GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics
Module S1

Paper D

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 D – Marking Guide

1. *(a)* (i) e.g.
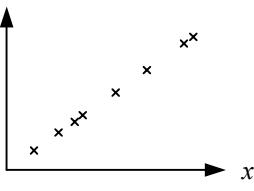
B2

(ii) e.g.
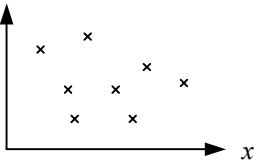
B2

(b) e.g. with small n weak evidence of +ve correlation,
with larger n stronger evidence of +ve correlation   B2   **(6)**

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2. *(a)* f. d. of 30-34 = $\frac{32}{5}$ = 6.4; 6.4 → 19.2 cm ∴ 1 → 3 cm   M1

f. d. of 35-39 = $\frac{28}{5}$ = 5.6; ∴ height = 3 × 5.6 = 16.8 cm   M1 A1

(b) height 2.7 cm ∴ f. d. = $\frac{2.7}{3}$ = 0.9   M1

∴ $\frac{n}{20}$ = 0.9; n = 18   M1 A1   **(6)**

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3. *(a)* $\frac{1}{4}$ = P(B) × $\frac{2}{3}$ ∴ P(B) = $\frac{1}{4}$ ÷ $\frac{2}{3}$ = $\frac{3}{8}$ M2 A1

(b) $\frac{7}{12}$ + $\frac{3}{8}$ − $\frac{1}{4}$ = $\frac{17}{24}$ M2 A1

(c) $P(B \mid A') = \frac{P(B \cap A')}{P(A')} = \frac{\frac{3}{8} - \frac{1}{4}}{1 - \frac{7}{12}} = \frac{3}{10}$ M2 A1   **(9)**

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4. *(a)* S_{xy} = 3871 − $\frac{57 \times 2222}{20}$ = ⁻2461.7   M1

S_{xx} = 401 − $\frac{57^2}{20}$ = 238.55   M1

$b = \frac{-2461.7}{238.55}$ = ⁻10.3194   M1 A1

$a = \frac{2222}{20} - (^-10.3194 \times \frac{57}{20})$ = 140.5104   M1 A1

y = 140.5104 − 10.3194x A1

P − 300 = 140.5104 − 10.3194(T − 20)   M1

P = 646.9 − 10.3T A1

(b) 460 = 646.9 − 10.3T M1

$T = \frac{646.9 - 460}{10.3}$ = 18.1 ∴ 18°C (nearest degree)   M1 A1   **(12)**

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5. (a) $2k + 3k + 4k + 5k + 6k = 1$; $k = \frac{1}{20}$ M1 A1

(b) $\sum x\mathrm{P}(x) = \frac{1}{20}(4 + 9 + 16 + 25 + 36) = \frac{9}{2}$ M2 A1

(c) $= \mathrm{P}(X > \frac{9}{2}) = \frac{5}{20} + \frac{6}{20} = \frac{11}{20}$ M1 A1

(d) $(2 \times \frac{9}{2}) - 5 = 4$ M1 A1

(e) $\mathrm{E}(X^2) = \sum x^2\mathrm{P}(x) = \frac{1}{20}(8 + 27 + 64 + 125 + 216) = 22$ M1 A1

$\mathrm{Var}(X) = 22 - (\frac{9}{2})^2 = \frac{7}{4}$ M1 A1 **(13)**

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6. (a) $\mathrm{P}(X > 2) = 0.75$; $\mathrm{P}(Z > \frac{2-\mu}{\sigma}) = 0.75$ M2

$\frac{2-\mu}{\sigma} = {}^-0.67$; $2 - \mu = {}^-0.67\sigma$ A1

$\mathrm{P}(X > 6) = 0.1$; $\mathrm{P}(Z > \frac{6-\mu}{\sigma}) = 0.1$ M2

$\frac{6-\mu}{\sigma} = 1.2816$; $6 - \mu = 1.2816\sigma$ A1

solve simul. giving $\mu = 3.3732$, $\sigma = 2.0496$; so $\mu = 3.37$, $\sigma = 2.05$ M1 A2

(b) $\mathrm{P}(X < 1) = \mathrm{P}(Z < \frac{1 - 3.3732}{2.0496}) = \mathrm{P}(Z < {}^-1.16) = 0.1230 \therefore 12.3\%$ M2 A1

(c) e.g. large discrepancy between predicted & actual $\therefore$ not v. suitable B2 **(14)**

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7. (a)

Number of points	(2 │ 4 means 24 points)	Totals
1	2	(1)
1	5 5 7 8 8 9 9	(7)
2	1 1 3 3 4 4 4 4	(8)
2	5 6 8 9	(4)
3	0 2 4	(3)
3	6 7 9	(3)
4	0 1 3	(3)
4	5	(1)

B3

(b) $Q_1 = 19$ A1
$Q_2 = 24$ A1
$Q_3 = 34 + \frac{1}{4}(36 - 34) = 34.5$ M1 A1

(c)
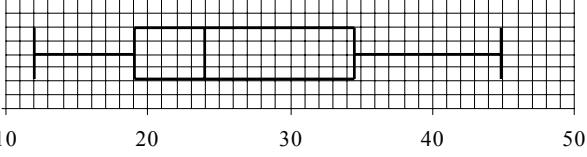
B3

(d)
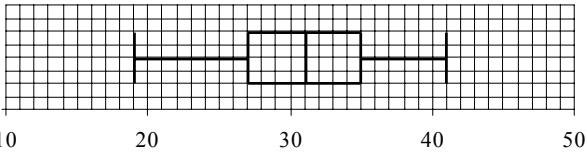
B2

(e) e.g. Tahira more points on av.; Tahira more consistent (smaller IQR);
Jane sometimes v. high i.e. +ve skew whereas Tahira symm. B3 **(15)**

Total **(75)**

Performance Record – S1 Paper D

Question no.	1	2	3	4	5	6	7	Total
Topic(s)	scatter diagrams, pmcc	histogram	probability	regression with coding	discrete r. v.	normal dist., modelling	stem & leaf, quartiles, boxplots	
Marks	6	6	9	12	13	14	15	75
Student								

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