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MATHEMATICS

0580/42

Paper 4 Paper 4 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 130

Published

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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
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1	(a) (i)	11 054.25 final answer	2 M1 for $18000 \times \left(1 - \frac{15}{100}\right)^3$ oe
	(ii)	16 500	3 M2 for $14025 \div \left(1 - \frac{15}{100}\right)$ oe or M1 for recognition of 14 025 as 85% soi
	(b)	260 final answer	2 M1 for $P\left(1 + \frac{5}{100}\right)^2 = 286.65$ oe
	(c) (i)	6.18	3 M2 for $\frac{224.72 - 200}{200 \times 2} \times 100$ oe or $\frac{1}{2} \left(\frac{224.72}{200} \times 100 - 100 \right)$ or M1 for $\frac{200 \times r \times 2}{100}$ oe or $\frac{224.72 - 200}{200 \times 2}$ or $\frac{224.72}{200} \times 100 - 100$ soi by 12.36 If zero scored, SC1 for 56.18 or 56.2 as final answer
	(ii)	6	3 M2 for $\sqrt{\frac{224.72}{200}}$ or $\sqrt{\frac{224.72}{2}}$ soi by 1.06 or 106 or 10.6 or M1 for $200 \left(1 + \frac{r}{100}\right)^2 = 224.72$ oe

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Question	Answer	Mark	Part marks	
2	(a)	1 1	1 1	
	(b)	Fully correct graph	4 B3FT for 6 or 7 points plotted or B2FT for 4 or 5 points plotted or B1FT for 2 or 3 points plotted	
	(c)	(i)	-1 < ans < -0.8 1.25 < ans < 1.45 2.5 < ans < 2.6	1 1 1
		(ii)	-0.7 < ans < -0.5	2 M1 for evidence of $y = -x$ or $\frac{x^3}{3} - x^2 + 1 = -x$
		(d)	(i)	$y = 1$ to 1.1 oe
	(ii)		$y = -0.4$ to -0.33 oe	1FT FT only if a clear minimum point
	3	(a)	$\frac{240 \sin 85}{\sin 50}$	M2 or M1 for $\frac{\sin 50}{240} = \frac{\sin 85}{AB}$ oe
312 or 312.1			B1	
(b)		$\frac{1}{2} \times 180 \times 240 \times \sin A = 12000$	M1	
		33.748 to 33.749	A2 A1 for $\sin = \frac{24000}{43200}$ or better or 0.555 or 0.556 or 0.5 or 0.5555 to 0.5556	
(c)		328 or 328.3 to 328.5	5 B1 for [angle A =] 78.75 seen M2 for $180^2 + (their AB)^2 - 2 \times 180 \times their AB \times \cos 78.75$ or M1 for $\cos 78.75 = \frac{180^2 + (their AB)^2 - x^2}{2 \times 180 \times (their AB)}$ A1 for 107 800 to 107 900	
(d)		(i)	108.75 or 108.7 or 108.8	1
		(ii)	288.75 or 288.7 or 288.8	2FT FT 180 + <i>their (d)(i)</i> M1 for 180 + <i>their (d)(i)</i> or 360 - (180 - <i>their (d)(i)</i>)

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Question	Answer	Mark	Part marks	
4	(a)	15	M1 for $10 \div 40 [\times 60]$	
	(b)	49.2 nfw	M1 for 35, 42.5, 47.5, 52.5, 57.5, 70 soi M1 for Σfx $8 \times 35 + 22 \times 42.5 + 95 \times 47.5 + 55 \times 52.5 + 14 \times 57.5 + 6 \times 70$ M1 dep for <i>their</i> $\Sigma fx \div 200$	
	(c)	Fully correct histogram	4 B3 for 4 correct blocks or B2 for 2 or 3 correct blocks or B1 for 1 correct block If zero scored, SC1 for correct frequency densities 0.8, 19, 11, 2.8, 0.3 soi	
	(d) (i)	125, 180	1	
	(ii)	Correct diagram	3 B1FT <i>their</i> (d)(i) for 6 correct heights within correct square(including boundaries) or touching correct line if should be on a grid line and B1 for 6 points at upper ends of intervals on correct vertical line and B1FT (dep on at least B1) for increasing curve or polygon through 6 points If zero scored, SC1FT for 5 correct points plotted	
	(iii) (a)	48 to 49	1	
	(b)	55	1	
	(c)	8 to 14	2FT	B1FT for 186 to 192 seen

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Question	Answer	Mark	Part marks
5 (a) (i)	$\frac{3}{4}, \frac{1}{4}$ $\frac{7}{8}, \frac{1}{8}$	2	B1 for any 2 correct
(ii)	$\frac{21}{32}$ oe	2	M1 for $\frac{7}{8} \times \frac{3}{4}$ oe
(iii)	$\frac{441}{1024}$ oe	2FT	M1 for $\left(\frac{7}{8} \times \frac{3}{4}\right)^2$ or <i>their</i> ((a)(ii))² oe
(b)	175	2	M1 for $200 \times \frac{7}{8}$
(c)	2400	2	M1 for $1575 \div \textit{their(a)(ii)}$

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Question	Answer	Mark	Part marks	
6 (a)	(i)	1.32	M1 for $0.8 \times 1.5 \times 1.1$	
	(ii)	0.725 or 0.7246 to 0.7247...	M1 for $\pi r^2 \times 0.8 = \text{their(a)(i)}$ or $\pi r^2 = 1.5 \times 1.1$ oe	
	(iii)	0.513 to 0.518 nfw	5 M1 for $2(1.5 \times 1.1 + 1.5 \times 0.8 + 1.1 \times 0.8)$ M1 for $[2 \times] \pi \times (\text{their (a)(ii)})^2$ M2 for $\pi \times 2 \times (\text{their (a)(ii)}) \times 0.8$ or M1 for $\pi \times 2 \times (\text{their (a)(ii)})$	
	(b) (i)	$x + y \geq 9$ oe $y \geq 2$ oe	1 1	If zero scored, SC1 for $x + y > 9$ and $y > 2$
	(ii)	Fully correct diagram with unwanted region shaded	4	B1 for $2x + 3y = 24$ ruled B1 for $x + y = 9$ ruled B1 for $y = 2$ ruled
	(iii)	20 [x =] 7 [y =] 2	1 1 1	If zero scored, SC1 for $2x + 3y$ evaluated from integers

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7	(a)	54.50 final answer	2	B1 for 54.495 to 54.496 or 54.5 or M1 for $200 \div 3.67$
	(b) (i)	$\frac{1000}{x(x+1)}$ final answer	3	M1 for $1000(x+1) - 1000x$ M1 for denominator $x(x+1)$
	(ii)	$\frac{1000}{x} - \frac{1000}{x+1} = 4.5[0]$ oe or $\frac{1000}{x(x+1)} = 4.5$ $1000 = 4.5x(x+1)$ $4.5x^2 + 4.5x - 1000 = 0$ $9x^2 + 9x - 2000 = 0$	M1 M1dep A1	Allow <i>their</i> (b)(i) for first M1 only for a single fraction Correctly multiplying by algebraic denominator Equation reached without any errors or omissions and at least one step after clearing the denominators of the fractions still with brackets included
	(iii)	$\frac{-9 \pm \sqrt{9^2 - 4(9)(-2000)}}{2(9)}$ – 15.42 14.42	2 B1 B1	B1 for $\sqrt{9^2 - 4(9)(-2000)}$ If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then B1 for $p = -9$ and $r = 2(9)$ SC1 for answers – 15.4 or – 15.42 to – 15.41 and 14.4 or 14.41 to 14.42 or for – 14.42 and 15.42 or – 15.42 and 14.42 seen but not final answer Answers without working only score B1, B1 or SC1
	(iv)	69.34 to 69.37 final answer must be 2 dp	2FT	FT $1000 \div$ <i>their</i> positive x with final answer rounded up or down to 2 dp or M1 for $1000 \div$ <i>their</i> positive x

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8	(a)	$[u =] 80$ $[v =] 160$	1 1	
	(b)	6.24 or 6.244 to 6.245	3	M2 for $\sqrt{8^2 - 5^2}$ oe or M1 for $l^2 + 5^2 = 8^2$ oe or B1 for suitable right angled triangle drawn with 5 on correct side
	(c)	5.05 or 5.052....	2	M1 for $\frac{4.8}{2.5} = \frac{9.7}{MN}$ oe
	(d)	4 nfw	4	M3 for $[x^n](x+1) = 4 \times \frac{5}{12}[x^n](x-1)$ oe, $n = 1, 2$ or 3 or M2 for $\frac{[x](x+1)}{\frac{5}{12}[x](x-1)} = \left(\frac{2[x]}{[x]}\right)^2$ oe or M1 for 2^2 or $\left(\frac{1}{2}\right)^2$ soi
9	(a) (i)	1.5 oe	1	
	(ii)	$\frac{3}{y-2}$ oe final answer	3	M1 for correct removal of fraction M1 for collection of terms in x and factorises OR M1 subtracts 2 from both sides M1 multiplies by x to remove fraction and M1 for correct division by expression of the form $ay + b$, a and $b \neq 0$
	(b) (i)	-3	1	
	(ii)	65 536 final answer	2	B1 for $h(16)$ oe e.g. $h(2^4)$
	(iii)	-6	2	M1 for $2 - x = 2^3$ oe
(iv)	3	1		
10	(a)	7.5	2	M1 for $3x + x + 3x + x = 60$ oe
	(b)	5	3	B2 for $3x + 4x + 5x [= 60]$ or better or M1 for $(3x)^2 + (4x)^2$ oe
	(c)	16.8 or 16.80....	3	M2 for $x + x + \frac{90}{360} \times \pi \times 2 \times x [= 60]$ oe or M1 for $\frac{90}{360} \times \pi \times 2 \times x$ oe