GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics
Module S1

Paper L

MARKING GUIDE

This guide is intended to be as helpful as possible to teachers by providing concise solutions and indicating how marks should be awarded. There are obviously alternative methods that would also gain full marks.

Method marks (M) are awarded for knowing and using a method.

Accuracy marks (A) can only be awarded when a correct method has been used.

(B) marks are independent of method marks.

Written by Shaun Armstrong & Chris Huffer

S1 Paper L – Marking Guide

1.	*(a)*	$S_{TT} = 1802 - \frac{124^2}{12} = 520.667$	M1	
		$S_{nn} = 18518 - \frac{384^2}{12} = 6230$	M1	
		$S_{Tn} = 2583 - \frac{124 \times 384}{12} = {}^-1385$	M1	
		$r = \frac{-1385}{\sqrt{520.667 \times 6230}} = {}^-0.7690$	M1 A1	
	(b)	it shows –ve correlation meaning less glove sales in higher temperatures	B1	
		e.g. people mainly buy gloves when their hands are cold	B1	**(7)**
2.	*(a)*	$\frac{3}{4} - \frac{1}{4} = \frac{1}{2}$	M1 A1	
	(b)	$\frac{3}{4} \times \mathrm{P}(B) = \frac{1}{2} \quad \therefore\ \mathrm{P}(B) = \frac{2}{3}$	M2 A1	
	(c)	$1 - [\mathrm{P}(B) + \mathrm{P}(A \cap B')] = 1 - (\frac{2}{3} + \frac{1}{4}) = \frac{1}{12}$	M2 A1	**(8)**
3.	*(a)*	$2\mathrm{E}(X) + 3 = 2a + 3$	A1	
	(b)	$2^2 \times \mathrm{Var}(X) = 4b$	M1 A1	
	(c)	$\mathrm{Var}(X) = \mathrm{E}(X^2) - [\mathrm{E}(X)]^2$	B1	
		$b = \mathrm{E}(X^2) - a^2$	M1	
		$\mathrm{E}(X^2) = a^2 + b$	A1	
	(d)	$\mathrm{E}[(X+1)^2] = \mathrm{E}(X^2 + 2X + 1) = \mathrm{E}(X^2) + 2\mathrm{E}(X) + 1$	M1 A1	
		$= a^2 + b + 2a + 1 = (a+1)^2 + b$	M1 A1	**(10)**
4.	*(a)*	$S_{xy} = 11600 - \frac{100 \times 23}{8} = 11312.5$	M1	
		$S_{xx} = 215000 - \frac{100^2}{8} = 213750$	M1	
		$b = \frac{11312.5}{213750} = 0.0529240$	M1 A1	
		$a = \frac{23}{8} - (0.0529240 \times \frac{100}{8}) = 2.21345$	M1 A1	
		$y = 2.21 + 0.0529x$	A1	
	(b)	$n - 20 = 2.21345 + 0.0529240(v - 700)$	M1	
		$n = {}^-14.8 + 0.0529v$	A1	
	(c)	$n = {}^-14.83 + 0.05292 \times 900 = 32.8 \quad \therefore\ 33$	M1 A1	**(11)**

5. *(a)*	y values = $^-3,\ ^-2,\ ^-1,\ 0,\ 1,\ 4,\ 9$	M1	
	$\sum fy = (^-3 \times 31) + (^-2 \times 6) + \ldots = {}^-86$	M1 A1	
(b)	$\sum f = 52;\quad \bar{y} = \frac{-86}{52} = {}^-1.6538$	M1	
	$\bar{x} = (200 \times {}^-1.6538) + 699.5 = 368.73 = £369$ (nearest £)	M1 A1	
	std. dev. of $y = \sqrt{\frac{424}{52} - (-1.6538)^2} = 2.3278$	M1	
	std. dev. of $x = 200 \times 2.3278 = 465.56 = £466$ (nearest £)	M1 A1	
(c)	e.g. mean is raised by a few very large values, most weeks a lot less is stolen; median is more typical but would suggest that the amount stolen is much less of a problem than it really is	B3	**(12)**
6. *(a)*	$\frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$	M2 A1	
(b)	P(more F) = P(3F) + P(2F)	M1	
	$= (\frac{6}{10} \times \frac{5}{9} \times \frac{4}{8}) + (3 \times \frac{4}{10} \times \frac{6}{9} \times \frac{5}{8}) = \frac{2}{3}$	M3 A2	
(c)	after M goes, left with 6F and 3M	M1	
	P(next 2 F) = $\frac{6}{9} \times \frac{5}{8} = \frac{5}{12}$	M1 A1	**(12)**
7. *(a)*	cum. freqs: 15, 46, 78, 101, 118, 120	M1	
	$Q_1 = 30.25^{th} = 30 + 30(\frac{15.25}{31}) = 44.8\ \ [30^{th} \rightarrow 44.5]$ $Q_2 = 60.5^{th} = 60 + 30(\frac{14.5}{32}) = 73.6\ \ [60^{th} \rightarrow 73.1]$ $Q_3 = 90.75^{th} = 90 + 30(\frac{12.75}{23}) = 106.6\ \ [90^{th} \rightarrow 105.7]$	M2 A3	
(b)	median = mean = 72 minutes	A1	
	$P(Z < \frac{Q_1 - 72}{48}) = 0.25$	M1	
	$\therefore \frac{Q_1 - 72}{48} = {}^-0.67;\ Q_1 = 39.8$ (1dp)	M1 A1	
	$P(Z < \frac{Q_3 - 72}{48}) = 0.75$	M1	
	$\therefore \frac{Q_3 - 72}{48} = 0.67;\ Q_3 = 104.2$ (1dp)	M1 A1	
(c)	e.g. median and quartiles from model all slightly lower than in new results but reasonably close so fairly suitable model	B2	**(15)**
		Total	**(75)**

Performance Record – S1 Paper L

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	Total
Topic(s)	pmcc	probability	discrete r. v.	regression	mean and std. dev. with coding	probability	interplo'n, normal dist.	
Marks	7	8	10	11	12	12	15	75
Student								