GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics

Module S1

Paper H

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 H – Marking Guide

1. *(a)* $\sum xP(x) = \frac{1}{8}k + \frac{3}{8}(k+4) + \frac{1}{2}(2k) = \frac{3}{2}(k+1)$ M2 A1

(b) $\frac{3}{2}(k+1) = 9;\ k = 5$ M1 A1 **(5)**

---

2. *(a)* e.g. using a distribution or other simplified way of representing a real situation that allows predictions to be made about it B2

(b) (i) not suitable e.g. discrete etc. / +ve skew B2

(ii) suitable e.g. likely to be similar time most days, sometimes fair bit more, sometimes fair bit less B2

(iii) not suitable e.g. very different values in winter / summer B2 **(8)**

---

3. *(a)* $1 - 0.22 = 0.78$ M1 A1

(b) $0.78 - 0.35 = 0.43$ M1 A1

(c) $\frac{P(A \cap B)}{P(A)} = \frac{0.7 - 0.43}{0.7} = 0.386$ (3sf) M2 A1

(d) not independent as e.g. $P(B \mid A) \neq P(B)$ B2 **(9)**

---

4. *(a)* $P(Z < \frac{127 - 122.3}{2.6}) = P(Z < 1.81) = 0.9649$ M2 A1

(b) $P(Z < \frac{121.5 - 122.3}{2.6}) = P(Z < {}^{-}0.31) = 0.3783$ M2 A1

(c) $P(Z < \frac{454 - \mu}{1.6}) = 0.05$ M1

$\frac{454 - \mu}{1.6} = {}^{-}1.6449;\ \mu = 456.6$ (4sf) M1 A2 **(10)**

---

5. *(a)* 5 vowels, 7 consonants

$P(V = 1) = 3 \times \frac{5}{12} \times \frac{7}{11} \times \frac{6}{10} = \frac{21}{44}$ M2 A1

(b) $P(V = 0) = \frac{7}{12} \times \frac{6}{11} \times \frac{5}{10} = \frac{7}{44}$

$P(V = 2) = 3 \times \frac{5}{12} \times \frac{4}{11} \times \frac{7}{10} = \frac{7}{22}$

$P(V = 3) = \frac{5}{12} \times \frac{4}{11} \times \frac{3}{10} = \frac{1}{22}$

v	0	1	2	3
$P(V = v)$	$\frac{7}{44}$	$\frac{21}{44}$	$\frac{7}{22}$	$\frac{1}{22}$

M2 A2

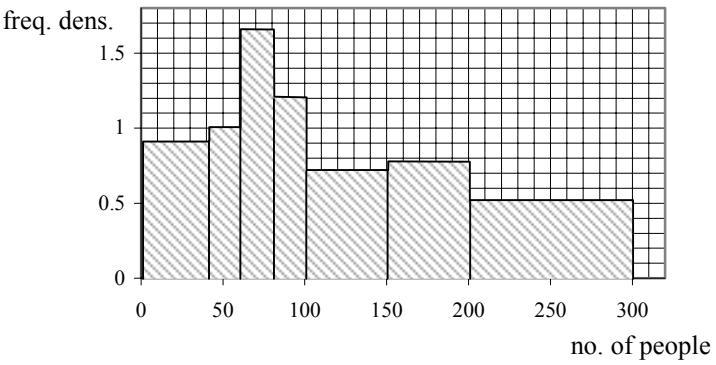
(c) $E(V) = \sum vP(v) = 0 + \frac{21}{44} + \frac{14}{22} + \frac{3}{22} = \frac{5}{4}$ M1 A1

$E(V^2) = \sum v^2P(v) = 0 + \frac{21}{44} + \frac{28}{22} + \frac{9}{22} = \frac{95}{44}$ M1 A1

$\text{Var}(V) = \frac{95}{44} - (\frac{5}{4})^2 = \frac{105}{176}$ or 0.597 (3sf) M1 A1 **(13)**

---

6. *(a)* freq. dens. = 0.9, 1, 1.65, 1.2, 0.72, 0.78, 0.52 — M1 A1



B2

(b) cum. freqs: 36, 56, 89, 113, 149, 188, 240 — M1

$Q_1 = 60^{th} = 60.5 + 20(\frac{4}{33}) = 62.9$ $[60.25^{th} \rightarrow 63.1]$

$Q_2 = 120^{th} = 100.5 + 50(\frac{7}{36}) = 110.2$ $[120.5^{th} \rightarrow 110.9]$

$Q_3 = 180^{th} = 150.5 + 50(\frac{31}{39}) = 190.2$ $[180.75^{th} \rightarrow 191.2]$ — M2 A3

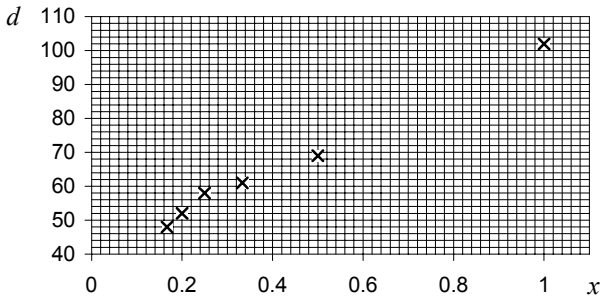
(c) $Q_3 - Q_2 = 80.0$, $Q_2 - Q_1 = 47.3$; $Q_3 - Q_2 > Q_2 - Q_1$ ∴ +ve skew — M2 A1 **(13)**

---

7. *(a)*

x	1	0.5	0.333	0.25	0.2	0.167
d	102	69	61	58	52	48

M1 A1



B3

(b) the points lie roughly on a straight line — B1

(c) $S_{xd} = 189.733 - \frac{2.45 \times 390}{6} = 30.483$ — M1

$S_{xx} = 1.491 - \frac{2.45^2}{6} = 0.490583$ — M1

$b = \frac{30.483}{0.490583} = 62.136$ — M1 A1

$a = \frac{390}{6} - (62.136 \times \frac{2.45}{6}) = 39.628$ — M1 A1

$d = 39.6 + 62.1x$ — A1

(d) $m = 13$, $x = \frac{1}{13}$; $d = 39.6 + (62.1 \times \frac{1}{13}) = 44.4$, so 44 cases — M2 A1

(e) not very reliable as it requires extrapolation well outside the data — B1 **(17)**

Total **(75)**

Performance Record – S1 Paper H

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	Total
Topic(s)	discrete r. v.	modelling, normal dist.	probability	normal dist.	discrete r. v.	histogram, interpol'n	scatter diagram, regression	
Marks	5	8	9	10	13	13	17	75
Student								