Solomon Press

Statistics S1

Paper B

(Mark Scheme)

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GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics

Module S1

Paper B

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 B – Marking Guide

1.

$\sum x = 14 \times 31.2 = 436.8$ M1

new $\sum x = 436.8 + 42 = 478.8$ M1

new mean $= \frac{478.8}{15} = 31.9$ years A1

$\sum x^2 = 14(7.4^2 + 31.2^2) = 14394.8$ M1

new $\sum x^2 = 14394.8 + 42^2 = 16158.8$ M1

new std. dev. $= \sqrt{\frac{16158.8}{15} - 31.92^2} = 7.6$ years M1 A1 **(7)**

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2. *(a)*

$S_{hh} = 65.7396 - \frac{36.22^2}{20} = 0.14518$ M1

$S_{vv} = 259853 - \frac{2275^2}{20} = 1071.75$ M1

$S_{hv} = 4128.03 - \frac{36.22 \times 2275}{20} = 8.005$ M1

$r = \frac{8.005}{\sqrt{0.14518 \times 1071.75}} = 0.6417$ M1 A1

(b) r is fairly strongly +ve, supporting hypothesis B2 **(7)**

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3. *(a)* $1 - 0.6 = 0.4$ M1 A1

(b) $0.6 - 0.2 = 0.4$ M1 A1

(c) $0.6 = 0.2 + \mathrm{P}(B) - 0.2\mathrm{P}(B)$ M2

$0.4 = 0.8\mathrm{P}(B)$; $\mathrm{P}(B) = 0.5$ M1 A1

(d) $1 - (0.2 \times 0.5) = 0.9$ M1 A1 **(10)**

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4. *(a)* $0.1 + 0.35 + k + 0.15 + k = 1$ M1

$2k = 0.4$; $k = 0.2$ A1

(b) $0.1 + 0.35 = 0.45$ A1

(c) $0.35 + 0.2 = 0.55$ M1 A1

(d) $\sum x\mathrm{P}(x) = 0.1 + 0.7 + 0.6 + 0.6 + 1 = 3$ M1 A1

(e) $\mathrm{E}(X^2) = \sum x^2\mathrm{P}(x) = 0.1 + 1.4 + 1.8 + 2.4 + 5 = 10.7$ M1 A1

$\mathrm{Var}(X) = 10.7 - 3^2 = 1.7$ M1

$\mathrm{Var}(3X + 2) = 3^2 \times 1.7 = 15.3$ M1 A1 **(12)**

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5. *(a)* $Q_1 = 63°$ A1

$Q_2 = \frac{71+72}{2} = 71.5°$ M1 A1

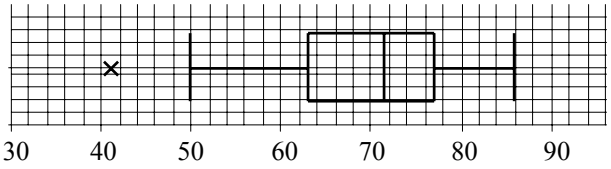
$Q_3 = 77°$ A1

(b) $Q_3 - Q_1 = 77 - 63 = 14$ M1

limits are $63 - (1.5 \times 14) = 42$ and $77 + (1.5 \times 14) = 98$ M1

$\therefore$ 41 is an outlier A1

(c)



B3

(d) – ve skew. B1

e.g. people know 90° so less likely to draw much larger than 75° B1 **(12)**

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6. *(a)* $\frac{4}{11}$ A1

(b) 3 T's, 7 consonants, $\therefore \frac{3}{7}$ M1 A1

(c) $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9} = \frac{1}{165}$ M2 A1

(d) 3 vowels: $\frac{4}{11} \times \frac{3}{10} \times \frac{2}{9} = \frac{4}{165}$ M1 A1

2 vowels: $3 \times \frac{4}{11} \times \frac{3}{10} \times \frac{7}{9} = \frac{14}{55}$ M1 A1

P(at least 2 vowels) $= \frac{4}{165} + \frac{14}{55} = \frac{46}{165}$ M1 A1 **(12)**

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7. *(a)* $P(Z > \frac{706-704}{\sqrt{3.2}}) = P(Z > 1.12) = 0.1314$ M2 A1

(b) $P(\frac{703-704}{\sqrt{3.2}} < Z < \frac{708-704}{\sqrt{3.2}})$ M1

$= P(^{-}0.56 < Z < 2.24)$ M1

$= P(Z < 2.24) - P(Z < ^{-}0.56)$ M1

$= 0.9875 - 0.2877 = 0.6998$ A1

(c) $P(Z < \frac{700-704}{\sqrt{3.2}}) = P(Z < ^{-}2.24) = 0.0125$ M1 A1

expect $0.0125 \times 1\,200 = 15$ M1 A1

(d) $P(Z < \frac{700-\mu}{\sqrt{3.2}}) = 0.01$ M1

$\frac{700-\mu}{\sqrt{3.2}} = {}^{-}3.0902$ M1

$\mu = 700 + (3.0902 \times \sqrt{3.2}) = 705.5$ ml (1dp) M1 A1 **(15)**

Total **(75)**