

GCE Examinations
Advanced Subsidiary / Advanced Level
Statistics
Module S1

Paper A

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.



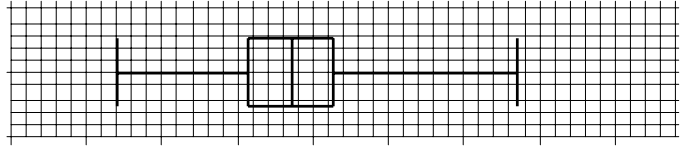
Written by Shaun Armstrong & Chris Huffer

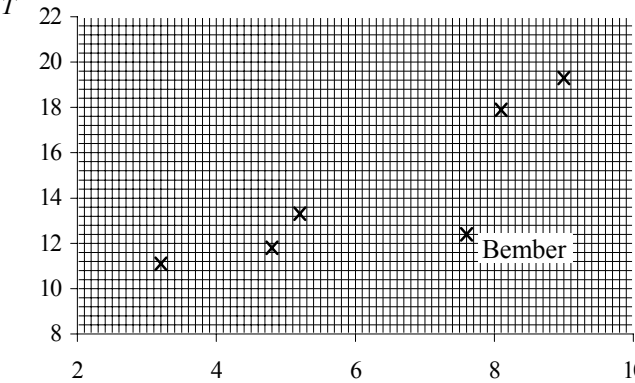
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S1 Paper A – Marking Guide

1.	(a)	$P(X > 23.8) = 0.2$	M1															
		$P(Z < \frac{23.3 - 22.8}{\sigma}) = 0.8$	M1															
		$\frac{0.5}{\sigma} = 0.8416$	B1															
		$\sigma = 0.5941; \sigma^2 = 0.3530$	M1 A1															
	(b)	$P(Z < \frac{21.82 - 22.8}{0.5941}) = P(Z < -1.65) = 0.0495$	M2 A1	(8)														
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2.	(a)	$P(B) \times P(A B) = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$	M1 A1															
	(b)	$\frac{P(B' \cap A)}{P(A)} = \frac{\frac{5}{16} - \frac{1}{8}}{\frac{5}{16}} = \frac{3}{5}$	M2 A1															
	(c)	$(1 - \frac{5}{16}) + \frac{1}{8} = \frac{13}{16}$	M1 A1															
	(d)	$P(A) \times P(B) = \frac{5}{16} \times \frac{1}{2} = \frac{5}{32}$ $\neq P(A \cap B) \therefore$ not independent	M1 M1 A1	(10)														
<hr/>																		
3.	(a)	$\sum fx = 303$	M1															
		mean = $\frac{303}{60} = 5.05$	M1 A1															
		$\sum fx^2 = 1753$	M1															
		std. dev. = $\sqrt{\frac{1753}{60} - (5.05)^2} = 1.93$	M1 A1															
	(b)	(by symmetry) 5	M1 A1															
	(c)	actual std. dev. much lower than in model tendency to pick numbers nearer the middle	B1 B1	(10)														
<hr/>																		
4.	(a)	<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>$P(x)$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td><td>$\frac{3}{8}$</td></tr></table>	x	1	2	3	4	5	6	$P(x)$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8}$	M2 A2	
	x	1	2	3	4	5	6											
	$P(x)$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8}$											
	(b)	$\sum xP(x) = \frac{1}{8}(1 + 2 + 3 + 4 + 5 + 18) = \frac{33}{8}$	M2 A1															
	(c)	$(4 \times \frac{33}{8}) - 1 = \frac{31}{2}$	M1 A1															
(d)	$E(X^2) = \sum x^2P(x) = \frac{1}{8}(1 + 4 + 9 + 16 + 25 + 108) = \frac{163}{8}$ $\text{Var}(X) = \frac{163}{8} - (\frac{33}{8})^2 = \frac{215}{64}$ or 3.36	M1 A1 M1 A1	(13)															

5. (a) 20 - 29: class width 10 \rightarrow 2 cm \therefore class width 5 \rightarrow 1 cm M1
 freq. den. = $\frac{18}{10} = 1.8 \rightarrow 7.2$ cm \therefore freq. den. 1 \rightarrow 4 cm M1
- (i) 30 - 34: class width 5 \therefore width 1 cm A1
 freq. den. = $\frac{24}{5} = 4.8 \therefore$ height 19.2 cm A1
- (ii) 50 - 69: class width 20 \therefore width 4 cm A1
 freq. den. = $\frac{5}{20} = 0.25 \therefore$ height 1 cm A1
- (b) cum. freqs: 2, 20, 44, 74, 101, 115, 120 M1
 $Q_1 = 30.25^{\text{th}} = 29.5 + 5\left(\frac{10.25}{24}\right) = 31.6$ [$30^{\text{th}} \rightarrow 31.6$]
 $Q_2 = 60.5^{\text{th}} = 34.5 + 5\left(\frac{16.5}{30}\right) = 37.3$ [$60^{\text{th}} \rightarrow 37.2$]
 $Q_3 = 90.75^{\text{th}} = 39.5 + 5\left(\frac{16.75}{27}\right) = 42.6$ [$90^{\text{th}} \rightarrow 42.5$] } M2 A3
- (c)  B4
 0 20 40 60 80
 symmetrical (or slight +ve skew) A1 (17)

6. (a)  B4
 2 4 6 8 10 P
 8 10 12 14 16 18 20 22 T
- (b) (i) Bember A1
 (ii) e.g. how near to town centre; size of shop B2
- (c) $S_{PT} = 574.25 - \frac{37.9 \times 85.8}{6} = 32.28$ M1
 $S_{PP} = 264.69 - \frac{37.9^2}{6} = 25.288$ M1
 $b = \frac{32.28}{25.288} = 1.2765$ M1 A1
 $a = \frac{85.8}{6} - 1.2765\left(\frac{37.9}{6}\right) = 6.2369$ M1 A1
 $T = 6.24 + 1.28P$ A1
- (d) $P = 6.8$ giving $T = 14.917 \therefore$ £14 900 M1 A1
- (e) $P = 17.2$ which lies outside the set of values used to obtain the equation B1 (17)

Total (75)

Performance Record – S1 Paper A

[illegible]