

- 2010 2 (b) When a motor-cyclist travels along a straight road from South to North at a constant speed of 12.5 m s^{-1} the wind appears to her to come from a direction North 45° East.

When she returns along the same road at the same constant speed, the wind appears to come from a direction South 45° East.

Find the magnitude and direction of the velocity of the wind.

$$\vec{V}_M = 0\vec{i} + 12.5\vec{j}$$

$$\vec{V}_{WM} = -x\vec{i} - x\vec{j}$$

$$\begin{aligned}\vec{V}_W &= \vec{V}_{WM} + \vec{V}_M \\ &= -x\vec{i} + (12.5 - x)\vec{j}\end{aligned}$$

$$\vec{V}_M = 0\vec{i} - 12.5\vec{j}$$

$$\vec{V}_{WM} = -y\vec{i} + y\vec{j}$$

$$\begin{aligned}\vec{V}_W &= \vec{V}_{WM} + \vec{V}_M \\ &= -y\vec{i} + (y - 12.5)\vec{j}\end{aligned}$$

$$\vec{V}_W = \vec{V}_W$$

$$\Rightarrow x = y \text{ and } 12.5 - x = y - 12.5$$

$$\Rightarrow x = y = 12.5$$

$$\vec{V}_W = -12.5\vec{i} + 0\vec{j}$$

$$\text{magnitude} = 12.5 \text{ m s}^{-1}$$

$$\text{direction} = \text{West}$$

5

5

5

5

5

5

30