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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 130

Published

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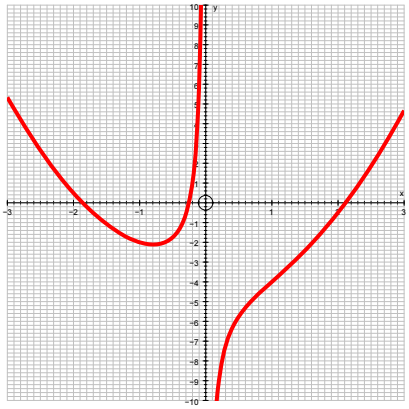
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Abbreviations

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 20 45 seen or 8 45 pm seen or [0]1 35 seen
(ii)	788 or 787.8 to 788.1	**2**	**M1** for 8800 ÷ 11h 10 mins oe
(b) (i)	4230[.00]	**2**	**M1** for 2350 ÷ 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**	**M2** for $2240 \div \frac{100+180}{100}$ oe or **M1** for 2240 associated with 280%
(d) (i)	1130	**4**	**M3** for (826.5[0] – 12 × (28 + 6.5[0])) ÷ 1.25 seen or **M2** for 826.5[0] – 12 × (28 + 6.5[0]) seen or **M1** for 12 × (28 + 6.5[0]) seen
(ii)	\$146.9[0] final answer	**2FT**	**FT** *their*(d)(i) × 0.13 correctly evaluated If answer not exact to at least 3 sf or better **M1** for *their* (d)(i) ÷ 10 × 1.3
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	**B2**	**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]
	10 and – 3 final answers	**B1**	
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 $k \leqslant -3$	**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 × 0.2) oe or **M1** for 0.3 × 0.2 or 0.06 oe nfww
(d)	0.243 oe	**5**	**M4** for 3(0.45 × 0.45 × 0.2) + 3(0.3 × 0.3 × 0.45) oe or **M3** for 3(0.45 × 0.45 × 0.2) **or** 3(0.3 × 0.3 × 0.45) oe or **M2** for 0.45 × 0.45 × 0.2 **and** 0.3 × 0.3 × 0.45 or **M1** for 0.45 × 0.45 × 0.2 **or** 0.3 × 0.3 × 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 × 35) + 2(60 × 30) + 2(30 × 35) oe or **M1** for one correct rectangle
(ii)	0.99 oe	**1FT**	FT *their*(b)(i) ÷ 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 $\sin^{-1}(30 \div$ *their* (c)(i)$)$ or **M1** for $\sin = 30 \div \sqrt{60^2+35^2+30^2}$ oe or for $\sin = 30 \div$ *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) ÷ 2 [= 15] **or** 150 ÷ 2 [=75] and 180 – 75 – 90 [=15]	**M1** **M1**	
(b)	15.5 or 15.45 to 15.46 nfww	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 [$\sin ABC =$] $\frac{8 \times \sin 72}{their(b)}$ or **M1** for $\frac{\sin ABC}{8} = \frac{\sin 72}{their(b)}$ oe
(d)	194 or 193.7 to 194.1 nfww	6	**M2** for $\frac{210}{360} \times \pi \times 8^2$ or **M1** for $[k]\,\pi \times 8^2$ seen **and** **M1** for ½ × 8^2 × sin 150 oe **and M2** for ½ × 8 × *their* (b) × sin(108 – *their* (c)) oe or **B1** for [angle *CAB*=] 108 – *their* (c)
(e)	12.1 or 12.11 to 12.13	2FT	**FT** *their* (d) ÷ 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)	$(5x + 7)(x – 3) = 4$	M1	
	$5x^2 – 15x + 7x – 21 = 4$ oe $5x^2 – 8x – 25 = 0$	B1 A1	Condone omission of ' = 4' 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	B1	or for $\left(x-\frac{4}{5}\right)^2$ oe
	$p = –(–8)$ and $r = 5 \times 2$ oe	B1	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 $\frac{4}{5}-\sqrt{\left(\frac{4}{5}\right)^2+5}$
	–1.57 and 3.17	B1B1	**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**	**B2** for answer $[y =]3x + c$ oe or answer $kx + 1$ ($k \neq 0$) or **M1** for $\frac{13 - -5}{4 - -2}$ oe or 3 **and M1** for correct substitution of (–2, –5) or (4, 13) into $y =$ (*their m*)$x + c$ oe
(c)	$y = 3x - 5$ oe	**2FT**	FT *their* gradient from (b) **M1** for $y = mx - 5$ with other m, $m \neq 0$ or $y =$ {*their* gradient from (b)}$x + c$ If 0 scored, **SC1** for answer $3x - 5$
(d)	$y = -\frac{1}{3}x + \frac{13}{3}$ oe isw	**5**	**B2FT for** $-\frac{1}{3}x + c$ (c can be numeric or algebraic) **FT** –1/ *their* gradient from (b) or **M1** for –1/ *their* gradient from (b) soi **and** **B1** for [midpoint of AB =] (1, 4) and **M1** for substitution of (1, k) or (k, 4) into a linear equation

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