2025 HSC Mathematics Advanced
Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	B
2	A
3	D
4	C
5	B
6	C
7	A
8	D
9	B
10	C

Section II

Question 11 (a)

Criteria	Marks
• Provides correct answer	2
• Finds correct value of t, or equivalent merit	1

Sample answer:

$$t = \frac{6+2}{2}$$
$$= 4$$

$$h = 4^2 - 8 \times 4 + 12$$
$$= -4$$

Question 11 (b)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$t = 4 + 4 = 8$ using axis of symmetry

$\therefore \quad t = 8$

Question 12

Criteria	Marks
• Provides correct solution	3
• Finds the correct gradient of the tangent, or equivalent merit	2
• Attempts to find the gradient of the tangent, or equivalent merit	1

Sample answer:

$$y = 5x^3 - \frac{2}{x^2} - 9$$

$$y = 5x^3 - 2x^{-2} - 9$$

$$y' = 15x^2 + 4x^{-3}$$

$$y' = 15x^2 + \frac{4}{x^3}$$

$$y' = 15(1) + \frac{4}{(1)}$$

$$y' = 19$$

$$y - y_1 = m(x - x_1)$$

$$y + 6 = 19(x - 1)$$

$$y + 6 = 19x - 19$$

$$y = 19x - 25$$

Question 13

Criteria	Marks
• Provides correct solution	2
• Shows understanding that the sequence is geometric, or equivalent merit	1

Sample answer:

$T_1 = 75, \quad T_2 = p, \quad T_3 = q, \quad T_4 = 2025$

$$\begin{aligned} ar^3 &= 2025 \\ (75)r^3 &= 2025 \\ r^3 &= 27 \\ r &= 3 \end{aligned}$$

$$T_2 = p = ar = 75 \times 3 = 225$$

$$T_3 = q = ar^2 = 75 \times 3^2 = 675$$

$p = 225 \;\; q = 675$

Question 14 (a)

Criteria	Marks
• Provides correct form and direction	2
• Provides correct direction, or equivalent merit	1

Sample answer:

Form: Linear
Direction: Negative

Question 14 (b)

Criteria	Marks
• Provides correct interpretation of both slope and y-intercept	2
• Provides correct interpretation of y-intercept, or equivalent merit	1

Sample answer:

Slope: For every 1 minute increase in time spent watching television per day the time spent exercising decreases by 0.7 minutes per day.

y-intercept: If someone doesn't watch television they are expected to exercise for 64.3 minutes per day.

Question 14 (c)

Criteria	Marks
• Provides correct answer	1

Sample answer:

$$y = 64.3 - 0.7x$$
$$y = 64.3 - 0.7 \times 42$$
$$= 34.9 \text{ minutes}$$

Question 14 (d)

Criteria	Marks
• Provides correct reason	1

Sample answer:

– 2 hours or 120 minutes of television suggests –19.7 minutes of exercise and can't do negative minutes of exercise.

<u>Alternative answer</u>:

– 2 hours or 120 minutes is outside the dataset so extrapolating is not reliable.

Question 15 (a)

Criteria	Marks
• Provides correct equation	2
• Finds k, or equivalent merit	1

Sample answer:

$k = 2$

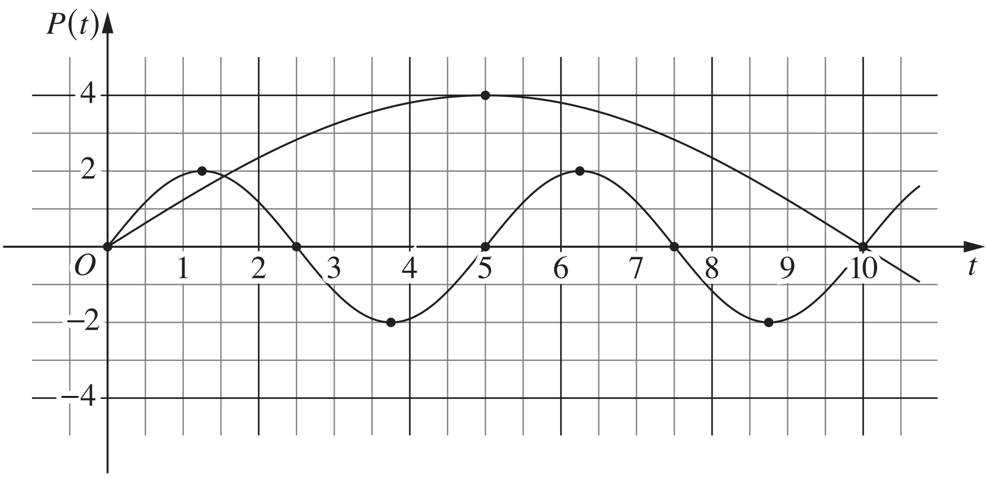
$$\text{Period} = \frac{2\pi}{a} = 5 \text{ ms} \qquad \text{so} \qquad a = \frac{2\pi}{5}$$

$$P_1(t) = 2\sin\frac{2\pi}{5}t$$

Question 15 (b)

Criteria	Marks
• Provides correct graph	2
• Draws a sine wave with an amplitude of 4, or equivalent merit	1

Sample answer:



Question 15 (c)

Criteria	Marks
• Provides correct answer	2
• Finds one correct endpoint of interval, or equivalent merit	1

Sample answer:

$6.25 < t < 8.75$

Question 16 (a)

Criteria	Marks
• Provides correct solution	4
• Finds both stationary points	3
• Finds one of the stationary points, or equivalent merit	2
• Attempts to use quotient rule, or equivalent merit	1

Sample answer:

$$f(x) = \frac{x^2}{e^x}$$

$$f'(x) = \frac{2xe^x - x^2e^x}{e^{2x}} = \frac{xe^x(2-x)}{e^{2x}}$$

$$f'(x) = \frac{x(2-x)}{e^x}$$

$$x = 0, \quad 2 - x = 0$$

$$x = 0, \quad x = 2$$

$$y = 0, \quad y = \frac{4}{e^2} = 0.541\ldots$$

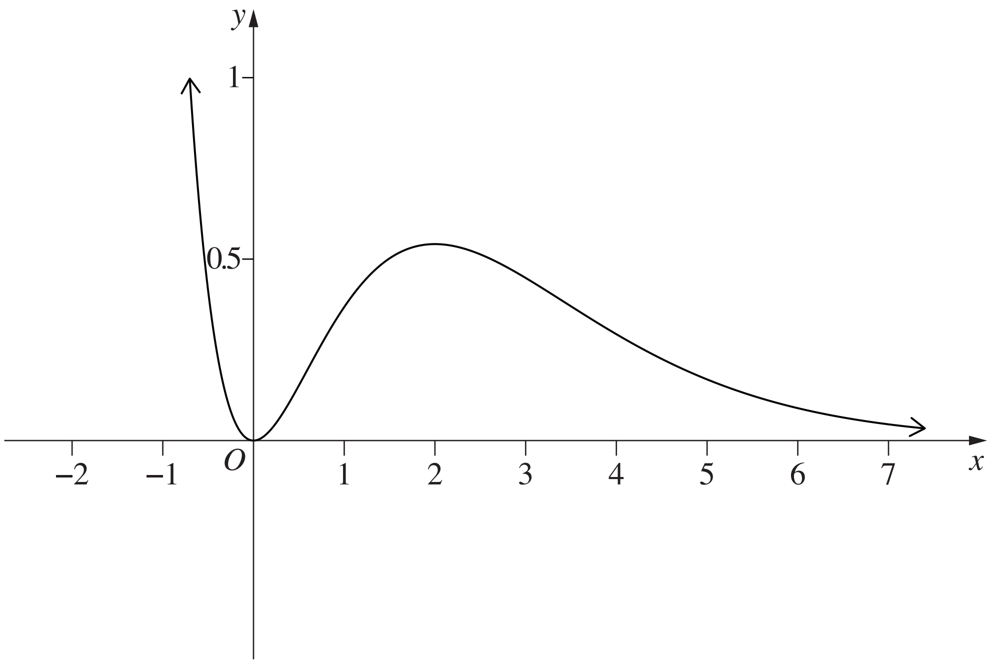
x	-1	0	1	2	3
$f'(x)$	Negative	0	Positive	0	Negative

$\therefore$ Minimum at $(0, 0)$ and maximum at $\left(2, \frac{4}{e^2}\right)$

Question 16 (b)

Criteria	Marks
• Provides correct graph	1

Sample answer:



Question 17 (a)

Criteria	Marks
• Provides correct solution	2
• Provides a correct A_1, or equivalent merit	1

Sample answer:

$$A_0 = 800\,000$$
$$A_1 = 800\,000 \times (1.005) - 5740$$
$$\begin{aligned} A_2 &= A_1 \times (1.005) - 5740 \\ &= \left(800\,000 \times (1.005) - 5740\right) \times 1.005 - 5740 \\ &= 800\,000(1.005)^2 - 5740(1.005) - 5740 \end{aligned}$$

Question 17 (b)

Criteria	Marks
• Provides correct solution	3
• Uses the sum of a geometric sequence in A_n, or equivalent merit	2
• Provides an expression that shows evidence of the pattern, or equivalent merit	1

Sample answer:

$$\begin{aligned} A_3 &= A_2 \times (1.005) - 5740 \\ &= \left(800\,000 \times (1.005)^2 - 5740 \times (1.005) - 5740\right) \times 1.005 - 5740 \\ &= 800\,000(1.005)^3 - 5740(1.005)^2 - 5740(1.005) - 5740 \end{aligned}$$

So, using the pattern above

$$A_n = 800\,000(1.005)^n - 5740\left(1.005^{n-1} + 1.005^{n-2} + \cdots + 1.005 + 1\right)$$

$$A_n = 800\,000(1.005)^n - \frac{5740\left(1.005^n - 1\right)}{1.005 - 1}$$

$$A_n = 800\,000(1.005)^n - \frac{5740\left(1.005^n - 1\right)}{0.005}$$

$$\begin{aligned} A_n &= 800\,000(1.005)^n - 1\,148\,000\left(1.005^n - 1\right) \\ &= 800\,000(1.005)^n - 1\,148\,000(1.005)^n + 1\,148\,000 \\ &= 1\,148\,000 - 348\,000(1.005)^n \end{aligned}$$

Question 17 (c)

Criteria	Marks
• Provides correct solution	2
• Attempts to use logarithms to find n, or equivalent merit	1

Sample answer:

$$400\,000 = 1\,148\,000 - 348\,000(1.005)^n$$

$$348\,000(1.005)^n = 748\,000$$

$$(1.005)^n = \frac{748}{348}$$

$$n\ln(1.005) = \ln\frac{748}{348}$$

$$n = \ln\left(\frac{748}{348}\right) \div \ln(1.005)$$

$$n = 153.4\ldots$$

So the balance will be less than \$400 000 after 154 months.

Question 18

Criteria	Marks
• Provides correct solution	2
• Finds a composite function, or equivalent merit	1

Sample answer:

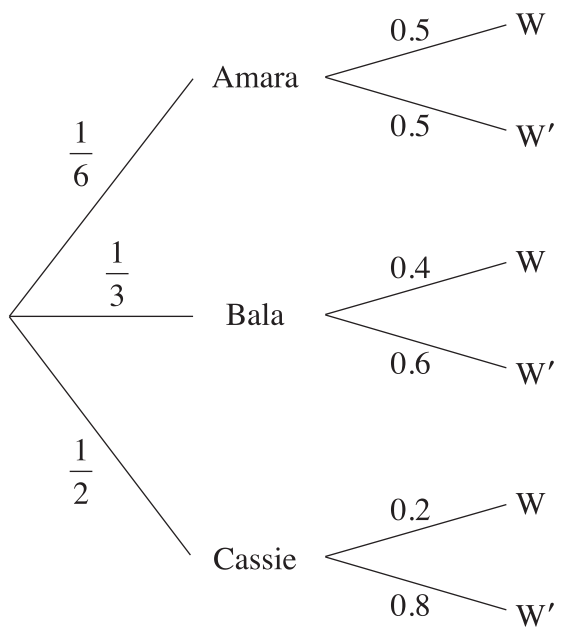
$$g(f(x)) = \frac{3}{x-1} + 5$$

Range: All real y, $y \neq 5$

Question 19

Criteria	Marks
• Provides correct solution	3
• Demonstrates some understanding of conditional probability in this context	2
• Shows evidence of correct interpretation of the ratio, or equivalent merit	1

Sample answer:



$$\text{P(Amara}|\text{wins)} = \frac{\frac{1}{6} \times 0.5}{\frac{1}{6} \times 0.5 + \frac{1}{3} \times 0.4 + \frac{1}{2} \times 0.2}$$

$$= \frac{5}{19}$$

Question 20

Criteria	Marks
• Provides correct solution	3
• Finds Lin's correct future value. or equivalent merit	2
• Finds the correct rate and number of periods, or equivalent merit	1

Sample answer:

$n = 7 \times 12$

$\quad = 84$ periods

$r = \dfrac{6}{12}$

$$21\,000\left(1 + \frac{6}{12}\%\right)^{84}$$

$= 31\,927.76$

$\therefore$ Monthly deposit $= \$31\,927.76 \div 104.07393$

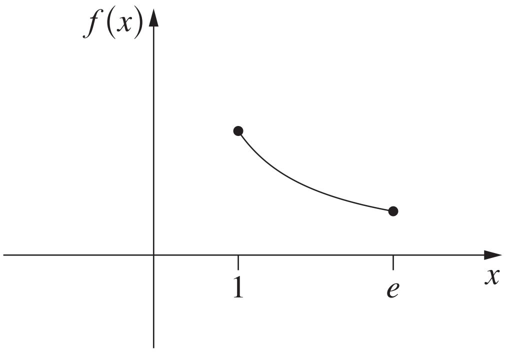
$\qquad\qquad\qquad\quad = \$306.78$

Question 21 (a)

Criteria	Marks
• Provides correct solution	2
• Attempts to find maximum value of $f(x)$, or equivalent merit	1

Sample answer:

$$f(x) = \frac{1}{x} \qquad 1 \le x \le e$$



So maximum of $f(x)$ on this interval is when $x = 1$.

Therefore, the mode is 1.

Question 21 (b)

Criteria	Marks
• Provides correct solution	3
• Finds the correct cumulative distribution function (cdf), or equivalent merit	2
• Writes a correct integral for the cumulative distribution function (cdf), or equivalent merit	1

Sample answer:

$$\int_1^{Q_1} \frac{1}{x}\,dx = 0.25$$

$$\int_1^{Q_1} \frac{1}{x}\,dx = \Big[\ln x\Big]_1^{Q_1} = \ln Q_1 - \ln 1$$

$$= \ln Q_1 = 0.25$$

$$Q_1 = e^{0.25} = 1.284$$

Question 22

Criteria	Marks
• Provides correct solution	2
• Factorises the numerator correctly, or equivalent merit	1

Sample answer:

$$\begin{aligned}
\text{LHS} &= \frac{\sin^4\theta + \cos^4\theta}{\sin^2\theta\cos^2\theta} + 2 \\
&= \frac{\sin^4\theta + \cos^4\theta + 2\sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta} \\
&= \frac{(\sin^2\theta + \cos^2\theta)^2}{\sin^2\theta\cos^2\theta} \\
&= \frac{(1)^2}{\sin^2\theta\cos^2\theta} \qquad (\text{as } \sin^2\theta + \cos^2\theta = 1) \\
&= \frac{1}{\cos^2\theta} \times \frac{1}{\sin^2\theta} \\
&= \sec^2\theta\,\text{cosec}^2\theta \\
&= \text{RHS}
\end{aligned}$$

Question 23 (a)

Criteria	Marks
• Provides correct solution	4
• Attempt to use a z-score in a calculation, or equivalent merit	3
• Calculates the percentage of males that weigh more than x kg	2
• Calculates the number of male sheep, or equivalent merit	1

Sample answer:

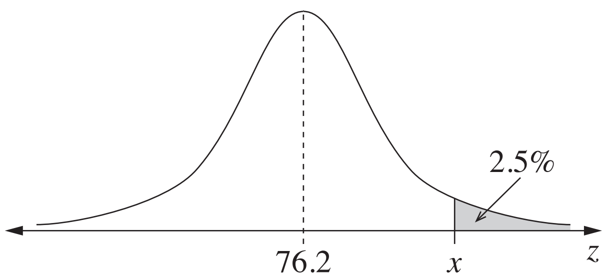
$$\text{Number of male sheep} = \frac{12\,600}{21} = 600$$

$$\text{Percentage of males weighing more than } x \text{ kg} = \frac{15}{600} \times 100 = 2.5\%$$

$x = 76.2 + 2 \times 6.8$

$x = 76.2 + 13.6$

$x = 89.8$ kg



$\therefore$ z-score = 2

Question 23 (b)

Criteria	Marks
• Provides correct reason	1

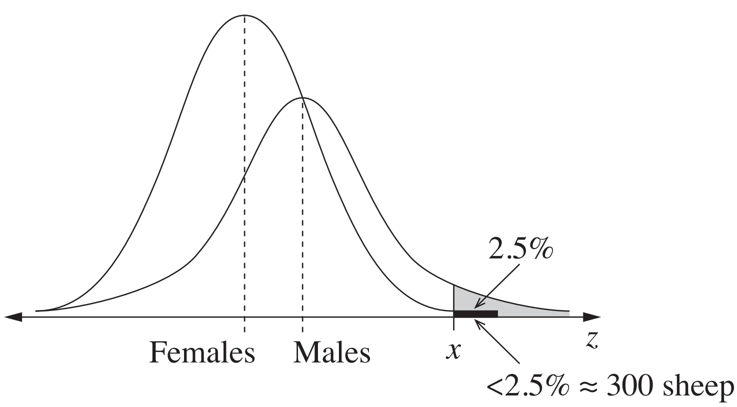
Sample answer:

$z = \dfrac{x - \mu}{\sigma}$ will be larger than 2 as the mean and standard deviation for females is smaller.

The percentage of female sheep with weight greater than x kg will be smaller than 2.5%.

So less than 300 females will weigh more than x kg.

Answer could include:



Question 24

Criteria	Marks
• Provides correct solution	4
• Finds value of a, or equivalent merit	3
• Sets one derivative equal to 1, or equivalent merit	2
• Provides a correct derivative, or equivalent merit	1

Sample answer:

The gradients of $y = e \ln x$ and $y = ax^2 + c$ at point of intersection are both equal to 1.

$$\therefore \quad \frac{d}{dx}(e \ln x) = 1$$

$$\therefore \quad \frac{e}{x} = 1$$

$$x = e \qquad (\therefore \; y = e)$$

$\therefore \quad y = ax^2 + c$ has gradient of 1 at point (e, e).

$$\therefore \; \frac{d}{dx}\left[ax^2 + c\right] = 2ax$$

$$\therefore \quad 2ax = 1 \text{ at } x = e$$

$$\therefore \; 2a \cdot e = 1$$

$$a = \frac{1}{2e} \qquad \text{------ ①}$$

and $y = ax^2 + c = e$ at $x = e$

$$\therefore \quad e = \frac{1}{2e} \cdot e^2 + c$$

$$e = \frac{e}{2} + c$$

$$\therefore \quad c = \frac{e}{2} \qquad \text{------ ②}$$

Question 25 (a)

Criteria	Marks
• Provides correct solution	2
• Attempts to use the product rule, or equivalent merit	1

Sample answer:

$$\begin{aligned}\frac{d}{dx}(\sin x - x\cos x) &= \cos x - \left[x \times (-\sin x) + \cos x\right] \\ &= \cos x + x\sin x - \cos x \\ &= x\sin x \quad \text{as required}\end{aligned}$$

Question 25 (b)

Criteria	Marks
• Provides correct solution	2
• Uses part (a) to rewrite the definite integral, or equivalent merit	1

Sample answer:

$$\begin{aligned}\int_0^{2025\pi} x\sin x\,dx &= \left[\sin x - x\cos x\right]_0^{2025\pi} \qquad \text{from part (a)} \\ &= (\sin 2025\pi - 2025\pi\cos 2025\pi) - (0) \\ &= 0 - 2025\pi \times (-1) \\ &= 2025\pi\end{aligned}$$

Question 25 (c)

Criteria	Marks
• Provides correct solution	2
• Sums an arithmetic sequence, or equivalent merit	1

Sample answer:

$$\begin{aligned}\text{Exact area of regions} &= \pi + 3\pi + 5\pi + \cdots + (2 \times 2025 - 1)\pi \\ &= \pi + 3\pi + 5\pi + \cdots + 4049\pi\end{aligned}$$

This is an arithmetic series with $a = \pi$, $d = 2\pi$, $n = 2025$ and $l = 4049\pi$

$$S_n = \frac{n}{2}(a + l)$$

$$\begin{aligned}S_n &= \frac{2025}{2}(\pi + 4049\pi) \\ &= 2025 \times 2025 \times \pi \\ &= (2025)^2\pi \text{ units}^2\end{aligned}$$

Question 26 (a)

Criteria	Marks
• Provides correct solution	2
• Finds an expression for r in terms of x, or equivalent merit	1

Sample answer:

Circumference of circle and perimeter of triangle must add to 100 cm.

So $2\pi r + 3x = 100$

That is $r = \dfrac{100 - 3x}{2\pi}$

$$\begin{aligned}
A(x) &= \text{Area of circle} + \text{area of equilateral triangle} \\
&= \pi r^2 + \frac{1}{2}x^2 \sin 60^\circ \\
&= \pi r^2 + \frac{\sqrt{3}}{4}x^2 \\
&= \pi\left(\frac{100 - 3x}{2\pi}\right)^2 + \frac{\sqrt{3}}{4}x^2 \\
&= \frac{1}{4}\left(\sqrt{3}\,x^2 + \frac{(100 - 3x)^2}{\pi}\right)
\end{aligned}$$

Question 26 (b)

Criteria	Marks
• Provides correct solution	3
• Finds the value of A at an endpoint, or equivalent merit	2
• Identifies that the quadratic will have a minimum turning point, or equivalent merit	1

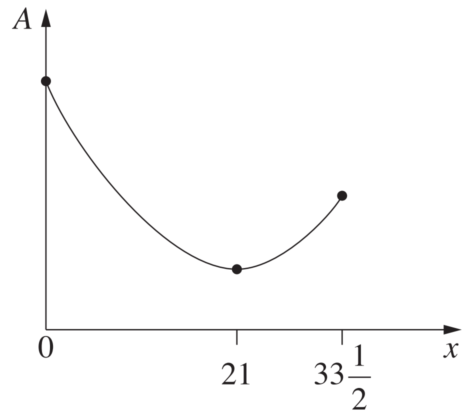
Sample answer:

$A(x)$ is a quadratic with positive coefficient of x^2 so A has a minimum stationary point.

The maximum will therefore occur on an endpoint of the domain.

When $x = 0$ $\quad r = \dfrac{50}{\pi}$ $\quad \text{Area} = \pi r^2 = \dfrac{50^2}{\pi} \approx 796$

When $r = 0$ $\quad x = 33\dfrac{1}{3}$ $\quad \text{Area} = \dfrac{1}{2}x^2 \sin 60° = \dfrac{\sqrt{3}}{4} \times 33.333^2 \approx 481$



$\therefore$ The maximum value of $A(x)$ occurs when all wire is used for the circle.

Question 27 (a)

Criteria	Marks
• Provides correct solution	2
• Attempts to use trapezoidal rule, or equivalent merit	1

Sample answer:

$$\text{Area } = \frac{b-a}{2n}\left\{f(a)+f(b)+2\left[f\left(x_1\right)\right]\right\}$$

$$= \frac{2-0}{2\times 2}\left\{1+\frac{1}{4}+2\times\frac{1}{2}\right\}$$

$$= \frac{1}{2}\left(1+\frac{1}{4}+1\right)$$

$$= \frac{9}{8}\text{ units}^2$$

Question 27 (b)

Criteria	Marks
• Provides correct solution	2
• Provides the correct antiderivative of $\left(\frac{1}{2}\right)^x$, or equivalent merit	1

Sample answer:

$$\int_0^2 \left(\frac{1}{2}\right)^x dx$$

$$= \left[\frac{\left(\frac{1}{2}\right)^x}{\ln\frac{1}{2}}\right]_0^2$$

$$= \frac{\left(\frac{1}{2}\right)^2}{\ln\frac{1}{2}} - \frac{\left(\frac{1}{2}\right)^0}{\ln\frac{1}{2}}$$

$$= \frac{-\frac{3}{4}}{-\ln 2}$$

$$= \frac{3}{4\ln 2}$$

Question 27 (c)

Criteria	Marks
• Provides correct solution	2
• Provides correct initial inequality, or equivalent merit	1

Sample answer:

$\frac{3}{4\ln 2} < \frac{9}{8}$ (Function is concave up.
$\therefore$ Exact value is less than trapezoidal approximation.)

$24 < 36\ln 2$

$2 < 3\ln 2$

$2 < \ln 8$

$e^2 < 8$

$e < \sqrt{8} = 2\sqrt{2}$

$\therefore \; e < 2\sqrt{2}$

Question 28 (a)

Criteria	Marks
• Provides correct solution	2
• Provides a correct expression relating the areas in the diagram, or equivalent merit	1

Sample answer:

Area of shaded segment = area of sector − area of triangle

area of sector − area of triangle = $\frac{1}{4} \times$ area of circle

$$\frac{1}{2} \times 10^2\theta - \frac{1}{2} \times 10^2 \sin\theta = \frac{10^2\pi}{4}$$

$$50\theta - 50\sin\theta = 25\pi$$

$$50(\theta - \sin\theta) = 25\pi$$

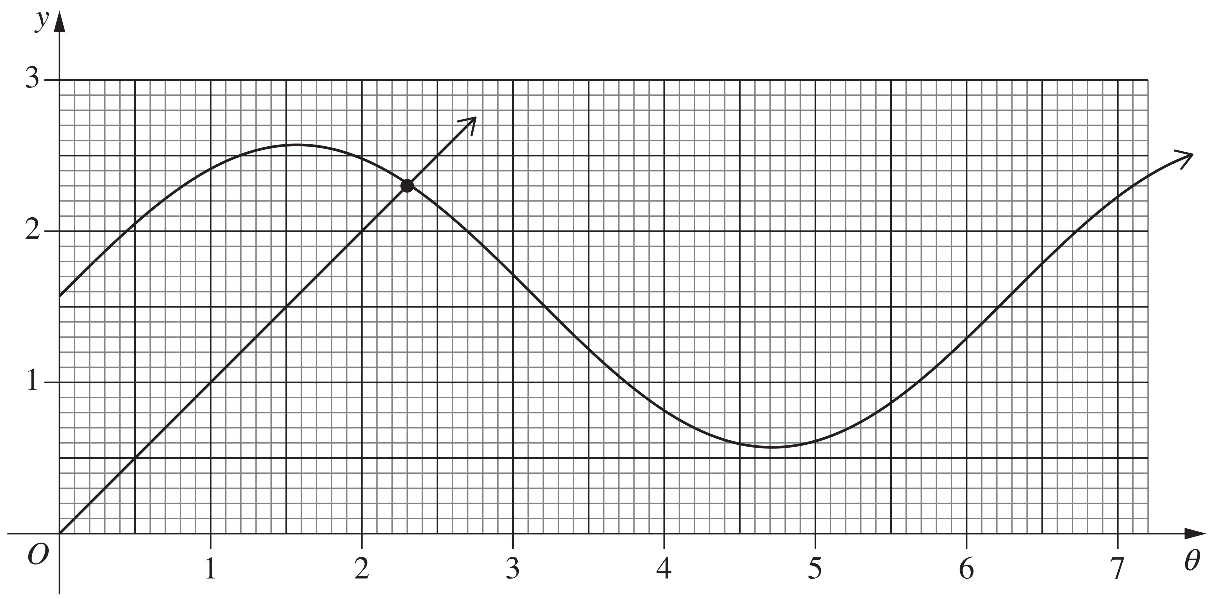
$$\theta - \sin\theta = \frac{\pi}{2}$$

$$\theta = \sin\theta + \frac{\pi}{2}$$

Question 28 (b)

Criteria	Marks
• Provides correct solution	2
• Finds the value of θ, or equivalent merit	1

Sample answer:



$$y = \sin\theta + \frac{\pi}{2}$$

$$\theta = \sin\theta + \frac{\pi}{2} \qquad \text{from part (a)}$$

Looking for point of intersection of $y = \theta$ and $y = \sin\theta + \frac{\pi}{2}$

So, $\theta = 2.3$ radians

$$\begin{aligned}\text{Arc length} &= r\theta \\ &= 10\text{ m} \times 2.3 = 23\text{ metres}\end{aligned}$$

Question 29 (a)

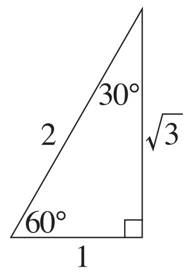
Criteria	Marks
• Provides correct solution	1

Sample answer:

$$\tan 60° = \frac{h}{OY} \text{ in } \triangle TYO$$

$$\therefore \quad OY = \frac{h}{\tan 60°}$$

$$= \frac{h}{\sqrt{3}}$$



Question 29 (b)

Criteria	Marks
• Provides correct solution	3
• Finds a quadratic expression in h, or equivalent merit	2
• Attempts to use the cosine rule to find a value for h, or equivalent merit	1

Sample answer:

In $\triangle TFO$, $\angle TFO = 45°$, $\angle TOF = 90°$

$\therefore\ \angle OTF = 45°$

$\therefore\ \triangle$ is isosceles and $OF = h$

In $\triangle FOY$, by cosine rule

$$h^2 = \left(\frac{h}{\sqrt{3}}\right)^2 + 4^2 - 2 \times 4 \times \frac{h}{\sqrt{3}} \cos 45°$$

$$h^2 = \frac{h^2}{3} + 16 - \frac{8h}{\sqrt{6}}$$

$$\frac{2h^2}{3} + \frac{8h}{\sqrt{6}} - 16 = 0$$

$$h = \frac{-\frac{8}{\sqrt{6}} \pm \sqrt{\frac{64}{6} + 4 \times \frac{2}{3} \times 16}}{\frac{4}{3}}$$

$$= 3.03 \text{ since } h > 0$$

Question 29 (c)

Criteria	Marks
• Provides correct solution	3
• Attempts to find the bearing, or equivalent merit	2
• Finds angle OFY, or equivalent merit	1

Sample answer:

$$\frac{\sin\theta}{\frac{h}{\sqrt{3}}} = \frac{\sin 45^\circ}{h}$$

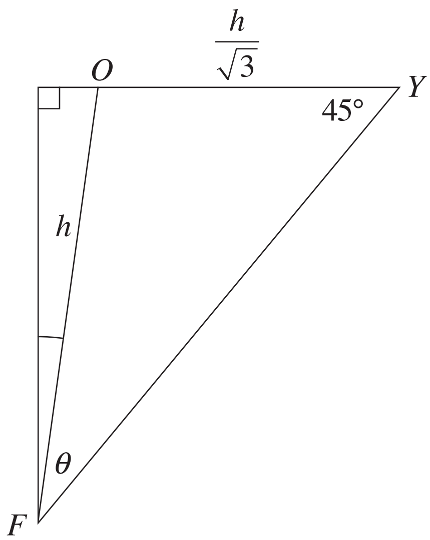
$$\sin\theta = \frac{1}{\sqrt{2}\sqrt{3}}$$

$$\theta = 24^\circ \ldots$$

$$\approx 24^\circ$$

$$\text{Bearing} = 45^\circ - 24^\circ$$

$$\approx 021^\circ$$



Question 30

Criteria	Marks
• Provides correct solution	3
• Obtains a quadratic in k, or equivalent merit	2
• Substitutes $x - k$ and $y - k$ into equation, or equivalent merit	1

Sample answer:

$x \longrightarrow x - k \qquad y \longrightarrow y - k$

$$
\begin{aligned}
y - k &= (x - k - 1)(x - k - 5) \\
11 - k &= (6 - k - 1)(6 - k - 5) \\
11 - k &= (5 - k)(1 - k) \\
11 - k &= 5 - 6k + k^2 \\
k^2 - 5k - 6 &= 0 \\
(k - 6)(k + 1) &= 0
\end{aligned}
$$

So, $k = 6$ since k is positive

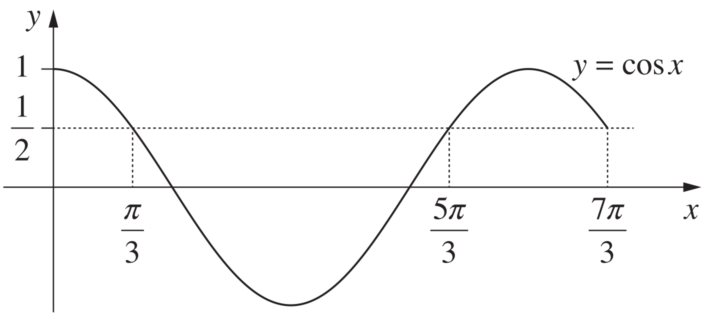
Question 31

Criteria	Marks
• Provides correct solution	3
• Finds $p = \frac{5}{6}$ or $p = \frac{7}{6}$, or equivalent merit	2
• Finds $x = \frac{\pi}{3}$ and $\frac{5\pi}{3}$, or equivalent merit	1

Sample answer:

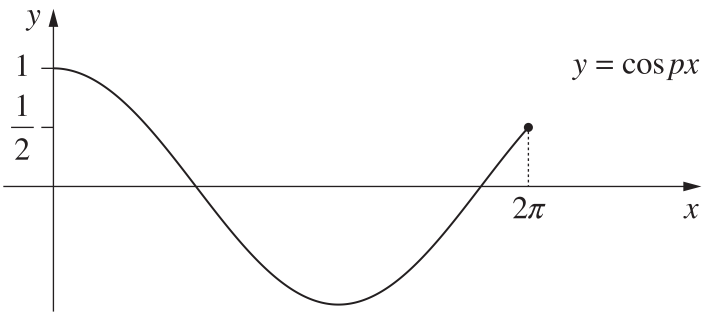
$$\cos x = \frac{1}{2}$$

$$x = \frac{\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{3}, \ldots$$



$y = \cos px$ dilation horizontally by a factor of $\frac{1}{p}$

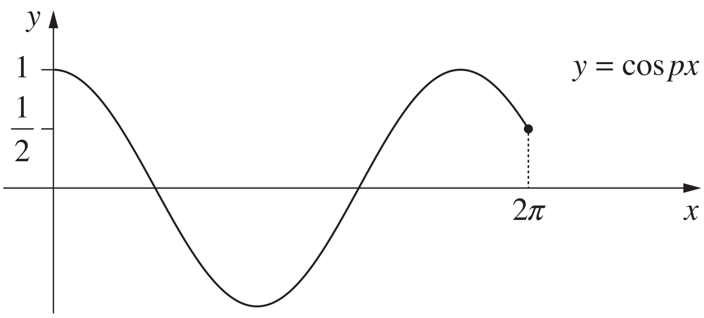
Lowest value of p to get 2 solutions



$$\therefore \quad \frac{5\pi}{3} \times \frac{1}{p} = 2\pi$$

$$p = \frac{5\pi}{3 \times 2\pi} = \frac{5}{6}$$

Highest value of p to get 2 solutions



$$\therefore \quad \frac{7\pi}{3} \times \frac{1}{p} = 2\pi$$

$$p = \frac{7\pi}{3 \times 2\pi} = \frac{7}{6}$$

$$\therefore \quad \frac{5}{6} \le p < \frac{7}{6}$$

2025 HSC Mathematics Advanced Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	MA-S1 Probability and Discrete Probability Distributions	MA11-7
2	1	MA-E1 Logarithms and Exponentials	MA11-9
3	1	MA-F1 Working with Functions	MA11-1
4	1	MA-F1 Working with Functions	MA11-1
5	1	MA-C4 Integral Calculus	MA12-7
6	1	MA-F1 Working with Functions	MA11-1
7	1	MA-S1 Probability and Discrete Probability Distributions	MA11-7
8	1	MA-S3 Random Variables	MA12-8
9	1	MA-C3 Applications of Differentiation	MA12-10
10	1	MA-C3 Applications of Differentiation	MA12-3

Section II

Question	Marks	Content	Syllabus outcomes
11 (a)	2	MA-F1 Working with Functions	MA11-2
11 (b)	1	MA-F1 Working with Functions	MA11-2
12	3	MA-C1 Introduction to Differentiation	MA11-5
13	2	MA-M1 Modelling Financial Situations	MA12-4
14 (a)	2	MA-S2 Descriptive Statistics and Bivariate Data Analysis	MA12-8
14 (b)	2	MA-S2 Descriptive Statistics and Bivariate Data Analysis	MA12-8
14 (c)	1	MA-S2 Descriptive Statistics and Bivariate Data Analysis	MA12-8
14 (d)	1	MA-S2 Descriptive Statistics and Bivariate Data Analysis	MA12-10
15 (a)	2	MA-T3 Trigonometric Functions and Graphs	MA12-5
15 (b)	2	MA-T3 Trigonometric Functions and Graphs	MA12-5
15 (c)	2	MA-T3 Trigonometric Functions and Graphs	MA12-5
16 (a)	4	MA-C3 Applications of Differentiation	MA12-6
16 (b)	1	MA-C3 Applications of Differentiation	MA12-6
17 (a)	2	MA-M1 Modelling Financial Situations	MA12-4
17 (b)	3	MA-M1 Modelling Financial Situations	MA12-4
17 (c)	2	MA-E1 Logarithms and Exponentials MA-M1 Modelling Financial Situations	MA11-6, MA12-2
18	2	MA-F1 Working with Functions	MA11-2
19	3	MA-S1 Probability and Discrete Probability Distributions	MA11-7
20	3	MA-M1 Modelling Financial Situations	MA12-2
21 (a)	2	MA-S3 Random Variables	MA12-8
21 (b)	3	MA-E1 Logarithms and Exponentials MA-S3 Random Variables	MA11-6, MA12-8

Question	Marks	Content	Syllabus outcomes
22	2	MA-T2 Trigonometric Functions and Identities	MA11-4
23 (a)	4	MA-S3 Random Variables	MA12-8
23 (b)	1	MA-S3 Random Variables	MA12-10
24	4	MA-C3 Applications of Differentiation	MA12-6
25 (a)	2	MA-C2 Differential Calculus	MA12-3
25 (b)	2	MA-C4 Integral Calculus	MA12-7
25 (c)	2	MA-M1 Modelling Financial Situations	MA12-4
26 (a)	2	MA-C3 Applications of Differentiation	MA12-3
26 (b)	3	MA-C3 Applications of Differentiation	MA12-3, MA12-10
27 (a)	2	MA-C4 Integral Calculus	MA12-7
27 (b)	2	MA-C4 Integral Calculus	MA12-7
27 (c)	2	MA-C3 Applications of Differentiation MA-C4 Integral Calculus MA-E1 Logarithms and Exponentials	MA12-10
28 (a)	2	MA-T1 Trigonometry and Measure of Angles	MA11-3
28 (b)	2	MA-T1 Trigonometry and Measure of Angles MA-T3 Trigonometric Functions and Graphs	MA11-3, MA12-9
29 (a)	1	MA-T1 Trigonometry and Measure of Angles	MA11-3
29 (b)	3	MA-T1 Trigonometry and Measure of Angles	MA11-3
29 (c)	3	MA-T1 Trigonometry and Measure of Angles	MA11-3
30	3	MA-F2 Graphing Techniques	MA12-1
31	3	MA-T3 Trigonometric Functions and Graphs	MA12-5, MA12-10