

GCE Examinations  
Advanced Subsidiary / Advanced Level

**Statistics**  
**Module S1**

Paper A

**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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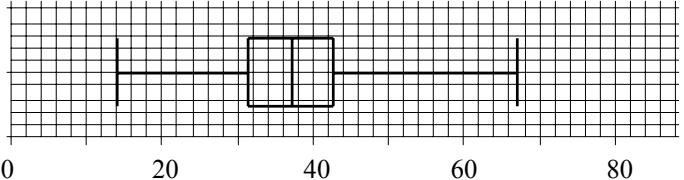
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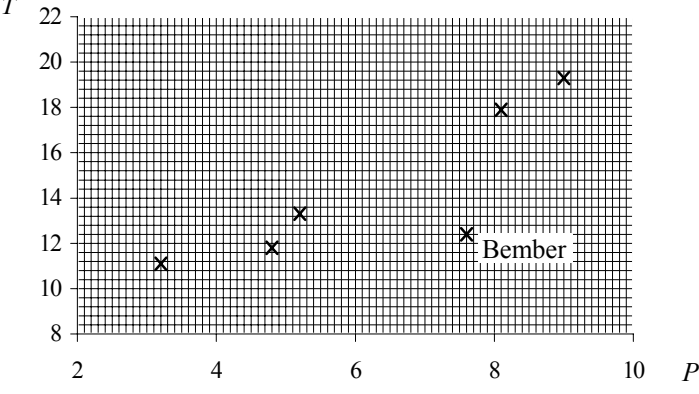
## S1 Paper A – Marking Guide

1. (a)  $P(X > 23.8) = 0.2$  M1  
 $P(Z < \frac{23.3 - 22.8}{\sigma}) = 0.8$  M1  
 $\frac{0.5}{\sigma} = 0.8416$  B1  
 $\sigma = 0.5941; \sigma^2 = 0.3530$  M1 A1
- (b)  $P(Z < \frac{21.82 - 22.8}{0.5941}) = P(Z < -1.65) = 0.0495$  M2 A1 **(8)**
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2. (a)  $P(B) \times P(A|B) = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$  M1 A1
- (b)  $\frac{P(B' \cap A)}{P(A)} = \frac{\frac{5}{16} - \frac{1}{8}}{\frac{5}{16}} = \frac{3}{5}$  M2 A1
- (c)  $(1 - \frac{5}{16}) + \frac{1}{8} = \frac{13}{16}$  M1 A1
- (d)  $P(A) \times P(B) = \frac{5}{16} \times \frac{1}{2} = \frac{5}{32}$  M1  
 $\neq P(A \cap B) \therefore$  not independent M1 A1 **(10)**
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3. (a)  $\sum fx = 303$  M1  
mean =  $\frac{303}{60} = 5.05$  M1 A1  
 $\sum fx^2 = 1753$  M1  
std. dev. =  $\sqrt{\frac{1753}{60} - (5.05)^2} = 1.93$  M1 A1
- (b) (by symmetry) 5 M1 A1
- (c) actual std. dev. much lower than in model B1  
tendency to pick numbers nearer the middle B1 **(10)**
- 
4. (a) 

$x$	1	2	3	4	5	6
$P(x)$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8}$

 M2 A2
- (b)  $\sum xP(x) = \frac{1}{8}(1 + 2 + 3 + 4 + 5 + 18) = \frac{33}{8}$  M2 A1
- (c)  $(4 \times \frac{33}{8}) - 1 = \frac{31}{2}$  M1 A1
- (d)  $E(X^2) = \sum x^2P(x) = \frac{1}{8}(1 + 4 + 9 + 16 + 25 + 108) = \frac{163}{8}$  M1 A1  
 $\text{Var}(X) = \frac{163}{8} - (\frac{33}{8})^2 = \frac{215}{64}$  or 3.36 M1 A1 **(13)**
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5. (a) 20 - 29: class width 10  $\rightarrow$  2 cm  $\therefore$  class width 5  $\rightarrow$  1 cm M1  
 freq. den. =  $\frac{18}{10} = 1.8 \rightarrow 7.2$  cm  $\therefore$  freq. den. 1  $\rightarrow$  4 cm M1
- (i) 30 - 34: class width 5  $\therefore$  width 1 cm A1  
 freq. den. =  $\frac{24}{5} = 4.8 \therefore$  height 19.2 cm A1
- (ii) 50 - 69: class width 20  $\therefore$  width 4 cm A1  
 freq. den. =  $\frac{5}{20} = 0.25 \therefore$  height 1 cm A1
- (b) cum. freqs: 2, 20, 44, 74, 101, 115, 120 M1  
 $Q_1 = 30.25^{\text{th}} = 29.5 + 5\left(\frac{10.25}{24}\right) = 31.6$  [30<sup>th</sup>  $\rightarrow$  31.6] }  
 $Q_2 = 60.5^{\text{th}} = 34.5 + 5\left(\frac{16.5}{30}\right) = 37.3$  [60<sup>th</sup>  $\rightarrow$  37.2] } M2 A3  
 $Q_3 = 90.75^{\text{th}} = 39.5 + 5\left(\frac{16.75}{27}\right) = 42.6$  [90<sup>th</sup>  $\rightarrow$  42.5] }
- (c)  B4
- symmetrical (or slight +ve skew) A1 (17)

6. (a)  B4
- (b) (i) Bember A1  
 (ii) e.g. how near to town centre; size of shop B2
- (c)  $S_{PT} = 574.25 - \frac{37.9 \times 85.8}{6} = 32.28$  M1  
 $S_{PP} = 264.69 - \frac{37.9^2}{6} = 25.288$  M1  
 $b = \frac{32.28}{25.288} = 1.2765$  M1 A1  
 $a = \frac{85.8}{6} - 1.2765\left(\frac{37.9}{6}\right) = 6.2369$  M1 A1  
 $T = 6.24 + 1.28P$  A1
- (d)  $P = 6.8$  giving  $T = 14.917 \therefore$  £14 900 M1 A1
- (e)  $P = 17.2$  which lies outside the set of values used to obtain the equation B1 (17)

Total (75)

