GCE Examinations

Advanced Subsidiary / Advanced Level

Statistics

Module S1

Paper K

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 K – Marking Guide

1. *(a)* $\frac{11}{16}\times\frac{10}{15}\times\frac{9}{14} = \frac{33}{112}$ or 0.295 (3sf) — M2 A1

(b) $\frac{5}{16}\times\frac{11}{15}\times\frac{4}{14} = \frac{11}{168}$ or 0.0655 (3sf) — M2 A1

(c) $3\times\frac{5}{16}\times\frac{11}{15}\times\frac{10}{14} = \frac{55}{112}$ or 0.491 (3sf) — M3 A1 **(10)**

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2. *(a)* $S_{AA} = 10131 - \frac{703^2}{50} = 246.82$ — M1

$S_{HH} = 1338.5 - \frac{217^2}{50} = 396.72$ — M1

$S_{AH} = 3253.5 - \frac{703\times217}{50} = 202.48$ — M1

$r = \frac{202.48}{\sqrt{246.82\times396.72}} = 0.6471$ — M1 A1

r is strongly +ve showing that older pupils tend to do more homework — B1

(b) e.g. younger pupils are set less homework and also do little or no paid work etc. apparent correlation is because both correlate with age — B2

(c) e.g. collect data from one year group, likely to have similar amounts of homework set, so will see effect of paid work — B2 **(10)**

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3. *(a)* midpoints: 20, 60, 100, 140, 180, 250, 350, 500 — M1

$\sum fm = 8060$ — A1

mean $= \frac{8060}{92} = 87.6$ (3sf) — M1 A1

$\sum fm^2 = 1\,700\,600$ — A1

std. dev. $= \sqrt{\frac{1700600}{92} - (87.609)^2} = 104$ (3sf) — M2 A1

(b) e.g. data very skewed, mean and std. dev. strongly affected by a few very large values — B2

(c) e.g. median and IQR — B1 **(11)**

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4. *(a)* $P(Z < \frac{20-21.6}{1.8}) = P(Z < {}^{-}0.89) = 0.1867$ — M2 A1

(b) $P(Z > \frac{24-21.6}{1.8}) = P(Z > 1.33) = 0.0918$ — M1 A1

$\therefore$ in 90 days expect $0.0918\times90 = 8.26$ $\therefore$ 8 times — M1 A1

(c) $P(X < 24 \mid X > 22) = \frac{P(22<X<24)}{P(X>22)}$ — M1 A1

$P(X > 22) = P(Z > \frac{22-21.6}{1.8}) = P(Z > 0.22) = 0.4129$ — M1 A1

$P(22 < X < 24) = P(X > 22) - P(X > 24) = 0.3211$ — M1

$\therefore$ require $\frac{0.3211}{0.4129} = 0.778$ (3sf) — A1 **(13)**

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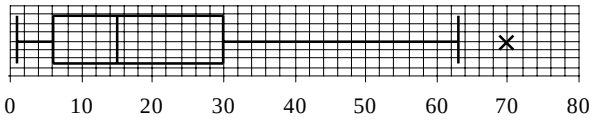
5. *(a)* 8, 4, 3, 1 — A1

(b) 4 months — A1

(c) $n = 31$; $Q_1 = 8^{th} = 6$ months — M1 A1
$Q_2 = 16^{th} = 15$ months — A1
$Q_3 = 24^{th} = 30$ months — A1

(d) $Q_3 - Q_1 = 30 - 6 = 24$ — M1
limits are $6 - (1.5 \times 24) = {}^{-}30$ and $30 + (1.5 \times 24) = 66$ — M1
$\therefore$ 70 is an outlier — A1

(e)



B3

(f) +ve skew — B1
e.g. lot of people unemployed for a short time, only a few for a long time — B1 **(14)**

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6. *(a)* discrete uniform — B1

(b) 2 — A1

(c) $\sum bP(b) = \frac{1}{2} + \frac{1}{2} + \frac{3}{4} = \frac{7}{4}$ — M1 A1

(d) $P(C = 2) = P(A = 1 \text{ and } B = 1) = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ — M2 A1

(e) $P(C = 3) = (\frac{1}{3} \times \frac{1}{4}) + (\frac{1}{3} \times \frac{1}{2}) = \frac{1}{4}$
$P(C = 4) = (\frac{1}{3} \times \frac{1}{4}) + (\frac{1}{3} \times \frac{1}{4}) + (\frac{1}{3} \times \frac{1}{2}) = \frac{1}{3}$
$P(C = 5) = (\frac{1}{3} \times \frac{1}{4}) + (\frac{1}{3} \times \frac{1}{4}) = \frac{1}{6}$
$P(C = 6) = (\frac{1}{3} \times \frac{1}{4}) = \frac{1}{12}$ — M3 A3

c	2	3	4	5	6
$P(C = c)$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{12}$

(f) $E(C) = \sum cP(c) = \frac{1}{3} + \frac{3}{4} + \frac{4}{3} + \frac{5}{6} + \frac{1}{2} = \frac{15}{4}$ — M1 A1
$E(A) + E(B) = 2 + \frac{7}{4} = \frac{15}{4} \quad \therefore E(C) = E(A) + E(B)$ — M1 A1 **(17)**

Total **(75)**

Performance Record – S1 Paper K

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	Total
Topic(s)	probability	pmcc	mean and std. dev.	normal dist.	stem & leaf, quartiles, boxplot	discrete r. v.	
Marks	10	10	11	13	14	17	75
Student							