



**Test Papers
Hub.**

HSC Mathematics Advanced Practice Paper 1

Practice Examination

**Reading time 10 minutes · Working time 3 hours · Section I: 10 multiple-choice ·
Section II: 90 marks · 100 marks in all**

How to use this booklet

- Reading time – 10 minutes. Working time – 3 hours. Write using black pen. Calculators approved by NESA may be used.
- A reference sheet is assumed to be provided, as in the real examination. For questions in Section II, show relevant mathematical reasoning and/or calculations.
- Worked solutions follow the paper: every question has step-by-step working and a key takeaway.

SECTION I

10 marks · Attempt Questions 1 – 10

Allow about 15 minutes for this section. Choose the best answer for each question.

1. The maximal domain of $f(x) = \sqrt{4 - 2x}$ is

- A $x < 2$
- B $x \leq 2$
- C $x \leq -2$
- D $x \geq 2$

2. A particle moves in a straight line so that its displacement x metres from the origin at time t seconds is $x = x^3 - 9x^2 + 24x$. Find the total distance travelled from $t = 0$ to $t = 4$.

- A 24
- B 4
- C 16
- D 25

3. The point $(-1, -3)$ lies on the graph of $y = f(x)$. The graph is transformed to $y = -4f(x - 2) + 1$. The image of the point is

- A $(1, 13)$
- B $(-3, 13)$
- C $(1, 8)$
- D $(1, -11)$

4. The maximum value of the function $f(x) = 3\sin(6x + 2) + 4$ is

- A 12
- B 3
- C 7
- D 1

5. The value of $\int$ from 0 to 1 of $(2x + \frac{1}{2x+1}) dx$ is

- A $\frac{4}{3}$
- B $\frac{\ln(3)}{2} + 1$
- C $\frac{\ln(3)}{2} + 2$
- D $\frac{\ln(5)}{2} + 4$

6. The value of $2\log_3(81) - \log_3(9)$ is

- A 2
- B 10
- C 729
- D 6

7. The exact value of $\tan(\frac{7\pi}{6})$ is

- A $\frac{1}{2}$
- B $\frac{\sqrt{3}}{3}$
- C $-\frac{\sqrt{3}}{3}$
- D $-\frac{1}{2}$

8. For what values of k does the equation $2x^2 + kx + 6 = 0$ have real roots? (Give boundary values correct to two decimal places.)

- A $k \leq -6.93$ or $k \geq 6.93$
- B $k \geq 48.00$
- C $k \leq 6.93$
- D $-6.93 \leq k \leq 6.93$

9. The graph of $y = x^3 - \frac{3x^2}{2} - 18x$ has a local maximum at $x = a$ and a local minimum at $x = b$. The value of $b - a$ is

- A -6
- B 6
- C 5
- D 1

WORKED SOLUTIONS

Answers & worked solutions

Multiple-choice answer key

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

SECTION I

1. The maximal domain of $f(x) = \sqrt{4 - 2x}$ is [Domain]

Correct answer: B — $x \leq 2$

- Need $4 - 2x \geq 0$.
- $4 \geq 2x$, so $x \leq 2$.
- Why the other options are wrong:
- A ($x < 2$): The root of 0 is allowed, so use $\leq$.
- C ($x \leq -2$): This has the opposite sign to the correct answer ($x \leq 2$): a sign was dropped or reversed during the working.
- D ($x \geq 2$): The expression under the root must be ≥ 0 : $4 - 2x \geq 0$, which reverses the inequality when dividing by -2 .

LOS: Methods: multiple choice

KEY TAKEAWAY

Square roots need a non-negative input: solve the inequality and watch the direction.

2. A particle moves in a straight line so that its displacement x metres from the origin at time t seconds is $x = x^3 - 9x^2 + 24x$. Find the total distance travelled from $t = 0$ to $t = 4$. [Motion in a line]

Correct answer: A — 24

- $v = dx/dt = 3x^2 - 18x + 24 = 3(t - 4)(t - 2)$, which is zero at $t = 2$ and $t = 4$.
- $x(0) = 0$, $x(2) = 20$, $x(4) = 16$.
- The particle changes direction at $t = 2$, so distance = $|20 - 0| + |16 - 20| = 24$.
- Why the other options are wrong:
- B (4): The particle also travels from $t = 0$ to $t = 2$.
- C (16): That is the displacement; distance adds the magnitude of each leg of the journey.
- D (25): This is the correct answer (24) plus 1: an extra 1 was added at the end of the calculation (an off-by-1 error).

LOS: Calculus