

**MARK SCHEME for the May/June 2014 series**

<b>0580 MATHEMATICS</b>	
<b>0580/31</b>	Paper 3 (Core), maximum raw mark 104

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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<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>IGCSE – May/June 2014</b>	<b>0580</b>	<b>31</b>

### 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		Answers	Mark	Part Marks	
1	(a) (i)	$\frac{3}{3+4+8}$ or $\frac{180}{3+4+8}$	M1	One mark for each. If zero, <b>SC1</b> for sum of both angles = 144.	
		$3 \div (15) \times 180$ or $\frac{180 \times 3}{15}$ (= 36)	M1		
	(ii)	48 [and] 96	1,1		
	(b) (i)	Angle $BAC = 35 (\pm 2^\circ)$	B1		If zero <b>SC1</b> for $AC$ and $BC$ reversed and triangle completed
		Angle $ABC = 65 (\pm 2^\circ)$ and triangle completed	B1		
	(ii)	4.45cm to 4.85cm	1 FT		FT for their shortest side
(c)	19.6 cao	2	M1 for $0.5 \times 7 \times 5.6$		
	cm <sup>2</sup> oe	1			
2	(a) (i)	86	1	B1 for any other multiple of 120	
	(ii)	55	1		
	(iii)	81	1		
	(iv)	64	1		
	(b) (i)	77	1		B1 for any other multiple of 120
		120	2		
	(c)	12 [days] 15 [hours]	1,1		

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	31

3	(a) (i)	Parallelogram	1	
	(ii)	0	1	
	(b)	Translation	1	
		$\begin{pmatrix} 9 \\ -6 \end{pmatrix}$	1	Independent Accept 9 right, 6 down
	(c) (i)	(1, 4), (4, 4), (5, 2), (2, 2).	2	SC1 for reflection in $x$ -axis
	(ii)	(-4, -1), (-4, -4), (-2, -5), (-2, -2)	2	SC1 for rotation 90° clockwise or correct rotation any centre
	(d)	(-6,8), (0,8), (-8,4), (-2,4)	2	SC1 for enlargement of S, scale factor 2, wrong position
	(e) (i)	6	2	M1 for $3 \times 2$
	(ii)	4	1	
	(iii)	24	1FT	FT $their(e)(i) \times their(e)(ii)$ Or FT area of $their(d)$ if a parallelogram and not congruent to S.
4	(a) (i)	2, 4, 2, 5, 6, 3, 3	2	B1 for 5 or 6 correct  Or 7 correct tallies if frequency column blank Or 7 correct frequencies in tally column
	(ii)	70	1FT	
	(iii)	30	1	
	(iv)	$\Sigma(\text{Frequency, } f \times \text{mass, } w)$  $1650 \div 25$	M1  B1	7 items attempted and added or sum of 25 masses
	(b)	768	2	M1 for $0.96 \times 800$ oe

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	31

	(c) (i) 49.5 cao  (ii) 69.3[0]  (iii) 110	3  1 FT  3	M1 for figs $66 \times 750$ soi M1 for $\div 1000$  <i>Their (c)(i)</i> $\times 1.40$  M2 for $\frac{\text{their}(c)(ii) - 33}{33} \times 100$ or M1 for <i>their (c)(ii)</i> $- 33$  Alternative method M2 for $\frac{\text{their}(c)(ii)}{33} \times 100 - 100$ Or M1 for $\frac{\text{their}(c)(ii)}{33}$
5	(a) Hexagon correct with arcs. $AF = 7 \text{ cm } (\pm 2\text{mm})$ $EF = 8 \text{ cm } (\pm 2\text{mm})$  (b) Hexagon  (c) (i) Bisector of $CD$ with 2 pairs of arcs  (ii) Bisector of angle $ABC$ with 2 pairs of correct arcs.  (iii) Correct enclosed region shaded  (d) (i) Semi-circle radius 2.5cm ( $\pm 2\text{mm}$ ) from P and inside polygon  (ii) 3930 or 3926 to 3928	2  1  2  2  1FT  2  2	B1 for correct hexagon without arcs or one length correct with arcs. Or B1 for two correct arcs    B1 for correct bisector with one pair or no arcs  B1 for bisector without 2 pairs of arcs  Their enclosed region provided at least 1 mark in each of parts (i) and (ii)  SC1 for arc centre P radius 2.5cm Or for arc inside polygon centre P touching boundaries twice or any circle centre P.  M1 for $(\pi \times 50^2) \div 2$ oe
6	(a) (i) $-1, -4, -8, 8, 4, 1.$  (ii) 8 points correctly plotted, within $\frac{1}{2}$ square.  2 smooth correct curves, not joined  (iii) 2	3  3FT  1  1	1 for each symmetrical pair  B2FT for 6 or 7 correct Or B1 FT for 4 or 5 correct

Page 5	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	31

	(b) (i)	-3 0 6	2	B1 for two correct  FT from their graph $\pm 0.1$
	(ii)	Correct ruled line	1	
	(c)	1.4 to 1.6 and -3.6 to -3.4	1FT,1FT	
	(d)	1.5	1	
7	(a) (i)	[Car angle =] $135 (\pm 2^\circ)$ $135 \div 360 \times 120$ (= 45 )	B1 M1	B1 for angles of $238^\circ$ to $242^\circ$ or 79 to 81 people  B1 for $x + 17$ – seen together B1 for $2x$  M1 FT for <i>their</i> $(4x + 48)$ [=120] or their $2x + x + x = 120 - 31 - 17$ or better. M1FT for their $(4x = 72)$ If zero SC2 for a correct numerical solution of their equation of equivalent difficulty.
	(ii)	$\frac{2}{3}$ or value from 0.658 to 0.675	2	
	(b) (i)	$x + 31 + x + 17 + 2x$ [= 120] or better	3	
	(ii)	18 cao	3	
8	(a)	$160c + 400f$ final answer	2	B1 for $160c$ or $400f$ seen
	(b)	$2x - 7y$ final answer www	2	B1 for $2x$ or $-7y$ or $6x - 15y$ or $-4x + 8y$ www
	(c)	$5x(xy - 4)$ final answer	2	B1 for $5(x^2y - 4x)$ or $x(5xy - 20)$

Page 6	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	31

	(d)	[x=] 5 [y=] -2	4	<p><b>M1</b> for correctly equating one set of coefficients  <b>M1</b> for correct method to eliminate one variable  <b>A1</b> for correct <math>x</math> or <math>y</math></p> <p>If zero scored <b>SC1</b> for 2 values satisfying one of the original equations</p> <p>Alternative method</p> <p><b>M1</b> for correct rearrangement of one equation  <math>x = (7 - 4y) \div 3</math> or <math>y = (7 - 3x) \div 4</math>  or  <math>x = (26 + 3y) \div 4</math> or <math>y = (4x - 26) \div 3</math>  <b>M1</b> for correct substitution in other equation  <math>4(7 - 4y) \div 3 - 3y = 26</math>  <math>4x - 3(7 - 3x) \div 4 = 26</math>  <math>3(26 + 3y) \div 4 + 4y = 7</math>  <math>3x + 4(4x - 26) \div 3 = 7</math>  <math>(7 - 4y) \div 3 = (26 + 3y) \div 4</math>  <math>(7 - 3x) \div 4 = (4x - 26) \div 3</math>  <b>A1</b> for correct <math>x</math> or <math>y</math></p> <p>If zero scored <b>SC1</b> for 2 values satisfying one of the original equations</p>
9	(a) (i)	48, 39 Subtract 9 oe	1, 1FT 1	FT 6th term = 5th term - 9
	(ii)	162, 486 Multiply by 3 oe	1, 1FT 1	FT 6th term = 5th term $\times$ 3
	(b) (i)	$93 - 9n$ oe final answer	2	<b>B1</b> for $-9n + c$ or $kn + 93$ , $k \neq 0$
	(ii)	-96 cao	2	<b>M1</b> for substitution of $n = 21$ into their <b>linear</b> expression