

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.



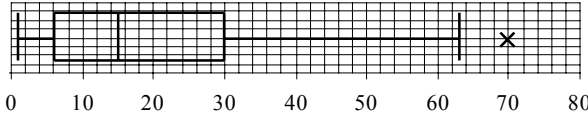
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## S1 Paper K – Marking Guide

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	
		$S_{AH} = 3253.5 - \frac{703 \times 217}{50} = 202.48$	M1	
		$r = \frac{202.48}{\sqrt{246.82 \times 396.72}} = 0.6471$	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 $0.0918 \times 90 = 8.26 \therefore 8$ times	M1 A1	
	(c)	$P(X < 24   X > 22) = \frac{P(22 < X < 24)}{P(X > 22)}$	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)	

5. (a) 8, 4, 3, 1 A1
- (b) 4 months A1
- (c)  $n = 31$ ;  $Q_1 = 8^{\text{th}} = 6$  months M1 A1  
 $Q_2 = 16^{\text{th}} = 15$  months A1  
 $Q_3 = 24^{\text{th}} = 30$  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)

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  
 $E(A) + E(B) = 2 + \frac{7}{4} = \frac{15}{4} \therefore E(C) = E(A) + E(B)$  M1 A1 (17)

Total (75)

