

MARK SCHEME for the May/June 2014 series

0581 MATHEMATICS

0581/41

Paper 4 (Extended), maximum raw mark 130

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

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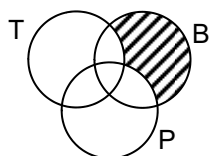
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Abbreviations

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

Qu		Answers	Mark	Part Marks
1	(a) (i)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	1	
	(ii)	Not possible	1	
	(iii)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	2	B1 for one row or column correct
	(iv)	$\frac{1}{5}\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ oe isw	2	B1 for $\frac{1}{5}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ seen or $k\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ seen
	(b)	1 column in C and 2 rows in D	1	Any clear indication
	(c)	Enlargement [Factor] 2 [Centre] (0, 0) oe	1 1 1	
2	(a)	8	2	M1 for $12 \div 1.5$ oe
	(b)	[Distance =] 36 <i>their</i> $36 \div 3 [= 12]$ oe	B1 M1	
	(c)	200	2	M1 for $12 \times 1000 \div 60$ oe e.g. $36000 \div 180$
	(d)	Horizontal line at 36 to 13 45 <i>(their</i> 13 45, 36) joined to (16 42, 0)	1 1FT	
3	(a)	62 705	2	M1 for $75246 \div 6$ soi by 12 541 or 75246×5
	(b)	10.9 or 10.88...	3	M2 for $\frac{(150\,675 - 135\,890)}{135\,890} \times 100$ oe or M1 for correct fraction soi by 0.1088... or $\frac{150\,675}{135\,890} \times 100$ soi by 110.88...

Qu	Answers	Mark	Part Marks
(c)	127 000	3	M2 for $135\,890 \div 1.07$ oe or M1 for 135 890 associated with 107%
(d) (i)	59 112 to 59 113 or 59 100 or 59 110 or 59 119 to 59 120 or 59 100 nfw	3	M2 for $\pi \times 21 \times (30^2 - 2^2)$ oe Or M1 for $\pi \times 21 \times 30^2$ or $\pi \times 21 \times 2^2$
(ii) (a)	0.0125	1	
(b)	7580 or 7582 or 7581 or 7583 nfw	4	M1 for $21 \times 29.7 \times \textit{their} 0.0125$ [=7.796 or 7.8[0]] and M1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times \textit{their} 0.0125)$ A1 for 7580 to 7583.2 (non integer) If 0 then SC1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times 0.125)$
4	(a) $4 - x$ correctly placed $5 - x$ correctly placed 7 correctly placed (b) $4 + 11 + (6 - x) + x + 9 + (4 - x) + (5 - x) + 7 = 40$ oe $46 - 2x = 40$ nfw $x = 3$ (c) (i) $\frac{9}{40}$ or 0.225 or 22.5% (ii) 2 (iii) 15 (iv) 25 (v) 4 (d) Correct region shaded.	1 1 1 M1 A1 B1 1 1FT 1FT 1FT 1 1	SC3 for 1, 2 and 7 all correctly placed instead of expressions in x FT from their Venn diagram, condone omission of one subset Must be in the form $a + bx = c$, ie each side simplified, or better ISW cancelling or conversion after correct answer seen FT from their Venn diagram and their x provided $n(B \cap P \cap T') \neq 5$ FT from their Venn diagram FT from their Venn diagram



Qu		Answers	Mark	Part Marks
5	(a)	[0]44 to [0]48	1	
	(b)	12.6 to 13.2	2	B1 for 8.4 to 8.8 seen
	(c)	340	1	
	(d)	1 : 150 000	2	M1 for $\times 100\,000$ soi
	(e)	Arcs for perp bisector of <i>SL</i>	1	Two pairs of correct arcs
		Ruled perp bisector of <i>SL</i>	1	Within tolerance of overlay
		Arcs for bisector of angle <i>PSL</i>	1	Marks on <i>PS</i> and <i>SL</i> plus one pair of correct arcs
Ruled bisector of angle <i>PSL</i>		1	Within tolerance of overlay	
	B marked within accuracy	1	Within tolerance of overlay Dep on two correct bisectors drawn	
(f)	3.375	2	M1 for 1.5×1.5^2 or $(2/3)^2$ seen	
6	(a) (i)	0.6 oe	2	M1 for $0.2 + 0.4$
	(ii)	1500	1	
	(iii)	0.03 oe	2	M1 for 0.1×0.3
	(b)	$\frac{112}{132}$ oe $\frac{28}{33} = 0.848[4\dots]$	3	M2 for $1 - \frac{5}{12} \times \frac{4}{11}$ or $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11} + \frac{7}{12} \times \frac{6}{11}$ or $\frac{7}{12} + \frac{5}{12} \times \frac{7}{11}$ or M1 for addition of any two of $\frac{7}{12} \times \frac{5}{11}$, $\frac{5}{12} \times \frac{7}{11}$, $\frac{7}{12} \times \frac{6}{11}$ or sum of 3 products with an error in the numerator of one product or for $\frac{5}{12} \times \frac{4}{11}$ identified

Qu		Answers	Mark	Part Marks
7	(a) (i)	Image: $(-4, -3), (-4, -1), (-3, -1)$	2	SC1 for translation $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -4 \end{pmatrix}$
	(ii)	Image: $(1, -1), (3, -1), (3, -2)$	2	SC1 for rotation about the origin but 90° anticlockwise
	(b) (i)	Image: $(2, 1), (2, 3), (4, 3)$	3	B2 for 2 correct vertices plotted or SC2 for 3 vertices shown in working or SC1 for 2 vertices shown in working or M1 $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} \times \begin{pmatrix} 1 & 1 & 2 \\ 1 & 3 & 3 \end{pmatrix}$
	(ii)	Stretch [factor] 2 Invariant line y-axis oe	1 1 1	Accept $x = 0$, stays the same
8	(a)	2.125 and 2.375	2	B1 for one correct value
	(b)	Correct curve	B4	B3FT for 11 correct plots or B2FT for 9 or 10 correct plots or B1FT for 7 or 8 correct plots
	(c)	Ruled tangent at $x = 2$ Gradient from 7.8 to 10.2	B1 2	No daylight at $x = 2$. Consider point of contact as midpoint between two vertices of daylight, this must be between $x = 1.8$ and 2.2 Dep on B1 awarded Allow integer/integer or a mixed number if within range or M1 dep for $(\text{change in } y) \div (\text{change in } x)$ Dependent on any tangent drawn or close attempt at a tangent at <u>any</u> point Must see correct or implied calculation from a drawn tangent
	(d)	0 and -1.75 to -1.65 and 1.65 to 1.75	2	B1 for two correct values
	(e)	-1.2 to $-0.8 < k < 2.8$ to 3.2	2	B1 for each correct or SC1 for reversed answers

Qu		Answers	Mark	Part Marks
9	(a) (i)	37.5 to 38.5	1	
	(ii)	19.5 to 20.5 nfw	2	B1 for [LQ =] 23.5 to 24 or [UQ =] 43.5 to 44
	(iii)	43	2	B1 for 56 seen or horizontal line drawn at cf = 56
	(b) (i)	31.8[4...] nfw	4	M1 for midpoints soi (condone 1 error or omission) and M1 for use of $\sum ft$ with t in correct interval including both boundaries (condone 1 further error or omission) and M1 (dep on 2nd M1) for $\sum ft \div 80$ (2547.5 \div 80)
	(ii)	Correct histogram	4	B1 for each correct block with correct width and height If B0 then SC1 for four correct f.d.s or four correct widths
10	(a) (i)	5	1	
	(ii)	$-2\frac{1}{3}$ oe	2	B1 for [h(-1) =] $\frac{1}{3}$ soi or M1 for $2(3^x) - 3$
	(iii)	$\frac{x+3}{2}$ or $\frac{x}{2} + 1.5$ as final ans	2	M1 for $y + 3 = 2x$ or $x = 2y - 3$ or $\frac{y}{2} = x - 1.5$ or better or correct reverse flowchart
	(iv)	$4x - 9$ as final answer nfw	2	M1 for $2(2x - 3) - 3$
	(v)	$(2x - 3)(x + 1) = 1 + 2(x + 1)$ $2x^2 - 3x + 2x - 3$ or better seen $2x^2 - 3x - 6 = 0$	M1 B1 A1	$(2x - 5)(x + 1) = 1$ (eliminate fractions) $2x^2 - 5x + 2x - 5$ or better seen No errors or omissions seen

Qu		Answers	Mark	Part Marks
	(vi)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$	B2	B1 for $\sqrt{(-3)^2 - 4 \times 2 \times -6}$ or better [$\sqrt{5}$] and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ B1 for $p = -(-3)$ and $r = 2 \times 2$ or better
		2.64 and - 1.14 cao	B1B1	SC1 for 2.64 and -1.14 seen in working or 2.6 and -1.1 as final ans or 2.637. and -1.137.. as final ans or -2.64 and 1.14 as final ans
	(b)	$\frac{x-1}{x+5}$ as final answer nfw	4	B3 for $(x-1)(x-2)$ and $(x+5)(x-2)$ or B2 for $(x-1)(x-2)$ or $(x+5)(x-2)$ or SC1 for $(x+a)(x+b)$ where $a + b = 3$ or -3 or $ab = 2$ or -10
11	(a) (i)	(-5, 7)	1	
	(ii)	5	2	M1 for $\sqrt{(-3)^2 + 4^2}$ or better
	(b) (i)	(a) $\frac{3}{5}\mathbf{a} + \frac{2}{5}\mathbf{b}$ or $\frac{1}{5}(3\mathbf{a} + 2\mathbf{b})$ final answer	2	M1 for any correct vector path for \overrightarrow{ON}
		(b) $\frac{2}{5}\mathbf{a}$	2	M1 for any correct vector path for \overrightarrow{NY}
	(ii)	$NY = \frac{2}{5}BC$ oe [NY] parallel to [BC]	1dep 1dep	dep on (b)(i)(b) correct dep on $\overrightarrow{NY} = k\mathbf{a}$, $k \neq 1$