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**MATHEMATICS**

**0580/32**

Paper 3 (Core)

**May/June 2017**

MARK SCHEME

Maximum Mark: 104

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**Published**

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
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

Question	Answer	Mark	Part marks
1(a)	14.9[0]	3	<b>M2</b> for $3 \times 2.8[0] + 2 \times 3.25$ or better or <b>B1</b> for 8.4[0] or 6.5[0]
1(b)	4	1	
	3.4[0]	2	<b>M1</b> for $20 - (\text{their } 4 \times 4.15)$
1(c)	8.74	2	<b>M1</b> for $7.60 \times 1.15$ oe
1(d)	72	2	<b>M1</b> for $96 \div 4 [\times 3]$
1(e)(i)	60	2	<b>B1</b> for two from 9 or 36, 12.5, 11.5
1(e)(ii)	5 nfww	3	<b>M2</b> for $(\text{their } 60 \times 3) \div 36$ or better or <b>M1</b> for $\text{their } 60 \times 3$ or better or $\text{their } 60 \div 36$
1(f)	5568	3	<b>M2</b> for $6.4[0] \times 72.5 \times 12$ or better or <b>M1</b> for $6.4[0] \times 72.5$ or $6.4[0] \times 12$
2(a)	10a final answer	1	
2(b)	$16f - 4g$ final answer or $4(4f - g)$ final answer	3	<b>M2</b> for $2 \times (5f + 2g) + 2 \times (3f - 4g)$ oe or <b>B1</b> for $10f + 4g$ or $6f - 8g$ or $8f - 2g$ or $16f + kg$ or $kf - 4g$
2(c)(i)	125	2	<b>M1</b> for $5 \times 7 + 9 \times 10$ or better
2(c)(ii)	85	2	<b>M1</b> for $4 \times 5^2 - 3 \times 5$ or better
2(d)	7	3	<b>M1</b> for $15x - 30 [= 75]$ or $3x - 6 = 15$ <b>M1FT</b> for correct second step
2(e)(i)	$x + 4$ $4x$ $4x - 6$	2	<b>B1</b> for any two correct
2(e)(ii)	$x + x - 5 + x + 4 + 4x + 4x - 6 = 125$	1	

Question	Answer	Mark	Part marks
2(e)(iii)	12	2	<b>M1</b> for $11x = 125 + 7$ or $x - \frac{7}{11} = \frac{125}{11}$ or better
3(a)(i)	62	1	
3(a)(ii)(a)	$\frac{17}{84}$ oe isw	1	
3(a)(ii)(b)	$\frac{21}{38}$ oe isw	1	
3(a)(ii)(c)	$\frac{164}{210}$ oe isw	1	
3(a)(iii)	43.5 oe	2	<b>M1</b> for an ordered list giving at least the first 5 or the last 5 numbers in order or 42 and 45 identified
3(b)	3.44	3	<b>M2</b> for $(1 \times 5 + 2 \times 8 + 3 \times 12 + 4 \times 14 + 5 \times 7 + 6 \times 4) \div 50$ implied by $172 \div 50$ or <b>M1</b> for $(1 \times 5) + (2 \times 8) + (3 \times 12) + (4 \times 14) + (5 \times 7) + (6 \times 4)$ or 172
3(c)(i)	4 points plotted within tolerance	2	<b>B1</b> for 2 or 3 points plotted within tolerance
3(c)(ii)	(10, 35) indicated	1	
3(c)(iii)	Positive	1	
3(c)(iv)	Correct ruled line	1	
3(c)(v)	28 to 32	1	If zero scored, <b>FT</b> their line of best fit if positive
4(a)(i)	36	1	
4(a)(ii)	4	1	
4(a)(iii)	11	1	
4(a)(iv)	36 or 4 or both	1	
4(a)(v)	27	1	

Question	Answer	Mark	Part marks
4(b)	160 cao	2	<b>M1</b> for any common multiple $160n$ or any product that equals 160  or two lists of correct multiples of each number  or either number correctly reduced to its prime factors
4(c)(i)	8.3	1	
4(c)(ii)	27	1	
5(a)	Rotation	1	
	(0, 0) oe	1	
	$90^\circ$ [anticlockwise] oe	1	
5(b)	Enlargement	1	
	(0, 2)	1	
	[sf=]2	1	
5(c)(i)	Correct reflection points at (4, -2), (8, -2) and (4, -8)	1	
5(c)(ii)	Correct translation points at (-7, 5), (-4, 5) and (-4, 7)	2	<b>B1</b> for $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
5(c)(iii)	Correct rotation points at (-2, -2), (-4, -2) and (-2, -5)	2	<b>B1</b> for rotation of $180^\circ$ about the wrong centre
6(a)	Completely correct ruled triangle with arcs	3	<b>B1</b> for $AC$ of length 8 cm <b>B1</b> for $BC$ of length 7 cm  or if zero scored, <b>M1</b> for two correct intersecting arcs  If zero scored, <b>SC1</b> for ruled triangle with arcs with $AC$ of length 7 cm and $BC$ of length 8 cm

Question	Answer	Mark	Part marks
6(b)	Accurate ruled bisector of angle $S$ with two correct pairs of arcs and reaching side $QR$	<b>B2</b>	<b>B1</b> for correct ruled bisector of angle $S$ which reaches $QR$ drawn without arcs or with wrong arcs or correct short line with arcs or 2 pairs of correct arcs with no line
	Accurate ruled bisector of side $SR$ with two correct pairs of arcs and reaching side $PQ$	<b>B2</b>	<b>B1</b> for correct ruled bisector of $SR$ which reaches $PQ$ drawn without arcs or with wrong arcs or correct short line with arcs or 2 pairs of correct arcs with no line
	correct region shaded	<b>B1dep</b>	Dep. on a ruled line through angle $S$ and a ruled line through side $SR$
7(a)(i)	270	<b>1</b>	
7(a)(ii)	152	<b>3</b>	<b>M1</b> for $180 - 118$ soi by 62  <b>M1</b> for $180 - 90 - \textit{their} 62$ soi by 28 or better <b>and</b> $180 - \textit{their} 28$ or $90 + \textit{their} 62$
7(a)(iii)	108	<b>3</b>	<b>M2</b> for $\sqrt{117^2 - 45^2}$ or better or <b>M1</b> for $[\dots]^2 + 45^2 = 117^2$ or better
7(b)	40	<b>3</b>	<b>M1</b> for $180 - 171$ soi by 9 <b>M1</b> for $360 \div \textit{their} 9$
8(a)	$-3, -5, -7.5, 7.5, 3.75, 3$	<b>3</b>	<b>B2</b> for 4 or 5 correct <b>B1</b> for 2 or 3 correct
8(b)	Correct curve drawn	<b>4</b>	<b>B3FT</b> for 9 or 10 points correctly plotted or <b>B2FT</b> for 7 or 8 points correctly plotted or <b>B1FT</b> for 5 or 6 points correctly plotted
8(c)	$1.8 \leq x < 2$	<b>1</b>	If zero scored, then <b>FT</b> their graph
9(a)(i)	32	<b>1</b>	
	38	<b>1FT</b>	<b>FT</b> <i>their</i> $32 + 6$
9(a)(ii)	-2	<b>1</b>	
	-8	<b>1FT</b>	<b>FT</b> <i>their</i> $-2 - 6$

Question	Answer	Mark	Part marks
9(b)	$11n + 3$ oe final answer	<b>2</b>	<b>B1</b> for $11n + k$ ( $k$ may be 0) or $jn + 3$ ( $j \neq 0$ ) or $11n + 3$ or $14 + 11(n - 1)$ seen but not as final answer
9(c)	$-5$	<b>1</b>	
9(d)(i)	$n^2 + 1$ oe	<b>1</b>	
9(d)(ii)	$3n^2$ oe	<b>1</b>	