



eClassroom

INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 1

Statistics 1

Exam Questions by Topic: Mark Scheme

Pearson Edexcel International Advanced Level (WST01/01) • Calculator and Statistical Tables allowed

Every question in the booklet, marked line by line the way an examiner marks it

Chapters (tap a chapter to jump to it)	Qs	Marks	Page	My score
1 Mathematical Modelling Not examined on its own: modelling ideas are tested within Chapters 2 to 7	—	—	Not applicable	
2 Measures of Location and Spread Averages, quartiles, interpolation, standard deviation, coding	10	83	own PDF	
3 Representations of Data Histograms, stem and leaf, box plots, outliers, skewness, comparisons	10	80	own PDF	
4 Probability Venn and tree diagrams, conditional probability, independence	10	80	own PDF	
5 Correlation and Regression PMCC, least squares regression, interpretation, coding	10	84	own PDF	
6 Discrete Random Variables Probability and cumulative distributions, $E(X)$, $\text{Var}(X)$, uniform	10	82	own PDF	
7 The Normal Distribution Standardising, tables, finding μ and σ , conditional problems	10	83	3	

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How to use this mark scheme

The same marking rules Pearson examiners use for WST01.

Mark every line, not just the answer. Method marks are given for a correct method even when the final answer is wrong. If you lost marks, find the *first* line where your working differs from the scheme. That is the thing to fix.

Code	Meaning
M1	Method mark: for knowing a correct method and attempting to apply it. Small slips in the working do not lose this mark.
dM1	Dependent method mark: can only be given if the method mark before it has been given.
A1	Accuracy mark: for a correct answer or line of working. It can only be given if the method mark it depends on has been given.
B1	Independent mark: for a correct result or statement, whatever method was used.
*	The answer is given in the question. Every step must be shown, and the answer must follow from correct working (cso).
cao	Correct answer only.
cso	Correct solution only: no errors anywhere in the working.
ft	Follow through: the mark can be given for correct work using your own earlier (wrong) answer.
oe	Or equivalent: any correct equivalent form is accepted.

“Solutions relying on calculator technology are not acceptable.” When a question says this, a correct final answer with no algebraic working scores **no marks**. The notes under each scheme line say when this applies.



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Chapter 7: The Normal Distribution

Mark scheme. Marks are shown on the right of each line.

Question 1

5 marks

Part	Scheme	Marks
(a)	$P\left(Z < \frac{56 - 50}{4}\right) = \Phi(1.5)$ 0.9332	M1 A1 (2)
(b)	Standardises both: $z = -1.5$ and $z = 2$ $\Phi(2) - \Phi(-1.5) = 0.9772 - 0.0668$ 0.9104	M1 M1 A1 (3)
Total for Question 1: 5 marks		

Question 2

5 marks

Part	Scheme	Marks
(a)	$z = \frac{99 - 120}{15} = -1.4, \text{ so } P(Z > -1.4) = \Phi(1.4)$ 0.9192	M1 A1 (2)
(b)	$\frac{a - 120}{15} = 1.6449$ 1.6449 from the percentage points table $a = 144.7$ (144.67...) <i>Using 1.64 or 1.65 scores M1 B0 A1 if the answer rounds correctly.</i>	M1 B1 A1 (3)
Total for Question 2: 5 marks		



Question 3

5 marks

Part	Scheme	Marks
(a)	$\Phi(z) = 0.8413$ gives $z = 1$ $\frac{36 - 30}{\sigma} = 1$ $\sigma = 6$	B1 M1 A1 (3)
(b)	0.1587 By symmetry: 24 is the same distance below the mean as 36 is above it	B1 B1 (2)
Total for Question 3: 5 marks		

Question 4

5 marks

Part	Scheme	Marks
(a)	$P(Z > z) = 0.2$ gives $z = 0.8416$ $\frac{40 - \mu}{5} = 0.8416$ $\mu = 35.8$ (35.792)	B1 M1 A1 (3)
(b)	$P\left(Z < \frac{30 - 35.792}{5}\right) = P(Z < -1.16)$ 0.123 (0.1230 from tables; 0.1234 by calculator)	M1 A1 (2)
Total for Question 4: 5 marks		

Question 5

5 marks

Part	Scheme	Marks
(a)	$Q_1: P(Z < z) = 0.25$ gives $z = -0.6745$ (accept -0.67) $Q_1 = 71.9$ $IQR = 16.2$ ($2 \times 0.6745 \times 12$)	M1 A1 A1 (3)
(b)	Limit = $Q_3 + 1.5 \times IQR = 88.09 + 24.28 = 112.4$, i.e. $z = 2.70$ $1 - \Phi(2.70) = 0.0035$	M1 A1 (2)
Total for Question 5: 5 marks		



Question 6

12 marks

Part	Scheme	Marks
(a)	$P(Z < -1) = 1 - 0.8413$ 0.1587	M1 A1 (2)
(b)	$P(Z > 1.5) = 1 - 0.9332$ 0.0668	M1 A1 (2)
(c)	Three positions for the large apple: $3 \times 0.0668 \times 0.9332^2$ Correct expression 0.175	M1 A1 A1 (3)
(d)	$P(170 < X < 180) = \Phi(1.5) - \Phi(1) = 0.9332 - 0.8413 = 0.0919$ $\frac{0.0919}{0.9332}$ 0.0985 <i>The numerator is the range 170 to 180 (more than 170 and not large).</i>	M1 M1 A1 (3)
(e)	$\frac{w - 150}{20} = -1.2816$ $w = 124.4$ (124.368)	M1 A1 (2)
Total for Question 6: 12 marks		



Question 7

12 marks

Part	Scheme	Marks
(a)	$P(T < 46) = 0.1$ gives $z = -1.2816$	B1
	$\frac{46 - \mu}{\sigma} = -1.2816$, so $46 = \mu - 1.2816\sigma$ *	B1*
	$70 = \mu + 0.8416\sigma$	B1
		(3)
(b)	Subtracts: $24 = 2.1232\sigma$	M1
	$\sigma = 11.3$ (11.30...)	A1
	$\mu = 60.5$ (60.49)	A1
		(3)
(c)	$z = \frac{50 - 60.49}{11.30} = -0.93$ and $z = \frac{65 - 60.49}{11.30} = 0.40$	M1
	$\Phi(0.40) - \Phi(-0.93) = 0.6554 - 0.1762$	M1
	0.479 (0.478 using unrounded values)	A1
		(3)
(d)	$P(T > 65) = 0.3446$ and $P(T > 50) = 0.8238$	M1
	$\frac{0.3446}{0.8238}$	M1
	0.418 (awrt 0.42)	A1
		(3)
Total for Question 7: 12 marks		



Question 8

11 marks

Part	Scheme	Marks
(a)	By symmetry $P(X < 30) = 0.9$ $\frac{30 - 25}{\sigma} = 1.2816$ $\sigma = 3.901 \dots = 3.90 \text{ *}$	M1 M1 A1* (3)
(b)	$P\left(Z > \frac{7}{3.901}\right) = P(Z > 1.79)$ 0.0367 (0.0364 by calculator)	M1 A1 (2)
(c)	$\frac{P(X > 30)}{P(X > 25)} = \frac{0.1}{0.5}$ 0.2	M1 A1 (2)
(d)	$1 - 0.9^4$ 0.3439	M1 A1 (2)
(e)	$\frac{k}{\sigma} = 0.6745 \text{ (accept 0.67)}$ $k = 2.63$	M1 A1 (2)
Total for Question 8: 11 marks		



Question 9

11 marks

Part	Scheme	Marks
(a)	$z = \frac{49.5 - 50}{0.4} = -1.25$ and $z = 1.25$ $2\Phi(1.25) - 1 = 2 \times 0.8944 - 1$ 0.7888	M1 M1 A1 (3)
(b)	$z = \frac{49.5 - 50.2}{0.5} = -1.4$ and $z = \frac{50.5 - 50.2}{0.5} = 0.6$ $\Phi(0.6) - \Phi(-1.4) = 0.7257 - 0.0808$ 0.6449	M1 M1 A1 (3)
(c)	$0.6 \times 0.7888 + 0.4 \times 0.6449$ 0.731	M1 A1 (2)
(d)	$P(A \cap \text{acceptable}) = 0.6 \times 0.7888 = 0.4733$ $\frac{0.4733}{0.7312 \dots}$ 0.647	M1 M1 A1 (3)
Total for Question 9: 11 marks		



Question 10

12 marks

Part	Scheme	Marks
(a)	$P(Z < z) = 0.0228$ gives $z = -2$ $\frac{30 - \mu}{\mu/4} = -2$ $30 - \mu = -\frac{\mu}{2}$, so $\mu = 60$ * $\sigma = 15$	B1 M1 A1* B1 (4)
(b)	$P(X > 75) = 1 - \Phi(1) = 0.1587$ and $P(X > 60) = 0.5$ $\frac{0.1587}{0.5}$ 0.3174	M1 M1 A1 (3)
(c)	$60 + 1.6449 \times 15$ 84.7	M1 A1 (2)
(d)	$P(45 < X < 75) = 2\Phi(1) - 1 = 0.6826$ $200 \times 0.6826 = 136.5$ About 68% of a normal distribution lies within one standard deviation of the mean	M1 A1 B1 (3)
Total for Question 10: 12 marks		

