

**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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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 $3136 \div (17 + 32)$ soi by 64 or 2048
	(ii) Their 1088×2 and $(3136 - \text{their } 1088) \times 4.5$ $2176 + 9216$	M1 E1	2048 may be 32×64
	(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 $11392 \div 1.28$ 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

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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 $500 \div 12$ 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 $33000 \div 1800$ soi by 18.3(3...) or correct in mins and secs for their 33000

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

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7			The marks for the reasons are dependent on 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 QP is parallel to OR or \mathbf{r}	1dep 1dep	Dependent on correct answer in (iii) Dependent on multiple of \mathbf{r} as answer in (iii)

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