reasons not in context For context we require faults/faulty/components mentioned at least once	
	B1	Two correct reasons with context mentioned at least once (ignore extraneous non-contradictory comments)	
(b)	M1	For awrt 0.0105 or awrt 0.0442	
	M1	For awrt 0.0256 or awrt 0.0095 (allow awrt 0.974 or awrt 0.991)	
	A1	A1 for both tails of the CR oe e.g. $X < 2$ and $X > 10$ Allow use of any letter	
(c)	B1ft	Ft their CR provided that the answer < 0.05	
(d)	M1	Ft their CR. For a correct ft comparison of 4 with their CR from part (b) Do not allow non-contextual contradictory statements.	
	A1ft	For a correct contextual statement ft their CR. Must have the words highlighted in bold Allow e.g. evidence to support percentage of faulty components is 20%	
(e)	B1	Both hypotheses correct must be correctly linked to H_0 and H_1 Must be in terms of p or π	
	M1	For p -value of $[P(X \leq 2) =]$ awrt 0.0982 (If multiple p -values seen, then 0.0982 must be selected) or for $\text{CR} \leq 2$	
	M1	For a correct non contextual statement consistent with their p -value and 10% / their CR and 2 Do not allow non-contextual contradictory statements. May be implied by a correct contextual statement on its own	
	A1	(Dep on 2 nd M1) For a correct contextual statement. Must have the words highlighted in bold o.e.	

Question Number	Scheme				Marks
5(a)	(4, 4, 4) (4, 4, 6) (4, 4 8)				B1
	(4, 4, 4) (4, 4, 6) (4, 6, 4) (6, 4, 4) (4, 4, 8) (4, 8, 4) (8, 4, 4)				B1
					(2)
(b)	$(4, 4, 4) \left(\frac{1}{2}\right)^3 \left[= \frac{1}{8} \right]$				M1M1
	$(4, 4, 6) \quad 3 \times \left(\frac{1}{2}\right)^2 \times \left(\frac{3}{10}\right) \left[= \frac{9}{40} \right] \qquad (4, 4, 8) \quad 3 \times \left(\frac{1}{2}\right)^2 \times \left(\frac{2}{10}\right) \left[= \frac{3}{20} \right]$				
	$P(M = 4) = \frac{1}{8} + \frac{9}{40} + \frac{3}{20} = \frac{1}{2}$				M1A1
					(4)
(c)	$P(M = 8) = \left(\frac{2}{10}\right)^3 + 3 \times \left(\frac{2}{10}\right)^2 \times \frac{1}{2} + 3 \times \left(\frac{2}{10}\right) \times \frac{3}{10} \left[= \frac{13}{125} \right]$				M1 M1
	$P(M = 6) = \left(\frac{3}{10}\right)^3 + 3 \times \left(\frac{3}{10}\right)^2 \times \frac{1}{2} + 3 \times \left(\frac{3}{10}\right) \times \frac{2}{10} + 6 \times \frac{1}{2} \times \frac{3}{10} \times \frac{2}{10} \left[= \frac{99}{250} \right]$				A1
	<i>m</i>	4	6	8	A1
	$P(M = m)$	$\frac{1}{2} [= 0.5]$	$\frac{99}{250} [= 0.396]$	$\frac{13}{125} [= 0.104]$	
					(4)
(d)	$1 - \frac{99}{250} = \frac{151}{250} \Rightarrow \left(\frac{151}{250}\right)^n < 0.05$				M1
	$n > 5.94 \text{ or } n > \frac{\log(0.05)}{\log\left(\frac{151}{250}\right)} \text{ or } n > \log_{\left(\frac{151}{250}\right)}(0.05) \text{ or } \left(\frac{151}{250}\right)^5 \text{ and } \left(\frac{151}{250}\right)^6$				dM1
	$n = 6$				A1
					(3)
	Notes				Total 13
(a)	B1	For the 3 distinct possibilities			
	B1	For all 7 possibilities with no errors or additions. Allow (4, 4, 4) (4, 4, 6)×3 (4, 4, 8)×3			
(b)	M1	For a correct calculation for $P(M = 4)$ (may be embedded in an overall calculation)			
	M1	For 2 correct calculations for $P(M = 4)$ (may be embedded in an overall calculation)			
	M1	For adding all 3 correct calculations together			
	A1	oe Must come from correct working. Answer only is 0 out of 4.			
(c)	M1	For a correct calculation for either $P(M = 8)$ or $P(M = 6)$ (implied by 1 st A1)			
	M1	For a correct calculation for both $P(M = 8)$ and $P(M = 6)$ allow $1 - \frac{1}{2} - \frac{99}{250}$ or $1 - \frac{1}{2} - \frac{13}{125}$			
	A1	For either $\frac{13}{125}$ or $\frac{99}{250}$			
	A1	Fully correct sampling distribution. Need not be in a table.			
	SC:	If M0M0 scored but $P(M = 4) + P(M = 6) + P(M = 8) = 1$, score M0M1A0A0 Except in the case where $P(M = 4) = 0.5$, $P(M = 6) = 0.3$, $P(M = 8) = 0.2$ which scores 0.			
(d)	M1	For $1 - 'P(M = 6)' < 0.05$ (allow = or any inequality sign)			
	dM1	(dep on previous M1) For $n > 5.9(4)$ (allow = or any inequality sign) or a correct method using logs to find the value of n or correct trial and improv. method			

	A1	cao Must come from correct probability $P(M = 6) = \frac{99}{250}$ Do not allow $n \geq 6$	
Question Number	Scheme		Marks
6(a)	$\frac{a+b}{2} = \frac{5a}{2}$		M1
	$b = 4a$		A1
	$[P(X > b - 2a) \Rightarrow] P(X > 2a) = \frac{4a - 2a}{4a - a}$ or $P\left(X > \frac{b}{2}\right) = \frac{b - \frac{b}{2}}{b - \frac{b}{4}}$		M1
	$\frac{2}{3}$		A1
			(4)
(b)(i)	$\left[E(Y^2) = \text{Var}(Y) + E(Y)^2\right] \frac{(c-3)^2}{12} + \left(\frac{3+c}{2}\right)^2 = 549$		M1
	$c^2 + 3c - 1638 = 0$ oe		M1
	$c = 39$		A1
			(3)
(ii)	$\left[P\left(4Y - 14 < \frac{17 - Y}{2}\right) \Rightarrow\right] P(Y < 5)$		M1
	$\frac{5-3}{\text{"39"}-3}$		M1
	$\frac{1}{18}$		A1
			(3)
Notes			Total 10
(a)	M1	For use of $\frac{a+b}{2}$ to set up an equation in terms of a and b	
	A1	oe e.g. $a = \frac{b}{4}$	
	M1	For a correct expression for $P(X > b - 2a)$ their a or their b provided this leads to a probability Allow use of integration $\int_{2a}^{4a} \frac{1}{4a-a} dx$ or $\int_{\frac{b}{2}}^b \frac{1}{b-\frac{1}{4}} dx$	
	A1	oe	
(b)	M1	For use of $\text{Var}(Y) + E(Y)^2 = 549$ Allow use of correct integration with limits substituted for this mark $\int_3^c \frac{1}{c-3} y^2 dy = 549 \Rightarrow \frac{1}{c-3} \left(\frac{c^3 - 3^3}{3}\right) = 549$	
	M1	For a correct 3TQ oe or a correct cubic $c^3 - 1647c + 4914 = 0$ oe	
	A1	cao if other root(s) shown then they must be rejected. Do not allow awrt 39	
(ii)	M1	For $P(Y < 5)$ allow $Y < 5$ for this mark	
	M1	For use of $\frac{5-3}{\text{"c"}-3}$	

	A1	Or exact equivalent e.g. 0.05	
Question Number	Scheme		Marks
7(a)	$[140p = 42 \Rightarrow] p = 0.3$		B1
	$\sigma^2 = 140 \times "0.3" \times (1 - "0.3")$		M1
	29.4		A1
			(3)
(b)(i)	${}^nC_2 \left(\frac{1}{3}\right)^2 \left(1 - \frac{1}{3}\right)^{n-2}$		B1
	${}^nC_2 \left(\frac{1}{3}\right)^2 \left(1 - \frac{1}{3}\right)^{n-2} = {}^nC_3 \left(\frac{1}{3}\right)^3 \left(1 - \frac{1}{3}\right)^{n-3}$ or		M1
	$"\frac{n(n-1)}{2 \times 1} \left(\frac{1}{3}\right)^2 \left(1 - \frac{1}{3}\right)^{n-2} = \frac{n(n-1)(n-2)}{3 \times 2 \times 1} \left(\frac{1}{3}\right)^3 \left(1 - \frac{1}{3}\right)^{n-3}"$ oe		
	$\frac{1}{2} \times \frac{2}{3} = \frac{1}{6} \times \frac{1}{3} \times (n-2)$ oe (may be implied by $6 = n-2$)		
	$n = 8$		A1
		(4)	
(c)	$\frac{e^{-\lambda} \lambda^r}{r!} = \frac{(r+2)e^{-\lambda} \lambda^{r+2}}{(r+2)!}$		M1
	$\frac{(r+2)!}{r!(r+2)} = \frac{\lambda^{r+2}}{\lambda^r}$		M1
	$\lambda = \sqrt{r+1}$		A1
			(3)
Notes			Total 10
(a)	B1	oe cao	
	M1	For use of $np(1-p) = \sigma^2$ ft their p	
	A1	oe	
(b)(i)	B1	For a correct expression. isw after a correct expression is seen	
(ii)	M1	For setting up a correct equation ft (b)(i) Allow use of any clear notation for nC2 and nC3	Condone use of $p = 0.3$
	M1	For reducing to a correct linear equation in n	Condone use of $p = 0.3$
	A1	cao	
(c)	M1	For setting up a correct equation	
	M1	For attempting to rearrange to have an equation with one side in terms of r and the other side in terms of λ $r + 1 = \lambda^2$ implies M1M1	
	A1	oe e.g. $\lambda = \sqrt{\frac{(r+2)!}{r!(r+2)}}$ do not allow $\pm$	