BOARD OF STUDIES
NEW SOUTH WALES

2009 HSC Mathematics
Marking Guidelines

Question 1 (a)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct graph, showing intercepts	2
• Draws a straight line with positive slope, or equivalent merit	1

Question 1 (b)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Makes some progress	1

Question 1 (c)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Obtains one solution	1

Question 1 (d)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Differentiates correctly, or equivalent merit	1

Question 1 (e)

Outcomes assessed: P4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Makes some progress	1

Question 1 (f)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct answer, rounded correctly	2
• Makes significant progress	1

Question 2 (a) (i)

Outcomes assessed: P7, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows understanding of the product rule, or equivalent merit	1

Question 2 (a) (ii)

Outcomes assessed: P7, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows understanding of the chain rule, or equivalent merit	1

Question 2 (b) (i)

Outcomes assessed: P8, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 2 (b) (ii)

Outcomes assessed: P8, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows some understanding of integrating with negative powers	1

Question 2 (b) (iii)

Outcomes assessed: P8, H5

MARKING GUIDELINES

Criteria	Marks
• Correct solution	3
• Makes substantial progress	2
• Makes some progress	1

Question 2 (c)

Outcomes assessed: H5, H9

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows some understanding of sigma notation	1

Question 3 (a)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows some understanding of summing an arithmetic series	1

Question 3 (b) (i)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct equation	2
• Finds correct gradient, or equivalent merit	1

Question 3 (b) (ii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Attempts to use formula for the distance, or equivalent merit	1

Question 3 (b) (iii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 3 (c)

Outcomes assessed: P4, P5

MARKING GUIDELINES

Criteria	Marks
• Correct sketch	2
• Shows some understanding of regions in the plane	1

Question 3 (d)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct solution	3
• Shows a good understanding of Simpson's rule	2
• Shows some understanding of Simpson's rule	1

Question 4 (a)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows some understanding of the sum of a geometric series	1

Question 4 (b)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct solution	3
• Obtains $k^2 + 4k - 12 = 0$, or equivalent progress	2
• Attempts to use the discriminant = 0	1

Question 4 (c) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Proves the triangles similar (showing two pairs of angles equal is sufficient)	2
• Shows some understanding of similar triangles	1

Question 4 (c) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 4 (c) (iii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Attempts to show $\triangle AMP \equiv \triangle CMP$, or equivalent progress	1

Question 4 (c) (iv)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct solution	1

Question 4 (c) (v)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct solution	1

Question 5 (a) (i)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct equation	2
• Finds correct gradient, or equivalent merit	1

Question 5 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Finds relevant lengths, or equivalent progress	1

Question 5 (b) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 5 (b) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 5 (b) (iii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 5 (c) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Attempts to use the formula for area, or equivalent merit	

Question 5 (c) (ii) (1)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 5 (c) (ii) (2)

Outcomes assessed: P2, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Finds length of chord or length of arc, or equivalent merit	1

Question 6 (a)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct solution	3
• Correct primitive, or equivalent progress	2
• Shows some understanding of how to compute volumes of revolution	1

Question 6 (b) (i)

Outcomes assessed: H3, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Obtains $e^{-1600k} = \frac{1}{2}$, or equivalent merit	1

Question 6 (b) (ii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Makes some progress	1

Question 6 (c) (i)

Outcomes assessed: P2, P3, P6

MARKING GUIDELINES

Criteria	Marks
• Solves to find the values of a and b	3
• Solves to find the value of a, or of b, or equivalent merit	2
• Matches the derivatives at O, or at P, or equivalent merit	1

Question 6 (c) (ii)

Outcomes assessed: P3, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Finds the y-coordinate at P, or finds the y-coordinate at the vertex, or equivalent merit	1

Question 7 (a) (i)

Outcomes assessed: H5, H9

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Shows an understanding of the need to integrate or differentiate twice	1

Question 7 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	3
• Solves the correct quadratic, or equivalent merit	2
• Attempts to solve $\dot{x} = 0$ as a quadratic in e^{-t}	1

Question 7 (a) (iii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 7 (b) (i)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 7 (b) (ii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Both correct answers	2
• Correct height at low tide, or correct value for t	1

Question 7 (b) (iii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct time interval — i.e. between 6 am and 10 am	3
• Makes significant progress	2
• Attempts to solve $h \geq 1.35$	1

Question 8 (a) (i)

Outcomes assessed: H7

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 8 (a) (ii)

Outcomes assessed: H6, H7

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 8 (a) (iii)

Outcomes assessed: H7, H9

MARKING GUIDELINES

Criteria	Marks
• Correct graph showing all important features	2
• Draws a graph showing some of the important features	1

Question 8 (b) (i)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 8 (b) (ii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	3
• Makes substantial progress	2
• Obtains an expression for M by setting $A_{288} = 0$	1

Question 8 (b) (iii)

Outcomes assessed: H2, H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	3
• Makes substantial progress	2
• Obtains the equation $346\,095 \times 1.005^n - 2937\left(\frac{1.005^n - 1}{0.005}\right) = 0$, or equivalent merit	1

Question 8 (b) (iv)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 9 (a)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Shows some understanding of complementary events, or equivalent merit	1

Question 9 (b) (i)

Outcomes assessed: P3

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 9 (b) (ii)

Outcomes assessed: P3, P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 9 (b) (iii)

Outcomes assessed: P3, P4

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Correctly identifies the cost for one section, or equivalent merit	1

Question 9 (b) (iv)

Outcomes assessed: H5, H9

MARKING GUIDELINES

Criteria	Marks
• Correct solution, including justification [using parts (i) and (ii) or otherwise]	4
• Obtains $C = 12\,200$	3
• Correctly solves $\frac{dC}{dx} = 0$, or equivalent progress	2
• Correctly differentiates C, or equivalent progress	1

Question 9 (b) (v)

Outcomes assessed: H5, H9

MARKING GUIDELINES

Criteria	Marks
• Correct description of path	2
• Makes some progress	1

Question 10 (a)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Attempts to shows $f'(x) \neq 0$	1

Question 10 (b)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 10 (c) (i)

Outcomes assessed: P3

MARKING GUIDELINES

Criteria	Marks
• Correct solution	1

Question 10 (c) (ii)

Outcomes assessed: H3, H5, H9

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Obtains $g'(x)$, or equivalent progress	1

Question 10 (d)

Outcomes assessed: H6, H9

MARKING GUIDELINES

Criteria	Marks
• Correct sketch showing: correct graphs for $y = g(x)$ and $y = f(x)$, with $f(0) = 0$; $g(0) = 0$, and $f(x) > g(x)$ for $x > 0$	2
• Correct sketch showing at least two of the above	1

Question 10 (e)

Outcomes assessed: H3, H5

MARKING GUIDELINES

Criteria	Marks
• Correct solution	2
• Makes some progress	1

Question 10 (f)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Attempts to use the result in part (e), or equivalent merit	1

Mathematics

2009 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
1 (a)	2	6.1	P4
1 (b)	2	1.4	P4
1 (c)	2	1.4, 9.1	P4
1 (d)	2	8.5	P6
1 (e)	2	5.2, 5.3, 13.1	P4, H5
1 (f)	2	12.4	H3
2 (a) (i)	2	8.8, 12.4	P7, H5
2 (a) (ii)	2	8.8, 12.4	P7, H5
2 (b) (i)	1	11.2	P8, H5
2 (b) (ii)	2	11.2	P8, H5
2 (b) (iii)	3	11.1, 11.2	P8, H5
2 (c)	2	7.0	H5, H9
3 (a)	2	7.1	H5
3 (b) (i)	2	6.2	P4
3 (b) (ii)	2	6.5	P4
3 (b) (iii)	1	4.3	P4
3 (c)	2	4.4, 9.1	P4, P5
3 (d)	3	11.3	H8
4 (a)	2	7.3	H4, H5
4 (b)	3	9.2	P4
4 (c) (i)	2	2.3	P2
4 (c) (ii)	1	2.3	P2
4 (c) (iii)	2	2.3	P2
4 (c) (iv)	1	2.5	H2
4 (c) (v)	1	2.5	H2
5 (a) (i)	2	6.2	P4
5 (a) (ii)	2	6.8	H5
5 (b) (i)	1	3.1	H5
5 (b) (ii)	1	3.2	H5
5 (b) (iii)	1	3.2	H5
5 (c) (i)	2	5.5, 13.1	H5
5 (c) (ii) (1)	1	13.1	H5
5 (c) (ii) (2)	2	2.3, 13.1	P2, H5
6 (a)	3	11.4, 13.6	H8

Question	Marks	Content	Syllabus outcomes
6 (b) (i)	2	14.2	H3, H5
6 (b) (ii)	2	14.2	H4, H5
6 (c) (i)	3	8.6, 9.1	P2, P3, P6
6 (c) (ii)	2	9.1, 10.2	P3, H5
7 (a) (i)	2	14.3	H5, H9
7 (a) (ii)	3	14.3	H5
7 (a) (iii)	1	14.3	H5
7 (b) (i)	1	13.7	H4, H5
7 (b) (ii)	2	13.7	H4, H5
7 (b) (iii)	3	13.7	H4, H5
8 (a) (i)	1	10.1	H7
8 (a) (ii)	1	10.2	H6, H7
8 (a) (iii)	2	10.1, 10.2	H7, H9
8 (b) (i)	1	7.5	H4, H5
8 (b) (ii)	3	7.5	H4, H5
8 (b) (iii)	3	7.5	H2, H4, H5
8 (b) (iv)	1	7.5	H4, H5
9 (a)	2	3.1, 3.2, 3.3	H5
9 (b) (i)	1	1.1	P3
9 (b) (ii)	1	1.1, 2.3	P3, P4
9 (b) (iii)	2	1.1, 1.3, 2.3	P3, P4
9 (b) (iv)	4	1.3, 10.6	H5, H9
9 (b) (v)	2	10.6	H5, H9
10 (a)	2	10.2	H6
10 (b)	1	10.2, 10.4	H6
10 (c) (i)	1	1.3	P3
10 (c) (ii)	2	8.8, 10.1, 12.5	H3, H5, H9
10 (d)	2	10.5, 12.5	H6, H9
10 (e)	2	8.8, 12.5	H3, H5
10 (f)	2	11.4	H8