GradeMax

Pearson

Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Level

In Statistics S2 (WST02) Paper 01

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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 $\surd$ 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
   - $\sqsubset$ 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)	**List\database\register (o.e)** of **all** the **students [**in the school]	B1
		(1)
(b)	Individual **student(s)**	B1
		(1)
(c)	Advantage: Less time consuming to obtain/analyse it or less expensive	B1
	Disadvantage: Less precise or may not be representative	B1
		(2)

	Notes	**Total 4**
(a)	**B1**	For a suitable sampling frame e.g. a list/database/ register/ spreadsheet of all students and indicating that it contains **all** (can be implied) students in the school. Do not allow what maybe be a partial list (e.g. a list of 50 students, students/number of students who use canteen etc)
(b)	**B1**	For a suitable sampling units e.g. student (s) at the school / student (s) who complete the survey (about the canteen). Do not allow student (s) satisfaction / opinion (o.e.)
	Part (c)	**If there are no label stating advantage / disadvantage, then mark the first as the advantage and the second as disadvantage.** **Allow multiple statements but if they have a contradictory statement – lose B mark**
(c)	**B1**	A correct advantage of taking a random sample. e.g. Quicker / cheaper/ less time consuming compared to a census etc B1 If not labelled, assume the response refers to the sample
	B1	A correct disadvantage of taking a random sample. e.g. Not accurate/ information obtained can be inaccurate / It is less accurate compared to a census etc – B1 Any reference to bias - B0 If not labelled, assume the response refers to the sample

Question Number	Scheme	Marks
2(a)	F(5) = 1 so [$k(5 + 3) = 1$] or F(5) – F(-3) = 1 so [$k(5 + 3)$ - $k(-3 + 3) = 1$]	M1
	$8k = 1$ so $k = \frac{1}{8}$*	A1*
		(2)
(b)(i)	[$P(X > 2) =$]$1 - F(2) = 1 - \frac{1}{8}(2+3)$ **or** $\int_{[2]}^{[5]} \frac{1}{8}\,dx = \left[\frac{x}{8}\right]_{[2]}^{[5]}$ or 1 – (F(2) – F(-3))	M1
	$= \frac{3}{8}$	A1
(ii)	[$P(X = 5) =$] 0	B1
		(3)
(c)	$\left[\frac{d}{dx}F(x)\right] = \frac{d}{dx}\left[\frac{1}{8}(x+3)\right] = \frac{1}{8}$	M1
	$f(x) = \begin{cases} \frac{1}{8} & -3 \leqslant x \leqslant 5 \\ 0 & \text{otherwise} \end{cases}$	A1 A1
		(3)
(d)	[Continuous] uniform	B1
		(1)
(e)(i)	$E(X) = \frac{-3+5}{2} = 1$	B1
(ii)	$[\text{Var}(X)] = \frac{(5+3)^2}{12}$ **or** $[\text{Var(X)}] = \left[\frac{x^3}{3}\text{ "f}(x)\text{"}\right]_{-3}^{5} - (\text{"1"})^2$	M1
	$\text{Var}(X) = \frac{16}{3}$	A1
		(3)

	Notes	Total 12
(a)	**M1**	For writing or using F(5) = 1 **or** F(5) – F(-3) = 1 **or** substituting $x = 5$ **and** $k = \frac{1}{8}$ into F(x) and showing it equals 1 .
	A1*	Fully correct solution with at least $8k = 1$ seen then leading to a statement that $k = \frac{1}{8}$
(b)(i)	**M1**	For using 1 – F(2) / 1 – (F(2) – F(-3)) or $\int_{[2]}^{[5]} \frac{1}{8}\,dx = \left[\frac{x}{8}\right]_{[2]}^{[5]}$ (no limits needed)
	A1	$\frac{3}{8}$ or exact equivalent
(ii)	**B1**	Cao
(c)	**M1**	Attempt to differentiate given F(x) , at least one . (Can be implied by 1st A1)
	A1	For $f(x) = \frac{1}{8}$ or $f(x) = k$ with the correct interval stated (condone < , but must be consistent)
	A1	Fully correct (fully correct distribution (including the f (x)) implies 3/3)) (Accept if left in k)

(d)	**B1**	Allow rectangular (distribution). (Allow $X \sim U(-3,5)$ or $X \sim Uniform(-3,5)$) Discrete – B0
(e)(i)	**B1**	cao
(ii)	**M1**	use of $\frac{(\beta-\alpha)^2}{12}$ or $\left[\frac{x^3}{3}\text{ "f }(x)\text{"}\right]_{-3}^{5} - (\text{"1"})^2$, (follow through a constant f(x))
	A1	$\frac{16}{3}$ or exact equivalent (Correct answer only 2/2)

Question Number	Scheme	Marks
3(a)	Poisson/Po/Poiss with $(\lambda =)$ 8.5 or $[X \sim]\text{Po}(8.5)$ (o.e)	B1
		(1)
(b)	**Cars** pass the junction **singly/randomly/independently**/at a **constant** (mean/average **rate**)	B1
		(1)
(c)	$\text{P}(X < 3) = \text{P}(X \leqslant 2) = 0.0093$ (calc 0.00928…) **awrt 0.0093**	B1
	$\text{P}(5 < X < 11) = \text{P}(X \leqslant 10) - \text{P}(X \leqslant 5) = 0.7634 - 0.1496$	M1
	= 0.6138 (calc 0.6137…) **awrt 0.614**	A1
		(3)
(d)	N(255, 255)	M1
	$[\text{P}(X > 280) =]\text{P}\left(Z > \frac{280.5 - "255"}{\sqrt{"255"}}\right)$ or $[\text{P}(X > 280) =]\text{P}\left(Z > \frac{"255" - 280.5}{\sqrt{"255"}}\right)$	M1M1
	$\Rightarrow [= \text{P}(Z > \pm "1.596...")]$	
	= 0.0548 ((Calc: 0.055147…)) **awrt 0.0548 – awrt 0.0552**	A1
		(4)
(e)	$\text{H}_0 : \lambda = 4.25 \quad \text{H}_1 : \lambda < 4.25$ **Allow 8.5**	B1
		(1)
(f)	$[\text{P}(X \leqslant 3)] =$ awrt 0.0301 **or** $[\text{P}(X \leqslant 4)] =$ awrt 0.0744	M1
	$X \leqslant 3$	A1
		(2)
(g)	5 is not in the critical region/Do not reject H_0	M1
	Insufficient evidence to suggest /prove that the **mean rate** of cars passing the junction has **decreased (o.e)**	A1ft
		(2)

	Notes		Total 14
(a)	**B1**	For Poisson / Po and 8.5 e.g. Po(8.5), (Condone Poisson/Po with mean 8.5). P(8.5) B0	
(b)	**B1**	For a correct assumption (must have the context of cars, and bolded words).	
(c)	**B1**	awrt 0.0093 (Calc: 0.00928…)	
	M1	For writing or using $\text{P}(X \leqslant 10) - \text{P}(X \leqslant 5)$ (o.e) May be implied by awrt 0.614	
	A1	awrt 0.614 (Calc: 0.61376…)	
(d)	**M1**	Writing or using $\text{N}(255, 255)$. (Implied by the standardisation $\frac{x - 255}{\sqrt{255}}$)	
	M1	Standardising with (279.5 / 280 / 280.5) **,** their mean **and** standard deviation.	
	M1	Correct continuity correction seen (279.5 or 280.5)	
	A1	awrt 0.0548 – awrt 0.0552 (Calc: 0.055147…) (**NB exact Poisson is 0.05687 and scores 0/4)**	
(e)	**B1**	For correct hypotheses and attached to H_0 and H_1 in terms of λ or μ. (Allow 8.5)	
(f)	**M1**	Either $[\text{P}(X \leqslant 3)] =$ awrt 0.0301 or $[\text{P}(X \leqslant 4)] =$ awrt 0.0744. Implied by a correct CR coming from correct working. If a two-tail critical region is being calculated award M1 for $X \leqslant 3$ seen, ignore upper tail	
	A1	For a correct critical region (o.e) e.g. $X \leqslant 3$, $X < 4$, $0 \leq X \leq 3$, $0 < X \leq 3$, $0 < X < 4$ etc Do not allow if written as a probability statement. Allow any letter. Accept $CR \leqslant 3$ (o.e)	

		Correct answer only (2/2)
(g)	**M1**	Follow through their CR. Correct non contextual statement (ignore any comparison of numbers). Don't allow contradictory statements. Implied by a correct contextual statement. (Condone acceptance region)
	A1ft	Correct contextual statement in context, contains words in bold (o.e). Must have an idea of rate. (Condone councillor officer claim (the number of cars passing the junction during a 2-minute period) is incorrect o.e.) Insufficient evidence to suggest that there are fewer cars passing **each minute / per minute (o.e)** is fine (Sufficient evidence to suggest that) the rate is **8.5** cars every **2 minutes** \ **4.25** cars **every 1 minutes** (o.e)

Question Number	Scheme	Marks
4(a)	$0.25\times£5+0.4\times£6+0.35\times£7$ (o.e)	M1
	$=[£]6.10$	A1
		(2)
(b)	5 5 5 6 6 6 7 7 7 5 5 6 (x3) 6 6 7 (x3) 6 7 7 (x3) 5 5 7 (x3) 5 6 6 (x3) 5 7 7 (x3) 5 6 7 (x6)	B1B1
		(2)
(c)	P(5) = 0.25 P(6) = 0.4 P(7) = 0.35	B1
	Range can be 0, 1, or 2	B1
	$[\mathrm{P}(R=0)]=0.25^3+0.4^3+0.35^3=\frac{49}{400}$	M1
	$[\mathrm{P}(R=1)]=0.25^2\times0.4\times3+0.4^2\times0.35\times3+0.4\times0.35^2\times3+0.25\times0.4^2\times3=\frac{51}{100}$	M1
	$[\mathrm{P}(R=2)]=0.25^2\times0.35\times3+0.25\times0.35^2\times3+0.25\times0.4\times0.35\times6=\frac{147}{400}$	M1
	r | 0 | 1 | 2 P($R=r$) | $\frac{49}{400}$ (0.1225) | $\frac{51}{100}$ (0.51) | $\frac{147}{400}$ (0.3675)	A1
		(6)

	Notes	Total 10
(a)	**M1**	For $0.25\times£5+0.4\times£6+0.35\times£7$ (o.e) (May be implied by a correct answer)
	A1	[£] 6.10 (allow 6.1)
	Part b)	If combinations not given in b), award the B marks, if the combinations are seen in c)
(b)	**B1**	For 8 of the 10 possible combinations (Ignore repeats). (Condone if they sum the combinations, combinations need to be seen)
	B1	All possible 10 combinations given (Ignore repeats). (Condone if they sum the combinations, combinations need to be seen)
(c)	**B1**	All three probabilities written or used (may be seen in an equation in c) or implied by a correct probability)
	B1	All three ranges and no extras (may see these in the table) Need to be ranges
	M1	A correct method for $\mathrm{P}(R=0)$ (implied by $\frac{49}{400}$ (o.e) or exact equivalent, may be in table))
	M1	A correct method for $\mathrm{P}(R=1)$ (implied by $\frac{51}{100}$ (o.e) or exact equivalent, may be in table))
	M1	A correct method for $\mathrm{P}(R=2)$ (implied by $\frac{147}{400}$ (o.e) or exact equivalent, may be in table)) **or** their 3 probabilities sum to 1
	A1	fully correct with probabilities or exact equivalents. (Need not be in a table but must be attached to the correct range. (Fully correct with no incorrect working implies 6/6)

Question Number	Scheme	Marks
5(a)(i)	B(20, 0.45)	
	$[P(X=6)] = {}^{20}C_6 \times 0.45^6 \times 0.55^{14} = 0.0746$ ((Calc: 0.074599…) **awrt 0.0746**	M1 A1
(ii)	B(30, 0.2)	
	$[P(X \geqslant 12)] = 1 - P(X \leqslant 11) = 1 - 0.9905$	M1
	= 0.0095 (Calc: 0.00949…)) **awrt 0.0095**	A1
		(4)
(b)	$\sqrt{10p(1-p)} = 1.5$	M1
	$10p^2 - 10p + 2.25 = 0$ (o.e)	M1
	p = awrt 0.658 **and** p = awrt 0.342	A1
	Mean = np So mean $= 10 \times$ "0.3418..." **or** mean $= 10 \times$ "0.6581..."	M1
	= awrt 3.42 and awrt 6.58	A1
		(5)
(c)	As the probability of completing a **medium** trick is 0.45 you would expect the probability of completing an **easy** trick to have a higher probability (0.6581…) (o.e)	M1
	So most likely value is awrt 6.58	A1
		(2)
(d)	$H_0 : p = 0.2$ $H_1 : p > 0.2$	B1
	$[P(X \geqslant 10) = 1 - P(X \leqslant 9)] = 1 - 0.9389$ or $[P(X \geqslant 11) = 1 - P(X \leqslant 10)] = 1 - 0.9744$	M1
	= 0.0611 or CR: $X \geqslant 11$ or $X > 10$ (o.e)	A1
	Do not reject H_0/Not in CR/Not significant	M1
	Insufficient evidence to support **Paula's or her belief (o.e)** \ Insufficient evidence to suggest that the **probability** of completing a **hard trick** successfully has **increased** (o.e)	A1ft
		(5)

	Notes		Total 16
(a)(i)	**M1**	Correct method to finding $P(X=6)$. Allow equivalent expressions. Using $P(X <= 6) - P(X <= 5)$ M1. May be implied by awrt 0.0746	
	A1	awrt 0.0746 (Calc: 0.074599…).	
(ii)	**M1**	For writing or using $1 - P(X \leqslant 11)$ (Implied by $1 - 0.9905$)	
	A1	awrt 0.0095 (Calc: 0.00949…) (Correct answer 2/2)	
(b)	**M1**	For use of $\sqrt{np(1-p)} = 1.5$ or $\sqrt{np(1-p)} = \sigma$	
	M1	Correct three-term quadratic $10p^2 - 10p + 2.25 = 0$ (o.e)	
	A1	p = awrt 0.658 **and** p = awrt 0.342. condone ($p = \frac{10+\sqrt{10}}{20}$ and $p = \frac{10-\sqrt{10}}{20}$) (Correct values seen with no incorrect working seen M1M1A1)	
	M1	Use of mean = np , (Follow through their p values ($0 \leq p \leq 1$))	
	A1	awrt 3.42 and awrt 6.58 or condone ($\frac{10+\sqrt{10}}{2}$ and $\frac{10-\sqrt{10}}{2}$)	

(c)	**M1**	Identifying 'their' probability of an **easy** trick must greater than 0.45 \ has larger probability than a **medium** trick (o.e) They must be comparing 'their' probability of an easy trick with 0.45 \ probability of a medium trick Must be 6.58 (or surd form) since using 0.348 would mean an **easy** trick is harder than a **medium** trick M1A1
	A1	identifying awrt 6.58 condone ($p = \frac{10+\sqrt{10}}{2}$)
(d)	**B1**	For correct hypotheses and attached to H_0 and H_1 in terms of p or π
	M1	Use of either $1-\mathrm{P}(X \leqslant 9)$ or $1-\mathrm{P}(X \leqslant 10)$ (calculating **just** $\mathrm{P}(X=10)$ M0). (Implied by awrt 0.0611 or 0.0256)
	A1	awrt 0.0611 or critical region : $X \geqslant 11$, $X > 10$ (o.e), (Condone 0.9389 < 0.95 o.e)
	M1	A correct non contextual statement. Do not allow contradictory statements. May be implied by a correct contextual statement on its own. (0.0256/0.0355 and comparing to 0.05 is M0. Follow through their probability / critical region.
	A1ft	correct contextual statement using the bolded word (o.e). Don't accept chance as an alternative to probability.

Question Number	Scheme	Marks
6(a)	$\frac{9}{10}np = np(1-p) \Rightarrow 0.9 = 1-p$	M1
	$p = 0.1$	A1
		(2)
(b)	$\frac{e^{-\lambda}\lambda^{19}}{19!} = \frac{e^{-\lambda}\lambda^{20}}{20!}$	M1
	$\frac{20!}{19!} = \frac{\lambda^{20}}{\lambda^{19}}$	M1
	$\lambda = 20$	A1
	$np = \lambda \quad \Rightarrow \quad n = \frac{"20"}{"0.1"}$	M1
	$n = 200$	A1
		(5)
(c)	**Reasonable (o.e)** as n is large and p is small	B1
		(1)
	Notes	**Total 8**

(a)	**M1**	Use $\frac{9}{10}np = np(1-p)$ leading to an equation in p only
	A1	0.1 (correct answer with no incorrect working seen 2/2)
(b)	**M1**	For $\frac{e^{-\lambda}\lambda^{19}}{19!} = \frac{e^{-\lambda}\lambda^{20}}{20!}$ (Allow if 0.1n has been used for λ). (Condone if no brackets seen)
	M1	Cancelling $e^{-\lambda}$
	A1	$\lambda = 20$ or 0.1n=20 (Correct value seen M1M1A1) (Implied by n=200)
	M1	Use of $np = \lambda$. Follow through their λ / 0.1n and p (p must be a probability)
	A1	n = 200 (correct answer seen with no incorrect working (5/5))
(c)	**B1**	Reasonable (o.e) and a correct reason (allow Reasonable as mean is approximately equal to the variance (Sight of 18 needed))

Question Number	Scheme	Marks
7(a)	$\frac{1}{2}k(2k-3)=1$	M1
	$k^2-\frac{3}{2}k-1=0$ (o.e) so $(k-2)(2k+1)=0 \Rightarrow k=2$	A1*
		(2)
(b)	[Mode] = 4	B1
		(1)
(c)	Gradient = 2 so $y=2x+c$ Goes through (3, 0) so $c=-6$	M1
	$f(x)=\begin{cases}2x-6 & 3\leqslant x\leqslant 4\\ 0 & \text{otherwise}\end{cases}$	dM1 A1
		(3)
(d)	$E\left(X^2\right)=\int_{[3]}^{[4]}x^2\left(2x-6\right)dx$	M1
	$=\left[\frac{1}{2}x^4-2x^3\right]_3^4$	dM1
	$=\left(128-128\right)-\left(\frac{81}{2}-54\right)\left[=\frac{27}{2}\right]$	M1
	$\text{Var}(X)="\frac{27}{2}"-\left(\frac{11}{3}\right)^2$	M1
	$=\frac{1}{18}$	A1
		(5)
	Notes	**Total 11**

(a)	**M1**	for use of area = 1 or using k=2 and showing the area = 1
	A1	for a correct three term quadratic = 0 or a correct method to find k e.g. $(k-2)(2k+1)=0$ **and** a statement that $k = 2$ (must reject k=-0.5 if stated). If they have shown by verification that the area = 1, we also need a statement $k = 2$. Correct answer with no incorrect working seen (2/2).
(b)	**B1**	4 (Condone 2k)
(c)	**M1**	for either $y=2x+c$ or $y=ax-6$ with $a > 1$ or $y-2=m(x-4)$, $m > 1$
	dM1	for their f(x) = 2x – 6 associated with the correct range, dep on 1st M1 (condone < but must be consistent)
	A1	fully correct (Correct answer 3/3)
(d)	**M1**	for $\int x^2 f(x)\,dx$ (Condone missing dx or use of another letter), Ignore limits. Using their f(x) but must be an equation of a line. We must see f(x) in the integral so just seeing $\int x^2\,dx$ - M0
	dM1	Dep of 1st M1, for an integration using their f(x) (at least 1 term $x^n \rightarrow x^{n+1}$). Condone upper limit as 2k
	M1	for correct substitution of limits seen (3 and 4 (2k)) into their integration. Check unseen substitution for a single term.
	M1	for a correct method to find the variance. ft their 13.5 Var(X)<0 or $E\left(X^2\right)<0$ is M0
	A1	$\frac{1}{18}$ or exact equivalent