

FREE SAMPLE: THE FIRST 3 QUESTIONS

PAPER 1 · PURE MATHEMATICS

Pure Mathematics · 100 marks · Questions 1 – 17 · 2 hours

Answer ALL questions. Questions 1 to 5 are one-mark multiple-choice items: circle one letter. For the other questions show all necessary working; marks for method may be lost if working is missing. Unless a question says otherwise, give non-exact numerical answers to three significant figures and angles in degrees to one decimal place. Marks are shown in brackets.

1. Evaluate $\log_2 16 + \log_2 2 - \log_2 8$. Circle your answer. [1 mark]

- A 1
- B 8
- C 2
- D 7

2. Solve the inequality $x^2 - 36 < 0$. Circle your answer. [1 mark]

- A $-6 < x < 6$
- B $x < -6$ or $x > 6$
- C $x > 6$
- D $x < -6$

3. Use the Newton–Raphson method with $x_0 = 2$ to solve $x^3 - 2x - 5 = 0$. What is x_1 ? Circle one option. [1 mark]

- A $\frac{21}{10}$
- B $\frac{25}{12}$
- C 12
- D $\frac{19}{10}$

THE WORKED ANSWERS TO THOSE 3 QUESTIONS

1. Evaluate $\log_2 16 + \log_2 2 - \log_2 8$. Circle your answer. [1 mark] [Exponentials and logarithms]

Correct answer: C — 2

- Convert each logarithm: $\log_2 16 = 4$, $\log_2 2 = 1$ and $\log_2 8 = 3$.
- So the value is $4 + 1 - 3 = 2$.
- 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 · Exponentials and logarithms

KEY TAKEAWAY

$\log_a(a^n) = n$; add and subtract logs of powers of the same base.

2. Solve the inequality $x^2 - 36 < 0$. Circle your answer. [1 mark] [Algebra]

Correct answer: A — $-6 < x < 6$

- Factorise: $(x + 6)(x - 6) < 0$, with roots $x = -6$ and $x = 6$.
- The quadratic has a positive x^2 coefficient, so it is negative between its roots: $-6 < x < 6$.
- 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 · Algebra

KEY TAKEAWAY

A positive quadratic is below zero between its roots.

3. Use the Newton–Raphson method with $x_0 = 2$ to solve $x^3 - 2x - 5 = 0$. What is x_1 ? Circle one option. [1 mark] [Numerical methods]

Correct answer: A — $\frac{21}{10}$

- $f(x) = x^3 - 2x - 5$ so $f'(x) = 3x^2 - 2$.
- $x_1 = x_0 - f(x_0)/f'(x_0) = 2 - \frac{-1}{10} = \frac{21}{10}$.
- 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 · Numerical methods

KEY TAKEAWAY

$x_{n+1} = x_n - f(x_n)/f'(x_n)$: remember the minus sign.