



General Certificate of Education

Mathematics 6300 *Specification A*

MAME Methods

Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Key to Mark Scheme

| | | |
|---------------------|---|---|
| M | mark is for | method |
| m | mark is dependent on one or more M marks and is for | method |
| A | mark is dependent on M or m marks and is for | accuracy |
| B | mark is independent of M or m marks and is for | accuracy |
| E | mark is for | explanation |
| ✓ or ft or F | | follow through from previous incorrect result |
| CAO | | correct answer only |
| AWFW | | anything which falls within |
| AWRT | | anything which rounds to |
| AG | | answer given |
| SC | | special case |
| OE | | or equivalent |
| A2,1 | | 2 or 1 (or 0) accuracy marks |
| -x EE | | deduct x marks for each error |
| NMS | | no method shown |
| PI | | possibly implied |
| SCA | | substantially correct approach |
| c | | candidate |
| sf | | significant figure(s) |
| dp | | decimal place(s) |

Abbreviations used in Marking

| | |
|----------------------------|---------------------------------|
| MC – x | deducted x marks for mis-copy |
| MR – x | deducted x marks for mis-read |
| ISW | ignored subsequent working |
| BOD | given benefit of doubt |
| WR | work replaced by candidate |
| FB | formulae book |

Application of Mark Scheme

| | |
|---|--|
| No method shown: | |
| Correct answer without working | mark as in scheme |
| Incorrect answer without working | zero marks unless specified otherwise |
| More than one method / choice of solution: | |
| 2 or more complete attempts, neither/none crossed out | mark both/all fully and award the mean mark rounded down |
| 1 complete and 1 partial attempt, neither crossed out | award credit for the complete solution only |
| Crossed out work | do not mark unless it has not been replaced |
| Alternative solution using a correct or partially correct method | award method and accuracy marks as appropriate |

MAME

| Q | Solution | Marks | Total | Comments |
|---------------|--|---------------------|----------|---|
| 1(a) | $k = \frac{1}{8}$ | B1 | 1 | |
| (b)(i) | Method for mean Mean = 3.5 | M1 A1F | 2 | Award even if candidate then divides, eg by 5 ft wrong value for $k (<1)$ |
| (ii) | $E(X^2) = 16.25$ $\text{Var}(X) = 16.25 - 3.5^2 = 4$ | B1F M1A1F | 3 | PI by full correct calculation; ft as above ft wrong values |
| Total | | | 6 | |
| 2(a) | $3x^2 + 7x - 6 = 0$ | B1 | 1 | convincingly shown (AG) |
| (b) | Valid method for quadratic $x = \frac{2}{3}$ or $x = -3$ $y = \frac{11}{3}$ or $y = 0$ | M1 A1A1 m1A1F | 5 | leading to two roots ft wrong x values provided $y = x + 3$ used |
| Total | | | 6 | |
| 3(a) | $x^2 - 10x + 29 = (x - 5)^2 + 4$ | B1B1 | 2 | |
| (b) | ' $B > 0$ ', or 'min value is 4', etc | E2,1F | 2 | E1 for 'discriminant < 0 ' only (OE); ft wrong values provided candidate's $B > 0$ Allow E2 for complete sketch or E1 for incomplete sketch |
| Total | | | 4 | |
| 4(a) | 90, 200, 280 in table | B3, 2, 1 | 3 | -1 for each error (consistent errors count as one) |
| (b) | Points plotted correctly Polygon or curve drawn All correct | B1F M1 A1F | 3 | ft candidate's (increasing) values ft candidate's points |
| (c) | Method for estimated median Correct value | M1 A1 | 2 | P1 by correct value stated Consistent with candidate's graph to within 0.1g |
| (d) | 30 th percentile is 454 (grams) | B1F | 1 | ft wrong CFs |
| Total | | | 9 | |

MAME (cont)

| Q | Solution | Marks | Total | Comments |
|--------------|--|-------|----------|---|
| 5(a) | $\sqrt{3} = 3^{\frac{1}{2}}$ | B1 | 1 | |
| (b) | $3\sqrt{3} = 3^{\frac{3}{2}}$ | B1F | 1 | ft wrong answer (fractional) to (a) |
| (c) | $(3\sqrt{3})^3 = 3^{\frac{9}{2}}$ | M1A1F | 2 | M1 for use of $(a^b)^c = a^{bc}$; ft wrong answer to (b) |
| (d) | $\frac{1}{9} = 3^{-2}$ | B1 | | |
| | $\frac{1}{9}\sqrt{3} = 3^{-\frac{3}{2}}$ | B1F | 2 | ft wrong answer to (a) |
| Total | | | 6 | |
| 6(a)(i) | $P(\text{top}) = \frac{5}{25} \left(= \frac{1}{5} \right)$ | B1 | 1 | |
| (ii) | $P(\text{from BT}) = \frac{10}{25} \left(= \frac{2}{5} \right)$ | B1 | 1 | |
| (iii) | $P(\text{top from BT}) = \frac{2}{25}$ | B1 | 1 | Condone assumption of independence here |
| (b) | $\frac{1}{5} \times \frac{2}{5} = \frac{2}{25}$, so independent | M1A1 | 2 | |
| (c) | Cond prob = $\frac{8}{20} \left(= \frac{2}{5} \right)$ | M1A1 | 2 | M1 for $\frac{n}{20}$ or $\frac{x}{4/5}$ OE |
| Total | | | 7 | |
| 7(a) | Mean = 40 (minutes) | B1 | | |
| | Method for variance or SD | M1 | | |
| | Variance = $\frac{48270}{30} - 40^2 (= 9)$ | A1F | | ft wrong value for mean |
| | SD = 3 (minutes) | A1F | 4 | ft one small error |
| (b) | Mean $y = 50$ | B1F | | ft wrong value for mean x |
| | SD = 3 | B1F | 2 | ft wrong value for SD of x |
| Total | | | 6 | |

MAME(cont)

| Q | Solution | Marks | Total | Comments |
|---------------|---|-----------------|-----------|--|
| 8(a) | At P, $x^2 = 18$ | M1 | | OE; B1 for verification with evidence shown |
| | $x_p = 3\sqrt{2}$ convincingly shown | A1 | 2 | AG; A0 if decimal approximation used |
| (b)(i) | $y' = 4x^3 - 36x$ | M1 A1A1 | 3 | If at least one power correct |
| | Substituting $x = 3\sqrt{2}$ into y' $y'_p = 108\sqrt{2}$ | m1 A1 | 2 | NMS 2 / 2 |
| (iii) | At S, $4x^3 = 36x$ | m1 | | B1 for verification with evidence shown |
| | ...so $x^2 = 9$ and $x = 3$ | A2, 0 | 3 | AG; condone no mention of $x > 0$ |
| (c)(i) | $\int y \, dx = \frac{1}{5}x^5 - \frac{18}{3}x^3 (+c)$ | M1 A1A1 | 3 | If at least one power correct |
| | Calculation of $(\pm)(F(3) - F(0))$ $F(3) = -113.4$ So area = 113.4 | m1 A1 A1F | 3 | $F(0) = 0$ may be implied or $ F(3) = 113.4$ ft wrong (negative) value for $F(3)$ |
| | Total | | 16 | |
| | TOTAL | | 60 | |