

**[C100/SQP328]**

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Mathematics

Higher

Paper 1

Specimen Marking Instructions

Example 2 based on 2004 Examination Paper  
(for examinations from Diet 2008 onwards)

NATIONAL  
QUALIFICATIONS

**Note:** In the Specimen Marking Instructions the Marking Scheme indicates which marks awarded are strategy marks (ss), which marks awarded are processing marks (pd) and which marks awarded are interpretation and communication marks (ic).

## SECTION A

1	B	$m = \frac{p - (-5)}{7 - 4}$ $3 = \frac{p + 5}{3} \Rightarrow p = 4$	2 marks
2	C	$u_1 = u_0 + 5 = -3 + 5 = 2$ $u_2 = u_1 + 5 = 2 + 5 = 7$	2 marks
3	C	$y = -\frac{2}{3}x + \frac{1}{3}, m = -\frac{2}{3}$ $m = \frac{3}{2}$	2 marks
4	A	$f(-3) = (-3)^3 - (-3)^2 - 5(-3) - 3$ $f(-3) = -24$	2 marks
5	A	$x^2 - 16x + 64 - 37$ $(x - 8)^2 - 37$ $q = -37$	2 marks
6	A	$\frac{2}{3}(8 - 2x^2)^{-\frac{1}{3}} \times (-4x)$ $\frac{-8x}{3(8 - 2x^2)^{\frac{1}{3}}}$	2 marks
7	D	$f(x) = (x - 1)(x^2 - 4x - 5)$ $f(x) = (x - 1)(x - 5)(x + 1)$	2 marks
8	C	$L = \frac{b}{1 - a}$ $L = \frac{3}{1 - 0.4} = 5$	2 marks
9	C	$x = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$ $x = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$	2 marks

10	A	$\vec{PQ} = \begin{pmatrix} 2 \\ 4 \\ -4 \end{pmatrix}, \vec{QR} = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix}$ $\vec{PQ} = 2\vec{QR}$ $PQ:QR = 2:1$	2 marks
11	A	$y = \frac{1}{2}x, \text{ gradient} = \frac{1}{2}$ $p = \tan^{-1}\left(\frac{1}{2}\right)$	2 marks
12	D	$g'(x) = (x + 1)^2$ $g'(x) \geq 0 \text{ for all } x$ <p>so <math>g</math> is never decreasing</p>	2 marks
13	A	$\log_2(x + 1) - \log_2 9$ $\log_2\left(\frac{x + 1}{9}\right)$	2 marks
14	D	<p>reflect original in the axis; then translate this image upwards by 3 units</p>	2 marks
15	B	$\vec{OT} = \vec{OP} + \frac{1}{2}\vec{PQ}$ $\vec{PQ} = \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix} \text{ so } \vec{OT} = \begin{pmatrix} \frac{3}{2} \\ 4 \\ 0 \end{pmatrix}$	2 marks
16	D	$\vec{AB} = \begin{pmatrix} 2 \\ 4 \\ -4 \end{pmatrix} \text{ and } \vec{AD} = \begin{pmatrix} 8 \\ 16 \\ -16 \end{pmatrix}$ <p><math>A = (-3, 4, 7)</math> and so <math>D = (5, 20, -9)</math></p>	2 marks
17	C	<p>substitute <math>(3, -18)</math></p> $-18 = k \times 3 \times (3 - 6)$ $\Rightarrow k = 2$	2 marks

18	B	$\frac{dy}{dx} = 3 \times -\sin(5x) \times 5$ $\frac{dy}{dx} = -15\sin(5x)$	2 marks
19	A	$\frac{1}{\frac{3}{2}} \times (4x+1)^{\frac{3}{2}} \text{ divided by } 4$ $\frac{1}{6} (4x+1)^{\frac{3}{2}} + c$	2 marks
20	A	$\frac{2}{3}(3+1)^{\frac{1}{2}} - \frac{2}{3}(0+1)^{\frac{1}{2}}$ $\frac{2}{3} \times \sqrt{4} - \frac{2}{3} \times \sqrt{1} = \frac{2}{3}$	2 marks

[END OF SECTION A]

## SECTION B

Qu	<p>The Primary Method m/s is based on the following generic m/s.</p> <p>THIS GENERIC M/S MAY BE USED AS AN EQUIVALENCE GUIDE BUT ONLY WHERE A CANDIDATE DOES NOT USE THE PRIMARY METHOD OR ANY ALTERNATIVE METHOD SHOWN IN DETAIL IN THE MARKING SCHEME.</p>	<p>Primary Method: Give 1 mark for each •</p>
21	<p><b>(a) 7 marks</b></p> <p><b>(b) 2 marks</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> ss: know to differentiate</li> <li>•<sup>2</sup> pd: differentiate</li> <li>•<sup>3</sup> ss: know to set derivative to zero</li> <li>•<sup>4</sup> pd: process</li> <li>•<sup>5</sup> pd: process</li> <li>•<sup>6</sup> ic: justify using eg nature table</li> <li>•<sup>7</sup> ic: interpret nature table</li> <li>•<sup>8</sup> ic: sketch</li> <li>•<sup>9</sup> ic: sketch</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{dy}{dx} =</math></li> <li>•<sup>2</sup> <math>3x^2 + 6x - 9</math></li> <li>•<sup>3</sup> <math>3x^2 + 6x - 9 = 0</math></li> <li>•<sup>4</sup> <math>x = -3, x = 1</math></li> <li>•<sup>5</sup> <math>y = 32, y = 0</math></li> <li>•<sup>6</sup> "nature table"</li> <li>•<sup>7</sup> max at <math>x = -3</math>, min at <math>x = 1</math></li> </ul> <p style="text-align: right;"><i>7 marks</i></p> <ul style="list-style-type: none"> <li>•<sup>8</sup> diagram with max/min correct</li> <li>•<sup>9</sup> diagram with (0, 5) and (-5, 0) correct</li> </ul> <p style="text-align: right;"><i>2 marks</i></p>
22	<p style="text-align: right;"><b>4 marks</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> ss: use the log laws</li> <li>•<sup>2</sup> ss: transfer from log to exponential</li> <li>•<sup>3</sup> pd: start to solve equation</li> <li>•<sup>4</sup> pd: complete solving</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\log_x 32 = 5</math></li> <li>•<sup>2</sup> <math>32 = x^5</math></li> <li>•<sup>3</sup> <math>x = \sqrt[5]{32}</math></li> <li>•<sup>4</sup> <math>x = 2</math></li> </ul> <p style="text-align: right;"><i>4 marks</i></p>
23	<p style="text-align: right;"><b>5 marks</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> ss: know to use double angle formula</li> <li>•<sup>2</sup> pd: factorise</li> <li>•<sup>3</sup> pd: solve</li> <li>•<sup>4</sup> ic: interpret solutions</li> <li>•<sup>5</sup> ic: interpret solutions</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>2\sin x \cos x - \cos x = 0</math></li> <li>•<sup>2</sup> <math>\cos x(2\sin x - 1) = 0</math></li> <li>•<sup>3</sup> <math>\cos x = 0 \quad \sin x = \frac{1}{2}</math></li> <li>•<sup>4</sup> <math>x = \frac{\pi}{2} \quad x = \frac{\pi}{6}</math></li> <li>•<sup>5</sup> <math>x = \frac{3\pi}{2} \quad x = \frac{5\pi}{6}</math></li> </ul> <p style="text-align: right;"><i>5 marks</i></p>

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24	<p style="text-align: center;"><b>7 marks</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> ic: interpret diagram</li> <li>•<sup>2</sup> pd: expand trig expression</li> <li>•<sup>3</sup> pd: simplify</li> <li>•<sup>4</sup> ss: use appropriate formula</li> <li>•<sup>5</sup> pd: process</li> <li>•<sup>6</sup> ic: interpret</li> <li>•<sup>7</sup> pd: simplify</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>D\hat{E}A = (2x^\circ + 90^\circ)</math></li> <li>•<sup>2</sup> <math>\cos(2x^\circ)\cos(90^\circ) - \sin(2x^\circ)\sin(90^\circ)</math></li> <li>•<sup>3</sup> <math>-\sin(2x^\circ)</math></li> <li>•<sup>4</sup> <math>-2\sin(x^\circ)\cos(x^\circ)</math></li> <li>•<sup>5</sup> <math>CE = \sqrt{1^2 + 3^2} = \sqrt{10}</math> <i>stated/implied by</i> •<sup>6</sup></li> <li>•<sup>6</sup> <math>\sin(x^\circ) = \left(\frac{1}{\sqrt{10}}\right)</math> <i>and</i> <math>\cos(x^\circ) = \frac{3}{\sqrt{10}}</math></li> <li>•<sup>7</sup> <math>\cos D\hat{E}A = -2\left(\frac{1}{\sqrt{10}}\right)\left(\frac{3}{\sqrt{10}}\right) = -\frac{6}{10}</math></li> </ul> <p style="text-align: right;"><i>7 marks</i></p>
<p style="text-align: center;"><b>Note</b></p> <p>1 Although unusual, it would be perfectly acceptable for a candidate to go from •<sup>1</sup> to •<sup>3</sup> without expanding (via knowledge of transformations). In this case •<sup>2</sup> would be awarded by default.</p>		

<p>1 common wrong solution</p> <ul style="list-style-type: none"> <li>•<sup>1</sup>✓ <math>D\hat{E}A = (2x^\circ + 90^\circ)</math></li> <li>•<sup>2</sup>✓ <math>\cos(2x^\circ)\cos(90^\circ) - \sin(2x^\circ)\sin(90^\circ)</math> <math>\cos(2x^\circ) \times 1 - \sin(2x^\circ) \times 0</math></li> <li>•<sup>3</sup>✗ <math>\cos(2x^\circ)</math></li> <li>•<sup>4</sup>✓ <i>eg</i> <math>2\cos^2 x - 1</math></li> <li>•<sup>5</sup>✓ <math>CE = \sqrt{1^2 + 3^2} = \sqrt{10}</math> <i>stated/implied by</i> •<sup>6</sup></li> <li>•<sup>6</sup>✓ <math>\cos(x^\circ) = \frac{3}{\sqrt{10}}</math></li> <li>•<sup>7</sup>✓ <math>\cos D\hat{E}A = 2\left(\frac{3}{\sqrt{10}}\right)\left(\frac{3}{\sqrt{10}}\right) - 1 = \frac{8}{10}</math></li> </ul> <p style="text-align: center;"><b>6 marks awarded</b></p>	<p>2 another common wrong solution</p> <ul style="list-style-type: none"> <li>•<sup>1</sup>✓ <math>D\hat{E}A = (2x^\circ + 90^\circ)</math> <math>\cos(2x^\circ + 90^\circ)</math></li> <li>•<sup>2</sup>✗ <math>\cos(2x^\circ) + \cos(90^\circ)</math></li> <li>•<sup>3</sup>✗ <math>\cos(2x^\circ)</math> [<i>working eased</i>]</li> <li>•<sup>4</sup>✓ <i>eg</i> <math>2\cos^2 x - 1</math></li> <li>•<sup>5</sup>✓ <math>CE = \sqrt{1^2 + 3^2} = \sqrt{10}</math> <i>stated/implied by</i> •<sup>6</sup></li> <li>•<sup>6</sup>✓ <math>\cos(x^\circ) = \frac{3}{\sqrt{10}}</math></li> <li>•<sup>7</sup>✓ <math>\cos D\hat{E}A = 2\left(\frac{3}{\sqrt{10}}\right)\left(\frac{3}{\sqrt{10}}\right) - 1 = \frac{8}{10}</math></li> </ul> <p style="text-align: center;"><b>5 marks awarded</b></p>
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25	<p style="text-align: center;"><b>5 marks</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> ss: know to integrate</li> <li>•<sup>2</sup> pd: express in integrable form</li> <li>•<sup>3</sup> pd: interpret</li> <li>•<sup>4</sup> ss: introduce constant and substitute</li> <li>•<sup>5</sup> pd: process</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>f(x) = \int (6x(x-2)) dx</math></li> <li>•<sup>2</sup> <math>\int (6x^2 - 12x) dx</math></li> <li>•<sup>3</sup> <math>2x^3 - 6x^2</math></li> <li>•<sup>4</sup> <math>4 = 2 \times 1^3 - 6 \times 1^2 + c</math></li> <li>•<sup>5</sup> <math>c = 8</math></li> </ul> <p style="text-align: right;"><i>5 marks</i></p>
		<p><b>Note</b></p> <p><math>1 \int_0^2 6x(x-2) dx = [2x^3 - 6x^2]_0^2 = -8</math> may be awarded •<sup>1</sup>, •<sup>2</sup> and •<sup>3</sup>.</p>

[END OF SECTION B]

[END OF SPECIMEN MARKING INSTRUCTIONS]