Magnitude and direction

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Find the magnitude of $(5, 12)$. [2 marks]

$\sqrt{25 + 144} = 13$.

Answer: 13

2. Find the exact magnitude and direction of $(-4, 4)$. [2 marks]

The magnitude is $\sqrt{32}$.

A quadrant-II arrow with equal component sizes makes angle 135°.

Answer: $4\sqrt{2}$ and 135°.

3. A displacement is $(8, -6)$ m. Find its magnitude and its direction south of east to 0.1°. [3 marks]

$\sqrt{64 + 36} = 10$.

$\tan^{-1}\left(\frac{6}{8}\right) = 36.869\ldots^\circ$.

Answer: 10 m; 36.9° south of east.

4. A non-zero vector has magnitude 10 and direction 60°. Find its exact components. [3 marks]

Horizontal component: $10\cos 60^\circ = 5$.

Vertical component: $10\sin 60^\circ = 5\sqrt{3}$.

Answer: $(5, 5\sqrt{3})$.

5. Find k if $(k, 4)$ has magnitude 5. [3 marks]

$k^2 + 16 = 25$, so $k^2 = 9$.

Both horizontal directions have the required magnitude.

Answer: $k = 3$ or $k = -3$.

6. Explain why $(0, 0)$ cannot be assigned a unique direction angle. [2 marks]

Every angle would produce the same zero displacement when the magnitude is zero.

Answer: It represents no directed movement, so no direction is distinguished.