



**Test Papers
Hub.**

QCAA Specialist Mathematics Practice Paper 1

Units 3 & 4 — External Assessment Practice

Technology-free paper · 10 multiple-choice + short response · perusal 5 minutes, working 90 minutes · 60 marks

How to use this booklet

- Perusal time – 5 minutes. Working time – 90 minutes. Calculators are NOT permitted in this paper (technology-free).
- Section 1 has 10 multiple-choice questions; Section 2 is short response. Show all relevant mathematical reasoning and/or calculations. A QCAA-approved formula book is assumed to be provided.
- Worked solutions, with a key takeaway for every question, follow the paper.

PAPER 1 — TECHNOLOGY-FREE — SECTION 1 (MULTIPLE CHOICE)

10 marks · perusal 5 minutes, working 90 minutes (whole paper)

Choose the best answer for each question. Calculators are NOT permitted.

1. The modulus of $(1 + 5i)(2 + i)$ is

- A 130
- B $\sqrt{7}$
- C $\sqrt{5} + \sqrt{26}$
- D $\sqrt{130}$

2. The real part of $(1 + \sqrt{3}i)^3$ is

- A -16
- B 0
- C -8
- D 8

3. The vectors $\mathbf{a} = 3\mathbf{i} + \mathbf{j} + 4\mathbf{k}$ and $\mathbf{b} = (2, 4, k)$ are perpendicular. The value of k is

- A $-\frac{5}{2}$
- B $-\frac{3}{2}$
- C $\frac{5}{2}$
- D $-\frac{7}{2}$

4. One solution of $z^2 - 4z + 29 = 0$ is $z = 2 + 5i$. The other solution is

- A $-2 - 5i$
- B $2 - 5i$
- C $5 + 2i$
- D $-2 + 5i$

5. The system $2x - 2y = -4$ and $2x + 1y = -7$ is written as $\mathbf{AX} = \mathbf{B}$ with $\mathbf{A} = \begin{bmatrix} 2 & -2 \\ 2 & 1 \end{bmatrix}$. Using $\mathbf{A}^{-1}$, the value of x is

- A -3
- B -1
- C -2
- D 3

6. The line $r(\lambda) = j + 2k + \lambda(-2i + 3k)$ meets the plane $x + y + z = 1$ when λ equals

- A 1
- B -1
- C 2
- D -2

7. The set of complex numbers z satisfying $|z - (-3 - 2i)| = 2$ is a circle with

- A centre $(-3, -2)$, radius 2
- B centre $(-3, -2)$, radius 4
- C centre $(-2, -3)$, radius 2
- D centre $(3, 2)$, radius 2

8. $dy/dx = 0.25y$ and $y = 6$ when $x = 0$. The value of y when $x = 3$, correct to two decimal places, is

- A 976528.75
- B 12.7
- C 2.12
- D 6.75

9. A vector of magnitude 30 in the same direction as $a = 2i - 10j - 11k$ is

- A $60i - 300j - 330k$
- B $4i - 20j - 22k$
- C $4i - 8j - 9k$
- D $2/15i - 2/3j - 11/15k$

10. A random sample of 64 observations from a population with known standard deviation 5 has mean 52.7. A 95% confidence interval for the population mean, to one decimal place, is

- A (51.7, 53.7)
- B (42.9, 62.5)
- C (51.5, 53.9)
- D (50.3, 55.1)

WORKED SOLUTIONS

Answers & worked solutions

Multiple-choice answer key

P1-1 D	P1-2 C	P1-3 A	P1-4 B	P1-5 A	P1-6 D
P1-7 A	P1-8 B	P1-9 B	P1-10 C		

PAPER 1 — TECHNOLOGY-FREE — SECTION 1 (MULTIPLE CHOICE)

1. The modulus of $(1 + 5i)(2 + i)$ is [Complex moduli]

Correct answer: D — $\sqrt{130}$

- $|z_1 z_2| = |z_1| |z_2|$.
- $= \sqrt{(26)} \times \sqrt{(5)} = \sqrt{130}$.
- Why the other options are wrong:
- A (130): Take the square root.
- B ($\sqrt{7}$): Use $|z_1| |z_2|$.
- C ($\sqrt{5} + \sqrt{26}$): The modulus of a product is the PRODUCT of the moduli, not the sum.

LOS: Methods: multiple choice

KEY TAKEAWAY

$|z_1 z_2| = |z_1| |z_2|$: multiply the moduli.

2. The real part of $(1 + \sqrt{3}i)^3$ is [De Moivre]

Correct answer: C — -8

- Write in polar form: $1 + \sqrt{3}i = 2 \operatorname{cis}\left(\frac{\pi}{3}\right)$.
- De Moivre: $(r \operatorname{cis} \theta)^n = r^n \operatorname{cis}(n\theta) = 8 \operatorname{cis}(\pi)$.
- Real part = -8.
- Why the other options are wrong:
- A (-16): This is the correct answer (-8) doubled: a scaling factor was applied (or a factor missed) that the working above does not use.
- B (0): That is the imaginary part.
- D (8): Check the angle: $n\theta$ in the correct quadrant.

LOS: Methods: multiple choice

KEY TAKEAWAY

De Moivre's theorem: raise the modulus to the power and multiply the argument by the power.