General Certificate of Education Ordinary Level 2018
Mathematics 4048/02
Syllabus 4048 Paper 2
**SUGGESTED** Solutions & Marking Scheme Mark Allocation
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| | | | | | |
|---|---|---|---|---|---|
| 1 | (ai) | $\dfrac{tv^2}{5}$ | B1 | o.e. | |
| | | | | | |
| | (aii) | $\dfrac{4(y+3)-5(3-2y)}{(y+3)(3-2y)}$ | M1 | Join fraction | |
| | | $=\dfrac{4y+12-15+10y}{(3-2y)(y+3)}$ <br> $=\dfrac{14y-3}{(3-2y)(y+3)}$ | A1 | | |
| | | | | | |
| | (b) | $\dfrac{(4x+3)(4x-3)}{(4x+3)(x-3)}$ | M2 | M1 for each factorisation s.o.i. | |
| | | $=\dfrac{4x-3}{x-3}$ | A1 | | |
| | | | | | |
| | (c) | $20=(2x+5)(x+1)$ <br> $2x^2+5x+2x+5=20$ | M1 | Expand | |
| | | $2x^2+7x-15=0$ <br> $(2x-3)(x+5)=0$ | M1 | | |
| | | $x=\dfrac{3}{2}$ or $x=-5$ | A1 | o.e. | |
| | | | | | [9] |



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|---|---|---|---|---|---|
| 2 | (a) | Difference $=12(\$3900)-\$44000=\$2800$ | M1 | s.o.i. | |
| | | Percentage increase $=\dfrac{\$2800}{\$44000}\times 100\%=6\dfrac{4}{11}\%=6.36\%$ | A1 | Accept 3 s.f. | |
| | | | | | |
| | (b) | Interest earned $=\$6500\left(1+\dfrac{2.35}{100}\right)^6-\$6500$ | M2 | M1 for C.I.<br>M1 for difference | |
| | | $=\$972.0615149=\$972.06$ (2 d.p.) | A1 | | |
| | | | | | |
| | (ci) | $\$1.97=£1\Rightarrow \$1=£\dfrac{1}{1.97}=£0.5076142132$<br>The cost per night for both hotels are the same in their own respective currencies. Since there is lesser pounds than euros per Singapore dollar, the hotel in London costs more per night than the hotel in Paris. | B1 | Show clear working with explanation | |
| | | | | | |
| | (cii) | Total cost for London hotel $=£145\times 3=£435$<br>Total cost for Paris hotel $=€145\times 4=€580$ | M1 | Total cost for any hotel s.o.i. | |
| | | <u>In Singapore Dollars:</u><br>Total for London $=£435\times 1.97=\$856.95$<br>Total for Paris $=\dfrac{€580}{0.66}=\$\dfrac{29000}{33}=\$878.7878...$ | M1 | Conversion to SGD for any hotel s.o.i. | |
| | | Total to be paid with fee $=101.8\%\left(\$856.95+\$\dfrac{29000}{33}\right)$ | M1 | 101.8% o.e. | |
| | | $=\$1766.981161=\$1767$ (nearest dollar) | A1 | | |
| | | | | | [10] |

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|---|---|---|---|---|---|
| 3 | (a) | $\mathbf{P} = \begin{pmatrix} 490 & 280 & 210 \\ 350 & 210 & 210 \end{pmatrix}$ | B1 | c.a.o. | |
| | | | | | |
| | (b) | $\mathbf{N} = \begin{pmatrix} 0.75 \\ 1.50 \\ 2.25 \end{pmatrix}$ | B1 | o.e. | |
| | | | | | |
| | (c) | $\mathbf{T} = \begin{pmatrix} 1260 \\ 1050 \end{pmatrix}$ | B2 | B1 for each correct element | |
| | | | | | |
| | (d) | The total costs of selling Apple and Cherry pies from all small, medium and large sizes are \$1260 and \$1050 respectively. | B1 | Must state sizes and type of pie | |
| | | | | | |
| | (e) | **Number of pies sold:**<br>Small $=700$, Medium $=408$, Large $=348$ | M1 | Number of pies | |
| | | **Sales from pies sold:**<br>Small $=\$735$, Medium $=\$856.80$, Large $=\$1096.20$ | M1 | Total sales | |
| | | Profit $=\$2688-(\$1260+\$1050)$ | M1 | FT from (c) | |
| | | $=\$378$ | A1 | | |
| | | | | | [9] |



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| 4 | (ai) | $6n+5$ | B2 | B1 per term | |
| | (aii) | For any integer $n$, $3n$ is a multiple of 3. Since 5 is not a multiple of 3, the $n$th term is not a full multiple of 3. Thus, there is no term that is a multiple of 3. | B1 | o.e. | |
| | (bi) | $\dfrac{19}{180}$ | B1 | | |
| | (bii) | $\dfrac{4k-1}{205-5k}=\dfrac{7}{32}$<br>$128k-32=1435-35k$ | M1 | Remove fraction o.e. | |
| | | $163k=1467$ | M1 | Isolate $k$ | |
| | | $k=9$ | A1 | | |
| | (biii) | $\dfrac{4n-1}{205-5n}>1$<br>$4n-1>205-5n$ | M1 | Remove fraction o.e. | |
| | | $9n>206$<br>$n>22.888...$ or $22\dfrac{8}{9}$ | A1 | | |
| | | Least value of $n=23$ | A1 | | |
| | | | | | [10] |
| 5 | (a) | $\overrightarrow{OB}=\begin{pmatrix}-1\\2\end{pmatrix}$ | B1 | | |
| | (b) | $A(-7, 0)$ | B1 | | |
| | | $D(-3, -3)$ | B1 | | |
| | (c) | Angle $BAD$ $=\tan^{-1}\left(\dfrac{2}{6}\right)+\tan^{-1}\left(\dfrac{3}{4}\right)$ | M2 | | |
| | | $=55.304846468°=55.3°$ (1 d.p.) | A1 | | |
| | (d) | $BD=\sqrt{\left(-3-(-1)\right)^2+(-3-2)^2}$ | M2 | M1 for each correct difference | |
| | | $=5.3851648$ units $=5.39$ units (3 s.f.) | A1 | | |
| | | | | | [9] |



| | | | | | |
|---|---|---|---|---|---|
| 6 | (a) | $\dfrac{3500}{x}$ | B1 | | |
| | | | | | |
| | (b) | $\dfrac{3500}{x-10}$ | B1 | | |
| | | | | | |
| | (c) | $\dfrac{3500}{x-10}-\dfrac{3500}{x}=21$ | M1 | Form equation | |
| | | $\dfrac{3500x-3500x+35000}{x^2-10x}=21$ | M1 | Join fraction | |
| | | $35000=21x^2-210x$<br>$21x^2-210x-35000=0$<br>$7\left(3x^2-30x-5000\right)=0$<br>$3x^2-30x-5000=0$ (Shown) | A1<br>AG | | |
| | | | | | |
| | (d) | $x=\dfrac{-(-30)\pm\sqrt{(-30)^2-4(3)(-5000)}}{2(3)}$ | M2 | M1 for correct discriminant<br>M1 for formula | |
| | | $x=46.1298756$ or $-36.1298756$<br>$=46.13$ or $-36.13$ (2 d.p.) | A1<br>A1 | Deduct A1 if not given to 2 d.p. | |
| | | | | | |
| | (e) | Time taken $=\dfrac{3500}{2(46.1298756)-10}$ | M1 | Must use at least 5 s.f. o.e. | |
| | | $=42$ minutes 30 seconds (nearest 10 seconds) | A1 | | |
| | | | | | [11] |

| | | | | | |
|---|---|---|---|---|---|
| 7 | (a) | Angle $OCA$ = Angle $ODB = 90°$<br>(Tangent perpendicular to radius) | M1 | | |
| | | $OC = OD$ (Radii of circle)<br>Angle $AOC$ = Angle $BOD$ (Vert. opp. angles) | M1 | Both reasons given | |
| | | Hence, triangles $OAC$ and $OBD$ are congruent.<br>(AAS Congruency Test) | A1 | Must state AAS | |
| | | | | | |
| | (bi) | $\cos 30° = \frac{AC}{7} \Rightarrow AC = 7\cos 30°$ | M1 | Find $AC$ or $OC$ using trigo s.o.i. | |
| | | Area of triangle $OAC = \frac{1}{2}(7)(7\cos 30°)\sin 30°$ | M1 | Area of triangle formula s.o.i. | |
| | | $= 10.608811196 \text{ cm}^2 = 10.6 \text{ cm}^2$ (3 s.f.) | A1 | | |
| | | **<u>Alternatively:</u>** | | | |
| | | $\cos 30° = \frac{AC}{7} \Rightarrow AC = 7\cos 30°$ | *M1* | | |
| | | $\sin 30° = \frac{OC}{7} \Rightarrow OC = 7\sin 30° = 3.5 \text{ cm}$ | *M1* | | |
| | | Area of triangle $OAC$<br>$= \frac{1}{2}(3.5)(7\cos 30°)$<br>$= 10.608811196 \text{ cm}^2 = 10.6 \text{ cm}^2$ (3 s.f.) | *A1* | | |
| | | | | | |
| | (bii) | Sector area $= \frac{60°}{360°} \times \pi(3.5)^2 = \frac{49}{24}\pi$ | M1 | s.o.i. | |
| | | Shaded area<br>$= \pi(7)^2 - \pi(3.5)^2 - 2(10.608811196) + 2\left(\frac{49}{24}\pi\right)$ | M1 | | |
| | | $= 107.0640761015 = 107 \text{ cm}^2$ (3 s.f.) | A1 | | |
| | | | | | [9] |

| | | | | | |
|---|---|---|---|---|---|
| 8 | (a) | Let $M$ be the centre of the square base $ABCD$. | | | |
| | | $AM^2 + AM^2 = 15^2$ <br> $2AM^2 = 225 \Rightarrow AM^2 = \frac{225}{2}$ | M1 | Find $AM$ o.e. | |
| | | $AE^2 = 20^2 + \frac{225}{2} = 512.5$ | M1 | Find $AE^2$ o.e. | |
| | | $AE = \sqrt{512.5} = 22.63846284 = 22.6$ cm (3 s.f.) (Shown) | A1 <br> AG | | |
| | | | | | |
| | (b) | Let $F$ be the midpoint of $AB$. | | | |
| | | $AF = 7.5$ cm | M1 | s.o.i. | |
| | | $\cos\angle BAE = \frac{7.5}{\sqrt{512.5}}$ | M1 | | |
| | | $\angle BAE = \cos^{-1}\left(\frac{7.5}{\sqrt{512.5}}\right)$ <br> $= 70.65263004° = 70.7°$ (1 d.p.) | A1 | | |
| | | | | | |
| | (c) | Total surface area <br> $= 15^2 + 4\left(\frac{1}{2}(15)\left(\sqrt{512.5}\right)\sin 70.65263004°\right)$ | M2 | M1 for area of triangle <br> M1 for all 5 sides | |
| | | $= 865.80028090249 = 866$ cm$^2$ (3 s.f.) | A1 | | |
| | | | | | |
| | (d) | $\frac{\text{Area of base } PQRS}{\text{Area of base } ABCD} = \left(\frac{16}{20}\right)^2 = \frac{16}{25}$ | M1 | | |
| | | Area of base $PQRS = \frac{16}{25} \times 15^2 = 144$ cm$^2$ | A1 | | |
| | | | | | [11] |



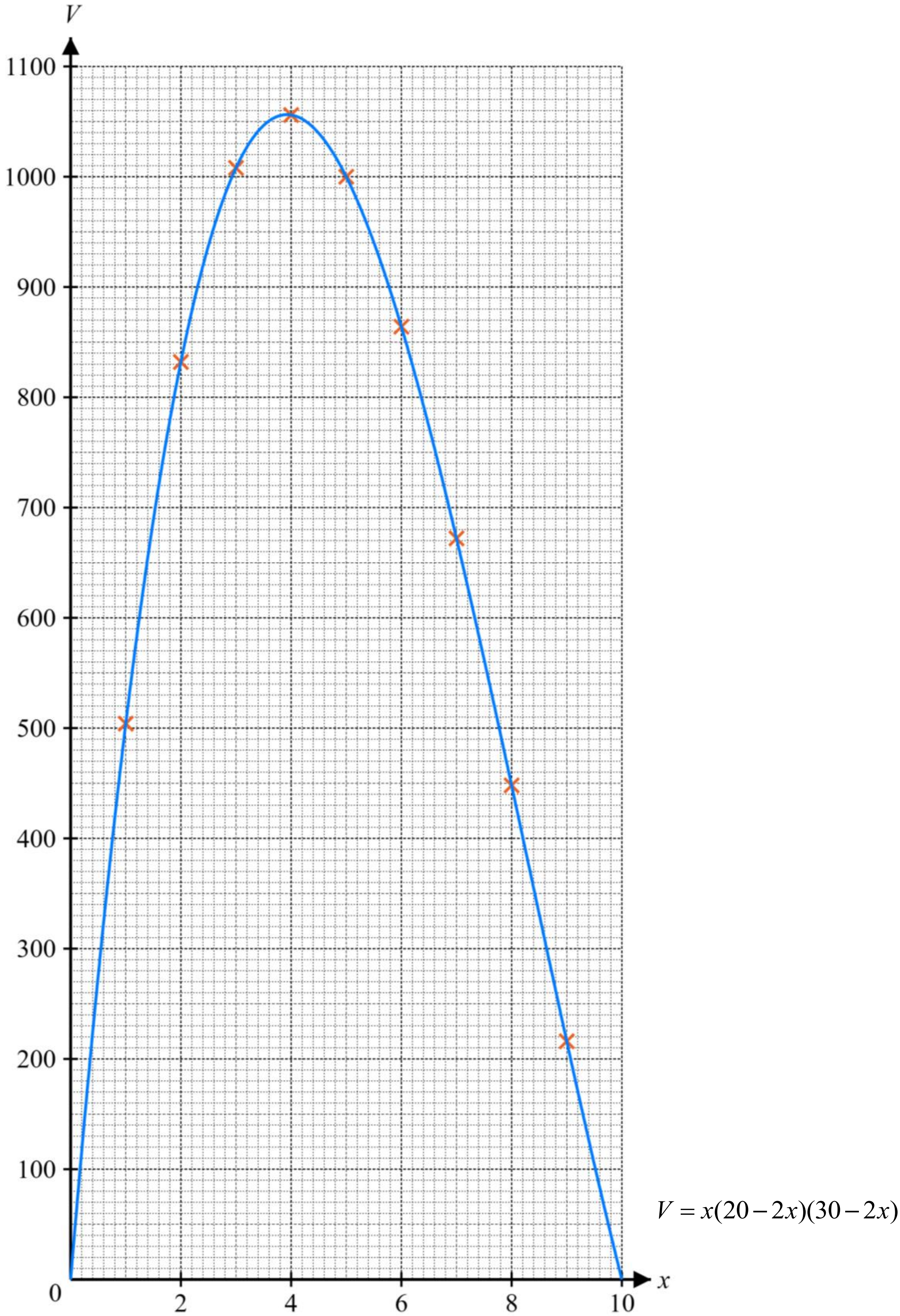
| | | | | | |
|---|---|---|---|---|---|
| 9 | (ai) | $3.0 \le m < 3.5$: 19; $3.5 \le m < 4.0$: 12; $4.0 \le m < 4.5$: 4 | B1 | | |
| | | | | | |
| | (aii) | Mean $= 3.26$ | B1 | | |
| | | | | | |
| | (aiii) | SD $= 0.524$ | B1 | | |
| | | | | | |
| | (aiv) | The <u>mid-values</u> of the intervals are used in calculation, and not the individual data values. | B1 | Mid-value o.e. | |
| | | | | | |
| | (av) | Number of babies $= 10\% \times 50 = 5$<br>From the graph, there are 5 babies with mass less than or equal to 2.575 kg. | M1 | 2.575 kg s.o.i. | |
| | | Thus, there are <u>90% of babies</u> with mass <u>greater than 2.575 kg</u> and the data from the hospital does not support the claim. | A1 | | |
| | | <u>**Alternatively:**</u> | | | |
| | | From the graph, there are 41 newborn babies who have a mass greater than 2.8 kg. | M1 | | |
| | | Percentage $= \frac{41}{50} \times 100\% = 82\% \neq 90\%$<br>Thus the data from the hospital does not support the claim. | A1 | | |
| | | | | | |
| | (bi) | $\frac{2}{5}$ | B1 | c.a.o. | |
| | | | | | |
| | (bii) (a) | $\frac{13}{25} \times \frac{12}{24}$ | M1 | | |
| | | $= \frac{13}{50}$ | A1 | o.e. | |
| | | | | | |
| | (bii) (b) | $\frac{9}{25} \times \frac{6}{24} \times 2$ | M1 | M1 for one case s.o.i. | |
| | | $= \frac{9}{50}$ | A1 | | |
| | | | | | [11] |

| | | | | | |
|---|---|---|---|---|---|
| 10 | (a) | Area of cardboard $=0.2\times0.3-4(0.05)^2=0.05\text{ m}^2$ | M1 | o.e. | |
| | | Mass of box $=0.05\times210=10.5\text{ g}$ | A1 | | |
| | | | | | |
| | (bi) | Length $=(30-2x)$ cm, Breadth $=(20-2x)$ cm,<br>Height $=x$ cm<br>Volume $=x(20-2x)(30-2x)$ | B1<br><br>AG | | |
| | | | | | |
| | (bii) | Since Length $>0$, $30-2x>0\Rightarrow x<15$.<br>Since Breadth $>0$, $20-2x>0\Rightarrow x<10$. | B1 | | |
| | | Thus, as height $>0$, $x>0$ and $0<x<10$. | AG | | |
| | | | | | |
| | (c) | (see table below) | | | |
| | | Refer to graph on page 10 | | | |
| | | Table constructed above for any 9 distinct values | T1 | Allow any 9 values in the range $0<x<10$ | |
| | | Scale used to draw graph must be reasonable<br>E.g. 2 cm to 2 units on $x$-axis is acceptable but not a scale of 3 cm to 2 units (odd use of scale is not accepted) | S1 | | |
| | | Plotting of all points in table constructed<br>(Allow P1 if there are at least 7 distinct points plotted) | P1 | Allow P1 even if T1 is not awarded | |
| | | Smooth curve passing through all plotted points<br>(Allow C1 if there are at least 6 distinct points plotted) | C1 | | |
| | | From the graph, largest value of $x=5.8$. | M1 | Accept $\pm0.2$ | |
| | | Area of cardboard $=0.2\times0.3-4(0.058)^2=0.046544\text{ m}^2$ | M1 | | |
| | | Mass of box<br>$=0.046544\times210=9.77424\text{ g}=9.77\text{ g}$ (3 s.f.) | A1 | | |
| | | | | | [11] |

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| $V$ | 504 | 832 | 1008 | 1056 | 1000 | 864 | 672 | 448 | 216 |

END OF MARKING SCHEME




V
1100
1000
900
800
700
600
500
400
300
200
100
0
2
4
6
8
10
x
V = x(20 − 2x)(30 − 2x)