## MARK SCHEME for the October/November 2015 series

## 4024 MATHEMATICS (SYLLABUS D)

4024/22
Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.
Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE ${ }^{\circledR}$, Cambridge International A and AS Level components and some Cambridge O Level components.

| Question | Answers | Mark | Part Marks |
| :---: | :---: | :---: | :---: |
| 1 (a) (i) (a) | 396 | 2 | M1 for $\frac{60}{100} \times 360+15 \times 12$ or B1 for $\frac{60}{100} \times 360$ seen |
| (b) | 110 isw | 1ft |  |
| (ii) | 770 | 2 | M1 for $x-\frac{26}{100} x=569.80$ oe or B1 for $\div$ by figs 74 |
| (b) | 1.21 | 3 | M2 for $\frac{850}{1.87} x=550$ oe or B1 for $\frac{850}{1.87}$ or $\frac{1.87}{850}$ or $\frac{850}{550}$ or $\frac{550}{850}$ or $\frac{x}{1.87}$ or $\frac{550}{x}$ |
| 2 (a) | 14 | 2 | M1 for $\frac{1}{2} \times C A \times(11-7)$ oe or SC 1 for 28 |
| (b) | 10.8 | 2 | M1 for $\sqrt{(8-(-2))^{2}+(7-11)^{2}}$ |
| (c) | 22.8 | 2 ft | B1 for $[B C=] 5$ soi or <br> M1 for (b) + their $B C+C A$ |
| (d) | 21.8 | 2 ft | M1 for $\tan A=\frac{(11-7)}{(8-(-2))}$ oe |
| 3 (a) (i) | Convincing explanation | 1 |  |
| (ii) | 28 | 2 | B1 for $O \widehat{C} D=124$ or triangle $C O D$ isosceles soi |
| (iii) | 76 | 1ft |  |
| (b) (i) | Convincing explanation | 2 | B1 for a correct pair of equal angles stated |
| (ii) | 2.5 | 3 | B1 for $8.5-$ SR or $8.5-$ QS seen and <br> M1 for $\frac{12}{5}=\frac{8.5-S R}{S R}$ or $\frac{12}{5}=\frac{Q S}{8.5-Q S}$ |


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| Question | Answers | Mark | Part Marks |
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| 4 (a) (i) | 2.12 | 2 | M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times r^{3}=20$ soi or SC1 for 1.68 |
| (ii) | 6.79 | 2 | B1 for $\sqrt[3]{\frac{50}{20}}$ or $\sqrt[3]{\frac{20}{50}}$ oe or M1 for $\left(\frac{5}{x}\right)^{3}=\frac{20}{50}$ oe |
| (b) | 187 | 3 | M1 for $\pi(\text { figs } 15)^{2}$ oe and M1 for $\left[\frac{1}{2} \times\right] 4 \times \pi \times(\text { figs } 55)^{2}-50 \times$ their $\pi r^{2}$ |
| 5 (a) | 51.2 | 2 | M1 for $A C^{2}+40^{2}=65^{2}$ oe |
| (b) | 12.7 | 2 | M1 for $\frac{A F}{30}=\sin 25$ oe |
| (c) | 40.4 | 3 | M1 for $\frac{35}{A G}=\cos 30$ oe and a further M1 for $(A G=) \frac{35}{\cos 30}$ oe |
| 6 (a) (i) | -4.62-2.38 final answer | 2 | B1 for one value <br> SC1 for both -4.6 and -2.4 |
| (ii) | $(B=) 7(C=) 11$ | 3 | M1 for $\left(x+\frac{7}{2}\right)^{2}=\frac{5}{4}$ and <br> B1 for one correct value |
| (b) | $x<-2$ | 2 | M1 for isolating $3 x$ and -6 soi |
| (c) | $(x+3 y)(6-t)$ oe | 2 | M1 for the correct extraction of a common factor at any stage |
| (d) | $(a=) 17(b=)-16$ | 4 | M1 for equalising one set of coefficients or substitution and a further <br> M1 for eliminating one variable or simplifying an equation in one variable and A1 for 17 and <br> A1 for - 16 <br> After A0, SC1 for correct substitution into one of the original equations to find the other variable |


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| Question | Answers | Mark | Part Marks |
| :---: | :---: | :---: | :---: |
| 7 (a) | Fully shown | 2 | M1 for the area sine formula |
| (b) | $2 x^{2}-19 x+6(=0)$ correctly obtained | 3 | B1 for both $x+12$ and $4+2 x-5$ and M1 for $\frac{x(2 x-5)}{\text { their }(x+12) \text { their }(4+2 x-5)}=\frac{1}{3}$ |
| (c) (i) | 9.170 .33 | 3 | B1 for $\sqrt{(-19)^{2}-4 \times 2 \times 6}$ soi and B1 for $\frac{-(-19) \pm \sqrt{\text { their } 313}}{2 \times 2}$ soi and M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$ |
| (ii) | 0.33 with reason | 1 |  |
| (d) | 6.35 | 3ft | $\begin{aligned} & \text { M2 for }\left(B C^{2}=\right) \\ & \mathrm{c}(\mathrm{i})^{2}+(2 \mathrm{c}(\mathrm{i})-5)^{2}-2 \times \mathrm{c}(\mathrm{i}) \times(2 \mathrm{c}(\mathrm{i})-5) \times \cos 25 \end{aligned}$ <br> or <br> M1 for correct formula with one error and A1 ft for correct evaluation from their M1 $\mathbf{S C} 1$ for $x^{2}+(2 x-5)^{2}-2 x(2 x-5) \cos 25$ oe |
| 8 (a) (i) | 2.62 | 2 | M1 for $\frac{25}{360} \times 2 \pi \times 6$ |
| (ii) | 7.85 | 2 | M1 for $\frac{25}{360} \times \pi \times 6^{2}$ |
| (b) (i) | 39.3 | 1ft |  |
| (ii) | 88.8 | 3ft | B1 for 30 or 60 or <br> M1 for $5 \times$ (a)(i) <br> and <br> indep M1 for $2 \times(\mathrm{a})$ (ii) |
| (iii) | 471 to 472 | 2 ft | B1 for height = 15 and radius $=12$ soi |
| (c) (i) | $(h=) \frac{800}{\pi r^{2}}$ | 1 |  |
| (ii) | $h$ is divided by 4 oe | 1 |  |


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| Question | Answers | Mark | Part Marks |
| :---: | :---: | :---: | :---: |
| 9 (a) | 36 | 1 |  |
| (b) | Correct plots ft and curve | 2 | P1 for 6 correct plots ft |
| (c) (i) | $4<$ gradient $<6$ | 2 ft | B1 for tangent at $t=4$ |
| (ii) | Speed oe | 1 |  |
| (d) | Their 2.5 | 2 ft | B1 for their 1.8 and their 4.3 |
| (e) (i) | Their 1.65 towards Their 4.7 away from | 2 ft | B1 for one correct ft |
| (ii) | $t^{2}+\frac{48}{t}-20=12 \text { oe isw }$ | 1 |  |
| (iii) | -32 cao | 1 |  |
| 10 (a) | Correct histogram | 3 | If 3 not scored, up to 2 marks from: <br> B1 for correct fd's (allow one error) B1 for correct column widths B1 for correct heights from their fd's |
| (b) | $95<t \leqslant 100$ | 1 |  |
| (c) | 98.2 | 3 | M1 for $\sum f x$ <br> B1 for division by 80 seen |
| (d) | $\frac{28}{80} \text { oe }$ | 1 |  |
| (e) (i) | $\frac{992}{6320} \text { oe }$ | 2 | $\text { M1 for } 2 \times \frac{32}{80} \times \frac{31}{79} \text { or } \frac{32}{80} \times \frac{31}{80}$ |
| (ii) | $\frac{64}{6320} \text { oe }$ | 2 | M1 for $\frac{4}{80} \times \frac{8}{79}$ or $2 \times \frac{4}{80} \times \frac{8}{80}$ |


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| Question | Answers | Mark | Part Marks |
| :---: | :---: | :---: | :---: |
| 11 (a) (i) | 6.08 | 1 |  |
| (ii) | $\binom{1}{4}$ | 2 | M1 for $\overrightarrow{A F}=\overrightarrow{A H}+\overrightarrow{H F}$ oe or <br> B1 for $\frac{1}{2}\binom{6}{1}$ |
| (iii) (a) | $\binom{4}{-7}$ | 1 |  |
| (b) | $\overrightarrow{G D}=2 \overrightarrow{F H}$ stated or appropriate numerical vector statement | 1 | dep |
| (iv) | $(9.5,3)$ | 1ft |  |
| (b) (i) | Correct image | 1 |  |
| (ii) | Centre ( 4,0 ) oe <br> Scale factor $\times 2$ oe | 2 | B1 for either |
| (iii) | $(5,2)$ | 1 |  |
| (iv) | Correct image | 2 | B1 for either <br> Stem of flag $R$ on or parallel to $y=-x$ <br> or <br> Hypotenuse of flag parallel to $y$-axis. <br> SC1 for correct clockwise rotation |

