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MARK SCHEME

Maximum Mark: 120

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MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M Method marks, awarded for a valid method applied to the problem.
- A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘**dep**’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

| | |
|------|----------------------------|
| awrt | answers which round to |
| cao | correct answer only |
| dep | dependent |
| FT | follow through after error |
| isw | ignore subsequent working |
| nfww | not from wrong working |
| oe | or equivalent |
| rot | rounded or truncated |
| SC | Special Case |
| soi | seen or implied |

| Question | Answer | Marks | Partial Marks |
|----------|--|-----------|--|
| 1(a)(i) | 10 | 1 | |
| 1(a)(ii) | 0.1 | 1 | |
| 1(b) | 5 | 2 | M1 for $g(5) = 0.2$ oe |
| 1(c) | 0 and -4 nfw | 3 | M1 for $h(x) = 4$ or $3(x+2)^2 - 2 [= 10]$ B1 for $(x+2)^2 = 4$ oe or $3x^2 + 12x = 0$ oe |
| 1(d) | $\frac{1}{9x^2}$ or $\frac{1}{(3x)^2}$ oe final answer | 2 | M1 for $(3x-2+2)^2$ |
| 2(a) | 88, 181.5, 110 | 5 | B4 for any two correct or all three correct values seen OR M1 for converting times to same units e.g. 160 : 330 : 200 M2 for correct method to find any part e.g. $\frac{\text{their } 160 \text{ or } 330 \text{ or } 200}{\text{their } 690} \times 379.5$ oe or M1 for correct use of total e.g. $\frac{379.5}{\text{their } 690}$ soi 0.55 A1 for any one value correct, correctly placed |
| 2(b)(i) | 66.69 | 2 | M1 for 70.2×0.95 oe |
| 2(b)(ii) | 65[.00] cao | 3 | M2 for $\frac{70.2}{1.08}$ oe or M1 for $70.2 = 108\%$ soi |
| 2(c)(i) | $450 \times \frac{3.5}{100} [\times 5]$ or $5 \times \frac{3.5}{100} [\times 450]$ or better | M1 | |
| | $450 + 450 \times 5 \times \frac{3.5}{100}$ leading to $450 + 78.75$ or better. | A1 | i.e. full and correct conclusion to $450 + 78.75$ [= 528.75] |
| 2(c)(ii) | 3.35 or 3.350... | 3 | M2 for $\sqrt[5]{\frac{530.6}{450}}$ or M1 for $450 \times []^5 = 530.6$ oe |
| 3(a)(i) | Points correctly plotted | 2 | B1 for 2 or 3 correct points |
| 3(a)(ii) | Negative | 1 | |

| Question | Answer | Marks | Partial Marks |
|-----------|----------------------------------|-------|--|
| 3(b)(i) | 8 | 1 | |
| 3(b)(ii) | 18.3 or 18.33 or $18\frac{1}{3}$ | 1 | |
| 3(c)(i) | $y = 97[.0] - 9.84x$ | 2 | or 97.02... and -9.836... B1 for $97[.0] + kx$, or $a - 9.84x$, If 0 scored SC1 for $97 - 9.8x$ |
| 3(c)(ii) | 21.2 to 21.3 or 21 | 1 | Strict FT <i>their</i> (c)(i) provided a linear expression |
| 4(a) | 171 cao nfw | 3 | B2 for 171.25 or 171.3 or M2 for complete method with 1 numerical error or M1 for at least 3 mid-pts (60, 135, 165, 195, 230, 275) soi |
| 4(b) | $\frac{44}{595}$ cao | 3 | B2 for $\frac{1056}{14280}$ oe accept 0.0739 or 0.07394 to 0.07395 or M1 for $\frac{33}{120} \times \frac{32}{119}$ |
| 4(c)(i) | 0.1, 0.9, 1.1, 0.5, 0.7, [0.1] | 2 | B1 for 3 or 4 correct |
| 4(c)(ii) | Correct histogram | 4 | B1 for suitable scale B1 for correct column widths B1FT for 4 or more correct heights |
| 5(a)(i) | $-6p + 6q$ oe | 1 | |
| 5(a)(ii) | $-2p + 2q$ oe | 2 | FT <i>their</i> (a)(i) $\div 3$ provided in form $ap + bq$ B1 for $-2p + kq$ or for $kp + 2q$ M1 for $\overline{AD} = 2p$ oe or $\overline{AE} = 2q$ or correct route |
| 5(a)(iii) | $4p$ cao | 1 | |
| 5(a)(iv) | $-6p + 2q$ oe | 2 | B1 for $-6p + kq$ or for $kp + 2q$ M1 for a correct route |
| 5(b)(i) | 216 | 2 | M1 for $\left(\frac{1}{3}\right)^2$ or 3^2 oe soi |
| 5(b)(ii) | 96 | 3 | M2 for $\left(\frac{1}{2}\right)^2$ or 2^2 oe soi or M1 for triangle <i>EFC</i> is similar to triangle <i>EDA</i> soi |

| Question | Answer | Marks | Partial Marks |
|----------|----------------------------------|-------|---|
| 6(a) | 192 | 2 | M1 for $\frac{1}{3} \times (\sqrt{72})^2 \times 8$ oe |
| | cm ³ | 1 | |
| 6(b) | 12 | 2 | M1 for $(\sqrt{72})^2 + (\sqrt{72})^2$ oe |
| 6(c) | 10 | 3 | M2 for $8^2 + (0.5 \text{ their (b)})^2$ or M1 for [PD oe =] $0.5 \times \text{their (b)}$ |
| (d) | 53.1 or 53.13 | 2 | M1 for $\tan = \frac{8}{0.5 \times \text{their (b)}}$ or $\sin = \frac{8}{\text{their (c)}}$ or $\cos = \frac{0.5 \times \text{their (b)}}{\text{their (c)}}$ |
| 6(e)(i) | $\sqrt{82}$ or 9.06 or 9.055... | 3 | M2 for $8^2 + (0.5 \times \sqrt{72})^2$ or $(\text{their (c)})^2 - (0.5 \times \sqrt{72})^2$ or M1 for $(0.5 \times \sqrt{72})^2$ |
| 6(e)(ii) | 62.1 or 62[.0] or 62.00 to 62.10 | 2 | M1 for $\tan = \frac{8}{0.5 \times \sqrt{72}}$ oe |
| 6(f) | 4 cao | 3 | M2 for $\sqrt[3]{\frac{24}{\text{their (a)}}}$ or $\sqrt[3]{\frac{\text{their (a)}}{24}}$ soi by 2 or $\frac{1}{2}$ or M1 for $\frac{24}{\text{their (a)}}$ or $\frac{\text{their (a)}}{24}$ soi by 8 or $\frac{1}{8}$ |
| 7(a) | 6810 or 6806 to 6808 | 3 | M2 for $\frac{1}{2} \times \frac{4}{3} \pi (15^3 - 5^3)$ or M1 for either $[\frac{1}{2} \times] \frac{4}{3} \pi \times 15^3$ or $[\frac{1}{2} \times] \frac{4}{3} \pi \times 5^3$ |
| 7(b) | 2200 or 2199... | 5 | M4 for $2 \times \pi \times 5^2 + 2 \times \pi \times 15^2 + \pi \times (15^2 - 5^2)$ or M1 for each term |
| 8(a) | (-1, 5) | 2 | B1 for each |
| 8(b) | (-1, -5) | 2 | B1 for each |
| 8(c) | Reflection y-axis oe | 2 | B1 for each |
| 9(a)(i) | Correct graph | 2 | B1 for correct shape with a max |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-----------|--|
| 9(a)(ii) | (0, 10) (3.7[0], 0) or (3.701 to 3.702, 0) | 2 | B1 for each |
| 9(a)(iii) | 3.54 or 3.541... | 1 | |
| 9(b)(i) | Correct graph | 2 | B1 for correct shape with a min |
| 9(b)(ii) | (1.47, 0.488) or (1.473 to 1.474, 0.4877...) | 2 | B1 for each |
| 9(b)(iii) | 0.0982 or 0.09819 to 0.09820 and 2.98 or 2.975 or 2.976 | 2 | B1 for each |
| 9(b)(iv) | 1.1[0] or 1.098... 3.98 or 3.975 to 3.976 | 2 | FT <i>their</i> (iii) + 1 B1 for each |
| 10(a) | appropriate sketch giving one positive and one negative answer or fully correct use of formula | M2 | M1 for sketch of parabola or parabola and straight line or $\sqrt{3^2 - 4(4)(-12)}$ or $\frac{-3 \pm \sqrt{\dots}}{2(4)}$ oe |
| | 1.4[0] and -2.15 final answers | B2 | B1 for each If 0 scored B1 for 1.397... and -2.147... or SC1 for 2.15 and -1.4[0] |
| 10(b) | $x > 1.40$ and $x < -2.15$ | 2 | FT $[x] > \textit{their} \max(a)$, $[x] < \textit{their} \min(a)$ B1 for each |
| 10(c) | $-1.75 \leq x \leq 1$ nfw | 4 | B3 for 1, -1.75 oe B2 for 1 inequality correct B1 for 1 correct value seen or M2 for appropriate sketch or correct factorising or correct use of formula or M1 for $4x^2 + 3x - 7 \leq 0$ |
| 11(a) | $[x =] 5$ $[y =] 2$ with correct working | 4 | M1 for correctly equating one set of coefficients M1 for correct method to eliminate one variable OR M1 for equation $x =$ or $y =$ from one equation M1 for correct substitution into other equation B1 for $x = 5$ B1 for $y = 2$ If zero scored SC1 for correct subst into one of original equs and evaluation to find other variable |
| 10(b) | $[a =] 10$ $[b =] 4$ | 2 | B1 for each FT <i>their</i> (a) $\times 2$ |

| Question | Answer | Marks | Partial Marks |
|-----------|--|----------|--|
| 10(c)(i) | $[p =] \log 5$ and $[q =] \log 2$ Final answers | 3 | B2 FT <i>their</i> (a) for either seen or B1 FT for each correct decimal answer 0.699 or 0.6989 to 0.6990 0.301 or 0.3010... or M1 for $10^p = \textit{their} 5$ or $10^q = \textit{their} 2$ |
| 10(c)(ii) | 1 cao | 1 | |