

Vectors ~ The Swimming Question

Example: Curtis can swim at 3.2 m/s and Aidan can swim at 3.0 m/s. They both want to cross a 10 m wide river flowing to the west at 1.1 m/s. If Curtis swims so he goes directly across, but Aidan goes with the flow who gets to the other side first?

Curtis ~ goes directly across.

$$\bar{v} = \sqrt{3.2^2 - 1.1^2}$$

$$= 3.0 \text{ m/s [N]}$$

$$\bar{v} = \frac{d}{t}$$

$$t = \frac{d}{\bar{v}} = \frac{10}{3} = \underline{\underline{3.33 \text{ s}}}$$

$$\sin \theta = \frac{1.1}{3.2}$$

$$\theta = \sin^{-1}(0.34375) = 20^\circ$$

Heading is 3.2 m/s [N20°E]

Aidan - goes w flow (doesn't fight current)

$$\bar{v} = \sqrt{3.0^2 + 1.1^2}$$

$$= 3.2 \text{ m/s}$$

$$\theta = \tan^{-1}(1.1/3.0)$$

$$= 20^\circ$$

$$\therefore \bar{v} = 3.2 \text{ m/s [N20°W]}$$

$$\cos \theta = \frac{10}{d}$$

$$\cos 20 = \frac{10}{d}$$

$$d = \frac{10}{\cos 20}$$

$$= \underline{\underline{10.64 \text{ m}}}$$

$$\bar{v} = \frac{d}{t}$$

$$t = \frac{d}{\bar{v}}$$

$$= \frac{10.64}{3.2}$$

$$= \underline{\underline{3.325 \text{ s}}}$$

$$* X = \sqrt{10.64^2 - 10^2}$$

$$= 3.6 \text{ m [downstream]}$$