

**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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<p>3</p>	<p>(a) $72 - 2x$ oe seen $x(72 - 2x) = 72x - 2x^2$</p> <p>(b) $2x(36 - x)$ or $-2x(x - 36)$</p> <p>(c) 630, 640, 70</p> <p>(d) 8 correct plots</p> <p>(e) (i) 7.5 to 8.5 27.5 to 28.5 (ii) 641 to 660</p> <p>(f) 41</p>	<p>M1 E1 2 3 P3ft C1 2 1 2</p>	<p>No errors or omissions</p> <p>isw solutions B1 for answers $2(36x - x^2)$ or $x(72 - 2x)$ or correct answer spoiled by incorrect simplification</p> <p>B1 for each correct value</p> <p>ft for their values ft P2 for 6 or 7 correct plots ft P1 for 4 or 5 correct plots</p> <p>Curve of correct shape through minimum of 7 of their points No ruled sections</p> <p>B1 for either value correct</p> <p>M1 for $500 \div 12$ soi by 41.6... to 42</p>
<p>4</p>	<p>(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</p> <p>(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...</p> <p>(ii) 84(.0) to 84.1 www</p> <p>(c) (i) 33000 (ii) 18min 20s cao</p>	<p>M1 A1 M1 M1 M1 A1 M1 M1 M1 E1 3 1 2</p>	<p>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</p> <p>soi by 28.26 to 28.3 or 9π</p> <p>soi by 4.71 to 4.72 or 1.5π</p> <p>10.5π implies M3</p> <p>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</p> <p>M1 for their $33000 \div 1800$ soi by 18.3(3...) or correct in mins and secs for their 33000</p>

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<p>5</p>	<p>(a) 8 correct plots 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 C1ft 1 1 1ft 1 3 2 1 1ft 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 $2 \times$ 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>
<p>6</p>	<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 3 2 2 4 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>

7	<p>(a) $w = 59$ (angle in) isosceles (triangle)</p> <p>$x = 31$ (angle in) semicircle (= 90) oe</p> <p>$y = 62$ (angles in) same segment or (on) same arc (are =)</p> <p>$z = 28$ (angles in) triangle (= 180)</p> <p>(b) (i) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ (ii) $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$</p> <p>(c) (i) $\frac{1}{3} \mathbf{t}$ final answer (ii) $\frac{1}{3} (-\mathbf{t} + \mathbf{r})$ final answer (iii) $\frac{1}{3} \mathbf{r}$ final answer (iv) $QP = \frac{1}{3} OR$ oe QP is parallel to OR or \mathbf{r}</p>	<p>1 1</p> <p>1ft 1</p> <p>1 1</p> <p>1ft 1</p> <p>1 1</p> <p>1ft 1</p> <p>1</p> <p>2ft</p> <p>1</p> <p>2</p> <p>2</p> <p>1dep 1dep</p>	<p>The marks for the reasons are dependent on correct angle or correct ft angle Any incorrect statement in reason loses that mark</p> <p>ft 90 – their w Allow diameter</p> <p>ft 180 – their($w + x + y$) or 90 – their y</p> <p>ft $\begin{pmatrix} 0 \\ 7 \end{pmatrix}$ – their (i) B1 ft for one correct element</p> <p>M1 for correct unsimplified answer or $\overrightarrow{TR} = -\mathbf{t} + \mathbf{r}$ oe or $\overrightarrow{TP} = \frac{1}{3} \overrightarrow{TR}$ oe</p> <p>M1 for correct unsimplified answer or $\overrightarrow{QT} + \overrightarrow{TP}$ oe for any correct path or $\frac{1}{3} \mathbf{t}$ + their (ii)</p> <p>Dependent on correct answer in (iii)</p> <p>Dependent on multiple of \mathbf{r} as answer in (iii)</p>
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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) $P_6 = \frac{1}{2} \times 6 \times 7$ 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	