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.

S1 Paper H – Marking Guide

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

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

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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)**

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

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

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

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

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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)**

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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) $E(V) = \sum v P(v) = 0 + \frac{21}{44} + \frac{14}{22} + \frac{3}{22} = \frac{5}{4}$ M1 A1
            $E(V^2) = \sum v^2 P(v) = 0 + \frac{21}{44} + \frac{28}{22} + \frac{9}{22} = \frac{95}{44}$ M1 A1
            $Var(V) = \frac{95}{44} - (\frac{5}{4})^2 = \frac{105}{176}$ or 0.597 (3sf)   M1 A1   **(13)**

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6. (a) freq. dens. = 0.9, 1, 1.65, 1.2, 0.72, 0.78, 0.52   M1 A1
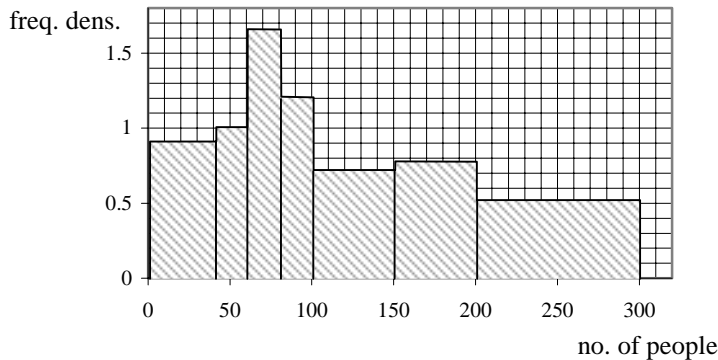
B2

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

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

$Q_2 = 120^{th} = 100.5 + 50(\frac{7}{36}) = 110.2$ [$120.5^{th} \to 110.9$]   M2 A3

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

(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)**

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7. (a)

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

M1 A1
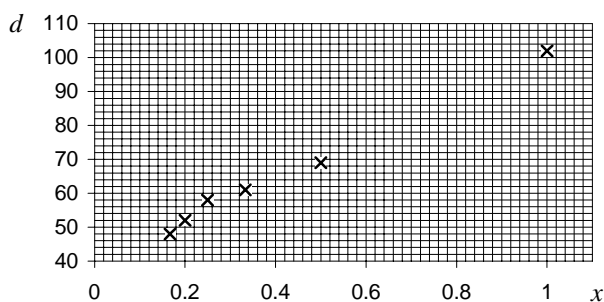
B3

(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)**

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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								

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