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

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

5	(a) (i)	8	1	
	(ii)	4	2	<b>M1</b> 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	<b>M2</b> for $x^2 = 16$ or $x^2 - 16 = 0$ or <b>M1</b> for $7 = (x-3)(x+3)$ or better
	(c)	$2x^2 + 7x - 11 [= 0]$ soi  $\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-11)}}{2(2)}$	<b>B1</b>  <b>B1FT</b> <b>B1FT</b>	<b>FT</b> $2x^2 + 7x \pm$ their $k$ [ $k \neq 0$ ] oe <b>B1FT</b> 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 $\frac{p - \sqrt{q}}{r}$ , <b>B1FT</b> for -7 and 2(2) or better or $-\frac{7}{4} +$ or $-\sqrt{\frac{137}{16}}$ oe
	(d)	$-\frac{4.68, 1.18 \text{ final answers}}$  $\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$	<b>B1B1</b>  2	If <b>B0, SC1</b> 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  <b>M1</b> 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	<b>B3FT</b> for 8 or 9 correct plots <b>B2FT</b> for 6 or 7 correct plots <b>B1FT</b> 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	<b>B2</b>	<b>B1</b> 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 $\pm 1$ mm vertically for 1 horizontal unit)
	(e)	-1.45 to -1.35 and 0.4 to 0.5 Tangent ruled at $x = 1.5$	<b>B2</b> <b>B1</b>	<b>B1</b> 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 $495[1] \times 1000 = 495000[\text{ml}]$	<b>M1</b> <b>M1</b>	
	(b) (i)	11	2	<b>M1</b> for $495000 \div 750 [= \div 60]$ oe [660] After 0 scored, <b>SC1</b> for answer figs 11
	(ii)	37.5 or 37.50 to 37.51	3	<b>M2</b> for $\sqrt{\frac{\text{figs}495}{112\pi}}$ oe or <b>M1</b> for $[112r^2 = ] \frac{\text{figs}495}{\pi}$ or $[\pi r^2 = ] \frac{\text{figs}495}{112}$ or better

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

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