

P12

## Relative Velocity in 2D

- When determining relative velocity, it is important to draw a labeled diagram and carefully assign subscript to velocity vectors.

Example 1:

A person in a small motorboat is trying to cross a river that flows due west with a strong current. The man starts on the south bank and is trying to reach the north bank directly north from his starting point. He should head

- a) due north
- b) due west
- c) in a northwesterly direction
- d) in a northeasterly direction

➤ Justify your reasoning.

➤ What determines the angle at which the man heads across the river?

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Example 2:

A boat's speed in still water is  $1.85\text{ m/s}$ . If the boat is to travel directly across a river whose current has speed of  $1.20\text{ m/s}$ . What is the angle the boat must head when going across the river? Include a labeled diagram.

Example 3:

A boat has a speed of  $1.75 \text{ m/s}$  in still water. The boat heads directly (no corrections) across the river whose current is  $1.28 \text{ m/s}$ .

A: What is the velocity (magnitude and direction) of the boat relative to the shore?

B: If the river is  $130 \text{ m}$  wide, how long will it take to cross and how far downstream will the boat be then?

Example 4: A truck is approaching an intersection moving with a velocity of  $15 \text{ m/s}$  [W]. A car is approaching the same intersection with a velocity of  $10 \text{ m/s}$  [N]. What is the relative velocity of the truck with respect to the car at the moment their individual velocities were measured? Include a labeled diagram.