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MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

Published

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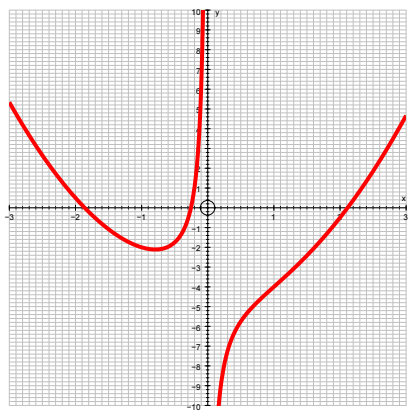
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	12 45 [pm]	2	B1 for 2045 seen or 8 45 pm seen or [0]1 35 seen
	(ii) 788 or 787.8 to 788.1	2	M1 for $8800 \div 11\text{h } 10\text{ mins}$ oe
	(b) (i) 4230[.00]	2	M1 for $2350 \div 5$ oe
		(ii) 22.2 or 22.2...	1
	(c) (i) 3808 final answer	2	M1 for $2240 \times \frac{100+70}{100}$ oe
		(ii) 800	3
	(d) (i) 1130	4	M3 for $(826.5[0] - 12 \times (28 + 6.5[0])) \div 1.25$ seen or M2 for $826.5[0] - 12 \times (28 + 6.5[0])$ seen or M1 for $12 \times (28 + 6.5[0])$ seen
		(ii) \$146.9[0] final answer	2FT
2 (a) (i)	5	1	
	(ii) $\frac{1}{2}$ oe	1	
	(iii) $\frac{5}{3}$ oe	2	M1 for $2^{3x} = 2^5$ oe or better or SC1 for either denominator or numerator of index correct in final answer
	(iv) $-\frac{2}{3}$ oe	2	M1 for $3^{3x} = 3^{-2}$ oe or better or $\left(\frac{1}{3}\right)^{-3x} = \left(\frac{1}{3}\right)^2$ or better or SC1 for $\frac{2}{3}$ or any negative index

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Question	Answer	Mark	Part marks
(b)	$(y - 10)(y + 3)$ seen 10 and -3 final answers	B2 B1	B1 for $y(y - 10) + 3(y - 10) [= 0]$ or $y(y + 3) - 10(y + 3) [= 0]$ or for $(y + a)(y + b) [= 0]$ where $ab = -30$ or $a + b = -7$ or for $y - 10 [= 0]$ and $y + 3 [= 0]$
3 (a) (i)	Image at (3, 1), (5, 1), (5, 4), (4, 4), (4, 2), (3, 2)	2	SC1 reflection in $y = 1$ or $x = k$ or 6 correct points not joined
(ii)	Image at (2, 1), (6, 1), (6, -5), (4, -5), (4, -1), (2, -1)	2	SC1 for other enlargement of scale factor -2 , correct size and correct orientation or 6 correct points but not joined
(iii)	Image at (-1 , -1), (-2 , -1), (-2 , -2), (-4 , -2), (-4 , -3), (-1 , -3)	3	M2 for 6 correct points shown in working or plotted correctly but not joined or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 & -1 & -2 & -2 & -3 & -3 \\ 1 & 2 & 2 & 4 & 4 & 1 \end{pmatrix}$ or for rotation 90° [anticlockwise] centre (0, 0) stated
(b)	Enlargement [sf] 3 origin oe	3	B1 for each
4 (a) (i)	-2 , -0.5 or $-\frac{1}{2}$	2	B1 for each
(ii)	Complete correct curve 	5	SC4 for correct curves but branches joined or touching y -axis or B3FT 9 or 10 points or B2FT for 7 or 8 points or B1FT for 5 or 6 points and B1indep two separate branches not touching or crossing y -axis
(b)	-1.95 to -1.8 -0.4 to -0.2 2.05 to 2.2	3	B1 for each
(c)	Any integer k where $k \leq -3$	1	

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Question	Answer	Mark	Part marks
(d) (i)	Correct line $y = -5x - 2$ ruled and – 0.4 to – 0.2 0.55 to 0.75	4	M2 for correct ruled line or M1 for correct line but freehand or for ruled line gradient – 5 or ruled line y -intercept – 2, but not $y = -2$ and A1 for each correct solution dependent on at least M1 If 0 scored, SC1 for both correct with no line drawn
(ii)	$[a =] 5$ and $[b =] -2$	2	B1 for one correct value or M1 for $x^3 + 5x^2 - 2x - 1 = 0$ seen
5 (a)	0.05 oe	2	M1 for $1 - (0.2 + 0.3 + 0.45)$ oe
(b)	15	1	
(c) (i)	0.75 oe	2	M1 for $0.45 + 0.3$ oe
(ii)	0.135 oe	2	M1 for 0.45×0.3 oe
(iii)	0.12 oe	3	M2 for $2(0.3 \times 0.2)$ oe or M1 for 0.3×0.2 or 0.06 oe nfw
(d)	0.243 oe	5	M4 for $3(0.45 \times 0.45 \times 0.2) +$ $3(0.3 \times 0.3 \times 0.45)$ oe or M3 for $3(0.45 \times 0.45 \times 0.2)$ or $3(0.3 \times 0.3 \times 0.45)$ oe or M2 for $0.45 \times 0.45 \times 0.2$ and $0.3 \times 0.3 \times 0.45$ or M1 for $0.45 \times 0.45 \times 0.2$ or $0.3 \times 0.3 \times 0.45$ oe or for identifying the correct 6 outcomes e.g. 10 0 0, 0 0 10, 0 10 0, 5 5 0, 5 0 5, 0 5 5
6 (a)	3	1	
(b) (i)	9900	3	M2 for $2(60 \times 35) + 2(60 \times 30) + 2(30 \times 35)$ oe or M1 for one correct rectangle
(ii)	0.99 oe	1FT	FT <i>their</i> (b)(i) $\div 10\,000$

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Question	Answer	Mark	Part marks
(c) (i)	75.7 or 75.66 to 75.67	4	M3 for $\sqrt{60^2 + 30^2 + 35^2}$ oe could be in stages or M2 for $60^2 + 30^2 + 35^2$ oe or M1 for $60^2 + 30^2$ or $60^2 + 35^2$ or $35^2 + 30^2$ oe
(ii)	23.4 or 23.3 or 23.34 to 23.36...	3	M2 for $\sin^{-1}(30 \div \sqrt{60^2 + 35^2 + 30^2})$ oe or for $\sin^{-1}(30 \div \text{their (c)(i)})$ or M1 for $\sin = 30 \div \sqrt{60^2 + 35^2 + 30^2}$ oe or for $\sin = 30 \div \text{their (c)(i)}$
(d) (i)	$30 \times 35 \times 60 [= 63\,000]$	1	With no errors seen
(ii)	22.4 or 22.38 to 22.391	3	M2 for $\sqrt{\frac{63\,000}{40\pi}}$ oe or M1 for $40\pi r^2 = 63\,000$ oe
7 (a)	$360 - 210 [= 150]$ $(180 - 150) \div 2 [= 15]$ or $150 \div 2 [=75]$ and $180 - 75 - 90 [=15]$	M1 M1	
(b)	15.5 or 15.45 to 15.46 nfw	4	M3 for $2 \times 8 \cos 15$ oe or M2 for $8 \cos 15$ oe or M1 for $\frac{x}{8} = \cos 15$ oe
(c)	29.5 or 29.4 or 29.39 to 29.50..	3	M2 for $[\sin ABC =] \frac{8 \times \sin 72}{\text{their}(b)}$ or M1 for $\frac{\sin ABC}{8} = \frac{\sin 72}{\text{their}(b)}$ oe
(d)	194 or 193.7 to 194.1 nfw	6	M2 for $\frac{210}{360} \times \pi \times 8^2$ or M1 for $[k] \pi \times 8^2$ seen and M1 for $\frac{1}{2} \times 8^2 \times \sin 150$ oe and M2 for $\frac{1}{2} \times 8 \times \text{their (b)} \times \sin(108 - \text{their (c)})$ oe or B1 for $[\text{angle } CAB=] 108 - \text{their (c)}$
(e)	12.1 or 12.11 to 12.13	2FT	FT $\text{their (d)} \div 4^2$ oe M1 for 4^2 or $\left(\frac{1}{4}\right)^2$ soi

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Question	Answer	Mark	Part marks
8 (a) (i)	-3	2	M1 for $[g(1)=]-2$ provided not used in a product or for $5\left(\frac{4}{x-3}\right)+7$ or better
(ii)	$\frac{4}{5x+4}$ final answer	2	M1 for $\frac{4}{5x+7-3}$
(iii)	$\frac{4+3x}{x}$ or $\frac{4}{x}+3$ final answer	3	M2 for $xy = 4 + 3x$ or $y - 3 = \frac{4}{x}$ or $x = \frac{4}{y} + 3$ or $x = \frac{4+3y}{y}$ or M1 for $x = \frac{4}{y-3}$ or $y(x-3) = 4$ or $x-3 = \frac{4}{y}$ or $x(y-3) = 4$
(iv)	2	1	
(b) (i)	$(5x+7)(x-3) = 4$ $5x^2 - 15x + 7x - 21 = 4$ oe $5x^2 - 8x - 25 = 0$	M1 B1 A1	Condone omission of '=' for the B mark Dep on M1B1 and no errors or omissions at any stage seen
(ii)	$\sqrt{(-8)^2 - 4(5)(-25)}$ or better $p = -(-8)$ and $r = 5 \times 2$ oe -1.57 and 3.17	B1 B1 B1B1	or for $\left(x - \frac{4}{5}\right)^2$ oe must see $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ or both or for $\frac{4}{5} + \sqrt{\left(\frac{4}{5}\right)^2 + 5}$ or $\frac{4}{5} - \sqrt{\left(\frac{4}{5}\right)^2 + 5}$ SC1 for final answers -1.6 or -1.574 to -1.575 and 3.2 or 3.174 to 3.175 or -1.57 and 3.17 seen in working or for -3.17 and 1.57 as final ans
9 (a)	19[.0] or 18.97.. nfww	3	M2 for $\sqrt{(4--2)^2 + (13--5)^2}$ oe or M1 for $(4--2)^2 + (13--5)^2$ oe

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Question	Answer	Mark	Part marks
(b)	$[y =] 3x + 1$	3	<p>B2 for answer $[y =]3x + c$ oe or answer $kx + 1$ ($k \neq 0$)</p> <p>or M1 for $\frac{13 - -5}{4 - -2}$ oe or 3</p> <p>and M1 for correct substitution of $(-2, -5)$ or $(4, 13)$ into $y = (\text{their } m)x + c$ oe</p>
(c)	$y = 3x - 5$ oe	2FT	<p>FT <i>their</i> gradient from (b)</p> <p>M1 for $y = mx - 5$ with other m, $m \neq 0$ or $y = \{\text{their gradient from (b)}\}x + c$</p> <p>If 0 scored, SC1 for answer $3x - 5$</p>
(d)	$y = -\frac{1}{3}x + \frac{13}{3}$ oe isw	5	<p>B2FT for $-\frac{1}{3}x + c$ (c can be numeric or algebraic)</p> <p>FT $-1/$ <i>their</i> gradient from (b)</p> <p>or M1 for $-1/$ <i>their</i> gradient from (b) soi</p> <p>and</p> <p>B1 for [midpoint of $AB =$] $(1, 4)$</p> <p>and M1 for substitution of $(1, k)$ or $(k, 4)$ into a linear equation</p>