GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics

Module S1

Paper F

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 F – Marking Guide

1. *(a)* mean $= \frac{1145.3}{15} = 76.4$ kg — M1 A1

variance $= \frac{88042.14}{15} - 76.353^2 = 39.6$ kg^2 — M2 A1

(b) mean lower as replacement weighs less — B2

variance higher as replacement's weight further from mean — B2 **(9)**

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2. *(a)* $a + b + \frac{1}{4} + 2a + \frac{1}{8} = 1$ — M1

$3a + b = \frac{5}{8}$; $b = \frac{5}{8} - 3a$ — M1 A1

(b) $\sum xP(x) = a + 2b + \frac{3}{4} + 8a + \frac{5}{8}$ — M1

$= 9a + 2(\frac{5}{8} - 3a) + \frac{11}{8} = 3a + \frac{21}{8}$ — M1 A1

(c) $3a + \frac{21}{8} = \frac{45}{16}$ — M1

$3a = \frac{45}{16} - \frac{21}{8} = \frac{3}{16}$ — M1

$a = \frac{1}{16}$, $b = \frac{7}{16}$ — A2 **(10)**

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3. *(a)* $P(Z < \frac{25 - 21.5}{2.2}) = P(Z < 1.59) = 0.9441$ — M2 A1

(b) $P(Z > \frac{19 - 21.5}{2.2}) = P(Z > {}^{-}1.14) = 0.8729$ $\therefore$ 87.3% — M2 A1

(c) $P(Z < \frac{20 - 21.5}{2.2}) = P(Z < {}^{-}0.68) = 0.2483$ — M1 A1

$P(2 \text{ of } 3 < 20) = 3 \times 0.2483^2 \times 0.7517 = 0.139$ — M2 A1 **(11)**

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4. *(a)* $0.76 = 0.5 + 0.42 - P(A \cap B)$ — M1

$P(A \cap B) = 0.92 - 0.76 = 0.16$ — M1 A1

(b) $(1 - 0.5) + 0.16 = 0.66$ — M2 A1

(c) $= \frac{P(B \cap A')}{P(A')} = \frac{0.42 - 0.16}{1 - 0.5} = 0.52$ — M2 A1

(d) $P(A) \times P(B) = 0.5 \times 0.42 = 0.21$ — M1 A1

$\neq P(A \cap B)$ $\therefore$ not independent — A1 **(12)**

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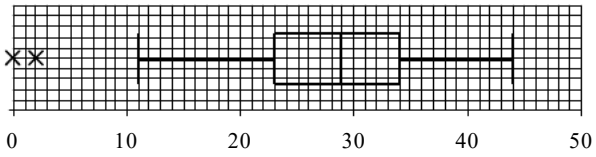
5. *(a)* $n = 31$, median = 29 — A1
$Q_1 = 23$ — A1
$Q_3 = 34$ — A1
$IQR = Q_3 - Q_1 = 34 - 23 = 11$ — M1 A1

(b) $Q_2 - Q_1 = 6$; $Q_3 - Q_2 = 5$ — M1
$\therefore Q_2 - Q_1 > Q_3 - Q_2$ $\therefore$ slight +ve skew — M1 A1

(c) e.g. recommend mean and std. dev. as they take account of all values and there is little skew / few extreme values — B2

(d) $Q_1 - 2s = 2.4$; $Q_3 + 2s = 54.6$ $\therefore$ outliers are 0, 2 — M1 A1



B4 **(16)**

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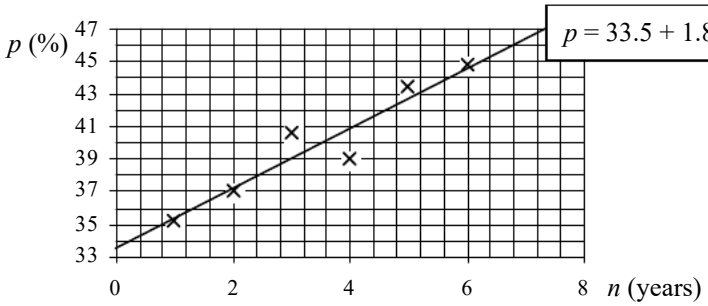
6. *(a)*



B4

(b) $S_{np} = 873 - \frac{21 \times 240.1}{6} = 32.65$ — M1

$S_{nn} = 91 - \frac{21^2}{6} = 17.5$ — M1

$b = \frac{32.65}{17.5} = 1.8657$ — M1 A1

$a = \frac{240.1}{6} - 1.8657 \times \frac{21}{6} = 33.4867$ — M1 A1

$p = 33.5 + 1.87n$ — A1

line on graph above — B2

(c) $S_{pp} = 9675.41 - \frac{240.1^2}{6} = 67.4083$ — M1

$r = \frac{32.65}{\sqrt{17.5 \times 67.4083}} = 0.9506$ — M1 A1

r strongly +ve supporting linear model — B1 **(17)**

Total **(75)**

Performance Record – S1 Paper F

Question no.	1	2	3	4	5	6	Total
Topic(s)	mean, variance	discrete r. v.	normal dist.	probability	stem & leaf, quartiles, boxplot	scatter diagram, regression, pmcc	
Marks	9	10	11	12	16	17	75
Student							