UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

0580 MATHEMATICS

0580/42 Paper 4 (Extended), maximum raw mark 130

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Abbreviations

cao correct answer only
cso correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
www without wrong working
art anything rounding to
soi seen or implied

Qu.	Answers	Mark	Part Marks
1	**(a) (i)** 14.62 final answer	**3**	**M2** for $0.85 \times 20 \times 0.86$ oe soi by 14.6(0) or **M1** for 0.85×20 soi by 17 or 0.85×0.86 soi by 0.731
	(ii) 20 www	**3**	**M2** for 16.40 /0.82 oe or **M1** for 16.40 associated with 82%
	(iii) 135 www	**2**	**M1** for $(108 \times 5)/4$
	(b) $c + 4d = 27.10$ oe	**B1**	Could use other variables but must be consistent
	$c + 7d = 34.30$ oe	**B1**	
	Elimination of one variable	**M1**	**M1** for correct elimination of one variable from their equations – condone 1 arithmetic slip
	(c =) 17.5(0) and (d =) 2.4(0)	**A1**	Correct answers from no working scores **SC1** only
	(c) 36 cao	**3**	**B1** for 7h 30 min or 7.5 or 450 (mins) seen and **M1** for $270/t$ where $7 \leq t \leq 9$
	(d) 606.744 or 606.74 or 606.7(0) or 607	**2**	**M1** for $540 \times (1.06)^2$ oe but not $(1 + 6\%)^2$ unless recovers For step by step method, must see 572.4(0) and a correct method for the second year **M0** if any further addition or subtraction

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2	**(a) (i)** 39	**2**	**B1** for (f(2) =) 6 or 6^2 seen or $(4x-2)^2+3$ seen
	(ii) $\frac{8}{x}+2$ or $\frac{8+2x}{x}$ or $\frac{2(4+x)}{x}$ or $8x^{-1}+2$ final answer	**2**	**M1** for $4\left(\frac{2}{x}+1\right)-2$
	(b) –2.5 oe	**2**	**M1** for $2+x=0.2x$ oe or $\frac{2}{x}=0.2-1$ or better
	(c) 2.2 oe	**2**	**M1** for $\frac{2}{5/3 \text{ oe}}+1$ allow 1.66 to 1.67 for 5/3 or $\frac{2}{2/x+1}+1$
	(d) (i) $4x-2=\frac{2}{x}+1$		oe with these four terms
	At least 1 intermediate step and $4x^2-3x-2=0$	**E1**	No errors
	(ii) $\frac{-(-3)\pm\sqrt{(-3)^2-4(4)(-2)}}{2(4)}$	**B1** **B1**	**B1** for $\sqrt{(-3)^2-4(4)(-2)}$ or better (41) and in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ **B1** for – (–3) and 2(4) or better
	1.18 and –0.43 cao	**B1B1**	**SC1** for 1.18 and –0.43 seen or 1.2 and –0.4 or 1.17... and –0.425…
3	**(a)** Reflection only	**B1**	Two transformations scores 0
	$x=-1$ oe only	**B1**	
	(b) (i) Triangle (–1, 2) (–1, 6) (–3, 6)	**B2**	**B1** for vertices plotted only or for clockwise rotation about (0,0)
	(ii) Triangle (–1, –2) (–1, –6) (–3, –6)	**B2**	**B1** for vertices plotted only or for reflection in $x=y$
	(iii) Triangle (1, –1) (7, –1) (7, 2)	**B2**	**B1** for vertices plotted only or for enlargement by 1.5 with correct orientation
	(c) (i) Triangle drawn at (2, 3) (6, 7) (6, 9)	**3**	**B2** for 2 correct vertices plotted or **SC2** for 3 correct coordinates shown in working or **SC1** for any 2 correct coordinates or **M1** for $\begin{pmatrix}1&0\\1&1\end{pmatrix}\begin{pmatrix}2&6&6\\1&1&3\end{pmatrix}$
	(ii) Shear (only)	**B1**	Two transformations scores 0
	y axis invariant	**B1**	or $x=0$ invariant
	(factor) 1	**B1**	
	(d) $\begin{pmatrix}0&1\\-1&0\end{pmatrix}$	**B2**	**B1** for either column or row correct

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4	**(a) (i)** 28 cao	**2**	**M1** for $\frac{350\times16}{200}$ oe or 350 ÷ 12.5 oe or 1.75 × 16 oe
	(ii) 420	**2ft**	ft for *their* 28 ×15 **M1** for *their* $28\times\frac{240}{16}$ or $\frac{350\times240}{200}$ oe or 1.75 × 240 oe
	(b) $(r^3 =)\frac{3\times1080}{4\pi}$ oe	**M1**	Correct rearrangement soi by 257 to 258
	$(r =)\sqrt[3]{\frac{3\times1080}{4\pi}}$ oe	**M1dep**	Dependent on previous **M1**
	6.36 or 6.37 www	**A1**	6.364 to 6.366
	(c) (i) 24	**B1**	
	(ii) 232 (231.6 to 232.2)	**3**	**M1** for $\pi \times 2.5^2 \times 1.8$ (soi by 35.3 to 35.4) or area = 20 × 30 – their 24 × $\pi \times 2.5^2$ (soi by 128.7 to 129) and **M1dep** for 1080 – ($\pi \times 2.5^2 \times 1.8$) × their 24 or their area × 1.8
5	**(a)** 63.45 or 63.5 cso	**4**	**M1** for 10, 30, 45, 55, 65, 75, 85, 95 At least 6 correct mid-values soi and **M1** for $\sum fx$ (6 × 10 + 12 × 30 + 20 × 45 +... 5 × 95) (12690) where x is in the correct interval allow one further slip and **M1** for their $\sum fx \div 200$ dep on second **M1**
	(b) (i) 75 117 195 200	**B2**	**B1** for 2 or 3 correct
	(ii) 8 correct points plotted	**P3ft**	**P2ft** for 6 or 7 **P1ft** for 4 or 5
	Curve (or polygon) correct through 8 points	**C1ft**	ft their increasing curve only if at least **B1** in **(b)(i)**. Ignore t = 0 to 20
	(c) (i) 65 to 67	**B1ft**	Or ft their curve at cf = 100
	(ii) 52 to 55	**B1**	
	(iii) 21 to 24	**B1**	
	(iv) 44 to 52	**B1**	Must be integer
	(v) Integer value of 200 – reading at 45 secs	**2ft**	**B1ft** for integer value of reading at 45 secs

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6	**(a) (i)** 141 (141.3 to 141.4)	**2**	**M1** for $\pi \times 4.5 \times 10$
	(ii) 8.93 (8.93…)	**3**	**M2** for $\sqrt{10^2 - 4.5^2}$ or **M1** for $h^2 + 4.5^2 = 10^2$ implied by 79.75
	(b) (i) 2.98 or 2.976 to 2.977	**2ft**	ft their **(a)(ii)** ÷ 3 www correct to 3sf or better **M1** for their **(a)(ii)** ÷ 3
	(ii) Answer rounds to 15.7	**2ft**	ft their **(a)(i)** ÷ 9 correct to 3 sf or better or $\pi \times 1.5 \times \sqrt{\text{their } 2.98^2 + 1.5^2}$ **M1** for their **(a)(i)** ÷ 9 or $\pi \times 1.5 \times 10 \div 3$ oe or $\pi \times 1.5 \times \sqrt{\text{their } 2.98^2 + 1.5^2}$
	(c) 535 or 536 (534.9 to 535.8)	**5**	**M1** for area of one circle $\pi \times 1.5^2$ or $\pi \times 4.5^2$ (7.0685 or 63.617) and **M1** for their **(a)(i)** – their **(b)(ii)** (large cone SA – small cone SA) (141 – 15.7) (= 125.3 to 125.7) and **M1** for $12 \times \pi \times 9$ (curved area of cylinder) (339.292..) and **M1** for correct collection of 4 areas
7	**(a)** 8.7, –3.2, –10	**B3**	8.66(..) or 8.67, –3.24, –9.99 if given to 2 dp **B1** for each correct value
	(b) 6 correct points plotted	**P2ft**	**P1ft** for 5 or 4 correct
	Smooth curve through 6 points and correct shape	**C1ft**	**C0** if curve crosses y-axis
	(c) Ruled tangent drawn at $x = 2$	**T1**	Not chord, allow slight daylight
	Rise/run (using correct scales)	**M1**	Dep **T1**
	3.4 to 4	**A1**	
	(d) $k > 1.85$ or $k >$ any value greater than 1.85	**B1**	Accept ≥ Ignore $k <$ any value greater than 1.85
	(e) (i) Correct ruled line for $-3 \leq x \leq 3$	**B2**	**SC1** for short ruled line or good freehand complete line or any ruled line grad –1 or ruled with y intercept of 1 (not $y = 1$)
	(ii) –1.75 to –1.9	**B1**	
	(f) (i) $x^2 + \frac{1}{x} = x + 2$	**B2**	**B1** for $x^2 - x - 2 + \frac{1}{x} = 0$ oe seen or $1 + x^3 = x^2 + 2x$ seen
	(ii) $(y =)\ x + 2$	**B1ft**	or their $ax + b$ numerical $a \neq 0$ and $b \neq 0$

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8	**(a)**	**(i)** $3^2 + 5^2 - 2 \times 3 \times 5 \cos 45$	**M2**	**M1** for correct implicit version
		3.575… or 3.576 cao	**E2**	**A1** for 12.78 to 12.8
		(ii) 36.3 to 36.4	**3**	**M2** for $(\sin BCA =) \frac{3 \times \sin 45}{\text{their } 3.58}$ or **M1** for $\frac{\sin BCA}{3} = \frac{\sin 45}{\text{their } 3.58}$ oe
	(b)	**(i)** 76	**B1**	
		(ii) 17.4 or 17.42 to 17.44	**3**	**M2** for $0.5 \times 3 \times 5 \times \sin 45 + 0.5 \times 5 \times 5 \sin$ their **(b)(i)** 5.3033... + 12.1286... or **M1** for $0.5 \times 3 \times 5 \times \sin 45$ or $0.5 \times 5 \times 5 \sin$ their **(b)(i)**
	(c)	48.2 (48.18 to 48.19)	**2**	**M1** for $\cos PAB = \frac{2}{3}$ oe

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9	**(a) (i)** $\frac{120}{336}$ oe $\frac{5}{14}$ 0.357(1…)	**3**	Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words isw incorrect cancelling/conversion to other forms Pen –1 once for 2sf answers **M2** for $\frac{6}{8}\times\frac{5}{7}\times\frac{4}{6}$ or **M1** for $\frac{5}{7}$ seen
	(ii) $\frac{180}{336}$ oe $\frac{15}{28}$ 0.536 or 0.5357…	**3**	**M2** for $\frac{2}{8}\times\frac{6}{7}\times\frac{5}{6}+\frac{6}{8}\times\frac{2}{7}\times\frac{5}{6}+\frac{6}{8}\times\frac{5}{7}\times\frac{2}{6}$ Accept $3\times\frac{2\times5\times6}{6\times7\times8}$ or **M1** for $\frac{2\times5\times6}{6\times7\times8}$ oe seen ($\frac{60}{336}$ oe $\frac{5}{28}$)
	(b) (i) $\frac{x}{25}\times\frac{x-1}{24}=\frac{7}{100}$ $\frac{x^2-x}{600}=\frac{7}{100}$	**M2**	**M1** for $\frac{x}{25}$ or $\frac{x-1}{24}$ seen
	or $x(x-1)=\frac{7}{100}\times25\times24$	**M1**	Or better, min requirement is $x^2 - x = 7 \times 6$
	$x^2 - x - 42 = 0$	**E1**	With no errors or omissions
	(ii) $(x+6)(x-7)$	**B2**	**SC1** any other $(x + a)(x + b)$ where $a \times b = -42$ or $a + b = -1$
	(iii) –6, 7	**B1ft**	Correct or follow through dep on at least **SC1** in **(b)(ii)**
	(iv) 18	**B1ft**	Correct or ft 25 – their positive integer solution Dep on pos and neg answer to **(b)(iii)** Answer must be positive integer

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