MARK SCHEME for the May/June 2015 series

0444 MATHEMATICS (US)

0444/31	Paper 3, maximum raw mark 104

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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

			Answer	Mark	Part marks
1	**(a)**	**(i)**	At least two of 1, 2, 3, 4, 6, 12	**1**	No incorrect factors
		(ii)	23	**1**	
		(iii)	4	**1**	
		(iv)	2 000 507	**1**	
		(v)	e.g. 75, 150	**1**	Accept any $75k$, $k > 0$
		(vi)	3.1416	**1**	
	(b)	**(i)**	163	**1**	
		(ii)	7.5	**1**	
	(c)	**(i)**	63521.8	**1**	
		(ii)	63500 cao	**1**	
	(d)	**(i)**	[0].234	**1**	
		(ii)	8 760 000	**1**	
2	**(a)**	**(i)**	6	**1**	
		(ii)	0.21	**2**	**M1** for $\dfrac{220}{38}$ or better
	(b)	**(i)**	5, 15, 20	**2**	**B1** for 1 correct answer in the right place or **M1** for $40 \div (1 + 3 + 4)[\times k]$ soi where k is 1 or 3 or 4
		(ii)	2 : 3 : 5	**2**	**M1** for (16,24,40) or better or **M1FT** for '*their* (5,15,20)' + (11,9,20) or better
	(c)	**(i)**	570	**1**	
		(ii)	$b + 2t = 240$	**2**	**B1** for $b + 2t$ seen

	(iii)	[*b*] 90 [*t*] 75 Working must be shown	**3**	**M1FT** for correct elimination of one variable **A1** for *b* = 90 **A1** for *t* = 75 If zero is scored **SC1** for 2 values satisfying one of their equations (ft) **SC1** if no working shown, but 2 correct answers given	
	(d)	16.83	**3**	**B1** for 340 or 0.2 or 5 seen **M1** for figs 340 ÷ figs 20 × figs 99 or figs 340 × figs 5 × figs 99	
3	**(a) (i)**	292	**1**		
	(ii)	380	**2**	**B1** for (9.5 ± 0.2) If zero scored, **SC1** for figs '372 to 388'	
	(iii)	125	**2**	**M1** for $\dfrac{450 \times 1000}{60 \times 60}$ or better	
	(b) (i)	0.85	**1**		
	(ii)	36	**1**		
	(c) (i)	6	**1**		
	(ii)	16	**1**		
	(iii)	17	**1**		
	(iv)	17.5	**2**	**M1** for (15+16+16+18+19+21) ÷ 6	
	(v)	$\dfrac{2}{6}$ oe	**1**		
	(d)	2.62	**2**	**M1** for 3.25 ÷ 1.24	
4	**(a) (i)**	rotation [centre] (0, 0) oe 90° clockwise oe	**1** **1** **1**		
	(ii)	reflection *y* axis or *x* = 0	**1** **1**		
	(iii)	translation $\begin{pmatrix} -8 \\ -5 \end{pmatrix}$	**1** **1**		
	(b)	correct enlargement shown	**2**	**B1** for enlargement of sf 2 anywhere on the grid	
5	**(a) (i)**	2	**1**		
	(ii)	0	**1**		

	(iii)	360	**1**		
(b)	**(i)**	correct bisector drawn with 2 pairs of correct arcs reaching *DC*	**2**	**B1** for correct bisector without arcs reaching *DC* or correct bisector with 2 pairs of arcs not reaching *DC*	
	(ii)	alternate [angles]	**1**		
	(iii)	isosceles	**1**		
		[angle] *DAE* = [angle] *DEA* oe	**1**		
	(iv)	trapezoid or trapezium	**1**		
6	**(a)** **(i)**	$(0, 1\frac{1}{2})$	**2**	**B1** for each co-ordinate	
	(ii)	$\begin{pmatrix} 6 \\ -7 \end{pmatrix}$	**1**		
	(iii)	(2, 3)	**1**		
(b)	**(i)**	Ruled straight line parallel to f(*x*) through (0, 1)	**2**	**B1** for ruled straight line parallel to f(*x*)	
	(ii)	Correct horizontal translation through (0, 0) and (1, 0)	**2**	**B1** for any horizontal translation	
7	**(a)**	153	**2**	**M1** for 90 + 63 or 180 − (90 + 63) oe or [angle *BCA*=]27	
		two correct geometrical reasons	**2**	**B1** for angle [in] semi-circle [is 90] **B1** for angles [in a] triangle [sum to] 180 or angles [on a] straight line [sum to] 180	
(b)		14.8 or 14.79 to 14.80	**5**	**M2** for $\frac{3}{4} \times \pi \times 3^2$ or **M1** for $\pi \times 3^2$ **M1** for 6 × 6 or 36 **M1dep** for *their* 6 × 6 – *their* $k \times \pi \times 3^2$	
(c)	**(i)**	36	**3**	**M2** for $\sqrt{45^2 - 27^2}$ or better or **M1** for $45^2 = GH^2 + 27^2$ or better	
	(ii)	108	**1FT**		
	(iii)	486	**2FT**	**M1FT** for 0.5 × 27 × *their* **(c)(i)**	

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	(iv)	36.9 or 36.86 to 36.87	2	**M1** for $\sin(....) = \dfrac{27}{45}$ or $\cos(....) = \dfrac{their\mathbf{(c)(i)}}{45}$ or $\tan(....) = \dfrac{27}{their\mathbf{(c)(i)}}$ or better
8	**(a) (i)**	0 , 6 , 6 , –6	2	**B1** for any 3 correct
	(ii)	8 points correctly plotted correct smooth curve	4	**B3FT** for 7 or 8 correct **B2FT** for 5 or 6 correct **B1FT** for 3 or 4 correct
	(b)	$(2.5, k)$ where $6 < k \leqslant 6.5$	1	
	(c)	5.4 to 5.7 −0.4 to −0.7	1FT 1FT	
	(d) (i)	correct line drawn	1	
	(ii)	$x = 2.5$	1	
	(iii)	15	1	
9	**(a)**	green	1	
	(b)	72	3	**B1** for $135° \pm 2°$ seen **M1** for $\dfrac{360 \times 27}{their\, 135}$ oe
	(c)	22.2	2	**M1** for $\dfrac{80 \pm 2}{360} \times 100$ or **M1FT** for $\dfrac{their\, \text{red}}{their\, \text{total}} \times 100$