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.

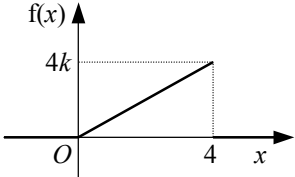(B) marks are independent of method marks.

S1 Paper A – Marking Guide

1. *(a)* median = 125 m — B1

IQR = middle half = 25 m (or 137.5 − 112.5) — 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)**

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5. *(a)*

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

B2

(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

$Var(X) = 7.5 - 2.5^2 = 1.25$ — M1 A1

$Var(4X - 1) = 16 \times 1.25 = 20$ — M1 A1 **(10)**

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6. *(a)* let X = no. out of 10 shares that have gone up ∴ $X \sim B(10, 0.35)$ M1

      (i) $P(X = 6) = 0.9740 - 0.9051 = 0.0689$ (3sf)   M1 A1

      (ii) $P(> 5$ gone down$) = P(X \le 4) = 0.7515 = 0.752$ (3sf)   M1 A1
                                [N.B. actual value rounds to 0.751]

    (b) let Y = no. out of 80 shares that have gone down ∴ $Y \sim B(80, 0.65)$ 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)**

                                            Total   **(60)**

Performance Record – S1 Paper A

Question no.	1	2	3	4	5	6	7	Total
Topic(s)	unif. dist., modelling	continuous r.v.	sampling	normal dist.	discrete r.v.	binomial dist., N approx.	unbiased estimates, confidence interval	
Marks	5	6	6	8	10	11	14	60
Student								

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