

SECTION A · PURE MATHEMATICS

Pure Mathematics · 50 marks · Questions 1 – 9

Answer ALL questions in Sections A and B. The paper lasts 2 hours and carries 100 marks: Section A is worth 50 marks and Section B is worth 50 marks. The first questions in each section are one-mark multiple-choice items. Show all necessary working. Unless a question says otherwise, give non-exact numerical answers to three significant figures.

1. An arithmetic series has first term 7 and common difference 2. Determine the sum of the first 15 terms. Circle one option. [1 mark]

- A 330
- B 280
- C 525
- D 315

2. Calculate the number of solutions of $\sin(4x) = \frac{-1}{5}$ for $0 \leq x \leq 2\pi$. Circle one option. [1 mark]

- A 9
- B 5
- C 8
- D 4

3. Evaluate $\int$ from 0 to 2 of $3x^3 \, dx$. Circle your answer. [1 mark]

- A 48
- B 12
- C 96
- D 24

THE WORKED ANSWERS TO THOSE 3 QUESTIONS

1. An arithmetic series has first term 7 and common difference 2. Determine the sum of the first 15 terms. Circle one option. [1 mark] [Sequences and series]

Correct answer: D — 315

- Use $S_n = \left(\frac{n}{2}\right)(2a + (n - 1)d)$ with $a = 7$, $d = 2$, $n = 15$.
- $S = \frac{15}{2} \times (14 + 28) = 315$.
- Marks (TPH scheme): B1 [AO1]. The other options come from common slips: a wrong formula, a wrong sign or a missed step.

LOS: Pure Mathematics · Sequences and series

KEY TAKEAWAY

$$S_n = \left(\frac{n}{2}\right)(2a + (n - 1)d).$$

2. Calculate the number of solutions of $\sin(4x) = \frac{-1}{5}$ for $0 \leq x \leq 2\pi$. Circle one option. [1 mark] [Trigonometry]

Correct answer: C — 8

- The graph of $y = \sin(4x)$ completes 4 full cycles in $0 \leq x \leq 2\pi$.
- Each cycle meets the line $y = \frac{-1}{5}$ exactly twice (as $|\frac{-1}{5}| < 1$), so there are 8 solutions.
- Marks (TPH scheme): B1 [AO1]. The other options come from common slips: a wrong formula, a wrong sign or a missed step.

LOS: Pure Mathematics · Trigonometry

KEY TAKEAWAY

A line between -1 and 1 meets each cycle of a sine wave twice.

3. Evaluate $\int$ from 0 to 2 of $3x^3 \, dx$. Circle your answer. [1 mark] [Integration]

Correct answer: B — 12

- Integrate: $\int 3x^3 \, dx = 3x^4/4$.
- Substitute the limits: $3 \times 2^4 \div 4 = 12$.
- Marks (TPH scheme): B1 [AO1]. The other options come from common slips: a wrong formula, a wrong sign or a missed step.

LOS: Pure Mathematics · Integration

KEY TAKEAWAY

Add one to the power, divide by the new power, then use the limits.