MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/43	Paper 4 (Extended), maximum raw mark 130

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)	3.9[0]	2	**M1** for $2.6 \div 2$
(ii)	$\dfrac{13}{18}$ cao	2	**B1** for any correct unsimplified fraction
(iii)	24	3	**M2** for $9 \div 0.375$ oe or **M1** for associating 9 with $(100 - 62.5)\%$
(b)	109 cao	3	**B2** for 108.5 to 108.6 or **M1** for $250 \times \left(1 - \dfrac{8}{100}\right)^{10}$ oe
2 (a) (i)	Image at $(-2, 5)$, $(1, 5)$, $(1, 7)$	2	**SC1** for translation $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or 3 correct vertices plotted but not joined
(ii)	Image at $(2, -3)$, $(5, -3)$, $(5, -5)$	2	**SC1** for a reflection in a horizontal line or in the line $x = -1$ or 3 correct vertices plotted but not joined
(b)	Rotation	1	Alt Enlargement SF -1 $(-1, 0)$
	180 oe	1	
	$(-1, 0)$	1	Not as column vector
(c) (i)	Reflection	1	
	$y = -x$ oe	1	
(ii)	$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$	2	**SC1** for a correct row or column

3	(a)	43 200	3	**M2** for $0.5 \times (35 + 25) \times 12 \times 120$ oe or **M1** for $0.5 \times (35 + 25) \times 12$ oe
	(b) (i)	$0.5 \times (25 + 30) \times 6 \times 120$ [$= 19\,800$]	**M2**	Dep on a valid method for obtaining the width of $30\,\text{cm}$ **B1** for $0.5 \times (25 + 35)$ oe
	(ii)	45.8 or 45.83…	**1FT**	**FT** for $\dfrac{19\,800}{their\ (a)} \times 100$
	(c)	1 hr 39 min	4	**B3** for 1.65 [h] or 99 mins or $\dfrac{33}{20}$ or **M2** for $\dfrac{19\,800}{12 \times 1000}$ oe or **M1** for $\dfrac{19\,800}{12}$ or $\dfrac{19\,800}{1000}$ or 12×1000 If zero scored then **SC1** for figs 165 **and** **B1** for converting their time (in hours) into hours and minutes
	(d)	12.8 or 12.80 to 12.81	3	**M2** for $\sqrt[3]{\dfrac{19\,800}{3\,\pi}}$ or **M1** for $\pi r^2\ 3r = 19\,800$
	(e)	21[.0]	2	**M1** for $\dfrac{19\,800}{1000} + 1.2$

4	**(a)**		-1.5, 0.5	**2**	**B1**, **B1**
	(b)		Correct curve	**5**	**B3 FT** for 10 or 11 points or **B2FT** for 8 or 9 points or **B1FT** for 6 or 7 points and **B1** independent for two branches **SC4** for correct curve but branches joined
	(c)		1.25 to 1.35	**1**	
	(d)		-1	**1**	
	(e)	**(i)**	$2 - x$	**1**	
		(ii)	Ruled line with gradient -1 through $(0, 2)$ and fit for purpose	**2FT**	**SC1** for **ruled** line, with gradient -1 or through $(0, 2)$, but not $y = 2$ **FT** *their* $y = mx + c$ from **(e)(i)**, if $m \neq 0$ **SC1FT** for **ruled** line either with correct gradient or through $(0, c)$, but not $y = c$
			1.15 to 1.25 cao	**1**	
5	**(a)**		2180 or 2181…. nfww	**4**	**M2** for $680^2 + 2380^2 - 2 \times 680 \times 2380 \cos 65$ oe or **M1** for correct implicit cosine formula **A1** for $4\,760\,000$ or $4\,758\,000$ to $4\,759\,000$
	(b)		78.7 or 78.71…	**3**	**M2** for $\dfrac{2380 \sin 40}{1560}$ or **M1** for $\dfrac{1560}{\sin 40} = \dfrac{2380}{\sin M}$ oe
	(c)		309 or 308.7…	**2FT**	**FT** $230 +$ *their* **(b)** **B1FT** $50 +$ *their* **(b)** for 129 or 128.7… [i.e. for C from M]
	(d)	**(i)**	23 39 oe	**1**	
		(ii)	650	**2**	**M1** for $1560 \div$ journey time

6	(a)		101.5625 or 102 or 101.5 to 101.6 nfww	4	**M1** for 55, 90, 110, 160 soi **M1** for Σfm with frequencies and each m in or on a boundary of a correct interval 2750, 2700, 4400, 6400 **M1 dep on 2nd M** for ÷ 160
	(b)		Correct histogram drawn with correct widths and heights 1, 1.5 and 2 (no gaps)	3	**B1** for each correct block If zero scored, **SC1** for correct heights or frequency densities
	(c)		$\dfrac{40}{160}$ oe	1	
	(d)	(i)	$\dfrac{1560}{25440}$ oe	2	**M1** for $\dfrac{40}{160} \times \dfrac{39}{159}$
		(ii)	$\dfrac{4000}{25440}$ oe	3	**M2** for $\dfrac{40}{160} \times \dfrac{50}{159} + \dfrac{50}{160} \times \dfrac{40}{159}$ oe or **M1** for one of these products soi
7	(a)		83 nfww	4	**B3** for $17x = 1411$ or $17x = 14.11$ oe in form $ax = b$ or final answer of 0.83 or **B2** for $6x + 11x - 55 = 1356$ oe or $6x + 11x -[0.]\,55 = 13[.]56$ or **M1** for $6x + 11(x - [0.0]5) = 13[.]56$
	(b)		$\dfrac{1}{3}$ oe nfww	4	**M1** for $y(y+3)$ oe or $\dfrac{1}{2}(2y+1)(y+1)$ oe and **B2** for $2y^2 + 6y = 2y^2 + 2y + y + 1$ oe or better or **B1** for $(2y+1)(y+1) = 2y^2 + 2y + y + 1$ soi

(c)	25 nfww	4	**M1** for $\dfrac{4[.]80}{w-1}$ or $\dfrac{7[.]80}{2w-11}$ **M1** for $\dfrac{4[.]80}{w-1} = \dfrac{7[.]80}{2w-11}$ oe **M1** for $480(2w-11) = 780(w-1)$ oe or ALT **M1** for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$ **M1** for $2wn - 11n = 7[.]80$ $2wn - 2n = 9[.]60$ oe **M1** for $9n = 180$ oe or better or ALT **M1** for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$ **M1** for $\dfrac{4[.]80 + n}{n} = \dfrac{7[.]80 + 11n}{2n}$ **M1** for $9n = 180$ oe or better	
(d) (i)	$\dfrac{1}{2}u(3u-2) = 2.5$ One further correct step leading to $3u^2 - 2u - 5 = 0$ with no errors	M1 A1	First step must involve $\dfrac{1}{2}u(3u-2)$	
(ii)	$(3u-5)(u+1)$	2	**SC1** for $(3u + a)(u + b)$ where $ab = -5$ or $a + 3b = -2$ $[a, b$ integers$]$	
(iii)	29.1 or 29.05…	3	**M2** for $\tan = \dfrac{their\ \frac{5}{3}}{3 \times their\ \frac{5}{3} - 2}$ or **M1** for substituting *their* positive value of u into $[u$ and$]$ $3u - 2$	
8 (a) (i)	Angle A is common to both triangles oe $ADB = ABC$ Third angle of triangles equal oe	1 1dep	Accept $DAB = CAB$ oe Dep on previous mark	
(ii)	Similar	1		
(iii)	8.25	2	**M1** for $\dfrac{16}{12} = \dfrac{11}{BD}$ oe or better	
(b) (i)	38	1		
(ii)	38	1		
(iii)	78	1		
(iv)	26	1		

(c)	36 nfww	5	**B4** for an equation in m that simplifies to $5m = 180$ or **B1** for each of 3 of the listed angles expressed in terms of m, in it's simplest form, stated or labelled on diagram Angle $PQO = m$ Angle $QOR = m$ Angle $OQR = 2m$ Angle $PQR = 3m$ or $180 - 2m$ or $90 + \dfrac{m}{2}$ Angle $POR = 180 - m$ or $4m$ or $360 - 6m$ Reflex angle $POR = 360 - 4m$ or $6m$ or $180 + m$	
9 **(a)**	8	1		
(b)	3	2	**B1** for [g(0.5) =] 2 soi or **M1** for $2\left(\dfrac{1}{x}\right) - 1$ or better	
(c)	$\dfrac{x+1}{2}$ final answer	2	**M1** for $x = 2y - 1$ or $y + 1 = 2x$ or better or $\dfrac{y}{2} = x - \dfrac{1}{2}$	
(d)	$4x - 3$	2	**M1** for $2(2x - 1) - 1$	
(e)	$4x^2 - 4x + 7$	2	**B1** for $\left[(2x-1)^2\right] = 4x^2 - 2x - 2x + 1$	
(f)	x	1		
(g)	$g^{-1}(x) = g(x)$	1		
(h)	fh(x)	1		

10	**A**	–13, –20	1	
		$-7n + 22$ oe	2	**SC1** for $-7n + k$ or $kn + 22$ oe
	B	$\dfrac{9}{22}, \dfrac{10}{23}$	1	
		$\dfrac{n+4}{n+17}$ oe	2	**B1** for $n + 4$ oe or $n + 17$ oe seen, but not in wrong position
	C	26, 37	1	
		$n^2 + 1$ oe	1	
	D	162, 486	1	
		$2 \times 3^{n-1}$ oe	2	**SC1** for $k \times 3^{n+p}$ [k, p integers] Accept $2 \times \dfrac{3^n}{3}$