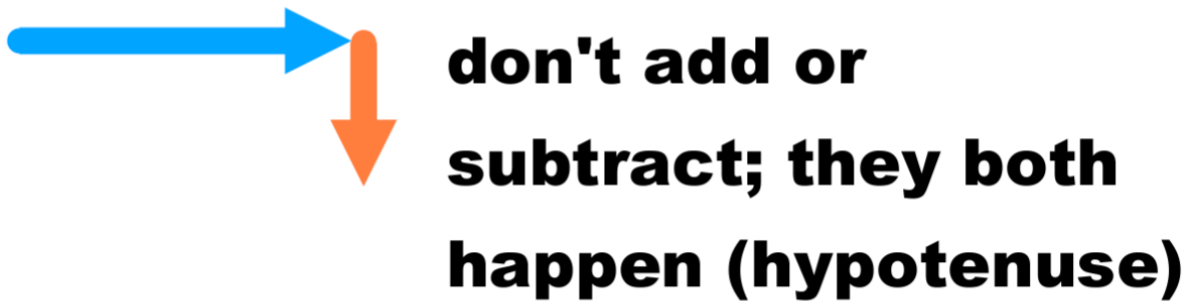
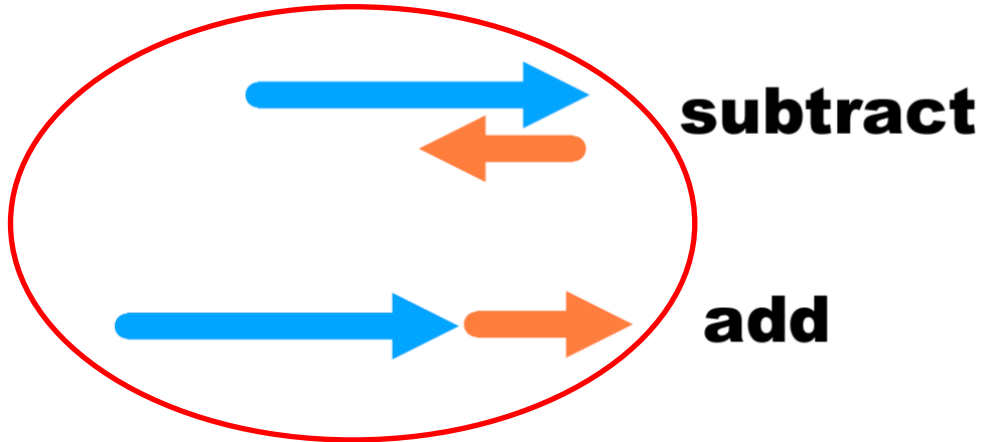


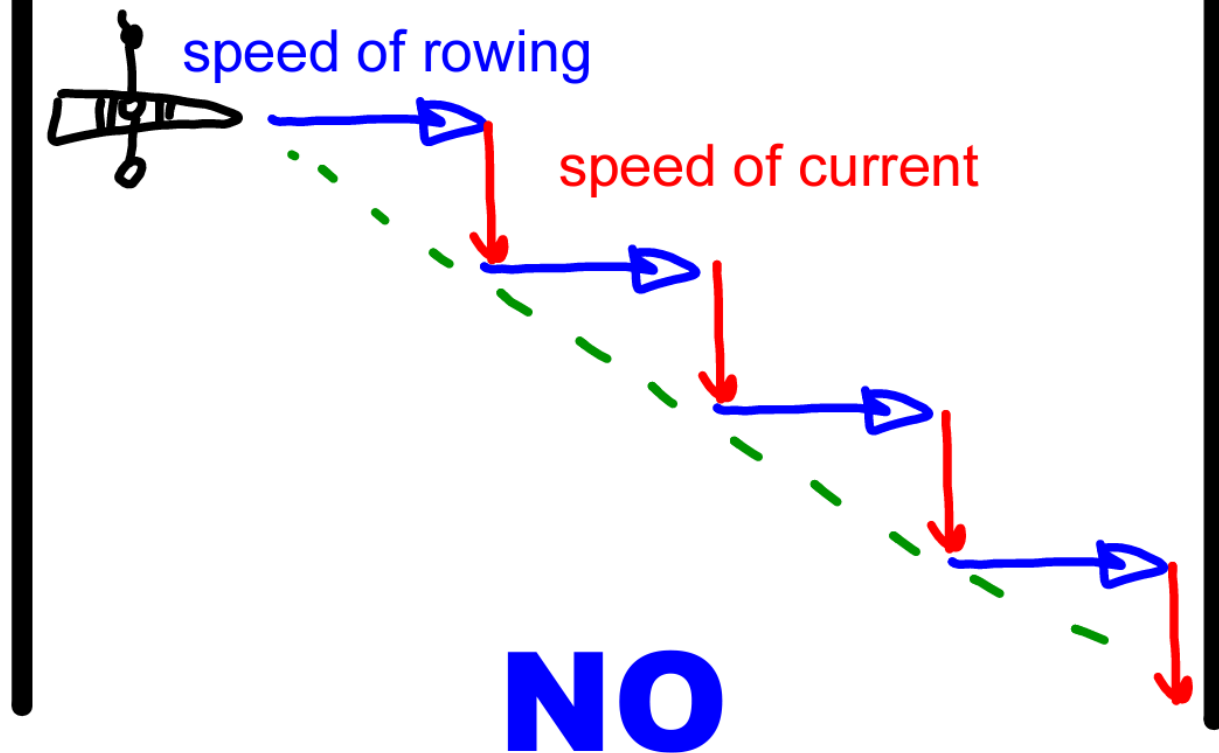
Vector traveling parallel simply ADD or SUBTRACT!

How to combine vectors



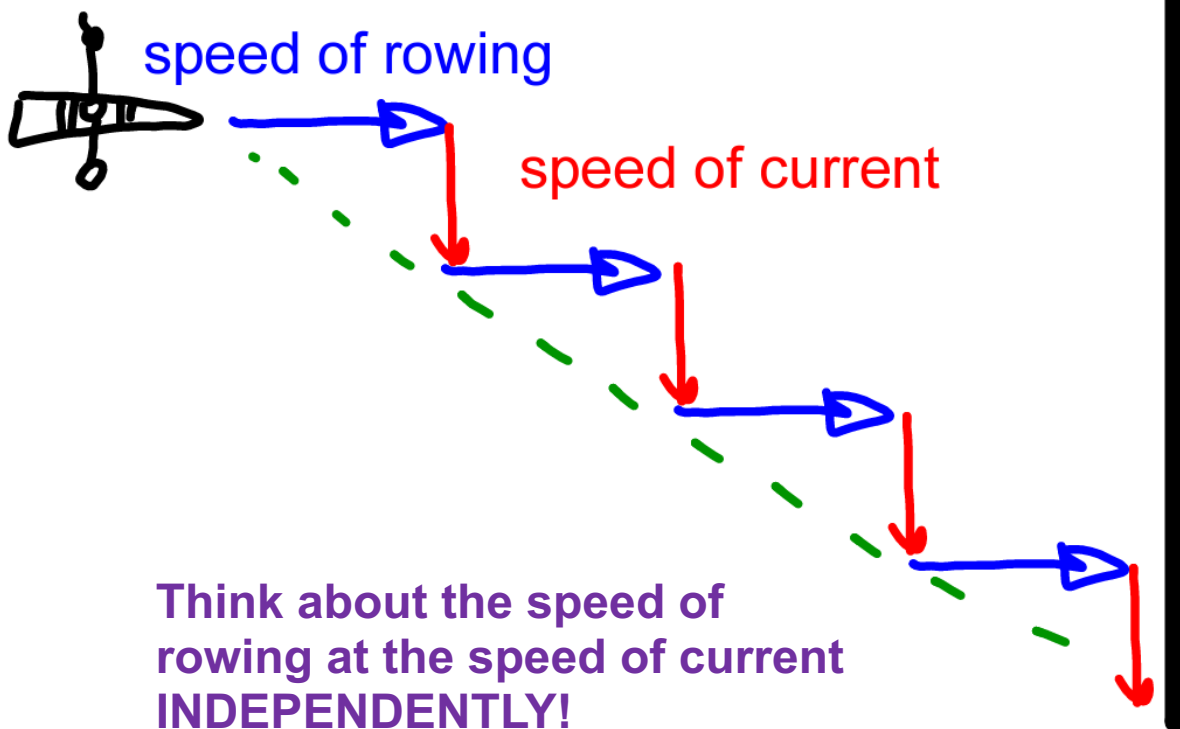
Rowing across a river

Does the current delay you?

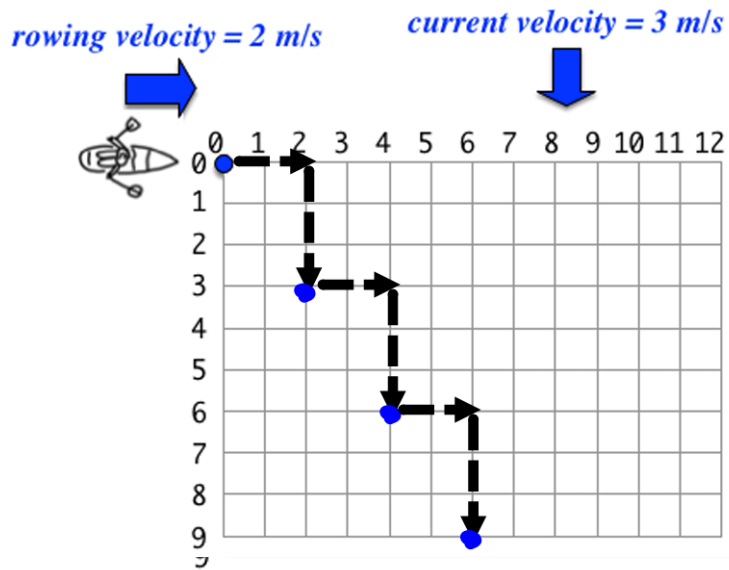


Rowing across a river

Does the current delay you?



Example!



First solve for the time it takes the boat to cross 12 m to the right.

Horizontal (x-direction)

Then solve for how far down the current carries the boat

Vertical (y-direction)

$$v_i = 2 \text{ m/s}$$

$$a = 0$$

$$d = 12$$

$$t = ?$$

USE KINEMATICS!

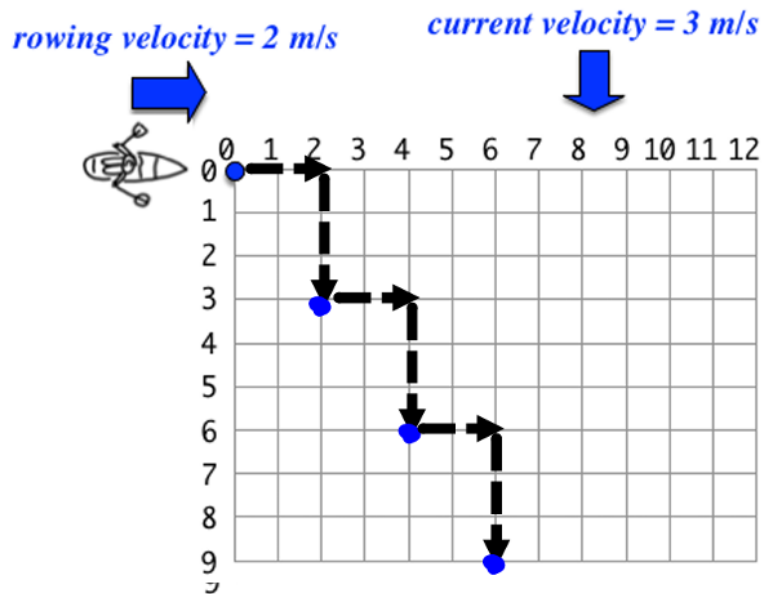
$$v_i = -3 \text{ m/s}$$

$$a = 0$$

$$d = ?$$

$$t = ?$$

Let's look at this a little closer!



First solve for the time it takes the boat to cross 12 m to the right.

Horizontal (x-direction)

Then solve for how far down the current carries the boat

Vertical (y-direction)

$$v_i = 2 \text{ m/s}$$

$$a = 0$$

$$d = 12$$

$$t = ?$$

We can find time from this and use that to find the displacement in this!

$$v_i = -3 \text{ m/s}$$

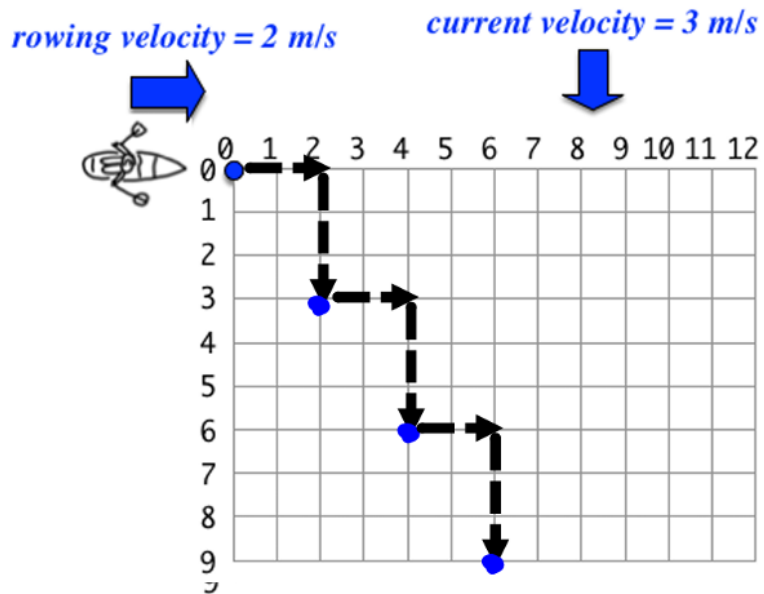
$$a = 0$$

$$d = ?$$

$$t = ?$$

SOLVE 'x' FIRST!

Let's look at this a little closer!



First solve for the time it takes the boat to cross 12 m to the right.

Horizontal (x-direction)

$$\begin{aligned} v_i &= 2 \text{ m/s} \\ a &= 0 \\ d &= 12 \end{aligned}$$

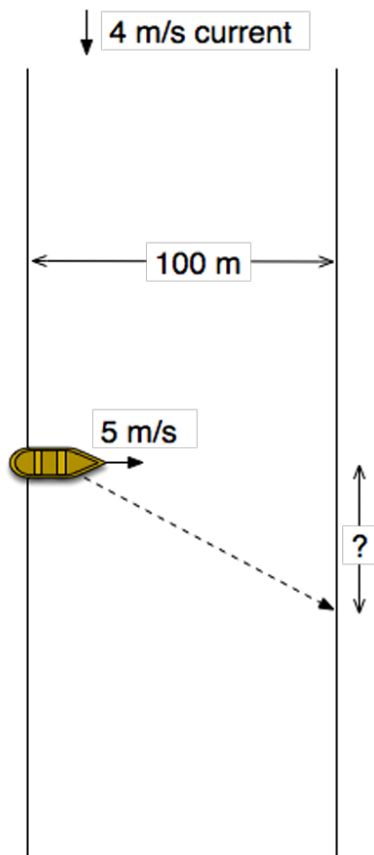
$$t = 6 \text{ seconds}$$

Then solve for how far down the current carries the boat

Vertical (y-direction)

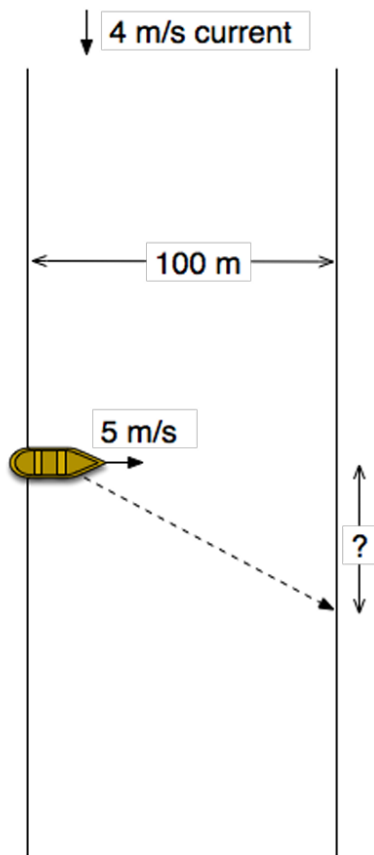
$$\begin{aligned} v_i &= -3 \text{ m/s} \\ a &= 0 \\ t &= 6 \text{ s} \end{aligned}$$

$$d = -18 \text{ meters}$$



The speed of the motorboat's engine is 5 m/s. The current flows at 4 m/s. If the motorboat is pointed straight across the river...

- (a) how long will it take to cross?
- (b) How far downstream will it be carried in that time?



The speed of the motorboat's engine is 5 m/s. The current flows at 4 m/s. If the motorboat is pointed straight across the river...

- how long will it take to cross?
- How far downstream will it be carried in that time?

x-direction:

$$d = 100 \text{ m}$$

$$v_i = 5 \text{ m/s}$$

$$a = 0$$

$$t = ?$$

$$d = v_i t + \frac{1}{2} a t^2$$

$$100 = 5t$$

$$t = 20 \text{ s}$$

y-direction:

$$d = ?$$

$$v_i = -4 \text{ m/s}$$

$$a = 0$$

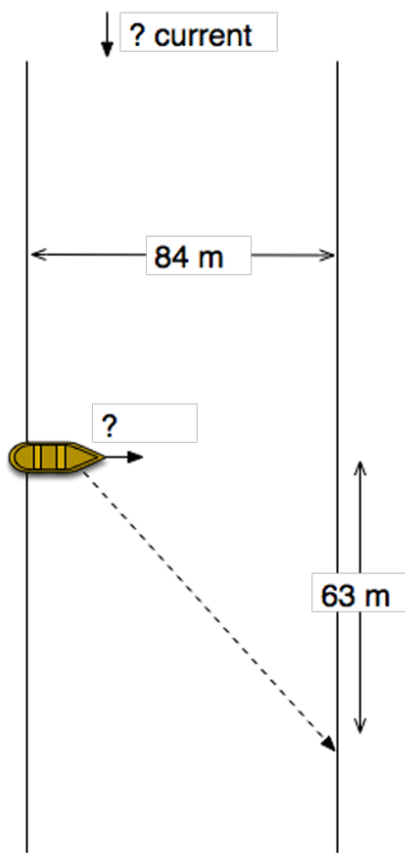
$$t = 20 \text{ s}$$

$$d = v_i t + \frac{1}{2} a t^2$$

$$d = (-4)(20)$$

$$d = -80 \text{ m}$$

It takes 20 seconds to cross and ends up 80 meters downstream!



The motorboat is pointed straight across the river and takes 7 seconds to cross. During that time, the motorboat is carried 63 m downstream.

- (a) What is the velocity of the current?
- (b) What velocity is provided by the motorboat's engines?

Try it!

Answer:

Speed of boat = 12 m/s

Speed of current = 9 m/s