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.

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S1 Paper A – Marking Guide

1. *(a)* $P(X > 23.8) = 0.2$ M1

$P\left(Z < \frac{23.3 - 22.8}{\sigma}\right) = 0.8$ M1

$\frac{0.5}{\sigma} = 0.8416$ B1

$\sigma = 0.5941;\ \sigma^2 = 0.3530$ M1 A1

(b) $P\left(Z < \frac{21.82 - 22.8}{0.5941}\right) = P(Z < {}^{-}1.65) = 0.0495$ M2 A1 **(8)**

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2. *(a)* $P(B) \times P(A \mid B) = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$ 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) $\left(1 - \frac{5}{16}\right) + \frac{1}{8} = \frac{13}{16}$ M1 A1

(d) $P(A) \times P(B) = \frac{5}{16} \times \frac{1}{2} = \frac{5}{32}$ M1

$\neq P(A \cap B)\ \therefore$ not independent M1 A1 **(10)**

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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 B1

tendency to pick numbers nearer the middle B1 **(10)**

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4. *(a)*

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

(b) $\sum xP(x) = \frac{1}{8}(1 + 2 + 3 + 4 + 5 + 18) = \frac{33}{8}$ M2 A1

(c) $\left(4 \times \frac{33}{8}\right) - 1 = \frac{31}{2}$ M1 A1

(d) $E(X^2) = \sum x^2 P(x) = \frac{1}{8}(1 + 4 + 9 + 16 + 25 + 108) = \frac{163}{8}$ M1 A1

$\text{Var}(X) = \frac{163}{8} - \left(\frac{33}{8}\right)^2 = \frac{215}{64}$ or 3.36 M1 A1 **(13)**

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5. *(a)* 20 - 29: class width 10 → 2 cm ∴ class width 5 → 1 cm — M1

freq. den. = $\frac{18}{10}$=1.8 → 7.2 cm ∴ freq. den. 1 → 4 cm — M1

(i) 30 - 34: class width 5 ∴ width 1 cm — A1

freq. den. = $\frac{24}{5}$ = 4.8 ∴ height 19.2 cm — A1

(ii) 50 - 69: class width 20 ∴ width 4 cm — A1

freq. den. = $\frac{5}{20}$ = 0.25 ∴ height 1 cm — A1

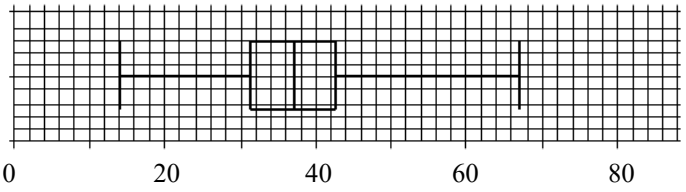
(b) cum. freqs: 2, 20, 44, 74, 101, 115, 120 — M1

$Q_1 = 30.25^{th} = 29.5 + 5(\frac{10.25}{24}) = 31.6$ [$30^{th} \rightarrow 31.6$]

$Q_2 = 60.5^{th} = 34.5 + 5(\frac{16.5}{30}) = 37.3$ [$60^{th} \rightarrow 37.2$] — M2 A3

$Q_3 = 90.75^{th} = 39.5 + 5(\frac{16.75}{27}) = 42.6$ [$90^{th} \rightarrow 42.5$]

(c)



B4

symmetrical (or slight +ve skew) — A1 **(17)**

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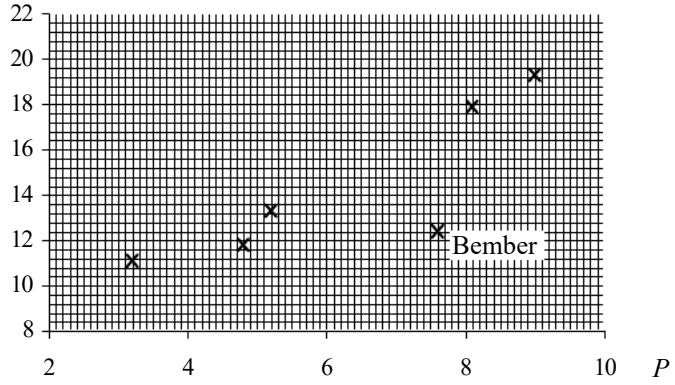
6. *(a)*



B4

(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 $T = 14.917$ ∴ £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

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