Specialist Mathematics Unit 1 & 2 — Practice Exam 2 — Answers & Explanations

Answers to the 15 questions in the free preview.

Specialist Mathematics

1. See explanation below — this question is not auto-marked.
Model answer: modulus = √(1² + (√3)²) = √(1 + 3) = √4 = 2. Argument = arctan(√3/1) = arctan(√3) = 60°, and since both real and imaginary parts are positive (first quadrant), the argument stays 60°. Award marks for correct modulus calculation and correct argument calculation with correct quadrant reasoning.

2. See explanation below — this question is not auto-marked.
Model answer: the complex conjugate of a + bi is a − bi (the sign of the imaginary part is flipped). Geometrically, a complex number and its conjugate are reflections of each other across the real (horizontal) axis on the Argand plane — they have the same real part and modulus, but opposite imaginary parts. Award marks for the correct algebraic definition and correct geometric description (reflection across the real axis).

3. B. A vector with magnitude 1
A unit vector is a vector with a magnitude (length) of exactly 1, often used to indicate direction only.

4. B. (3, 2)
Add corresponding components: (2+1, 3+(−1)) = (3, 2).

5. D. (6, 8)
Scalar multiplication multiplies every component: 2 × (3, 4) = (6, 8).

6. B. 11
Dot product = (1×3) + (2×4) = 3 + 8 = 11.

7. A. A scalar multiple of the other
Two vectors are parallel if one can be written as a scalar multiple of the other, e.g. b = ka for some scalar k.

8. C. A vector describing displacement from the origin to a point
A position vector represents the displacement from the origin to a specific point in space.

9. D. (2, 1)
Subtract corresponding components: (5−3, 2−1) = (2, 1).

10. B. 3
Magnitude = √(1² + 2² + 2²) = √(1 + 4 + 4) = √9 = 3.

11. B. The angle between two vectors
Rearranging a·b = |a||b|cos(θ) to solve for θ allows you to find the angle between two vectors.

12. C. It has magnitude 0 and no defined direction
The zero vector has a magnitude of 0 and no specific direction.

13. See explanation below — this question is not auto-marked.
Model answer: a + b = (3+(−1), −2+4) = (2, 2). a − b = (3−(−1), −2−4) = (4, −6). 2a = (2×3, 2×(−2)) = (6, −4). Award marks for each of the three correctly computed vectors.

14. See explanation below — this question is not auto-marked.
Model answer: u·v = (2×−3) + (5×4) = −6 + 20 = 14. Since the dot product is not 0, the vectors are NOT perpendicular (perpendicular vectors would need a dot product of exactly 0). Award marks for the correct dot product calculation and the correct perpendicularity conclusion.

15. See explanation below — this question is not auto-marked.
Model answer: magnitude = √(5² + (−12)²) = √(25 + 144) = √169 = 13. Unit vector = v / |v| = (5/13, −12/13). Award marks for the correct magnitude and correctly dividing each component by the magnitude.

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PREVIEW

That’s the end of the preview answers

These are the answers to the 15 preview questions. The full answer key covers all 30 questions in Specialist Mathematics Unit 1 & 2 — Practice Exam 2, with the working behind every mark.

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Specialist Mathematics	15	15

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