MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/42	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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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) (i)	$\dfrac{512}{7+11+14} \times 14$	M2	or **M1** for $\dfrac{512}{7+11+14}$
(ii)	112	1	
(b)	10 100	2	**M1** for 224×45 soi by 10080
(c)	19	2	**M1** for $224 \div 12$ soi by 18.66 to 18.67 or 18.7 or $18\dfrac{2}{3}$
(d) (i)	4093000	1	
(ii)	4.093×10^6	1FT	**FT** *their* **(d)(i)**
(e)	198 or 198.1 to 198.2	3	**M2** for $\dfrac{8.2-2.75}{2.75} \times 100$ oe or **M1** for $\dfrac{8.2}{2.75} \times 100$ or $\dfrac{8.2-2.75}{2.75}$
2 (a)	0 4 0.625 0.875	1,1,1,1	
(b)	Fully correct smooth curve	4	**B3 FT** for 8 or 9 points or **B2 FT** for 6 or 7 points or **B1 FT** for 4 or 5 points
(c)	line $y = x+1$ ruled and 0.2 to 0.3 and 1.8 to 1.95	3	Line must be fit for purpose ie at least from $x = 0$ to $x = 2$ **B2** for correct line and 1 correct value or **B1** for correct line or **SC1** for no/wrong line and 2 correct values

(d)	Tangent ruled at $x = -1.5$	**B1**	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.6$ and $x = -1.4$	
	2.2 to 5	**2**	**dep** on **B1** **M1** for $\dfrac{rise}{run}$ **also dep on** any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent	
3 **(a)**	Correct diagram	**3**	**B1** for correct vertical plots and **B1** for correct horizontal plots and **B1 dep on at least B1** for reasonable <u>increasing</u> curve or polygon through *their* 6 points If zero scored, **SC1** for 5 out of 6 correct plots
(b) **(i)**	32 to 34	**1**	
(ii)	120 – reading at $r = 50$	**2FT**	**B1FT** for reading at $r = 50$ seen
(c)	8 18 27	**2**	**B1** for 2 correct
(d)	35.2 or $35\frac{1}{6}$ or 35.16 to 35.17 nfww	**4**	**M1** for mid-values soi **M1 FT** for $\sum fx$ with x in the correct interval including boundaries **M1dep** for $\sum fx \div 120$ dependent on second **M1** earned
(e)	1.6 1.35 0.3	**4FT**	**FT** from **(c)** *their* $8 \div 5$ and *their* $27 \div 20$ **B3FT** for any 2 correct or **B2FT** for first **or** second answer correct or **B1** for 0.3 only
4 **(a)**	1.6[0] or 1.601 to 1.602	**3**	**M2** for $\dfrac{0.6}{\cos 68}$ oe or **M1** for $\cos 68 = \dfrac{0.6}{AC}$
(b)	43.5 or 43.6 or 43.49 to 43.56	**4**	**M2** for $\dfrac{1.9^2 + 2.3^2 - their\,1.6^2}{2 \times 1.9 \times 2.3}$ or **M1** for implicit statement **A1** for $[\cos =\,]$ 0.724 to 0.726

(c)	1.33 or 1.332...nfww	4	**M2** for $\sqrt{2.3^2 - \left(\frac{1}{2} \times 1.2\right)^2}$ or **M1** for $2.3^2 = h^2 + (0.5 \times 1.2)^2$ **and M1** for $\frac{1}{2} \times 1.2 \times their\,2.22$ (*their* 2.22 must come from attempt at Pythag or from trig in triangle *BCD*)
(d)	41.1 or 41.13 to 41.14	3	**M2** for $\sin = \dfrac{1.25}{1.9}$ oe or **M1** for correct angle identified
5 (a) (i)	$4x(3x+13) - 2x(4x - \{3x-9\}) = 24$ oe	**M1**	
	$12x^2 + 52x - 2x^2 - 18x$	**M1**	Correct removal of all *their* brackets Dep on two **areas** added or subtracted
	$5x^2 + 17x - 12 = 0$	**A1**	with no errors or omissions seen and at least one more line of working showing collection of like terms or division by 2
(ii)	$(5x - 3)(x + 4)$ [= 0]	**M2**	**M1** for $(5x + a)(x + b)$ where $ab = -12$ or $5b + a = 17$ [*a, b* integers]
	$\dfrac{3}{5}$ oe , -4	**A1**	If zero scored **SC1** for correct answers with no working or from other methods.
(b)	For correctly eliminating one variable	**M1**	
	$x = 3$ $y = -7$	**A1** **A1**	**SC1** if no working shown, but 2 correct answers given If zero scored **SC1** for 2 values satisfying one of the original equations
(c)	$t = -2$ nfww	5	**M1** for $2(t+3)(t+3) - t^2$ or better seen **M1** for denominator[s] $t(t+3)$ isw or for $t(t+3)$ isw on RHS **M1dep** for $2t^2 + 12t + 18 - t^2 = t^2 + 3t$ oe dependent on both numerators and denominator expanding to give quadratics **A1** for $9t + 18 = 0$ oe

6	(a)	(i)	43	1	
		(ii)	62	1	
			Isosceles triangle or *OYZ* is isosceles	1	
			Angle at centre is twice angle at circumference	1	
		(iii)	30 [Opposite angles of a]cyclic quadrilateral [add up to 180°]	2 1	**M1** for $p + 5p = 180$ oe
	(b)	(i)	1 : 2 oe	1	
		(ii)	*OQ* $MQ = NQ$	1 1	
			$OM = ON$	1	
			Centre or *O*	1	Not origin
7	(a)	(i)	Rotation	1	
			[+]90 or 90 anticlockwise oe	1	
			(0 , 2)	1	Not as column vector
		(ii)	Reflection $y = 1$ oe	1 1	
		(iii)	Enlargement [s f] $-\dfrac{1}{2}$ oe Origin oe	1 1 1	
	(b)		$\begin{pmatrix} -\dfrac{1}{2} & 0 \\ 0 & -\dfrac{1}{2} \end{pmatrix}$ oe	2FT	**FT** *their* s f from **(a)(iii)** **SC1** for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, $k \neq 1$ or 0
	(c)		Image at (4 , 1) (6, 1) (6 , 5) (4 , 3)	2	ruled or good freehand **SC1** for translation $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or for 4 correct vertices not joined
	(d)		Reflection $y = x$ oe	1 1	

8	(a)		$(4, 6)$	1, 1	
	(b)		4.47 or 4.472	3	**M2** for $\sqrt{(8-4)^2 + (5-3)^2}$ or better or **M1** for $(8-4)^2 + (5-3)^2$ or better
	(c)		$y = 2x - 2$ oe	3	**B2** for $2x - 2$ or $y = 2x + c$ oe or **M1** for $[m =] \dfrac{8-4}{5-3}$ oe soi by $2x$ **and M1** for (3, 4) or (5, 8) or *their* midpoint substituted into *their* $y = mx + c$ with m numerical
	(d)		-3	3	**M1** for use of gradient $\times$ *their* $m = -1$ soi by $-\dfrac{1}{2}$ **M1** for $r = $ *their* gradient $\times 6$ [+0]
9	(a)	(i)	11	1	
		(ii)	256	2	**M1** for $[g(3) =]$ 8 or 2^3 or 2^{2^x}
	(b)		$\dfrac{x-5}{2}$ oe final answer	2	**M1** for $x = 2y + 5$ or $2x = y - 5$ or better or $\dfrac{y}{2} = x + \dfrac{5}{2}$
	(c)		$19 - 6x$ final answer	2	**M1** for $2(7 - 3x) + 5$
	(d)		$-1, 0, 1, 2$	3	Additional values count as errors **B2** for one error /omission or **B1** for two errors/omissions or **M2** for $-2 < x \leqslant 2$ oe seen or **M1** for $-2 < x$ **or** $x \leqslant 2$ **or** $x = -2$ **and** $x = 2$ **or** $-4 < 2x \leqslant 4$
10	(a)		8 25 17	2	**B1** for 2 correct
	(b)		$n + 2$ oe	1	
	(c)	(i)	$(n - 1)^2$ oe	2	**M1** for $(n + k)^2$ for integer k
		(ii)	92	2	**M1** for $\sqrt{8281}$ or 91 seen
	(d)	(i)	$n^2 - 3n - 1$ final answer	2	**M1** for *their* $(n - 1)^2 - $ *their* $(n + 2)$ soi
		(ii)	39	1	

(e)	1 and $-\dfrac{1}{2}$ oe	**1**	
	$\dfrac{1}{4}$ oe	**1**	
	$-\dfrac{1}{8}$ oe	**1**	