

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/41

Paper 4 (Extended), maximum raw mark 130

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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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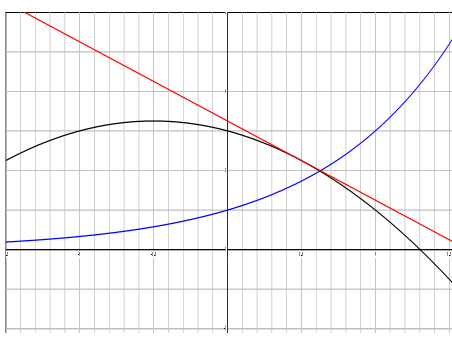
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Abbreviations

- 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)	1	
	(ii)	M2	M1 for $\frac{1.8}{27}$ oe [0.0667 or better]
	(b) (i)	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)	3	M2 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ and $\frac{27 - \text{their } 7.2}{27} \times 100$ oe or M1 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ or final answer of 26.6[6...] or 26.7
	(iii)	2	M1 for $\frac{9}{\text{figs } 36}$ oe

Qu.	Answer	Mark	Part marks
2	(a)	3	B1 for each correct value
	(b)	3	B2FT for 7 correct points or B1FT for 5 or 6 correct points
		3	B2FT for 7 correct points or B1FT for 5 or 6 correct points
	(c) (i)	1	Answer in range $1.2 < x < 1.4$
	(ii)	1	Answer in range $1.2 < x < 1.35$ Not from a line other than $y = 4$ ($\pm 1\text{mm}$)
(iii)	1	Answer in range $0.55 < x < 0.7$	
(d)	3	Correct tangent drawn And answer in range $-2.5 < m < -1.5$	B1 for correct tangent at $x = 0.5$ B2 for answer in range dep on close attempt at tangent M1 for $[-] \frac{\text{rise}}{\text{run}}$ 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)	1	3.2
	(ii)	1	4.2
	(iii)	1	4.6
	(iv)	1	196
	(b) (i)	2	100, 46, 12
	(ii)	2	4



Qu.	Answer	Marks	Part marks	
4	(a)	Enlargement		
		[centre] (-3, 4)	1	
		[scale factor] 3	1	
	(b) (i)	Image at (1, 5), (4, 5), (4, 6), (1, 7)	2	Do not allow column vector for coordinates 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 <i>their</i> $\Sigma fx \div 42$
	(b)	$160 < x \leq 165$ 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 $\frac{15.7}{\sin 30}$ or M1 for correct implicit statement
(b)	$[\sin E =] \frac{15.7 \times \sin 52}{16.5}$ 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 $0.5 \times 15.7 \times \text{their } 31.4 \sin(90 - 30)$ oe M1 for $0.5 \times 15.7 \times 16.5 \sin(128 - \text{their } 48.6 \text{ or } 48.57)$ oe M1 for $0.5 \times 16.5 \times 23.4 \sin(40.6 \text{ or } 40.57)$ oe

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

Qu.	Answer	Mark	Part marks
8	(a) (i)	118	M1 for $(3 \times 180 - 2 \times 110 - 84) \div 2$ or better
	(ii)	31	1FT FT $(180 - \textit{their (i)}) \div 2$
	(iii)	22	1FT FT $84 - 2 \times \textit{their (ii)}$ or $2 \times \textit{their (ii)} - 40$, 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 $6.9 \times \sqrt{\frac{5}{7.2}}$ oe or M1 for evidence of ratio of areas = (ratio of sides) ² or sf = 1.2	
9	(a)	$\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-3)}}{2}$ -2.30, 1.30 final answer	2 B1 for $\sqrt{1^2 - 4 \times 1 \times (-3)}$ or better and if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ 2 then B1 for $p = -1$ and $r = 2(1)$ or better 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)	$\frac{x-7}{2}$	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 $\frac{y-7}{2}$
(d)	-2	1	
(e)	1.158×10^{77}	4	B3 for 1.16×10^{77} or $1.1579... \times 10^{77}$ 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)	$5 \times 3^2 + 6 \times 3 = 63$	1	
	and $11 + 21 + 31 = 63$		
	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