GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics

Module S1

Paper E

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 E – Marking Guide

1. *(a)*

	Studio	Live	Total
Jazz	(13)	3	(16)
Blues	9	5	14
Total	22	(8)	(30)

A2

(b) $\frac{5}{30} = \frac{1}{6}$ A1

(c) $\frac{13}{22}$ M1 A1 **(5)**

---

2. *(a)* Discrete Uniform B1

(b) $R = 10Q + 4$ A2

(c) $E(R) = (10 \times 3) + 4 = 34$ M1 A1
$Var(R) = 10^2 \times 2 = 200$ M1 A1 **(7)**

---

3. *(a)* $P(Z < \frac{45-42}{\sqrt{18}}) = P(Z < 0.71) = 0.7611$ M2 A1

(b) $P(\frac{32-42}{\sqrt{18}} < Z < \frac{38-42}{\sqrt{18}}) = P(^{-}2.36 < Z < ^{-}0.94)$ M2
$= P(Z < ^{-}0.94) - P(Z < ^{-}2.36) = 0.1736 - 0.0091 = 0.1645$ M1 A1

(c) $P(Z < \frac{x-42}{\sqrt{18}}) = 0.95$; $\frac{x-42}{\sqrt{18}} = 1.6449$ M1 A1
$x = 42 + (1.6449 \times \sqrt{18}) = 49.0$ M1 A1 **(11)**

---

4. *(a)* cum. freqs: 36, 128, 202, 241, 255, 282, 300 M1
median = $150^{th} = 40 + 20(\frac{22}{74}) = 45.9$ $[150.5^{th} \rightarrow 46.1]$ M1 A1

(b) middle 80% = P_{10} to P_{90} B1
$P_{10} = 30^{th} = 20(\frac{30}{36}) = 16.7$ $[30.1^{th} \rightarrow 16.7]$ M1
$P_{90} = 270^{th} = 200 + 100(\frac{15}{27}) = 255.6$ $[270.9^{th} \rightarrow 258.9]$ M1
$\therefore$ limits are 17 and 256 years A2

(c) e.g. data v. skewed, some extremely high values
doesn't affect median but increases mean significantly B2
median better, most values below the mean B1 **(11)**

---

5. *(a)*

y	0	1	2	3	4
$P(Y = y)$	0.05	0.1	0.2	0.4	0.25

M1 A1

(b) $0.1 + 0.2 = 0.3$ M1 A1

(c) $\sum yP(y) = 0 + 0.1 + 0.4 + 1.2 + 1 = 2.7$ M1 A1

(d) $(2 \times 2.7) + 4 = 9.4$ M1 A1

(e) $E(Y^2) = \sum y^2P(y) = 0 + 0.1 + 0.8 + 3.6 + 4 = 8.5$ M1 A1
$Var(Y) = 8.5 - (2.7)^2 = 1.21$ M1 A1 **(12)**

---

6. *(a)* $0.45 \times 0.6 = 0.27$ M1 A1

(b) $1 - (0.45 \times 0.4 \times 0.6) = 1 - 0.108 = 0.892$ M2 A1

(c) $P(\text{passed } 1^{st} \text{ time} \mid \text{passed}) = \dfrac{P(\text{passed } 1^{st} \text{ time} \cap \text{passed})}{P(\text{passed})}$ M2

$= \frac{0.55}{0.892} = 0.617$ (3sf) A1

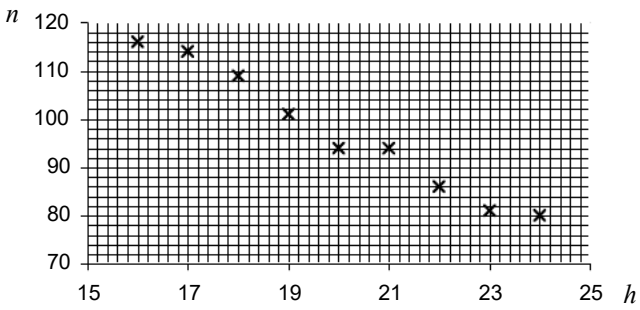
(d) 200 1st time, 120 2nd time, 80 3rd time A1

no. expected to pass = $(200 \times 0.55) + (120 \times 0.6) + (80 \times 0.4)$ M2

$= 110 + 72 + 32 = 214$ A1 **(12)**

---

7. *(a)*



B4

(b) $S_{hn} = 17204 - \frac{180 \times 875}{9} = {}^{-}296$ M1

$S_{hh} = 3660 - \frac{180^2}{9} = 60$ M1

$b = \frac{-296}{60} = {}^{-}4.9333$ M1 A1

$a = \frac{875}{9} - [{}^{-}4.9333 \times \frac{180}{9}] = 195.888$ M1 A1

$h = 195.9 - 4.93h$ A1

(c) no. of clinches decreases by 4.93 per hour awake B1

(d) e.g. ability likely to be roughly constant during normal waking hours only decreases when awake for longer than usual B2

(e) $195.9 - 4.93h = 213.4 - 5.87h$ M1

$0.94h = 17.5$; $h = 18.6$ hours M1 A1 **(17)**

Total **(75)**

Performance Record – S1 Paper E

Question no.	1	2	3	4	5	6	7	Total
Topic(s)	probability	discrete uniform dist.	normal dist.	interpol'n, inter-percentile range	discrete r. v.	probability	scatter diagram, regression	
Marks	5	7	11	11	12	12	17	75
Student								