

General Certificate of Education
Advanced Level Examination

MATHEMATICS A

Statistics 1

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.

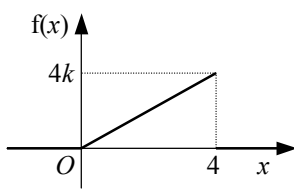


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S1 Paper A – Marking Guide

1.	(a)	median = 125 m IQR = middle half = 25 m (or $137.5 - 112.5$)	B1 M1 A1											
	(b)	e.g. likely to have higher prob. dens. near median and some values more than 25 m away from median	B2	(5)										
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2.	(a)		B2											
	(b)	$\frac{1}{2} \times 4 \times 4k = 1 \Rightarrow k = \frac{1}{8}$	M1 A1											
	(c)	$\frac{1}{2} \times (3k + 4k) \times 1 = \frac{7}{16}$	M1 A1	(6)										
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3.	(a)	(i) e.g. all individuals or items of relevance	B1											
		(ii) e.g. a selection of individuals or items from a population	B1											
	(b)	(i) census – e.g. need to know requirements of all for catering	B2											
		(ii) sample – e.g. testing is destructive, none left after census	B2	(6)										
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4.	(a)	$P(X > 23.3) = 0.2$	M1											
		$P(Z < \frac{23.3 - 22.8}{\sigma}) = 0.8$	M1											
		$\frac{0.5}{\sigma} = 0.8416$	B1											
		$\sigma = 0.5941; \sigma^2 = 0.353$ (3sf)	M1 A1											
	(b)	$P(Z < \frac{21.82 - 22.8}{0.5941}) = P(Z < -1.65) = 1 - 0.95053 = 0.0495$ (3sf)	M2 A1	(8)										
<hr/>														
5.	(a)	<table style="display: inline-table; vertical-align: middle;"><tr><td style="padding: 5px;">x</td><td style="padding: 5px;">1</td><td style="padding: 5px;">2</td><td style="padding: 5px;">3</td><td style="padding: 5px;">4</td></tr><tr><td style="padding: 5px;">$P(x)$</td><td style="padding: 5px;">$\frac{1}{4}$</td><td style="padding: 5px;">$\frac{1}{4}$</td><td style="padding: 5px;">$\frac{1}{4}$</td><td style="padding: 5px;">$\frac{1}{4}$</td></tr></table>	x	1	2	3	4	$P(x)$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	B2	
	x	1	2	3	4									
	$P(x)$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$									
	(b)	(by symmetry) $\frac{5}{2}$	B1											
	(c)	$(4 \times 2.5) - 1 = 9$	M1 A1											
(d)	$E(X^2) = \sum x^2 P(x) = \frac{1}{4}(1 + 4 + 9 + 16) = 7.5$	M1												
	$\text{Var}(X) = 7.5 - 2.5^2 = 1.25$ $\text{Var}(4X - 1) = 16 \times 1.25 = 20$	M1 A1 M1 A1	(10)											

6.	(a)	let X = no. out of 10 shares that have gone up $\therefore X \sim B(10, 0.35)$	M1	
	(i)	$P(X = 6) = 0.9740 - 0.9051 = 0.0689$ (3sf)	M1 A1	
	(ii)	$P(> 5 \text{ gone down}) = P(X \leq 4) = 0.7515 = 0.752$ (3sf)	M1 A1	
		[N.B. actual value rounds to 0.751]		
	(b)	let Y = no. out of 80 shares that have gone down $\therefore Y \sim B(80, 0.65)$	M1	
		N approx. $D \sim N(52, 18.2)$	M1 A1	
		$P(Y > 55) \approx P(D > 55.5)$	M1	
		$= P(Z > \frac{55.5 - 52}{\sqrt{18.2}}) = P(Z > 0.82)$	M1	
		$= 1 - 0.79389 = 0.206$ (3sf)	A1	(11)
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7.	(a)	$\hat{a} = \frac{20.08}{4} = 5.02$	M1 A1	
		$\hat{b}^2 = \frac{\sum (x - 5.02)^2}{3} = 0.019867$	M1 A1	
		$\hat{b} = \sqrt{0.019867} = 0.141$ (3sf)	A1	
	(b)	random sample	B1	
	(c)	those from sample of 50 as smaller s.e.	B2	
	(d)	$5.06 \pm 1.96 \times \frac{0.136}{\sqrt{50}}$	M1 A1	
		(5.02, 5.10)	A2	
	(e)	unlikely to be correct as not in C. I.	B2	(14)
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			Total	(60)

Performance Record – S1 Paper A

[illegible]