Position and displacement vectors

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. $A=(3,1)$, $B=(-2,7)$. Find $\overrightarrow{AB}$. [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: $(\mathbf{b}-\mathbf{c})-(\mathbf{a}-\mathbf{c})=\mathbf{b}-\mathbf{a}$.