

## **MARK SCHEME for the October/November 2013 series**

### **0580 MATHEMATICS**

**0580/43**

Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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.	Answers	Mark	Part Marks
<b>1</b>	<b>(a) (i)</b> 45	<b>2</b>	<b>M1</b> for $5 \times 63 \div 7$
	<b>(ii)</b> 20	<b>2</b>	<b>M1</b> for $5 \times 56 \div 14$
	<b>(iii)</b> 23.4 or 23.38 to 23.41	<b>3</b>	<b>M2</b> for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9} \times 100$ or $\frac{4.9 - 48.8 \div 13}{4.9} \times 100$ Or <b>M1</b> for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9}$ or $\frac{48.8}{13 \times 4.9} \times 100$ or 76.6[...]
<b>(b)</b>	128	<b>4</b>	Using fractions (percentages / decimals): <b>M1</b> for $\frac{3}{4} \times \frac{3}{8} \left[ = \frac{9}{32} \right]$ or $\frac{75}{100} \times 37.5$ [= 28.125%] <b>A1</b> for $\frac{9}{32}$ or 28.125[%] <b>M1</b> for $36 \div \frac{9}{32}$ oe or $36 \times \frac{100}{28.125}$ oe Partial percentages <b>M1</b> for (Remaining) $\frac{100 \times 36}{37.5}$ [= 96] <b>A1</b> for 96 <b>M1</b> for $96 \div \frac{75}{100}$ oe <b>SC1</b> for 288

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2	(a)	119.94[...] nfw	3	M2 for $\frac{62 \times \sin 122}{\sin 26}$ or M1 for $\frac{AC}{\sin 122} = \frac{62}{\sin 26}$ oe SC2 for correct answer from alternative methods
	(b)	109 or 108.7 to 108.8 nfw	4	M2 for $119.9..^2 + 55^2 - 2 \times 119.9.. \times 55 \cos 65$ A1 for 11827[...] or 11834 to 11835[...] or M1 for implicit version
	(c)	1970 or 1969 to 1970.4	2	M1 for $\frac{1}{2} \times 119.9.. \times 62 \times \sin 32$
	(d)	22300 or 22310 to 22320	3	M2 for $(their\ (c) + 0.5 \times 55 \times 119.9.. \times \sin 65) \times 4.5$ or M1 for $their\ (c) + 0.5 \times 55 \times 119.9.. \times \sin 65$
3	(a)	$9 - 2x, 7 - 2x$ oe	2	B1 for each, accept in any order
	(b)	$x(9 - 2x)(7 - 2x)$ $4x^3 - 32x^2 + 63x$	M1FT A1	Correct expansion and simplification with no errors
	(c)	24 20	2	B1 for each correct value
	(d)	Correct curve	3	B2FT for 5 correct plots or B1FT for 3 or 4 correct plots
	(e)	$0.65 \text{ to } 0.75 \leq x \leq 2$ oe	2	B1 for 0.65 to 0.75 seen
	(f) (i)	36 to 37	1	
	(ii)	1.2 to 1.4	1	
4	(a)	48 and 84 66 and 66	2	B1 for each pair
	(b)	540	2	M1 for $3 \times 180$ or $(2 \times 5 - 4) \times 90$ or $5 \times (180 - 360 \div 5)$ oe
	(c)	1620	2	M1 for $7 \times 360 - their\ 540 - 360$
	(d) (i)	$2x + 5 + 3y - 20 + 4x - 5 + x + y - 10 = 360$ oe	1	Allow partial simplification but not $7x + 4y - 30 = 360$
	(ii)	$2x + 5 + 3y - 20 = 180$	1	
	(iii)	$[x = ] 30, [y = ] 45$ nfw	4	M1 for correct multiplication M1 for correct elimination A1 $x = 30$ or $y = 45$  If 0 scored SC1 for correct substitution to find the other variable
	(iv)	65, 115, 115, 65	1	Accept in any order

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<p><b>5 (a) (i)</b> 3.81 or 3.812 to 3.813 or 3h 49min nfw</p> <p><b>(ii)</b> Correct histogram</p> <p><b>(b) (i)</b> <math>\frac{2}{5}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}</math> oe</p> <p><b>(ii)</b> <math>\frac{18}{20}</math> nfw <math>\left[\frac{9}{10}\right]</math></p> <p><b>(iii)</b> <math>\frac{27}{125}</math> [0.216]</p>		<p><b>4</b></p> <p><b>4</b></p> <p><b>2</b></p> <p><b>3</b></p> <p><b>2</b></p>	<p><b>M1</b> for midpoints soi (condone 1 error or omission and  <b>M1</b> for use of <math>\sum fx</math> with <math>x</math> in correct interval including both boundaries (condone 1 further error or omission) and  <b>M1 (dep on 2<sup>nd</sup> M1)</b> for <math>\sum fx \div 80</math> (<math>305 \div 80</math>)</p> <p><b>B1</b> for each correct block and  <b>B1</b> for correct widths</p> <p><b>B1</b> for <math>\frac{2}{5}</math> or both <math>\frac{1}{4}</math>s in correct place</p> <p><b>M2 FT</b> for <math>1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{4}</math>  or <math>\frac{3}{5} \times \frac{3}{4} + \frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}</math> oe  or  <b>M1 FT</b> for <math>\text{their } \frac{2}{5} \times \text{their } \frac{1}{4}</math>  or <math>\frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}</math> oe</p> <p><b>M1</b> for <math>\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}</math></p>
<p><b>6 (a)</b></p> <p><b>(b)</b></p> <p><b>(c)</b></p>	<p>329.7 to 330</p> <p>2970 or 2967 to 2969.[...]</p> <p>11.5 or 11.6 or 11.53 to 11.55</p>	<p><b>3</b></p> <p><b>4</b></p> <p><b>3FT</b></p>	<p><b>M2</b> for <math>\frac{1}{2}\pi(12^2 + 8.75^2 - 3.25^2)</math> oe  or <b>M1</b> for <math>\frac{1}{2}\pi 12^2</math> or <math>\frac{1}{2}\pi 8.75^2</math> or <math>\frac{1}{2}\pi 3.25^2</math></p> <p><b>SC2</b> for answer 1318 to 1320</p> <p><b>M3</b> for <math>\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35 + \text{their (a)}</math>  or  <b>M2</b> for <math>\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35</math>  or  <b>M1</b> for <math>\frac{1}{2}\pi \times 24</math> or <math>\frac{1}{2}\pi \times 17.5</math> or <math>\frac{1}{2}\pi \times 6.5</math></p> <p><b>SC3</b> for 3955 to 3960 dep on <b>SC2</b> in (a)</p> <p><b>M1</b> for <math>\text{their (a)} \times 35</math>  <b>A1</b> for 11500 or 11530 to 11550</p>

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(d)	(i)	$\frac{r}{h} = \frac{20}{40}$ or $\frac{r}{20} = \frac{h}{40}$	1	Accept $20 : 40 = r : h$ leading to $40r = 20h$ [ $r = h/2$ ] $\frac{20}{40} = \frac{1}{2}$ and $\frac{r}{h} = \frac{1}{2}$
	(ii)	35.3 or 35.31 to 35.34	3	<b>M2</b> for $\sqrt[3]{\frac{\text{their } 11545 \times 12}{\pi}}$ oe or $2 \times \text{their } r$ or <b>M1</b> for $\text{their } 11545 = \frac{1}{3} \times \pi \times \left(\frac{h}{2}\right)^2 \times h$ oe or $\text{their } 11545 = \frac{1}{3} \times \pi \times r^2 \times 2r$ oe
7	(a) (i)	$\frac{3}{2}$ or 1.5	2	<b>M1</b> for $\frac{14 - (-4)}{8 - (-4)}$ oe
	(ii)	$y = \frac{3}{2}x + 2$ oe	2	<b>B1</b> for $y = \text{their } \frac{3}{2}x + c$ o.e. or $y = mx + 2, m \neq 0$ <b>SC1</b> for $\frac{3}{2}x + 2$
	(iii)	$\begin{pmatrix} 12 \\ 18 \end{pmatrix}$	1	
	(iv)	21.6 or 21.63[...]	2	<b>M1 FT</b> for $\text{their } 12^2 + \text{their } 18^2$ oe
(b)	(i) (a)	$3b - 4a$	1	
	(b)	$\frac{1}{5}(6b - 8a)$ oe simplified	2	<b>M1</b> for $\frac{1}{5}(12a + 6b) - 4a$ or $AR = AO + OR$
	(c)	$6a + 3b$ oe simplified	1	
	(ii)	$OR$ is parallel to $OT$	1	Dep on $\overrightarrow{OT}$ correct
	(iii)	$\frac{9}{4}$ or 2.25	2	<b>M1</b> for $\left(\frac{3}{2}\right)^2$

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8	(a)	$\frac{2(s - ut)}{t^2}$ oe nfw	3	M1 for a correct rearrangement to isolate the $a$ term and M1 for a correct multiplication by 2 and M1 for a correct division by $t^2$
	(b)	36.75 cao	3	M2 for $15.5 + 2.5 \times 8.5$ B1 for two of 15.5, 2.5, 8.5 seen
	(c) (i)	$\frac{16}{5}$ or better [3.2]	1	
	(ii)	11.2	4	M2 for $\frac{1}{2}(25 + 10)16$ (= 280) or M1 for appreciation of distance from area and M1 for <i>their</i> $280 \div 25$ (dep on M1)
9	(a)	15 18 $3n + 3$ or $3(n + 1)$ 6 10 25 36 $(n + 1)^2$	9	B2 for 15, 6, 25 or B1 for two correct values  B3 for 18, 10, 36 or B1 for each correct value  B2 for $3n + 3$ oe or M1 for $3n + k$ , for any $k$  B2 for $(n + 1)^2$ oe or M1 for a quadratic expression
	(b)	14	2	M1 for $(n + 1)(n + 2) = 240$ or better or $15 \times 16 = 240$
	(c) (i)	$\frac{1}{2} + p + q = 9$	1	
	(ii)	$[p = ] 3$ $[q = ] \frac{11}{2}$	5	B2 for $4p + 2q = 23$ or B1 for $\frac{1}{2} \times 2^3 + p \times 2^2 + q \times 2$ oe M1 for correct multiplication and subtraction of <i>their</i> equations A1 for $[p = ] 3$ or $[q = ] \frac{11}{2}$ If 0 scored then SC1 for either correct

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<b>10 (a)</b>	$\frac{x}{x+3}$ cao	<b>3</b>	<b>B1</b> for $(x+3)(x-3)$ <b>B1</b> for $x(x-3)$
<b>(b)</b>	$\frac{3}{2}$ and $-5$	<b>7</b>	<p><b>M2</b> for <math>15(x+1) - 20x = 2x(x+1)</math> or <b>M1</b> for multiplication by one denominator only or <math>\frac{15(x+1) - 20x}{x(x+1)}</math></p> <p>and <b>B2</b> for <math>2x^2 + 7x - 15 [= 0]</math> or <b>B1</b> for <math>15x + 15 - 20x</math> or <math>2x^2 + 2x</math></p> <p>and <b>M2</b> for <math>(2x-3)(x+5)</math> or <i>their</i> correct factors or formula or <b>M1</b> for <math>(2x+a)(x+b)</math> where <math>ab = -15</math> or <math>a + 2b = 7</math></p> <p><b>A1</b> for <math>x = \frac{3}{2}</math> and <math>-5</math></p>