MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

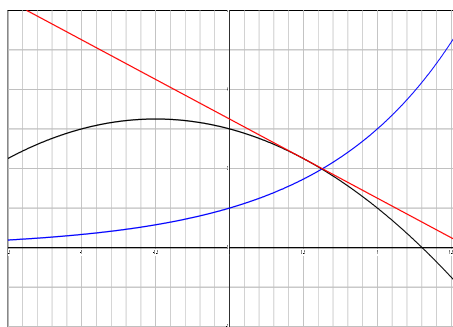**0580/41**   Paper 4 (Extended), maximum raw mark 130

Abbreviations

cao   correct answer only
cso   correct solution only
dep   dependent
ft   follow through after error
isw   ignore subsequent working
oe   or equivalent
SC   Special Case
www   without wrong working
art   anything rounding to
soi   seen or implied

Qu.			Answer	Mark	Part marks
1	**(a)**	**(i)**	[0]8 15	1	
		(ii)	$\frac{1.8}{27} \times 60$ [= 4] oe	M2	**M1** for $\frac{1.8}{27}$ oe [0.0667 or better]
	(b)	**(i)**	275	3	**M2** for $\frac{15-4}{4} \times 100$ or $\frac{15}{4} \times 100 - 100$ oe or **M1** for $\frac{15-4}{4}$ or $\frac{15}{4} \times 100$ or oe 375
		(ii)	73.3[3…]	3	**M2** for $\frac{1.8}{15} \times 60$ [=7.2 min] and $\frac{27 - their\ 7.2}{27} \times 100$ oe or **M1** for $\frac{1.8}{15} \times 60$ [=7.2 min] or final answer of 26.6[6…] or 26.7
		(iii)	25	2	**M1** for $\frac{9}{figs\ 36}$ oe

Qu.			Answer	Mark	Part marks
2	(a)		3, 0.33[3…], 1	3	**B1** for each correct value
	(b)		Correct quadratic curve	3	**B2FT** for 7 correct points or **B1FT** for 5 or 6 correct points
			Correct exponential curve	3	**B2FT** for 7 correct points or **B1FT** for 5 or 6 correct points
	(c)	(i)	Answer in range $1.2 < x < 1.4$	1	
		(ii)	Answer in range $1.2 < x < 1.35$	1	Not from a line other than $y = 4$ (±1mm)
		(iii)	Answer in range $0.55 < x < 0.7$	1	
	(d)		Correct tangent drawn And answer in range $-2.5 < m < -1.5$	3	**B1** for correct tangent at $x = 0.5$ **B2** for answer in range dep on close attempt at tangent **M1** for $[-]\dfrac{rise}{run}$ used with values soi from tangent, dep on close attempt at tangent or answer in range $1.5 < m < 2.5$ or **SC1** for close attempt at tangent to exponential curve and answer in the range $1.6 < m < 2.2$
3	(a)	(i)	3.2	1	
		(ii)	4.2	1	
		(iii)	4.6	1	
		(iv)	196	1	
	(b)	(i)	100, 46, 12	2	**B1** for 2 correct
		(ii)	4	2	**M1** for frequency of 60 or 140 seen in workspace

Qu.			Answer	Marks	Part marks
4	(a)		Enlargement	1	
			[centre] (–3, 4)	1	Do not allow column vector for coordinates
			[scale factor] 3	1	
	(b)	(i)	Image at (1 5), (4, 5), (4, 6), (1, 7)	2	**SC1** for translation by $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$
		(ii)	Image at (5, 1), (8, 1), (8, 3), (5, 2)	2	**SC1** for reflection in $y = 2$
		(iii)	Image at (– 4, 3), (– 1, 3), (– 1, 6), (– 4, 9)	2	**SC1** for three correct vertices or shape with vertices at (–4, 1) and (–1, 1), (–1, 4) and (–4, 7)
		(iv)	$\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$	2	**SC1** for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$, $k \neq \pm 1$ or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$
	(c)		Reflection $y = x$ oe	2	**B1 B1** independent
5	(a)		171.25 (or 171 or 171.2 or 171.3) www	3	**M1** for $5 \times 155 + 9 \times 162.5 + 18 \times 172.5 + 10 \times 185$ [$= 7192.5$] and **M1** (dep on **M1**) for *their* $\Sigma fx \div 42$
	(b)		$160 < x \le 165$ oe	1	
	(c)		Blocks with heights of 1.8, 1.2, 1, with correct interval widths and no gaps	4	**B3** for 2 correct blocks or **B2** for 1 correct block or **B1** for 3 correct frequency densities or heights or 3 correct widths

Qu.		Answer	Marks	Part marks
6	**(a)**	31.4	3	**M2** for $\dfrac{15.7}{\sin 30}$ or **M1** for correct implicit statement
	(b)	$[\sin E =] \dfrac{15.7 \times \sin 52}{16.5}$ 48.573…	**M2** **A1**	**M1** for correct implicit statement
	(c) (i)	$[\angle ACE =] 180 - 52 - 48.57$ $[= 79.43]$ $[\angle ECD =] 40.57…$	**M1** **A1**	
	(ii)	15.3 or 15.27 to 15.281 www	4	**M2** for $[(DE)^2 =] 16.5^2 + 23.4^2 - 2 \times 16.5 \times 23.4\cos(40.6 \text{ or } 40.57)$ or **M1** for full correct implicit statement **A1** for 233 to 234
	(d)	466 or 466.34 to 466.5	4	**M1** for $0.5 \times 15.7 \times$ *their* $31.4 \sin(90 - 30)$ oe **M1** for $0.5 \times 15.7 \times 16.5 \sin(128 - $ *their* 48.6 or $48.57)$ oe **M1** for $0.5 \times 16.5 \times 23.4 \sin(40.6$ or $40.57)$ oe

Qu.	Answer	Mark	Part marks
7 (a)	6.61 (6.614…) www	6	**B1** for $\dfrac{x+2}{2x+3} = \dfrac{9}{16}$ oe **M1** for $16(x+2) = 9(2x+3)$ or better **A1** for $[x =] 2.5$ **M2** for $\sqrt{\{(2 \times their\ x + 3)^2 - (their\ x + 2)^2\}}$ or **M1** for $(2 \times their\ x + 3)^2 - (their\ x + 2)^2$ or **SC2** for final answer of $4\sqrt{13}$ or $\dfrac{7\sqrt{15}}{2}$ or better **SC1** for final answer of $5\sqrt{7}$ or better
(b) (i)	White = 8.5, red = 11	5	**B3** for $7w + 5(w + 2.5) = 114.5$ or for $7(r - 2.5) + 5r = 114.5$ oe **B1** for 8.5 or 11 or **SC2** for $7w + 5 \times w + 2.5 = 114.5$ leading to 9.33[3…] or **SC1** for $7w + 5 \times w + 2.5 = 114.5$ OR **B1** for $r = w + 2.5$ oe **B1** for $7w + 5r = 114.5$ oe **M1** for elimination of a variable **A1** for 8.5 or 11
(ii) (a)	$\dfrac{42}{132}$ or $\dfrac{21}{66}$ or $\dfrac{14}{44}$ or $\dfrac{7}{22}$ (0.318 or 0.3181 to 0.3182)	2	**M1** for $\dfrac{7}{12} \times \dfrac{6}{11}$
(ii) (b)	$\dfrac{70}{132}$ or $\dfrac{35}{66}$ (0.53[0] or 0.5303…)	3	**M2** for $\dfrac{7}{12} \times \dfrac{5}{11} + \dfrac{5}{12} \times \dfrac{7}{11}$ or $1 -$ *their* (a) $- \dfrac{5}{12} \times \dfrac{4}{11}$ or **M1** for $\dfrac{7}{12} \times \dfrac{5}{11}$ or $\dfrac{35}{132}$ or **SC1** for $\dfrac{70}{144}$ oe from replacement

Qu.	Answer	Mark	Part marks
8 (a) (i)	118	**2**	**M1** for $(3 \times 180 - 2 \times 110 - 84)$ [÷ 2] or better
(ii)	31	**1FT**	FT $(180 - their \text{ (i)}) \div 2$
(iii)	22	**1FT**	FT $84 - 2 \times their$ (ii) or $2 \times their$ (ii) $- 40$, only if positive answer and less than 84
(b)	32	**4**	**B2** for $360 - 3y = 2(4y + 4)$ oe and **B1** for $11y = 352$ oe or **M1** for angle at centre = $2 \times$ angle at circumference soi
(c) (i)	Opposite angles [cyclic quad] add to 180	**1**	
(ii)	68	**3**	**M1** for [angle $PRS =$] $102 \div 3 \times 2$ and **M1** for angle PQS = angle PRS or angle PRQ = angle PSQ
(d)	5.75	**3**	**M2** for $6.9 \times \sqrt{\dfrac{5}{7.2}}$ oe or **M1** for evidence of ratio of areas = (ratio of sides)^2 or sf = 1.2
9 (a)	$\dfrac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-3)}}{2}$	**2**	**B1** for $\sqrt{1^2 - 4 \times 1 \times (-3)}$ or better and if in the form $\dfrac{p + \sqrt{q}}{r}$ or $\dfrac{p - \sqrt{q}}{r}$ then **B1** for $p = -1$ and $r = 2(1)$ or better
	–2.30, 1.30 final answer	**2**	**B1 B1** SC1 for –2.30 and 1.30 seen or –2.3 or –2.303 to – 2.302 **and** 1.3 or 1.302 to 1.303 or final answer –1.30 and 2.30
(b)	4, 30, 53	**3**	**M1** for $(2x + 7)^2 + (2x + 7) - 3$ and **B1** for $(2x + 7)^2 = 4x^2 + 14x + 14x + 49$ oe

Qu.			Answer	Mark	Part marks
	(c)		$\dfrac{x-7}{2}$	2	**M1** for $y - 7 = 2x$ or $x = 2y + 7$ or -7 then $\div\, 2$ clearly seen in correct order with arrow or better or $\dfrac{y-7}{2}$
	(d)		-2	1	
	(e)		1.158×10^{77}	4	**B3** for 1.16×10^{77} or $1.1579\ldots \times 10^{77}$ or 1.157×10^{77} or **B2** for 2^{256} seen or **B1** for 2^{8} seen or 256
10	(a)		50, 70	1	
			$10n$ oe	1	
			51, 71	1	
			$10n + 1$ oe	1	
	(b)	(i)	212	1	
		(ii)	$20n + 12$	1	
		(iii)	$20n + 152$	1	
	(c)	(i)	$5 \times 3^2 + 6 \times 3 = 63$ and $11 + 21 + 31 = 63$	1	
			or $32 + 31 = 63$ or $11 + 52 = 63$	1	
		(ii)	560	1	
	(d)		Complete solution with no errors seen and a conclusion e.g. $5n^2 + 6n + 10(n + 1) + 1$ $= 5n^2 + 6n + 10n + 10 + 1$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5(n + 1)^2 + 6(n + 1)$	4	**B1** for $5n^2 + 6n + 10n + 10 + 1$ or better **B1** for use of $5(n + 1)^2 = 5n^2 + 10n + 5$ oe at any stage **B1** for use of $6n + 6 = 6(n + 1)$ oe at any stage