

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.

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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 $\frac{1}{2} \times CA \times (11 - 7)$ oe or SC 1 for 28
(b)	10.8	2	M1 for $\sqrt{(8 - (-2))^2 + (7 - 11)^2}$
(c)	22.8	2ft	B1 for $[BC =] 5$ soi or M1 for (b) + their $BC + CA$
(d)	21.8	2ft	M1 for $\tan A = \frac{(11 - 7)}{(8 - (-2))}$ oe
3 (a) (i)	Convincing explanation	1	
(ii)	28	2	B1 for $\widehat{OCD} = 124$ or triangle COD 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 M1 for $\frac{12}{5} = \frac{8.5 - SR}{SR}$ or $\frac{12}{5} = \frac{QS}{8.5 - QS}$

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Question	Answers	Mark	Part Marks
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 πr^2
5 (a)	51.2	2	M1 for $AC^2 + 40^2 = 65^2$ oe
(b)	12.7	2	M1 for $\frac{AF}{30} = \sin 25$ oe
(c)	40.4	3	M1 for $\frac{35}{AG} = \cos 30$ oe and a further M1 for $(AG =) \frac{35}{\cos 30}$ oe
6 (a) (i)	-4.62 -2.38 final answer	2	B1 for one value SC1 for both -4.6 and -2.4
(ii)	(B =) 7 (C =) 11	3	M1 for $(x + \frac{7}{2})^2 = \frac{5}{4}$ and B1 for one correct value
(b)	$x < -2$	2	M1 for isolating $3x$ and -6 soi
(c)	$(x + 3y)(6 - t)$ 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 M1 for eliminating one variable or simplifying an equation in one variable and A1 for 17 and A1 for -16 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)	$2x^2 - 19x + 6 (= 0)$ correctly obtained	3	B1 for both $x + 12$ and $4 + 2x - 5$ and M1 for $\frac{x(2x-5)}{their(x+12)their(4+2x-5)} = \frac{1}{3}$
(c) (i)	9.17 0.33	3	B1 for $\sqrt{(-19)^2 - 4 \times 2 \times 6}$ soi and B1 for $\frac{-(-19) \pm \sqrt{their 313}}{2 \times 2}$ soi and M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$
(ii)	0.33 with reason	1	
(d)	6.35	3ft	M2 for $(BC^2 =)$ $c(i)^2 + (2c(i)-5)^2 - 2 \times c(i) \times (2c(i)-5) \times \cos 25$ or M1 for correct formula with one error and A1 ft for correct evaluation from their M1 SC1 for $x^2 + (2x-5)^2 - 2x(2x-5)\cos 25$ 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 M1 for $5 \times (a)(i)$ and indep M1 for $2 \times (a)(ii)$
(iii)	471 to 472	2ft	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)	$4 < \text{gradient} < 6$	2ft	B1 for tangent at $t = 4$
(ii)	Speed oe	1	
(d)	Their 2.5	2ft	B1 for their 1.8 and their 4.3
(e) (i)	Their 1.65 towards Their 4.7 away from	2ft	B1 for one correct ft
(ii)	$t^2 + \frac{48}{t} - 20 = 12$ oe isw	1	
(iii)	–32 cao	1	
10 (a)	Correct histogram	3	If 3 not scored, up to 2 marks from: B1 for correct fd's (allow one error) B1 for correct column widths B1 for correct heights from their fd's
(b)	$95 < t \leq 100$	1	
(c)	98.2	3	M1 for $\sum fx$ B1 for division by 80 seen
(d)	$\frac{28}{80}$ oe	1	
(e) (i)	$\frac{992}{6320}$ oe	2	M1 for $2 \times \frac{32}{80} \times \frac{31}{79}$ or $\frac{32}{80} \times \frac{31}{80}$
(ii)	$\frac{64}{6320}$ 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)	$\begin{pmatrix} 1 \\ 4 \end{pmatrix}$	2	M1 for $\overrightarrow{AF} = \overrightarrow{AH} + \overrightarrow{HF}$ oe or B1 for $\frac{1}{2}\begin{pmatrix} 6 \\ 1 \end{pmatrix}$
(iii) (a)	$\begin{pmatrix} 4 \\ -7 \end{pmatrix}$	1	
(b)	$\overrightarrow{GD} = 2\overrightarrow{FH}$ stated or appropriate numerical vector statement	1	dep
(iv)	(9.5, 3)	1ft	
(b) (i)	Correct image	1	
(ii)	Centre (4, 0) oe Scale factor $\times 2$ oe	2	B1 for either
(iii)	(5, 2)	1	
(iv)	Correct image	2	B1 for either Stem of flag R on or parallel to $y = -x$ or Hypotenuse of flag parallel to y -axis. SC1 for correct clockwise rotation