

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

**0581 MATHEMATICS**

**0581/41**

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.

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

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3	<p>(a) <math>72 - 2x</math> oe seen <math>x(72 - 2x) = 72x - 2x^2</math></p> <p>(b) <math>2x(36 - x)</math> or <math>-2x(x - 36)</math></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</p> <p>2</p> <p>3</p> <p>P3ft</p> <p>C1</p> <p>2 1</p> <p>2</p>	<p>No errors or omissions</p> <p>isw solutions <b>B1</b> for answers <math>2(36x - x^2)</math> or <math>x(72 - 2x)</math> or correct answer spoiled by incorrect simplification</p> <p><b>B1</b> for each correct value</p> <p>ft for their values ft <b>P2</b> for 6 or 7 correct plots ft <b>P1</b> for 4 or 5 correct plots Curve of <b>correct shape</b> through minimum of 7 of their points No ruled sections</p> <p><b>B1</b> for either value correct</p> <p><b>M1</b> for <math>500 \div 12</math> soi by 41.6... to 42</p>
4	<p>(a) <math>1.5^2 + 2^2</math> (<math>l =</math>) 2.5 <math>\pi \times 1.5 \times</math> their 2.5 <math>2 \times \pi \times 1.5 \times 4</math> Addition of their areas for cone and cylinder 49.45 to 49.5</p> <p>(b) (i) <math>\pi \times 1.5^2 \times 4</math> <math>\frac{1}{3} \pi \times 1.5^2 \times 2</math> 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</p> <p>M1 M1 M1 E1 3</p> <p>1 2</p>	<p>soi by 6.25 May be on diagram Their <math>2.5 \neq 2</math> soi by 11.77 to 11.8 or <math>3.75\pi</math> soi by 37.68 to 37.715 or <math>12\pi</math> soi by 15.75<math>\pi</math> This <b>M</b> mark is lost if any circles are added www 6</p> <p>soi by 28.26 to 28.3 or <math>9\pi</math> soi by 4.71 to 4.72 or <math>1.5\pi</math> <math>10.5\pi</math> implies M3 E1 3 <b>M1</b> for <math>\frac{1}{2} \pi \times 0.5^2</math> soi by 0.392 to 0.393 or <math>\pi/8</math> and <b>M1</b> for their <math>33 \div (\frac{1}{2} \pi \times 0.5^2)</math> soi by <math>264/\pi</math> or <b>SC1</b> for 42 to 42.1 as answer</p> <p>1 2 <b>M1</b> for their <math>33000 \div 1800</math> soi by 18.3(3...) or correct in mins and secs for their 33000</p>

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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) <math>\frac{55}{200}</math> oe <math>\left(\frac{11}{40}\right)</math> (ii) <math>\frac{1100}{39800}</math> oe <math>\left(\frac{11}{398}\right)</math></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><b>P2</b> for 6 or 7 correct plots <b>P1</b> for 4 or 5 correct plots ft their points Must join minimum of 7 points</p> <p><b>Strict</b> ft provided &gt; 0</p> <p>isw incorrect cancelling for both parts of (c)</p> <p><b>M2</b> for <math>2 \times</math> their <math>\frac{55}{200} \times \frac{10}{199}</math> oe soi by 0.0276... or <b>M1</b> for their <math>\frac{55}{200} \times \frac{10}{199}</math> oe <math>\left(\frac{11}{796}\right)</math> soi by 0.0138...</p> <p><b>B1</b> for 1 correct value</p> <p><b>Strict</b> ft from their 30 unless 0 <b>Strict</b> 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><b>M1</b> for <math>\frac{PQ}{19.5} = \frac{11}{16.5}</math> oe or sf = 2/3 or 1.5 seen or correct trig</p> <p><b>M2</b> for <math>\sqrt{19.5^2 - 16.5^2}</math> or explicit trig or <b>M1</b> for <math>x^2 + 16.5^2 = 19.5^2</math> or implicit trig</p> <p><b>M1</b> for <math>\sin = \frac{16.5}{19.5}</math> oe</p> <p><b>M1</b> for <math>0.02 \times (32)^3</math></p> <p><b>M2</b> for <math>67^2 + 105^2 - 2 \times 67 \times 105 \cos 143</math> or <b>M1</b> for implicit form <b>A1</b> for 26732 to 26896</p> <p><b>B1</b> for (DEF =) <math>78^\circ</math> May be on diagram and <b>M2</b> for <math>\frac{105 \times \sin 70}{\sin \text{their } 78}</math> provided their <math>78 \neq 32</math> or 70 or <b>M1</b> for <math>\frac{EF}{\sin 70} = \frac{105}{\sin \text{their } 78}</math> oe their <math>78 \neq 32</math> or 70</p>

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7	<p>(a) <math>w = 59</math> (angle in) isosceles (triangle)</p> <p><math>x = 31</math> (angle in) semicircle (= 90) oe</p> <p><math>y = 62</math> (angles in) same segment or (on) same arc (are =)</p> <p><math>z = 28</math> (angles in) triangle (= 180)</p> <p>(b) (i) <math>\begin{pmatrix} 2 \\ 3 \end{pmatrix}</math></p> <p>(ii) <math>\begin{pmatrix} -2 \\ 4 \end{pmatrix}</math></p> <p>(c) (i) <math>\frac{1}{3} \mathbf{t}</math> final answer</p> <p>(ii) <math>\frac{1}{3} (-\mathbf{t} + \mathbf{r})</math> final answer</p> <p>(iii) <math>\frac{1}{3} \mathbf{r}</math> final answer</p> <p>(iv) <math>QP = \frac{1}{3} OR</math> oe <math>QP</math> is parallel to <math>OR</math> or <math>\mathbf{r}</math></p>	<p>1</p> <p>1</p> <p>1ft</p> <p>1</p> <p>1</p> <p>1</p> <p>1ft</p> <p>1</p> <p>1</p> <p>1</p> <p>2ft</p> <p>1</p> <p>2</p> <p>2</p> <p>1dep</p> <p>1dep</p>	<p>The marks for the reasons are <b>dependent</b> on the correct angle or correct ft angle Any incorrect statement in reason loses that mark</p> <p>ft 90 – their <math>w</math> Allow diameter</p> <p>ft 180 – their(<math>w + x + y</math>) or 90 – their <math>y</math></p> <p>ft <math>\begin{pmatrix} 0 \\ 7 \end{pmatrix}</math> – their (i) <b>B1</b> ft for one correct element</p> <p><b>M1</b> for correct unsimplified answer or <math>\overrightarrow{TR} = -\mathbf{t} + \mathbf{r}</math> oe or <math>\overrightarrow{TP} = \frac{1}{3} \overrightarrow{TR}</math> oe</p> <p><b>M1</b> for correct unsimplified answer or <math>\overrightarrow{QT} + \overrightarrow{TP}</math> oe for any correct path or <math>\frac{1}{3} \mathbf{t}</math> + their (ii)</p> <p><b>Dependent</b> on correct answer in (iii)</p> <p><b>Dependent</b> on multiple of <math>\mathbf{r}</math> as answer in (iii)</p>
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<p><b>8</b></p>	<p>(a) (i) 3  (ii) 4  (iii) <math>4x - 3</math> final answer  (iv) <math>\frac{x+1}{2}</math> oe final answer  (v) <math>-\frac{1}{2}</math> and <math>1\frac{1}{2}</math></p> <p>(b) (i) <math>y = \frac{16}{x}</math> oe  (ii) 32</p>	<p>1  1  2  2  4  2  1</p>	<p><b>M1</b> for <math>2(2x - 1) - 1</math></p> <p><b>M1</b> for <math>x = 2y - 1</math> or <math>\frac{y+1}{2}</math> oe or <math>\frac{f(x)+1}{2}</math> oe</p> <p><b>B1</b> for <math>(2x - 1)^2</math> soi  <b>M2</b> for <math>2x - 1 = \pm 2</math> or <b>M1</b> for <math>2x - 1 = 2</math> <b>M1</b> for <math>4x^2 - 2x - 2x + 1</math> and <b>M1</b> for <math>(2x + 1)(2x - 3)</math> or correct substitution in formula  soi by <math>(4 \pm \sqrt{64})/8</math></p> <p>Condone <math>y = k/x</math> and <math>k = 16</math> stated  <b>M1</b> for <math>y = \frac{k}{x}</math> oe</p>
<p><b>9</b></p>	<p>(a) (i) 21  (ii) <math>P_6 = \frac{1}{2} \times 6 \times 7</math> or better (= 21)  (iii) 1275  (iv) 3825  (v) 11325  (vi) 7500</p> <p>(b) (i) 56  (ii) <math>S_6 = \frac{1}{6} \times 6 \times 7 \times 8</math> or better (= 56)  (iii) 1540</p> <p>(c) <math>56 - 35 = 21</math></p> <p>(d) Correct algebraic proof with no errors</p>	<p>1  1  1  1ft  1  1ft  2  1  1  1  3</p>	<p>Allow <math>3(6 + 1)</math></p> <p>ft for <math>3 \times</math> their (iii)</p> <p>ft their (v) – their (iv) provided <math>&gt; 0</math></p> <p><b>M1</b> for <math>1 \times 6 + 2 \times 5 + 3 \times 4 + 4 \times 3 + 5 \times 2 + 6 \times 1</math></p> <p><b>M1</b> for <math>\frac{1}{6}n(n+1)(n+2) - \frac{1}{6}(n-1)(n)(n+1)</math> oe  and <b>M1</b> for <math>\frac{1}{6}n(n+1)(3)</math> oe</p>