Mark Scheme 4751 June 2007 Section A

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|------|--|----|---|---|
| 1 | x > -0.6 o.e. eg $-3/5 < x$ isw | 3 | M2 for $-3 < 5x$ or $x > \frac{3}{5}$ or M1 for | |
| | | | $-5x < 3$ or $k < 5x$ or $-3 < kx$ [condone \le for Ms]; if 0, allow SC1 for -0.6 found | 3 |
| 2 | $t = [\pm] \sqrt{\frac{2s}{a}} \text{ o.e.}$ | 3 | B2 for <i>t</i> omitted or $t = \sqrt{\frac{s}{\frac{1}{2}a}}$ o.e. | |
| | | | M1 for correct constructive first step in rearrangement and M1 (indep) for finding sq rt of their t^2 | 3 |
| 3 | 'If 2 <i>n</i> is an even integer, then <i>n</i> is an odd integer' | 1 | or: $2n$ an even integer $\Rightarrow n$ an odd integer | |
| | showing wrong eg 'if n is an even integer, $2n$ is an even integer' | 1 | or counterexample eg $n = 2$ and $2n = 4$ seen [in either order] | 2 |
| 4 | <i>c</i> = 6 | 1 | | |
| | k = -7 | 2 | M1 for $f(2) = 0$ used or for long division as far as $x^3 - 2x^2$ in working | 3 |
| 5 | (i) $4x^4y$ | 2 | M1 for two elements correct: condone v^1 | 5 |
| • | | 2 | $(a)^{5}$ | |
| | (ii) 32 | 2 | M1 for $\left(\frac{2}{1}\right)^{5}$ or 2^{5} soi or $\left(\frac{1}{32}\right)^{5}$ or $\frac{1}{\frac{1}{32}}$ | 4 |
| 6 | $-720 [x^3]$ | 4 | B3 for 720; M1 for each of 3^2 and $\pm 2^3$ or $(-2x)^3$ or $(2x)^3$. | |
| | | | and M1 for 10 or $(5\times4\times3)/(3\times2\times1)$ or for | |
| | | | 1 5 10 10 5 1 seen but not for ${}^{5}C_{3}$ | 4 |
| 7 | -5 | 3 | M1 for $4x + 5 = 2x \times -3$ and | |
| | $\frac{1}{10}$ o.e. isw | | M1 for $10x = -5$ o.e. or M1 for | |
| | 10 | | $2 + \frac{5}{2x} = -3$ and M1 for $\frac{5}{2x} = -5$ o.e. | 3 |
| 8 | (i) $2\sqrt{2}$ or $\sqrt{8}$ | 2 | M1 for $7\sqrt{2}$ or $5\sqrt{2}$ seen | |
| | | | | |
| | (ii) $30 - 12\sqrt{5}$ | 3 | M1 for attempt to multiply num. and | |
| | | | denom. by $2 - \sqrt{5}$ and M1 (dep) for denom | 5 |
| | | | -1 or $4 - 5$ soi or for numerator $12\sqrt{5} - 30$ | 3 |
| 9 | (i) ±5 | 2 | B1 for one soln | |
| | (ii) $y = (r - 2)^2 - 4$ or $y = r^2 - 4r c c$ | 2 | M1 if y omitted or for $y = (x + 2)^2 - 4$ or | |
| | $\begin{array}{c} (1) \ y = (x - 2) \forall \forall y = x \forall x \forall \forall \forall \forall \forall \forall \forall \forall$ | - | $y = x^2 + 4x$ o.e. | 4 |
| 10 | (i) $\frac{1}{2} \times (x+1)(2x-3) = 9$ o.e. | M1 | for clear algebraic use of $\frac{1}{2}$ <i>bh</i> ; condone | |
| | | | (x+1)(2x-3) = 18 | |
| | $2x^2 - x - 3 = 18$ or $x^2 - \frac{1}{2}x - \frac{3}{2} = 9$ | A1 | allow <i>x</i> terms uncollected. | |
| | | | NB ans $2x^2 - x - 21 = 0$ given | |
| | (ii) $(2x-7)(x+3)$ | B1 | NB B0 for formula or comp. sq. | |
| | -3 and $7/2$ o.e. or ft their factors | B1 | if factors seen, allow omission of -3 | |
| | base 4, height 4.5 o.e. cao | B1 | B0 if also give $b = -9$, $h = -2$ | 5 |

Section B

| Deen | | | | | |
|------|-----|---|----------------------|---|---|
| 11 | i | grad AC = $\frac{7-3}{3-1}$ or 4/2 o.e.[= 2] | M1 | not from using $-\frac{1}{2}$ | |
| | | so grad AT = $-\frac{1}{2}$ | M1 | or ft their grad AC [for use of $m_1m_2 = -1$] | |
| | | eqn of AT is $y - 7 = -\frac{1}{2}(x - 3)$ | M1 | or subst (3, 7) in $y = -\frac{1}{2}x + c$ or in 2y + x = 17; allow ft from their grad of AT, except 2 (may be AC not AT) | |
| | | one correct constructive step towards $x + 2y = 17$ [ans given] | M1 | or working back from given line to $y = -\frac{1}{2}x + 8.5$ o.e. | 4 |
| | ii | x + 2(2x - 9) = 17 | M1 | attempt at subst for <i>x</i> or <i>y</i> or elimination | |
| | | 5x - 18 = 17 or $5x = 35$ o.e. x = 7 and $y = 5$ [so (7, 5)] | A1 B1 | allow $2.5x = 17.5$ etc graphically: allow M2 for both lines correct or showing (7, 5) fits both lines | 3 |
| | iii | $(x-1)^{2} + (2x-12)^{2} = 20$ $5x^{2} - 50x + 125[=0]$ $(x-5)^{2} = 0$ equal roots so tangent (5, 1) | M1 M1 A1 B1 | subst $2x - 9$ for y [oe for x] rearranging to 0; condone one error showing 5 is root and only root explicit statement of condition needed (may be obtained earlier in part) or showing line is perp. to radius at point of contact | |
| | | (5, 1) or | 21 | = 0, y = 1 | |
| | | $y - 3 = -\frac{1}{2}(x - 1) \text{ o.e. seen}$ subst or elim. with $y = 2x - 9$ x = 5 (5.1) | M1 M1 A1 B1 | or if $y = 2x - 9$ is tgt then line through C with gradient $-\frac{1}{2}$ is radius | |
| | | showing (5, 1) on circle | B1 | or showing distance between (1, 3) and $(5, 1) = \sqrt{20}$ | 5 |

Mark Scheme

| 12 | i | $4(x-3)^2-9$ | 4 | 1 for $a = 4$, 1 for $b = 3$, 2 for $c = -9$ or | |
|----|-----|--|-----------------------------|---|---|
| | | | | M1 for $27 - 4 \times 3^2$ or $\frac{27}{4} - 3^2 [= -\frac{9}{4}]$ | 4 |
| | ii | min at $(3, -9)$ or ft from (i) | B2 | 1 for each coord [e.g. may start again and use calculus to obtain $x = 3$] | 2 |
| | iii | (2x-3)(2x-9) | M1 | attempt at factorising or formula or use | |
| | | <i>x</i> = 1.5 or 4.5 o.e. | A2 | A1 for 1 correct; accept fractional equivs eg 36/8 and 12/8 | 3 |
| | iv | sketch of quadratic the right way up | M1 | | |
| | | crosses <i>x</i> axis at 1.5 and 4.5 or ft crosses <i>y</i> axis at 27 | A1 B1 | allow unsimplified shown on graph or in table etc; condone not extending to negative x | 3 |
| 13 | i | $2x^3 + 5x^2 + 4x - 6x^2 - 15x - 12$ | 1 | for correct interim step; allow correct long division of $f(x)$ by $(x - 3)$ to obtain $2x^2 + 5x + 4$ with no remainder | |
| | | 3 is root use of $b^2 - 4ac$ $5^2 - 4 \times 2 \times 4$ or -7 and [negative] implies no real root | B1 M1 A1 | allow $f(3) = 0$ shown or equivalents for M1 and A1 using formula or completing square | 4 |
| | ii | divn of $f(x) + 22$ by $x - 2$ as far as $2x^3 - 4x^2$ used $2x^2 + 3x - 5$ obtained (2x + 5)(x - 1) 1 and -2.5 o.e. | M1 A1 M1 A1 +A1 | or inspection eg $(x - 2)(2x^25)$ attempt at factorising/quad. formula/ compl. sq. | |
| | | or $2 \times 2^{3} - 2^{2} - 11 \times 2 - 12$ $16 - 4 - 22 - 12$ $x = 1$ is a root obtained by factor thm x = -2.5 obtained as root | M1 A1 B1 B2 | <u>or</u> equivs using $f(x) + 22$ not just stated | 5 |
| | iii | cubic right way up crossing x axis only once (3, 0) and $(0, -12)$ shown | G1 G1 G1 | must have turning points must have max and min below <i>x</i> axis at intns with axes or in working (indep of cubic shape); ignore other intns | 3 |