0580 MATHEMATICS

0580/47 **Paper 4**

Due to a security breach we required all candidates in Kuwait who sat the paper for 0580/42 to attend a re-sit examination in June 2014. Candidates outside Kuwait sat only the original paper and were not involved in a re-sit.

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/47   Paper 4 (Extended), maximum raw mark 130

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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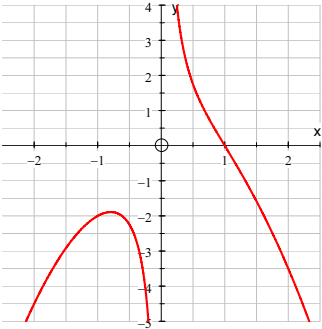
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question			Answer	Mark	Part Marks
1	(a)	(i)	[0]8 35	1	
		(ii)	48	2	**M1** for 88 ÷ *their* journey time
	(b)		14	2	**M1** for 12 ÷ 6 × 7 oe
	(c)	(i)	35.4 or 35.42 to 35.43	1	
		(ii)	15.5	3	**M2** for 12.4 ÷ 0.8 oe or **M1** for associating 12.4 with 80%
	(d)		17 16	3	**M1** for 88 ÷ 55 oe **A1** for 1h 36 [mins]
2	(a)	(i)	Triangle at (-7, 4), (-7, 6), (-4, 4)	2	**SC1** for translation $\begin{pmatrix} -8 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 2 \end{pmatrix}$, $k \neq 0$ or for 3 correct points not joined
		(ii)	Triangle at (-2, -1), (-4, -1), (-2, -4)	2	**SC1** for reflection in $y = x$ or for 3 correct plots not joined
	(b)		Rotation (0, 0) oe 90 clockwise oe	1 1 1	Marks independent
	(c)	(i)	Shear [factor] 2 invariant line *y*-axis oe	1 1 1	Marks independent

© Cambridge International Examinations 2014

	(ii)	$\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$	2	**SC1** for $\begin{pmatrix} 1 & 0 \\ k & 1 \end{pmatrix}$ $k \neq 0$ or $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$
3	(a)	32.1 or 32.13 to 32.14	3	**M2** for $\tan = \dfrac{11.6 \tan 53}{24.5}$ oe or **M1** for $\dfrac{TC}{11.6} = \tan 53$ oe or better or $\tan = \dfrac{their\,TC}{24.5}$ oe
	(b)	$[\cos =]\dfrac{24.5^2 + 11.6^2 - 29.5^2}{2 \times 24.5 \times 11.6}$ 103.7 to 103.8 nfww	**M2** **A2**	**M1** for $29.5^2 = 24.5^2 + 11.6^2 - 2 \times 24.5 \times 11.6 \cos ACB$ **A1** for $-0.238[\ldots]$ or $-\dfrac{1693}{7105}$
	(c)	138 or 137.87 to 138.1	2	**M1** for $0.5 \times 24.5 \times 11.6 \times \sin 104$ oe
	(d)	13[.0] or 12.99 to 13.01	3	**M2** for $\dfrac{11.6 \sin 104}{\sin 60}$ or **M1** for $\dfrac{11.6}{\sin 60} = \dfrac{AD}{\sin 104}$ oe
4	(a)	1015.7 to 1015.9	3	**M1** for $\pi \times 7^2 \times 10$ **M1** for $\frac{4}{3}\pi \times 5^3$
	(b)	6.11 or 6.12 or 6.113 to 6.117	4	**M1** for $\frac{4}{3}\pi \times 5^3 \times 7.85$ [4108 to 4114] **M1** for 1016×0.85 [863. …] **M1**dep on **M2** for their total mass $\div 1000 + 1.14$ **SC3** for figs 611 or 6111 to 6118
	(c)	6.6[0] or 6.597 to 6.600	3	**M2** for $1016 \div (\pi \times 7^2)$ oe or **M1** for $\pi \times 7^2 \times h = 1016$ oe
	(d) (i)	12.4 or 12.38 to 12.40	2	**M1** for $\frac{4}{3}\pi \times 5^3 \div 6.5^2$

	(ii)	366 to 370	3	**M2** for $\pi \times 7^2 \times (their\,(d)(i) - 10)$ oe or **M1 for** $\pi \times 7^2 \times their\,(d)(i)$
5	**(a)**	− 4.5, − 2, − 3.5	3	**B1, B1, B1**
	(b)	Complete correct curve	5	**B3FT** 10 points **or B2FT** for 8 or 9 points **or B1FT** for 6 or 7 points **And B1indep** two separate branches not touching or crossing y-axis
	(c) (i)	Correct line $y = x - 1$ ruled at least from $x = - 1$ and to $x = 1$	1	
	(ii)	Tangent $(- 1, - 2)$	1 1	
	(d) (i)	0.5, 2	1	
	(ii)	Correct curve	2	**B1FT** for 5 points
	(iii)	0.65 to 0.75	1	
	(iv)	3	2	**M1** for $\dfrac{1}{x} = 2x^2 + x^2$ or better or $1 - x^3 = 2x^3$ oe or $1 \div their\,(d)(iii)^3$
6	**(a) (i)**	88	1	
	(ii)	25 to 27	2	Not from $100 \div 4$ **M1** for $96(\pm 1) - 70(\pm 1)$ seen
	(iii)	64	2	**B1** for 36 soi
	(b) (i)	18, 24	2	**B1 B1**

	(ii)	85.5 nfww	**4**	**M1** for at least 4 correct of 45, 70, 85, 95, 125 soi **M1** for use of $\sum fx$ with x in correct interval including both boundaries 18×45 + *their*18× 70 + 20×85+ *their* 24×95 + 20×125 [810 + '1260' + 1700+ '2280' + 2500] **M1 dep on 2nd M1** for $\sum fx \div 100$ or FT (18 + *their* 18 + 20 + *their* 24 + 20)
	(iii)	0.72 oe 2.2 oe 0.4 oe	**3**	**B1FT** (18 + *their* 18) ÷ 50 **B1FT** (20 + *their* 24) ÷ 20 **B1**
7 **(a)**	**(i)**	$(2x+1)(x-1)=(x+1)^2 +8$ oe $2x^2 + x - 2x - 1$ **or** $x^2 + x + x + 1$ $x^2 - 3x - 10 = 0$	**M1** **B1** **A1**	Allow $2x^2 + x - 2x - 1 = x^2 + x + x + 1 + 8$ oe which is **M1B1** Allow $2x^2 - x - 1$ **or** $x^2 + 2x + 1$ Dependent on all brackets expanded, terms collected and correct conclusion with no errors or omissions.
	(ii)	$(x-5)(x+2)$	**2**	**SC1** for $(x+a)(x+b)$ where $ab = -10$ or $a+b = -3$
	(iii)	24	**2FT**	**FT** 4 × (a positive root + 1) **B1FT** for a correct positive root used from *their* (a)(ii)
(b)	**(i)**	$\dfrac{20}{x}$	**1**	

(ii)	$\dfrac{20}{x} - \dfrac{20}{x+1} = \dfrac{1}{4}$ oe	**M1**	Could be seen after some simplifying of 2 fractions Allow $\dfrac{20}{x+1} - \dfrac{20}{x} = \dfrac{1}{4}$ oe
	$4 \times 20(x+1) - 4 \times 20x =$ $x(x+1)$ oe $80x + 80 - 80x = x^2 + x$	**A1**	Could still be over common denominator.
	$x^2 + x - 80 = 0$	**A1**	Dependent on brackets expanded, terms collected and correct conclusion with no errors or omissions.

(iii)	$\dfrac{-1 \pm \sqrt{1^2 - 4(1)(-80)}}{2}$	**B2**	**B1** for $\sqrt{1^2 - 4(1)(-80)}$ seen **or** for $\left(x + \dfrac{1}{2}\right)^2$ If $\dfrac{p + \sqrt{q}}{r}$ or $\dfrac{p - \sqrt{q}}{r}$ seen **B1** for $p = -1$ **and** $r = 2(1)$ oe **or** for $-\dfrac{1}{2} + or - \sqrt{80 + \left(\dfrac{1}{2}\right)^2}$
	– 9.46, 8.46 final answers	**B1B1**	If B0, **SC1** for -9.5 or $-9.458\ldots$ **and** 8.5 or 8.458… or answers 9.46 **and** -8.46 or correct answers both seen

(iv)	4 [h] 29 [min] cao	**2**	**M1** for $\dfrac{20}{their\ positive\ root} + \dfrac{20}{their\ positive\ root\ +1}$ written

8	(a)	(i)	21	**1**	
		(ii)	7	**1**	
	(b)		5	**1**	
	(c)		$\dfrac{10}{23}$	**3**	Mark final answer **B2** for $\dfrac{240}{552}$ oe or **M1** for $\dfrac{16}{24} \times \dfrac{15}{23}$

(d)		$\dfrac{7}{12}$ oe	1	
(e)		$\dfrac{16}{21}$ oe	1	
9	**(a)**	**(i)**	$\begin{pmatrix} -8 \\ -21 \end{pmatrix}$	2	**B1** each component
		(ii)	-2	2	**M1** for $k\begin{pmatrix} 2 \\ 3 \end{pmatrix}+\begin{pmatrix} 5 \\ 12 \end{pmatrix}=\begin{pmatrix} 1 \\ 6 \end{pmatrix}$ oe
	(b)	**(i)**	$-\mathbf{a}+\mathbf{c}$	1	
		(ii)	$\frac{2}{3}(-\mathbf{a}+\mathbf{c})$ allow expanded	1FT	**FT** $\frac{2}{3}$ *their* (b)(i) dep on vector of form $m\mathbf{a}+n\mathbf{c}$ [m, $n\neq 0$]
		(iii)	$\frac{1}{3}\mathbf{a}+\frac{2}{3}\mathbf{c}$ allow factorised	2	**M1** for correct unsimplified answer or correct route e.g $\overrightarrow{OC}+\overrightarrow{CE}$ or $\mathbf{a}+$ *their* (b)(ii) or $\mathbf{c}-1/3$ *their* (b)(i)
10	**(a)**	**(i)**	23 $\quad$ $5n-2$ oe	1, 2	**B1** for $5n+k$
			81 $\quad$ 3^{n-1} oe	1, 2	**B1** for answer of form 3^k
		(ii)	127	2	**M1** for *their* $5n-2=633$
		(iii)	6.561×10^3	2	**B1** for 6561 or $6.56[1] \times 10^3$
	(b)	**(i)**	$2, -4$	4	**B2** for any two from $1+p+q=-1$, $2^2+2p+q=4$, $3^2+3p+q=11$, $4^2+4p+q=20$ or **B1** for one from above equations **M1** for correctly eliminating p or q from a pair of linear equations After **0** scored **SC2** for one correct solution
		(ii)	10196 $\quad$ cao	1	