

GCE Examinations
Advanced Subsidiary / Advanced Level
Statistics
Module S1

Paper B

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.



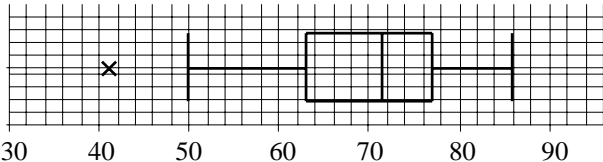
Written by Shaun Armstrong & Chris Huffer

© *Solomon Press*

These sheets may be copied for use solely by the purchaser's institute.

S1 Paper B – Marking Guide

1.	$\sum x = 14 \times 31.2 = 436.8$ new $\sum x = 436.8 + 42 = 478.8$ new mean = $\frac{478.8}{15} = 31.9$ years $\sum x^2 = 14(7.4^2 + 31.2^2) = 14394.8$ new $\sum x^2 = 14394.8 + 42^2 = 16158.8$ new std. dev. = $\sqrt{\frac{16158.8}{15} - 31.9^2} = 7.6$ years	M1 M1 A1 M1 M1 M1 A1	
2.	(a) $S_{hh} = 65.7396 - \frac{36.22^2}{20} = 0.14518$ $S_{vv} = 259853 - \frac{2275^2}{20} = 1071.75$ $S_{hv} = 4128.03 - \frac{36.22 \times 2275}{20} = 8.005$ $r = \frac{8.005}{\sqrt{0.14518 \times 1071.75}} = 0.6417$ (b) r is fairly strongly +ve, supporting hypothesis	M1 M1 M1 M1 A1 B2	 (7)
3.	(a) $1 - 0.6 = 0.4$ (b) $0.6 - 0.2 = 0.4$ (c) $0.6 = 0.2 + P(B) - 0.2P(B)$ $0.4 = 0.8P(B); P(B) = 0.5$ (d) $1 - (0.2 \times 0.5) = 0.9$	M1 A1 M1 A1 M2 M1 A1 M1 A1	 (10)
4.	(a) $0.1 + 0.35 + k + 0.15 + k = 1$ $2k = 0.4; k = 0.2$ (b) $0.1 + 0.35 = 0.45$ (c) $0.35 + 0.2 = 0.55$ (d) $\sum xP(x) = 0.1 + 0.7 + 0.6 + 0.6 + 1 = 3$ (e) $E(X^2) = \sum x^2P(x) = 0.1 + 1.4 + 1.8 + 2.4 + 5 = 10.7$ $\text{Var}(X) = 10.7 - 3^2 = 1.7$ $\text{Var}(3X + 2) = 3^2 \times 1.7 = 15.3$	M1 A1 A1 M1 A1 M1 A1 M1 A1 M1 M1 A1	 (12)

5. (a) $Q_1 = 63^\circ$ A1
 $Q_2 = \frac{71+72}{2} = 71.5^\circ$ M1 A1
 $Q_3 = 77^\circ$ A1
- (b) $Q_3 - Q_1 = 77 - 63 = 14$ M1
limits are $63 - (1.5 \times 14) = 42$ and $77 + (1.5 \times 14) = 98$ M1
 $\therefore 41$ is an outlier A1
- (c)  B3
- (d) - ve skew. B1
e.g. people know 90° so less likely to draw much larger than 75° B1 (12)
-
6. (a) $\frac{4}{11}$ A1
- (b) 3 T's, 7 consonants, $\therefore \frac{3}{7}$ M1 A1
- (c) $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9} = \frac{1}{165}$ M2 A1
- (d) 3 vowels: $\frac{4}{11} \times \frac{3}{10} \times \frac{2}{9} = \frac{4}{165}$ M1 A1
2 vowels: $3 \times \frac{4}{11} \times \frac{3}{10} \times \frac{7}{9} = \frac{14}{55}$ M1 A1
P(at least 2 vowels) = $\frac{4}{165} + \frac{14}{55} = \frac{46}{165}$ M1 A1 (12)
-
7. (a) $P(Z > \frac{706-704}{\sqrt{3.2}}) = P(Z > 1.12) = 0.1314$ M2 A1
- (b) $P(\frac{703-704}{\sqrt{3.2}} < Z < \frac{708-704}{\sqrt{3.2}})$ M1
 $= P(-0.56 < Z < 2.24)$ M1
 $= P(Z < 2.24) - P(Z < -0.56)$ M1
 $= 0.9875 - 0.2877 = 0.6998$ A1
- (c) $P(Z < \frac{700-704}{\sqrt{3.2}}) = P(Z < -2.24) = 0.0125$ M1 A1
expect $0.0125 \times 1200 = 15$ M1 A1
- (d) $P(Z < \frac{700-\mu}{\sqrt{3.2}}) = 0.01$ M1
 $\frac{700-\mu}{\sqrt{3.2}} = -3.0902$ M1
 $\mu = 700 + (3.0902 \times \sqrt{3.2}) = 705.5$ ml (1dp) M1 A1 (15)
-
- Total (75)

