Parallelism and collinearity

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Are $(2, 5)$ and $(6, 15)$ parallel? State a multiplier. [2 marks]

Both components are multiplied by three.

Answer: Yes; multiplier 3.

2. Are $(4, -2)$ and $(8, -5)$ parallel? Explain. [2 marks]

The first components suggest multiplier 2, but $2(-2) = -4$, not -5.

Answer: No.

3. Find a if $(a, 6)$ is parallel to $(2, 3)$. [2 marks]

The y-component doubles, so the x-component must also double.

Answer: $a = 4$.

4. Show that $A = (-1, 2)$, $B = (2, 8)$, $C = (4, 12)$ are collinear. [3 marks]

$AB = (3, 6)$ and $AC = (5, 10)$.

These are scalar multiples from a common starting point.

Answer: $\overrightarrow{AC} = \frac{5}{3}\overrightarrow{AB}$.

5. $A = (1, 1)$, $B = (5, 3)$, $C = (-1, 0)$. Express AC as a multiple of AB and locate C. [3 marks]

$AB = (4, 2)$ and $AC = (-2, -1)$.

The negative multiplier reverses direction.

Answer: $\overrightarrow{AC} = -\frac{1}{2}\overrightarrow{AB}$; C is beyond A away from B.

6. Find t for which $(2 + t, 1 - 2t)$ is parallel to $(3, -1)$. [3 marks]

Require $1 - 2t = -\frac{2 + t}{3}$.

$3 - 6t = -2 - t$, hence $t = 1$.

Answer: $t = 1$.