

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2014 series**

### **0580 MATHEMATICS**

**0580/42**

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>	

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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) 15, 19, 16	M1dep	Dependent on second method
		(ii) rectangular bars of height 1, 3.8 and 1.6  correct widths of 15, 5, 10 and no gaps	A1  1  B2FT  B1	SC2 for correct answer with no working  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
4	(a)	Enlargement [SF] $-\frac{1}{2}$ oe [centre] (2, 5)	3	B1 for each
	(b)	(i) Image at (-2, 6), (-8, 3), (-4, 3)	2	SC1 for reflection in any vertical line or for 3 correct points not joined
		(ii) Image at (3, -2), (3, 2), (6, 4)	2	SC1 for rotation $90^\circ$ [anti clockwise] around origin at (-3, 2) (-3, -2) (-6, -4) or for 3 correct points not joined
	(c)	(iii) 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
	(i)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 for a correct row or column
(ii)	Rotation, $90^\circ$ [anticlockwise] oe origin oe	2	B1 for two elements correct	

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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
		-4.68, 1.18 <b>final answers</b>	<b>B1B1</b>	If <b>B0</b> , <b>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
	(d)	$\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$	2	<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	

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6	(a)	-3, 7.375, 8.875	1, 1, 1	Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.9 or 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	<b>B2</b>	<b>B1</b> for each
		Tangent ruled at $x = 1.5$	<b>B1</b>	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 to 12	2	<b>Dep</b> on <b>B1</b> or close attempt at tangent at $x = 1.5$ <b>M1</b> for $y - \text{step}/x - \text{step}$ for their tangent
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

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

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(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>