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MATHEMATICS **0580/42**

Paper 42 (Extended) **March 2017**

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
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part Marks
1 (a)	22.9 or 22.85 to 22.86	**2**	**M1** for $\frac{8}{10+17+8}$ [× 100] oe
(b)	$5635\times\frac{17}{10+17+8}$ or better [= 2737]	**2**	**M1** for $\frac{5635}{(10+17+8)}$
(c)	5000	**3**	**M2** for $5635=k\left(1+\frac{2.42}{100}\right)^5$ oe or **B1** for $\left(1+\frac{2.42}{100}\right)$
(d)	9950	**2**	**M1** for 2 × 2500 or 3 × 1650
(e)	1.98 final answer	**2**	**B1** for 1.976 or 1.98 not final answer or **M1** for 130 × 0.0152
2 (a) (i)	Rotation	**1**	
	90° [anticlockwise] oe	**1**	
	(9, 5)	**1**	
(ii)	Translation	**1**	
	$\begin{pmatrix}-8\\-14\end{pmatrix}$ oe	**1**	
(iii)	Enlargement	**1**	
	[sf] $\frac{1}{3}$	**1**	
	(– 8, – 2)	**1**	
(b) (i)	Image at (1, – 3) (2, – 3) (2, – 5)	**2**	**M1** for triangle correct size and orientation, wrong position or **SC1** for correct reflection in $y = -x$
(ii)	$\begin{pmatrix}0&1\\1&0\end{pmatrix}$	**2**	**B1** for 1 correct column or row

Question	Answer	Marks	Part Marks
3 (a)	0 0.5 oe 1.25 oe	**1, 1, 1**	
(b)	Fully correct smooth curve	**4**	**B3 FT** for 7 or 8 points or **B2 FT** for 5 or 6 points or **B1 FT** for 3 or 4 points
(c)	3.6 to 3.8	**2**	**M1** for $y = 3.5$ soi
(d)	line $y = x + 1$ ruled	**M1**	
	-1.55 to -1.40 4.55 to 4.8	**A1 A1**	If 0 scored **SC1** for $y = x + 1$ stated or implied or for 2 correct values given
(e) (i)	Point plotted at (5, 5)	**1**	
(ii)	Tangent ruled from A	**1**	
(iii)	1.2 to 1.4	**B2**	B2 and M1 dep on reasonable attempt at tangent from (5, 5) **M1** for change in y/ change in x of *their* ruled line
4 (a)	$\frac{1}{8}$ oe	**3**	**M2** for $\frac{1}{2}\left(1-\frac{1}{6}-\frac{1}{4}-\frac{1}{3}\right)$ oe or **M1** for $\frac{1}{6}+\frac{1}{4}+\frac{1}{3}$ seen oe or idea that all sum to 1
(b)	$\frac{7}{12}$ oe	**2**	**M1** for $\frac{1}{3}+\frac{1}{4}$ oe
(c) (i)	$\frac{1}{16}$ oe	**2**	**M1** for $\frac{1}{4}\times\frac{1}{4}$ oe
(ii)	$\frac{2}{24}$ oe	**3**	**M2** for $2\times\frac{1}{6}\times\frac{1}{4}$ oe or **M1** for $\frac{1}{6}\times\frac{1}{4}$ oe
(d)	12	**1**	

Question	Answer	Marks	Part Marks
5 (a) (i)	$(3x-1)(x+4)$	**2**	**M1** for $(3x+b)(x+c)$ with $bc=-4$ or $3c+b=11$ or for $3x(x+4)-1(x+4)$ or for $x(3x-1)+4(3x-1)$
(ii)	$\frac{1}{3}$ oe and -4	**1**	
(b) (i)	$2\times2(x-4)-2(2x+11)=(2x+11)(x-4)$ or better	**M2**	**M1** for common denom $2(2x+11)(x-4)$ seen or attempt to multiply through by denoms or for $\frac{2(x-4)-(2x+11)}{(2x+11)(x-4)}\left[=\frac{1}{2}\right]$
	$2x^2+11x-8x-44$ or better	**B1**	or for other correct relevant 2 bracket expansion if alt method used
	$4x-16-4x-22=2x^2-8x+11x-44$ $2x^2+3x-6=0$	**A1**	correct solution reached with all brackets expanded and no errors or omissions seen
(ii)	$\frac{-3\pm\sqrt{(3)^2-4(2)(-6)}}{2\times2}$	**2**	**B1** for $\sqrt{(3)^2-4(2)(-6)}$ or better or $\left(x+\frac{3}{4}\right)^2$ oe and **B1** for $\frac{-3+\sqrt{q}}{2(2)}$ or $\frac{-3-\sqrt{q}}{2(2)}$ or better or $-\frac{3}{4}+\sqrt{\frac{57}{16}}$ oe or $-\frac{3}{4}-\sqrt{\frac{57}{16}}$ oe
	–2.64 and 1.14 final ans cao	**B1B1**	**SC1** for –2.6 or –2.637... **and** 1.1 or 1.137... or –2.64 and 1.14 seen in working or 2.64 and –1.14 as final answers
6 (a) (i)	27	**1**	
(ii)	3.89 or 3.888 to 3.889	**2**	**M1** for $\frac{7}{EZ}=\frac{9}{5}$ oe
(b)	76 cao	**3**	**B2** for $ABC = 104$ or $AOC = 152$ or $COD = 28$ or $OBA = 52$ **and** $OBC = 52$ or $BCD = 128$ **and** $OCB = 52$ or **B1** for any one of $OBA, OBC, OCB = 52$ or $BCD = 128$

Question	Answer	Marks	Part Marks
(c) (i)	90	**1**	
	angle in semicircle	**1**	
(ii)	27	**1**	
	tangent [perpendicular to] radius	**1**	
(iii)	rectangle	**1**	
7 (a)	72.7 or 72.70 to 72.71 nfww	**4**	**M1** for midpoints **soi** (condone 1 error or omission) (47.5, 55, 65, 80, 95, 110) **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (1092.5, 3520, 7930, 10880, 2470, 3190) **M1** (dep on 2nd M1) for $\sum fx \div 400$
(b) (i)	[23] 87 209 345 371 [400]	**2**	**B1** for 2 or 3 correct
(ii)	Correct graph	**3**	**B1FT** *their* **(b)(i)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least B1) for increasing curve or polygon through 6 points After 0 scored, **SC1FT** *their* **(b)(i)** for 5 correct points plotted
(iii) (a)	69 to 70	**1**	
(b)	20 to 23	**2FT**	**FT** *their* cumulative freq curve **M1** for correct UQ or LQ for *their* cumulative freq curve
(c)	72 to 75	**2**	**M1** for 240 soi
8 (a) (i)	5.14 or 5.135 to 5.142 nfww	**4**	**M2** for $[XY^2 =] 12.5^2 + 9.9^2 - 2 \times 12.5 \times 9.9 \times \cos 23$ or **M1** for implicit version **A1** for 26.4 to 26.5 OR **B1** for $[XYT =]$ 108 or $[TXY =]$ 49 **M2** for $\frac{12.5 \sin 23}{\sin(180-72)}$ oe or **M1** for $\frac{\sin(180-72)}{12.5} = \frac{\sin 23}{XY}$ oe

Question	Answer	Marks	Part Marks
(ii)	15.6 or 15.7 or 15.64 to 15.68	3	**M2** for $[TZ=]\frac{9.9}{\sin 37}\times\sin(72)$ oe or **M1** for $\frac{9.9}{\sin 37}=\frac{TZ}{\sin 72}$ oe OR **M2** for $\frac{12.5\times\sin(180-23-108)}{\sin 37}$ oe or **M1** for $\frac{\sin 37}{12.5}=\frac{\sin(180-23-108)}{TZ}$ oe
(b)	3.79 or 3.793 to 3.794	4	**M3** for $r=20.5\div\left(2+\frac{3\times 65\times 2\pi}{360}\right)$ oe or **M2** for $20.5=2r+\frac{3\times 65}{360}\times 2\pi r$ oe or **M1** for $[3\times]\frac{65}{360}\times 2\pi r$ oe or 20.5 = 2*r* + expression involving π
9 (a)	$x<10$ oe	1	Accept $x\leqslant 9$
	$y\geqslant 2$ oe	1	Accept $y > 1$
(b)	$x+3y\leqslant 21$ oe	1	Mark answer line isw
(c)	ruled broken line $x=10$	B1	or ruled line $x = 9$
	ruled line $y = 2$	B1	or ruled broken line $y = 1$
	ruled line from (0, 7) to (21, 0)	B2	**SC1** for line with negative gradient correct only at (0, 7) or (21, 0)
	correct region indicated cao	1	
(d) (i)	4	1	
(ii)	20	1	
10 (a) (i)	(6 – 2) × 180 or (2 × 6 – 4) × 90 or (360 ÷ 6)	M1	
	(6 – 2) × 180 ÷ 6 or (2 × 6 – 4) × 90 ÷ 6 or 180 – (360 ÷ 6)	M1dep	dep on previous M1
(ii)	1.73*x* or $x\sqrt{3}$ oe	3	**M2** for $2x\sin 60$ or $2x\cos 30$ oe or for $\sqrt{x^2+x^2-2\times x\times x\times\cos 120}$ or **M1** for $x\sin 60$ or $x\cos 30$ oe or for $x^2+x^2-2\times x\times x\times\cos 120$

Question	Answer	Marks	Part Marks
(iii)	$(10-x)\sin 30$ seen oe	**M1**	
	$10+2\left((10-x)\sin 30\right)$ oe	**M1dep**	dep on previous **M1**
	$10+10-x$ or $10+2\times\frac{1}{2}\times(10-x)$	**A1**	with no errors or omissions seen
(b)	12.7 or 12.67 to 12.68.... nfww	**4**	**B3** for 7.32 to 7.33 or **M2** for $x=20\div(1+1.73)$ oe or **M1** for $20-x$ = *their* **(a)(ii)** oe
11 (a)	4 5 6 7 8 16 32 64 128	**1** **3**	**B2** for 3 or 4 correct or **B1** for first 2 correct If 0 scored, **SC1** for 4 values correctly doubled **FT** one error
(b)	2^n oe	**1**	
(c) (i)	$2+4+8=14$	**1**	
	$16-2=14$	**1**	or for $14+2=16=2^4$
(ii)	62 and 6	**2**	**B1** for each
(iii)	$2^{n+1}-2$ oe	**1**	
(iv)	9	**1**	

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