UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

0580 MATHEMATICS

0580/41 Paper 4 (Extended), maximum raw mark 130

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UNIVERSITY of CAMBRIDGE
International Examinations

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)** 1088	2	**M1** for 3136 ÷ (17 + 32) soi by 64 or 2048
	(ii) Their 1088 × 2 and (3136 – their 1088) × 4.5	M1	2048 may be 32 × 64
	2176 + 9216	E1	
	(b) 11.9 to 11.9031 www	3	**M2** for $\frac{(12748-11392)\times 100}{11392}$ oe or **M1** for $\frac{12748-11392}{11392}$ soi by 0.1119 or $\frac{12748}{11392}(\times 100)$ soi by 111.9 or 112 or 1.119
	(c) 8900	3	**M2** for 11392 ÷ 1.28 oe or **M1** for 11392 = 128(%) oe
2	**(a) (i)** Correct reflection (1, –1) (4, –1) (4, –3)	2	**SC1** for reflection in *y*-axis or vertices only of correct triangle
	(ii) Correct rotation (–1, 1) (–1, 4) (–3, 4)	2	**SC1** for rotation 90 clockwise about O or vertices only of correct triangle
	(iii) Reflection only	1dep	Two transformations scores 0 Dependent on at least **SC1** scored in **both (i)** and **(ii)**
	$y = x$ oe **or** $y = -x$ oe	1	Only from **2 and 2** or **SC1 and SC1** scored Only from **2 and SC1** or **SC1 and 2** scored
	(b) (i) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ oe	2	**B1** for either column correct or determinant = 1
	(ii) Rotation, 90° clockwise, origin oe	2	**B1** for rotation **and** origin **B1** for 90° clockwise oe

3	**(a)** $72 - 2x$ oe seen $x(72 - 2x) = 72x - 2x^2$	M1 E1	 No errors or omissions
	(b) $2x(36 - x)$ or $-2x(x - 36)$	2	isw solutions **B1** for answers $2(36x - x^2)$ or $x(72 - 2x)$ or correct answer spoiled by incorrect simplification
	(c) 630, 640, 70	3	**B1** for each correct value
	(d) 8 correct plots	P3ft C1	ft for their values ft **P2** for 6 or 7 correct plots ft **P1** for 4 or 5 correct plots Curve of **correct shape** through minimum of 7 of their points No ruled sections
	(e) (i) 7.5 to 8.5 27.5 to 28.5 **(ii)** 641 to 660	 2 1	 **B1** for either value correct
	(f) 41	2	**M1** for 500 ÷ 12 soi by 41.6… to 42
4	**(a)** $1.5^2 + 2^2$ (l =) 2.5 $\pi \times 1.5 \times$ their 2.5 $2 \times \pi \times 1.5 \times 4$ Addition of their areas for cone and cylinder 49.45 to 49.5	M1 A1 M1 M1 M1 A1	soi by 6.25 May be on diagram Their $2.5 \neq 2$ soi by 11.77 to 11.8 or 3.75π soi by 37.68 to 37.715 or 12π soi by 15.75π This **M** mark is lost if any circles are added www 6
	(b) (i) $\pi \times 1.5^2 \times 4$ $\frac{1}{3}\pi \times 1.5^2 \times 2$ Addition of their volumes 32.9(7) to 32.99… **(ii)** 84(.0) to 84.1 www	M1 M1 M1 E1 3	soi by 28.26 to 28.3 or 9π soi by 4.71 to 4.72 or 1.5π 10.5π implies M3 **M1** for $\frac{1}{2}\pi \times 0.5^2$ soi by 0.392 to 0.393 or $\pi/8$ and **M1** for their $33 \div (\frac{1}{2}\pi \times 0.5^2)$ soi by $264/\pi$ or **SC1** for 42 to 42.1 as answer
	(c) (i) 33000 **(ii)** 18min 20s cao	1 2	 **M1** for their 33000 ÷ 1800 soi by 18.3(3…) or correct in mins and secs for their 33000

5	**(a)** 8 correct plots	P3	**P2** for 6 or 7 correct plots **P1** for 4 or 5 correct plots
	Joined by curve or ruled lines	C1ft	ft their points Must join minimum of 7 points
	(b) (i) 161 to 162	1	
	(ii) 171 to 172	1	
	(iii) Their **(b)(ii)** – 150	1ft	**Strict** ft provided > 0
	(c) (i) $\frac{55}{200}$ oe $\left(\frac{11}{40}\right)$	1	isw incorrect cancelling for both parts of **(c)**
	(ii) $\frac{1100}{39800}$ oe $\left(\frac{11}{398}\right)$	3	**M2** for 2 × their $\frac{55}{200} \times \frac{10}{199}$ oe soi by 0.0276… or **M1** for their $\frac{55}{200} \times \frac{10}{199}$ oe $\left(\frac{11}{796}\right)$ soi by 0.0138…
	(d) (i) 30, 35, 20	2	**B1** for 1 correct value
	(ii) Blocks in correct position		
	w = 1cm, fd = 4	1	
	w = 1cm, fd = 6	1ft	**Strict** ft from their 30 unless 0
	w = 2cm, fd = 3.5	1ft	**Strict** ft from their 35 unless 0
6	**(a) (i)** 13 cao www	2	**M1** for $\frac{PQ}{19.5} = \frac{11}{16.5}$ oe or sf = 2/3 or 1.5 seen or correct trig
	(ii) 10.39 to 10.4 www	3	**M2** for $\sqrt{19.5^2 - 16.5^2}$ or explicit trig or **M1** for $x^2 + 16.5^2 = 19.5^2$ or implicit trig
	(iii) 57.76 to 57.81 www	2	**M1** for sin = $\frac{16.5}{19.5}$ oe
	(iv) 655 to 655.4	2	**M1** for $0.02 \times (32)^3$
	(b) (i) 163.5 to 164 www	4	**M2** for $67^2 + 105^2 - 2 \times 67 \times 105\cos 143$ or **M1** for implicit form **A1** for 26732 to 26896
	(ii) 100.8 to 100.9 or 101 www	4	**B1** for (DEF =) 78° May be on diagram and **M2** for $\frac{105 \times \sin 70}{\sin \text{their } 78}$ provided their 78 ≠ 32 or 70 or **M1** for $\frac{EF}{\sin 70} = \frac{105}{\sin \text{their } 78}$ oe their 78 ≠ 32 or 70

7			The marks for the reasons are **dependent** on the correct angle or correct ft angle Any incorrect statement in reason loses that mark
	(a) $w = 59$ (angle in) isosceles (triangle)	1 1	
	$x = 31$ (angle in) semicircle (= 90) oe	1ft 1	ft 90 – their w Allow diameter
	$y = 62$ (angles in) same segment or (on) same arc (are =)	1 1	
	$z = 28$ (angles in) triangle (= 180)	1ft 1	ft 180 – their($w + x + y$) or 90 – their y
	(b) (i) $\begin{pmatrix}2\\3\end{pmatrix}$	1	
	(ii) $\begin{pmatrix}-2\\4\end{pmatrix}$	2ft	ft $\begin{pmatrix}0\\7\end{pmatrix}$ – their **(i)** **B1** ft for one correct element
	(c) (i) $\frac{1}{3}\mathbf{t}$ final answer	1	
	(ii) $\frac{1}{3}(-\mathbf{t}+\mathbf{r})$ final answer	2	**M1** for correct unsimplified answer or $\overrightarrow{TR} = -\mathbf{t}+\mathbf{r}$ oe or $\overrightarrow{TP} = \frac{1}{3}\overrightarrow{TR}$ oe
	(iii) $\frac{1}{3}\mathbf{r}$ final answer	2	**M1** for correct unsimplified answer or $\overrightarrow{QT} + \overrightarrow{TP}$ oe for any correct path or $\frac{1}{3}\mathbf{t}$ + their **(ii)**
	(iv) $QP = \frac{1}{3}OR$ oe	1dep	**Dependent** on correct answer in **(iii)**
	QP is parallel to OR or $\mathbf{r}$	1dep	**Dependent** on multiple of **r** as answer in **(iii)**

8	**(a) (i)** 3	1	
	(ii) 4	1	
	(iii) $4x - 3$ final answer	2	**M1** for $2(2x - 1) - 1$
	(iv) $\frac{x+1}{2}$ oe final answer	2	**M1** for $x = 2y - 1$ or $\frac{y+1}{2}$ oe or $\frac{f(x)+1}{2}$ oe
	(v) $-\frac{1}{2}$ and $1\frac{1}{2}$	4	**B1** for $(2x - 1)^2$ soi **M2** for $2x - 1 = \pm 2$ **M1** for $4x^2 - 2x - 2x + 1$ **or M1** for $2x - 1 = 2$ **and M1** for $(2x + 1)(2x - 3)$ or correct substitution in formula soi by $(4 \pm \sqrt{64})/8$
	(b) (i) $y = \frac{16}{x}$ oe	2	Condone $y = k/x$ and $k = 16$ stated **M1** for $y = \frac{k}{x}$ oe
	(ii) 32	1	
9	**(a) (i)** 21	1	
	(ii) $P_6 = ½ \times 6 \times 7$ or better (= 21)	1	Allow $3(6 + 1)$
	(iii) 1275	1	
	(iv) 3825	1ft	ft for $3 \times$ their **(iii)**
	(v) 11325	1	
	(vi) 7500	1ft	ft their **(v)** – their **(iv)** provided > 0
	(b) (i) 56	2	**M1** for $1 \times 6 + 2 \times 5 + 3 \times 4 + 4 \times 3 + 5 \times 2 + 6 \times 1$
	(ii) $S_6 = \frac{1}{6} \times 6 \times 7 \times 8$ or better (= 56)	1	
	(iii) 1540	1	
	(c) $56 - 35 = 21$	1	
	(d) Correct algebraic proof with no errors	3	**M1** for $\frac{1}{6}n(n + 1)(n + 2) - \frac{1}{6}(n - 1)(n)(n + 1)$ oe and **M1** for $\frac{1}{6}n(n + 1)(3)$ oe