

MARK SCHEME for the October/November 2014 series

0581 MATHEMATICS

0581/42

Paper 4 – Extended, maximum raw mark 130

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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

Qu.	Answer	Mark	Part marks
1	(a) (i) 49.5[0]	3	M2 for $16.5[0] \div 5 \times (5 + 3 + 7)$ or M1 for $16.5[0] \div 5$
	(ii) 66	1FT	FT <i>their</i> (a)(i) $\div 75 \times 100$ to 3 sf or better
	(b) 2 hours 39 mins 45 secs	3	B2 for 159.75 oe, e.g. 2.6625 [h] 9585 [s] or M1 for 3 hrs 33 mins oe / (2 + 9 + 1) oe
	(c) 18.75 final answer	3	M2 for $16.5[0] \div 0.88$ oe or M1 for 16.5[0] associated with 88[%]
2	(a) $x > 0.5$ oe final answer nfww	3	B2 nfww for 0.5 with no/incorrect inequality or equals sign as answer or M2 for $7x + 15x > 6 + 5$ or better or $-6 - 5 > -7x - 15x$ or better or M1 for $6 - 15x$ seen
	(b) (i) $(p - 2)(q + 4)$ final answer	2	M1 for $q(p - 2) + 4(p - 2)$ or $p(q + 4) - 2(q + 4)$
	(ii) $(3p - 5)(3p + 5)$ final answer	1	
	(c) $(5x - 9)(x + 2)$	M2	M1 partial factorisation, e.g. $x(5x - 9) + 2(5x - 9)$ or SC1 for $(5x + a)(x + b)$ where $ab = -18$ or $a + 5b = 1$
	$\frac{9}{5}$ oe and -2 final answer	B1	

3	(a)	$35 < t \leq 40$	1	
	(b)	22.5, 27.5, 32.5, 37.5, 42.5, 47.5	M1	At least 4 correct mid-values soi
		$(2 \times 22.5 + 6 \times 27.5 + 7 \times 32.5 + 19 \times 37.5 + 9 \times 42.5 + 7 \times 47.5)$	M1	$\sum fx$ where x is in the correct interval allow one further slip [45 + 165 + 227.5 + 712.5 + 382.5 + 332.5 = 1865]
	(c) (i)	$\div 50$ or their $\sum f$	M1dep	Dependent on second method
		37.3	A1	SC2 for correct answer with no working
(ii)	15, 19, 16	1		
4	(a)	rectangular bars of height 1, 3.8 and 1.6	B2FT	FT their (c)(i), on correct boundary lines B1FT for 2 correct heights If 0 scored for heights then SC1 for 3 correct frequency densities soi
	(b) (i)	correct widths of 15, 5, 10 and no gaps	B1	
	(b) (ii)	Enlargement [SF] – ½ oe [centre] (2, 5)	3	B1 for each
	(b) (iii)	Image at (–2, 6), (–8, 3), (–4, 3)	2	SC1 for reflection in any vertical line or for 3 correct points not joined
	(c) (i)	Image at (3, –2), (3, 2), (6, 4)	2	SC1 for rotation 90° [anti clockwise] around origin at (–3, 2) (–3, –2) (–6, –4) or for 3 correct points not joined
(c) (ii)	Image at (–5, 1), (–3, –2), (1, –2)	2	SC1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or for 3 correct points not joined	
(c) (iii)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 for a correct row or column	
(c) (iv)	Rotation, 90° [anticlockwise] oe origin oe	2	B1 for two elements correct	

5	(a) (i)	8	1	
	(ii)	4	2	M1 for $[g(17) =] \frac{7}{14}$ or $2\left(\frac{7}{x-3}\right)^2 + 7\left(\frac{7}{x-3}\right)$
	(b)	4 or -4	3	M2 for $x^2 = 16$ or $x^2 - 16 = 0$ or M1 for $7 = (x-3)(x+3)$ or better
	(c)	$2x^2 + 7x - 11 [= 0]$ soi $\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-11)}}{2(2)}$	B1 B1FT B1FT	FT $2x^2 + 7x \pm$ their k [$k \neq 0$] oe B1FT for $\sqrt{7^2 - 4(2)(-11)}$ or better or $\left(x + \frac{7}{4}\right)^2$ oe If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1FT for -7 and 2(2) or better or $-\frac{7}{4} +$ or $-\sqrt{\frac{137}{16}}$ oe
	(d)	$-\text{4.68, 1.18 final answers}$ $\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$	B1B1 2	If B0, SC1 for answers -4.7 and 1.2 or -4.676... and 1.176.. seen or for -4.68 and 1.18 seen or for answer 4.68 and -1.18 M1 for correct first step or better, e.g. $5y = x + 2$ or $x = \frac{y+2}{5}$ or $x = 5y - 2$ or $y + 2 = 5x$ or $\frac{y}{5} = x - \frac{2}{5}$
(e)	-2	1		

6	(a)	-3, 7.375, 8.875	1, 1, 1	Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.87 or 8.88 for 8.875
	(b)	Correct curve	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots Point must touch line if exact or be in correct square if not exact (including boundaries)
	(c) (i)	Any integer less than 7 or greater than 10	1	
	(ii)	7, 8 or 9	1	
	(d)	$y = 15x + 2$ ruled and fit for purpose	B2	B1 for short line but correct or freehand full length correct line or for ruled line through (0, 2) (but not $y = 2$) or for ruled line with gradient 15 (acc ± 1 mm vertically for 1 horizontal unit)
	(e)	-1.45 to -1.35 and 0.4 to 0.5 Tangent ruled at $x = 1.5$	B2 B1	B1 for each No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.4$ and 1.6
7	(a) (i)	$120 \times 55 \times 75 [= 495000]$ $\div 1000 [= 495]$ or $495[1] \times 1000 = 495000[\text{ml}]$	M1 M1	
	(b) (i)	11	2	M1 for $495000 \div 750 [= \div 60]$ oe [660] After 0 scored, SC1 for answer figs 11
	(ii)	37.5 or 37.50 to 37.51	3	M2 for $\sqrt{\frac{\text{figs}495}{112\pi}}$ oe or M1 for $[112r^2 =] \frac{\text{figs}495}{\pi}$ or $[\pi r^2 =] \frac{\text{figs}495}{112}$ or better

(c)	15	4	<p>B3 for answer 60 or M3 for $75 - \sqrt{145^2 - (55^2 + 120^2)}$ oe M2 for $\sqrt{145^2 - (55^2 + 120^2)}$ oe or M1 for $\sqrt{55^2 + 120^2}$</p>
(d)	24.4[4..] to 24.45	3	<p>M2 for $\cos^{-1}(\sqrt{55^2 + 120^2}/145)$ oe, e.g. or $\sin^{-1}(75 - \text{their (c)})/145$ or $\tan^{-1}((75 - \text{their (c)})/\sqrt{55^2 + 120^2})$ or M1 for $\cos = \sqrt{55^2 + 120^2}/145$ oe or $\sin = (75 - \text{their (c)})/145$ or $\tan = (75 - \text{their (c)})/\sqrt{55^2 + 120^2}$</p>
8 (a)	<p>Angle $LPQ = 32$ soi $58^2 + 74^2 - 2 \times 58 \times 74 \cos \text{their } P$</p> <p>39.50[1...]</p>	<p>B1 M2</p> <p>A2</p>	<p>M1 for correct implicit cos rule</p> <p>A1 for 1560.3 to 1560.4 or 1560</p>
(b)	<p>$\sin PQL = \frac{58 \sin \text{their } P}{39.5}$ oe</p> <p>51.1 or 51.08 to 51.09</p>	M2	M1 for $\frac{\sin PQL}{58} = \frac{\sin(\text{their } P)}{39.5}$ oe
(c) (i)	322	B1	M1 for 180 + 142 oe
(ii)	[0]13[.1] or 13.08 to 13.09	2	1FT FT <i>their (b)</i> – 38
(d)	17.8 or 17.77 to 17.78	3	<p>M1 for $74 \div 2.25$ oe soi by 32.888... to 3 sf or better M1 for dist or speed $\div 1.85$</p>
(e)	30.7 or 30.73 to 30.74...	3	<p>M2 for $58 \sin \text{their } P$ oe or $39.5 \sin \text{their (b)}$ or M1 for $\frac{x}{58} = \sin \text{their } P$ oe or $\frac{x}{39.5} = \sin \text{their (b)}$</p>
9 (a)	<p>28 45 17 21 45 66</p>	1, 1 1 1	
(b) (i)	$4n - 3$ oe	2	M1 for $4n + k$
(ii)	237	1	
(iii)	50	2FT	<p>FT <i>their (b)(i)</i> = 200 solved and then answer truncated dep on linear expression of form $an + k$ M1 for <i>their</i> $4n - 3 = 200$ or <i>their</i> $4n - 3 \leq 200$</p>

(c)	$p = 2$ and $q = -5$ with some correct supporting working leading to the solutions	5	<p>M2 for any 2 of $p + q + 3 = 0$ oe, $2^2 p + 2q + 3 = 1$ oe, $3^2 p + 3q + 3 = 6$ oe, $4^2 p + 4q + 3 = 15$ oe, $5^2 p + 5q + 3 = \text{their } 28$ oe, etc. or M1 for any one of these M1 indep for correctly eliminating p or q from pair of linear equations A1 for one correct value If 0 scored SC1 for 2 values that satisfy one of their original equations After M0, 2 correct answers SC1</p>
(d)	$2n^2 - n$ or $n(2n - 1)$	2	<p>B1 for answer $2n^2 + k[n]$ or M1 for <i>their quadratic</i> from (c) + <i>their linear</i> from (b)(i)</p>
10 (a) (i)	$\frac{1}{36}$ final answer	2	M1 for $\frac{1}{6} \times \frac{1}{6}$
(ii)	$\frac{1}{12}$ final answer	3	<p>M2 for $3\left(\frac{1}{6} \times \frac{1}{6}\right)$ oe or M1 for identifying 3 correct pairs (4, 6), (6, 4) and (5, 5)</p>
(b)	7	1	
	Refers to most combinations oe	1	Dependent on previous mark
(c)	$\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$	5	<p>M4 for $\frac{2}{36} + \left[\left(1 - \frac{3}{36}\right) \times \frac{2}{36}\right] + \left(\frac{1}{36} \times \frac{3}{36}\right)$ oe or M3 for 2 correct probabilities shown <u>added</u> from those above</p> <p>or M1 for $\left(1 - \frac{3}{36}\right) \times \frac{2}{36}$ seen oe And M1 for $\frac{1}{36} \times \frac{3}{36}$ seen oe or $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ oe alone or added to a probability not of the form $\frac{n}{36}$</p>