Position and displacement vectors

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. A=(3,1), B=(-2,7). Find $\vec{AB}$. [2 marks]

Subtract A's coordinates from B's coordinates.

Answer: $(-5, 6)$.

2. A particle starts at $(4, -3)$ and is displaced by $(-6, 5)$. Find its final position. [2 marks]

Add position and displacement.

Answer: $(-2, 2)$.

3. Find the midpoint of $(7, -4)$ and $(-1, 6)$. [2 marks]

Average corresponding coordinates.

Answer: $(3, 1)$.

4. A=(0,2), B=(12,8). Find P for AP:PB=1:2. [3 marks]

Use one third of $(12, 6)$ from A.

$(0, 2) + (4, 2) = (4, 4)$.

Answer: $(4, 4)$.

5. A=(2,1), B=(5,3). Find the point with $t = 2$ in $\mathbf{a} + t(\mathbf{b} - \mathbf{a})$ and explain its position. [3 marks]

The displacement is $(3, 2)$.

$A + 2(3, 2) = (8, 5)$.

Answer: $(8, 5)$, beyond B on the line from A through B.

6. An origin is shifted by vector $\mathbf{c}$. Prove that the displacement between A and B stays unchanged. [3 marks]

Subtract the shifted position vectors.

The two copies of the origin shift cancel.

Answer: $(\mathbf{b} - \mathbf{c}) - (\mathbf{a} - \mathbf{c}) = \mathbf{b} - \mathbf{a}$.