

# **CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the March 2016 series**

### **0580 MATHEMATICS**

**0580/42**

Paper 4 (Extended), maximum raw mark 130

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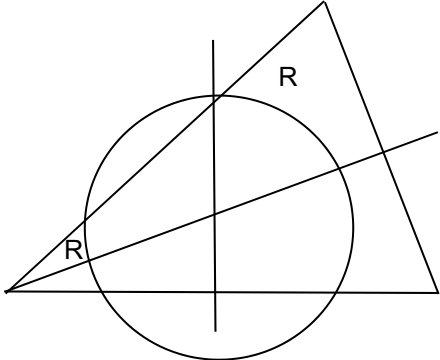
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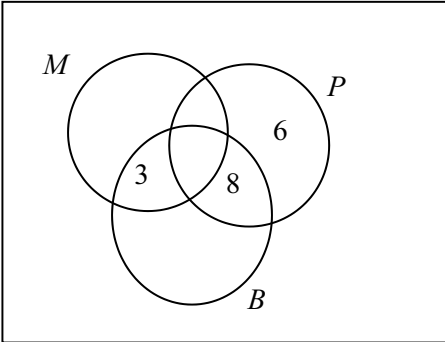
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### Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
<b>1</b>			
(a)	$\frac{8}{8+15+9} \times 640$ oe	<b>1</b>	With no errors seen
(b)	300 and 180	<b>2</b>	<b>B1</b> for each or <b>SC1</b> for answers reversed
(c)	10 nfw	<b>2</b>	<b>M1</b> for $160 \div 15.25$ implied by 10.5 or 10.49... nfw
(d)	$\frac{7}{24}$	<b>3</b>	<b>M1</b> for $\frac{3}{8} + \frac{1}{3}$ oe  <b>M1dep</b> on previous <b>M1</b> for $1 - \text{their} \left(\frac{3}{8} + \frac{1}{3}\right)$ oe
<b>2</b>			
(a)	Correct perpendicular bisector of <i>AB</i> with 2 pairs of correct arcs isw	<b>2</b>	<b>B1</b> for accurate with no/wrong arcs or <b>M1</b> for correct intersecting arcs with no or wrong line
(b)	Correct angle bisector at <i>A</i> with two pairs of correct arcs isw	<b>2</b>	<b>B1</b> for accurate with no/wrong arcs or <b>M1</b> for two pairs of correct arcs with no or wrong line
(c)	Circle centre <i>E</i> radius 5 cm isw	<b>2FT</b>	<b>FT</b> circle centre <i>their E</i> radius 5 cm provided (a) and (b) attempted  <b>M1</b> for $250 \div 50$ oe soi e.g. from arc If 0 scored <b>SC1</b> for circle centre <i>their E</i>
(d)		<b>2</b>	cao  <b>B1</b> for each If 0 scored, <b>SC1</b> for two 'correct' regions but in part (c), centre correct but radius incorrect

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Qu.	Answers	Mark	Part Marks
<b>3 (a) (i)</b>		<b>3</b>	<b>B1</b> for each
<b>(ii)</b>	46	<b>1FT</b>	<b>FT</b> $29 + \text{their } 3 \text{ values from (a)}$
<b>(iii)</b>	11	<b>1</b>	
<b>(iv)</b>	$\frac{7}{19}$ oe	<b>2</b>	<b>M1</b> for $\frac{n}{16 + \text{their } 3}$ ( $0 < n < (16 + \text{their } 3)$ ) or $\frac{4 + \text{their } 3}{k}$ ( $k > (4 + \text{their } 3)$ )
<b>(b) (i)</b>	$\frac{9}{200}$ or 0.045	<b>1</b>	
<b>(ii)</b>	10800	<b>3</b>	<b>M2</b> for $\frac{1}{2} (900 + 1500) \times 9$ oe or <b>M1</b> for method of finding a relevant area
<b>(iii)</b>	7.2	<b>1FT</b>	<b>FT</b> $(\text{their } 10800) \div 1500$
<b>4 (a) (i)</b>	64	<b>1</b>	
<b>(ii)</b>	16 to 16.5	<b>2</b>	<b>M1</b> for $UQ = 71$ to $71.5$ or $LQ = 55$
<b>(iii)</b>	62	<b>2</b>	<b>B1</b> for 24 indicated
<b>(iv)</b>	6	<b>2</b>	<b>B1</b> for 54 seen
<b>(b)</b>	[8] 12 23 11 [4] 2	<b>3</b>	<b>B2</b> for 1 incorrect reading FT others  <b>B1</b> for 2 correct
<b>(c)</b>	Blocks of height 0.6 2.3 1.1 0.4 with correct widths	<b>4FT</b>	<b>FT</b> <i>their (b)</i> for heights <b>B1FT</b> for each correct block  If <b>B0</b> , <b>SC1</b> for blocks of widths 20, 10, 10, 10 or for <i>their</i> correct frequency densities
<b>5 (a)</b>	6250	<b>3</b>	<b>M2</b> for $\frac{6000}{100 - 4} \times 100$ oe or <b>M1</b> for 6000 associated with 96 [%]
<b>(b)</b>	4441	<b>3</b>	<b>B2</b> for 4441.1 to 4441.2 or 4440 or <b>M1</b> for $\frac{6000}{1.351}$

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Qu.	Answers	Mark	Part Marks
(c)	1.58 or 1.581...	5	<b>M1</b> for $6000 \times \left(1 + \frac{1.5}{100}\right)^8$ oe <b>A1</b> for 6758.95..... or 6758.96 to 3 sf or better or 758.95 or 758.96 rounded or truncated to 3 sf  and <b>M2</b> for $\{their(6000 \times 1.015^8) - 6000\} \times \frac{100}{6000 \times 8}$ oe or <b>M1</b> for $\frac{6000 \times r \times 8}{100}$ oe
6 (a) (i)	Rotation	1	
	90° [anticlockwise] oe	1	
	(4, 4)	1	
(ii)	Enlargement	1	
	[centre] (5, 1)	1	
	[scale factor] 2	1	
(b) (i)	Image at (–2, 5) (–2, 7) (–1, 7)	2	<b>B1</b> for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
(ii)	Image at (–2, 1) (–2, –1) (–1, –1)	2FT	<b>FT</b> <i>their</i> triangle <i>P</i> reflected in line $y = 3$ <b>B1</b> for reflection of <b>triangle P</b> in the line $x = 3$ or $y = k$
(c)	Image at (–2, 3) (–4, 3) (–4, 4)	3	<b>B2</b> for 2 vertices correct in triangle or 3 correct co-ordinates soi in working or <b>B1</b> for 1 vertex in triangle correct soi or <b>M1</b> for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 3 & 3 & 4 \\ 2 & 4 & 4 \end{pmatrix}$ shown or statement rotation 90° [anticlockwise] about (0, 0)
7 (a)	3.5[0] 1.94 3.11	3	<b>B1</b> for each
(b)	Fully correct curve	5	<b>B3 FT</b> for 10 or 11 points or <b>B2 FT</b> for 8 or 9 points or <b>B1 FT</b> for 6 or 7 points  <b>B1 indep</b> two separate branches not touching or cutting <i>y</i> -axis  <b>SC4</b> for correct curve, but branches joined
(c)	– 0.7 to – 0.6	1	

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Qu.	Answers	Mark	Part Marks
(d) (i)	– 1 2.5	1 1	If 0,0, <b>M1</b> for $y = 2.5 - x$ oe seen in working
(ii)	– 0.6 to – 0.5 with correct ruled line	3	<b>B2FT</b> for drawing <i>their</i> ruled line from (d)(i)  or <b>M1</b> for ruled line through (0, 2.5)FT or gradient –1 FT
(e)	Correct tangent and $0.5 \leq \text{grad} \leq 0.85$	3	<b>B2</b> for close attempt at tangent at $x = 2$ and answer in range OR <b>B1</b> for ruled tangent at $x = 2$ , no daylight at $x = 2$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.8$ and $2.2$  <b>and M1</b> (dep on <b>B1</b> or close attempt at tangent [at any point ] for $\frac{\text{rise}}{\text{run}}$
8 (a)	15 nfw	3	<b>M1</b> for $y = k\sqrt{(x+2)}$ oe  <b>A1</b> for $k = 3$
(b)	$\frac{x+6}{x-2}$ nfw final answer	5	<b>B2</b> for $(x+6)^2$ oe or <b>SC1</b> for $(x+a)(x+b)$ where $ab = 36$ or $a+b = 12$ or $x(x+6) + 6(x+6)$  <b>B2</b> for $(x-2)(x+6)$ or <b>SC1</b> for $(x+a)(x+b)$ where $ab = -12$ or $a+b = 4$ or $x(x+6) - 2(x+6)$ or $x(x-2) + 6(x-2)$
(c)	$\frac{X}{W^2+1}$ nfw final answer	5	<b>M1</b> for $W^2 = \frac{X-a}{a}$ or $W\sqrt{a} = \sqrt{X-a}$ <b>M1</b> for next productive step  <b>M1</b> for 2nd productive step  <b>M1</b> for 3rd productive step  <b>M1</b> for final step leading to $a =$
(d)	$\frac{-7x-1}{x^2-1}$ or $\frac{-7x-1}{(x-1)(x+1)}$ final answer	5	<b>M1</b> for common denominator $(x-1)(x+1)$ isw  <b>M1</b> for $(x-2)(x-1) - (x+3)(x+1)$  <b>B2</b> for $x^2 - 2x - x + 2 - (x^2 + 3x + x + 3)$ oe or <b>B1</b> for either expansion

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Qu.	Answers	Mark	Part Marks
<b>9</b>	<b>(a) (i)</b> $y$	<b>1</b>	
	<b>(ii)</b> $x + y$	<b>1</b>	
	<b>(iii)</b> $x + 2y$	<b>2</b>	<b>M1</b> for a correct unsimplified route or identifying $\overline{OS}$
	<b>(b)</b> $-(\frac{1}{2}x + y)$ oe	<b>2</b>	<b>M1</b> for a correct unsimplified route or $\overline{GR} = -\frac{1}{2}x$ or $\overline{RG} = \frac{1}{2}x$
	<b>(c) (i)</b> $\overline{MG} = 2x + 2y$	<b>2</b>	<b>M1</b> for a correct unsimplified route e.g. $2\overline{PQ}$
	<b>(ii)</b> $\overline{MH} = x + y$ or $\overline{HG} = x + y$ $\overline{MG} = 2\overline{MH}$ oe	<b>M1</b>  <b>A1</b>	Accept $\overline{HM} = -x - y$ or $\overline{GH} = -x - y$  Dep on <b>(c)(i)</b> correct, arrows essential
<b>10</b>	<b>(a)</b> 5.2[0] or 5.196...	<b>3</b>	<b>M2</b> for $[h^2=] 6^2 - 3^2$ or better  or <b>M1</b> for $h^2 + 3^2 = 6^2$ or <b>B1</b> for $PR$ (or $PQ$ or $QR$ ) = 6
	<b>(b) (i)</b> 7.2[0] or 7.196...	<b>1FT</b>	<b>FT</b> their <b>(a)</b> + 2
	<b>(ii)</b> 62.4 or 62.35...	<b>5</b>	<b>M4</b> for $12 \times 6 \times \frac{1}{2} \tan 60$ oe  or <b>M3</b> for $6 \times \frac{1}{2} \tan 60$ oe  or <b>M2</b> for realising that $\frac{1}{2} \text{ base} = 1 \times \tan 60$ oe  or <b>B1</b> for angle 30 or 60 in correct position on diagram or in a calculation  If <b>0</b> scored, <b>SC1</b> for volume = an area $\times 12$ seen
<b>11</b>	<b>(a) (i)</b> 11	<b>1</b>	
	<b>(ii)</b> $14x + 3$ final answer	<b>1</b>	
	<b>(b)</b> $17 - 21x$ final answer	<b>2</b>	<b>M1</b> for $7(2 - 3x) + 3$ oe
	<b>(c)</b> $-\frac{1}{9}$	<b>3</b>	<b>M1</b> for $3(2 - 3x) = 7$ oe <b>M1</b> for correct first step
	<b>(d)</b> -1.3	<b>3</b>	<b>M1</b> for $2 - 3(x + 4) - (7x + 3) = 0$ <b>M1</b> for $-10x - 13 = 0$ oe  If <b>0</b> scored, <b>SC1</b> for answer - 0.7 oe after $2 - 3(x + 4) - 7x + 3 = 0$ shown previously