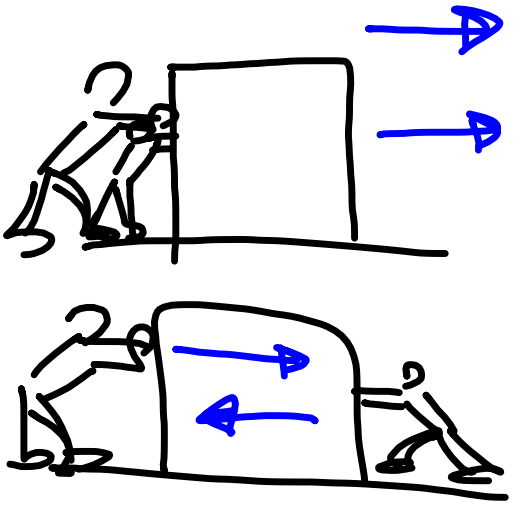
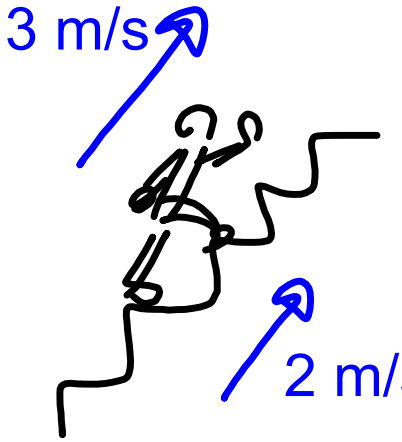
Vectors

Have amount & direction

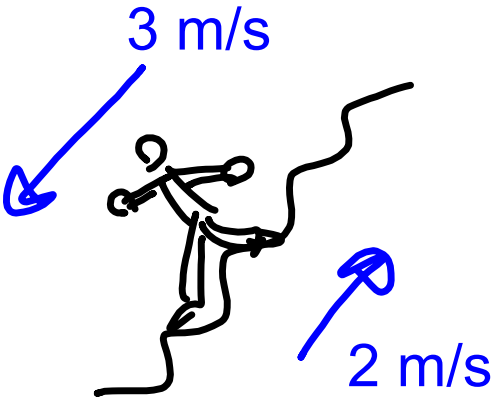
Ex: Forces



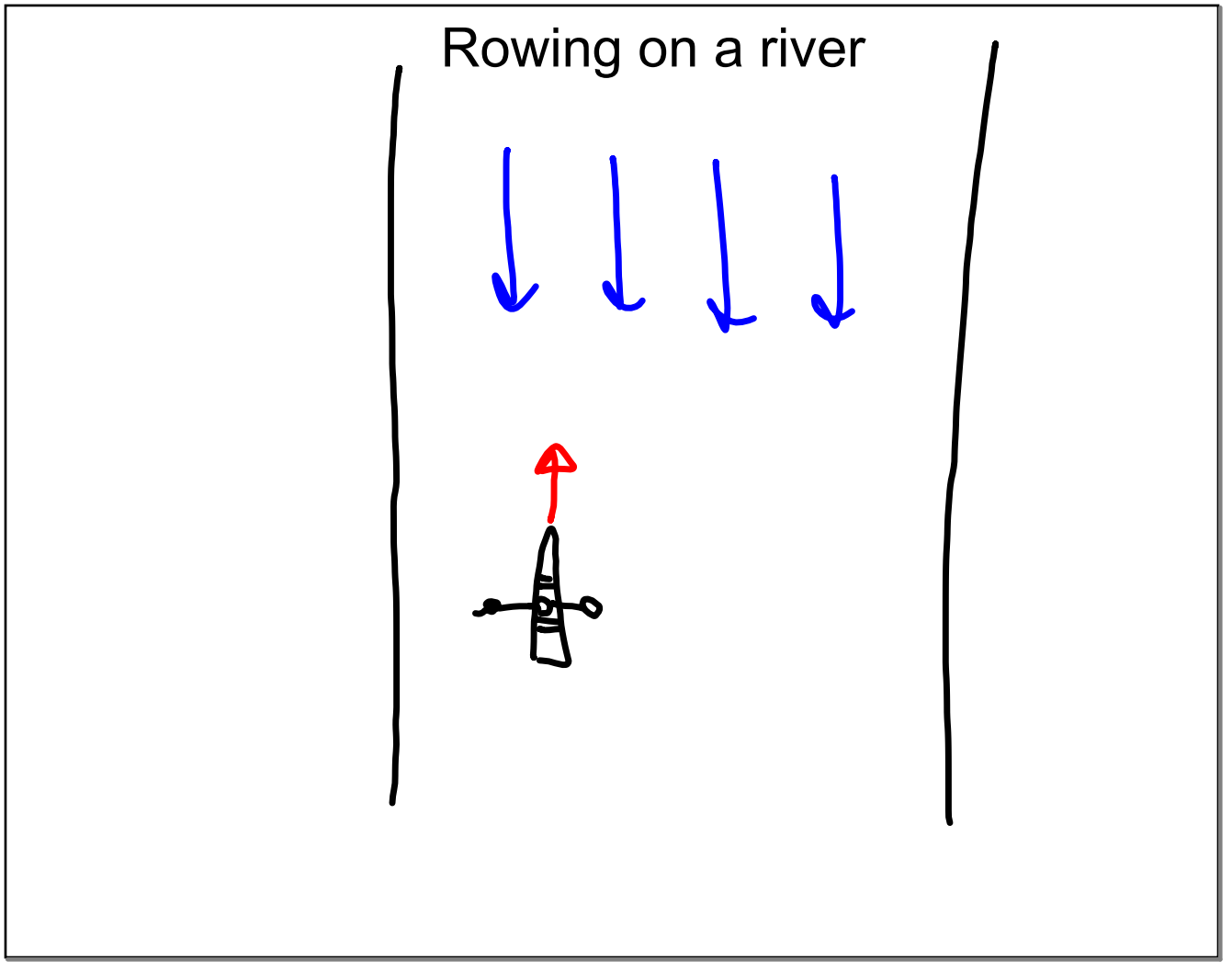
Escalators

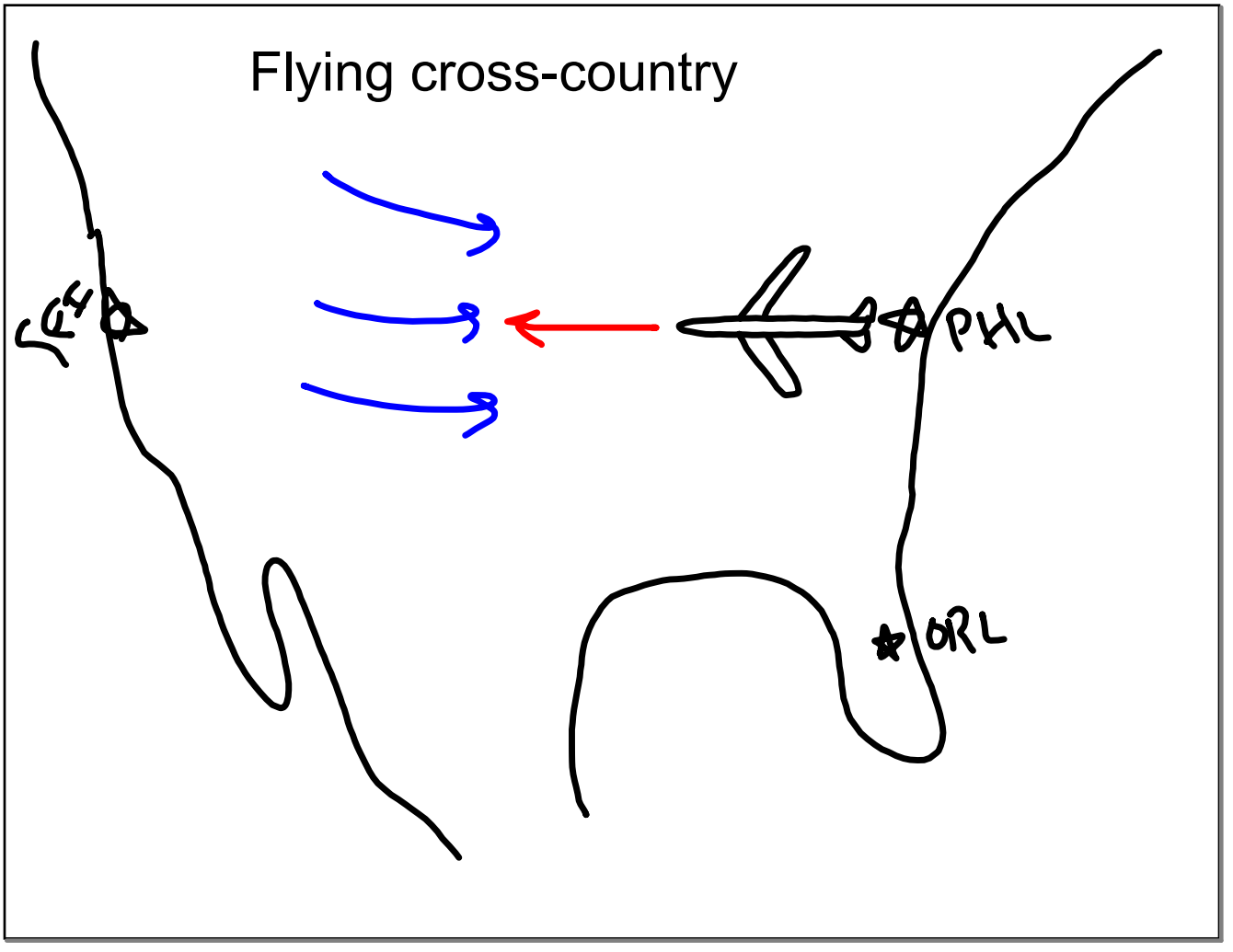


resultant $v = 5 \frac{m}{s}$



resultant $v = 1 \frac{m}{s}$


Rowing on a river


Flying cross-country
PHL
ORL

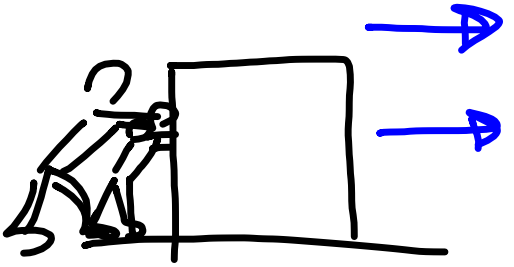
Vectors

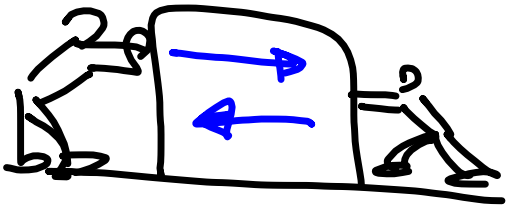
Have amount & direction

Ex: Forces

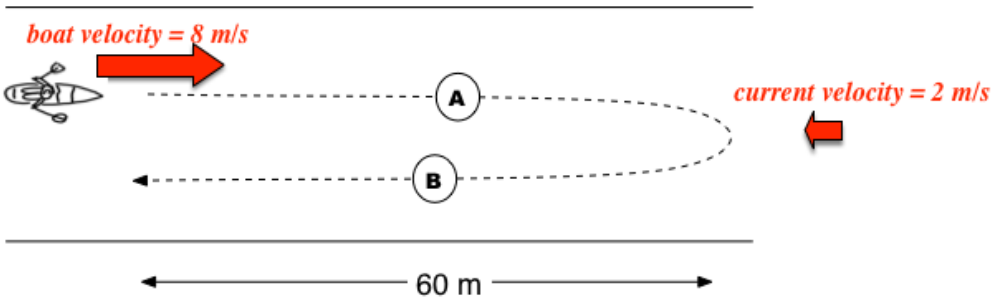
Velocities

Accelerations





1. Resultant V **Calculate the time for each leg of the journey**



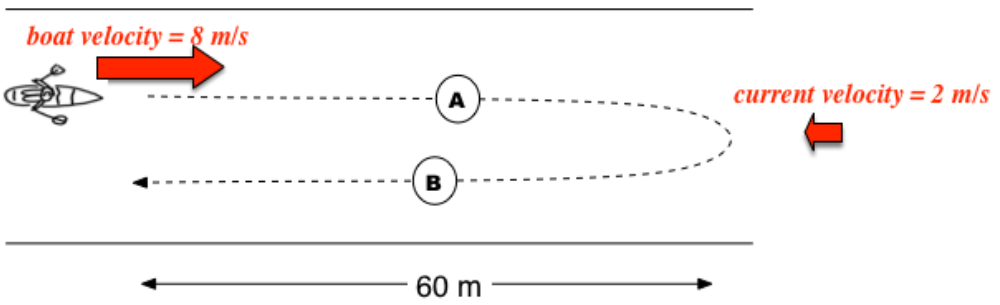
A The boat travels 60 m against the current.

Resultant Velocity V = _____.

B The boat travels 60 m with the current.

Resultant Velocity V = _____.

1. Resultant V **Calculate the time for each leg of the journey**



A The boat travels 60 m against the current.

Resultant Velocity V = 6 m/s.

Vi = 6 m/s
a = 0
Δx = 60 m
t = ?

$\Delta x = V_i t + 1/2at^2$

$60 = (6)t + 0$

10 s = t

B The boat travels 60 m with the current.

Resultant Velocity V = -10 m/s.

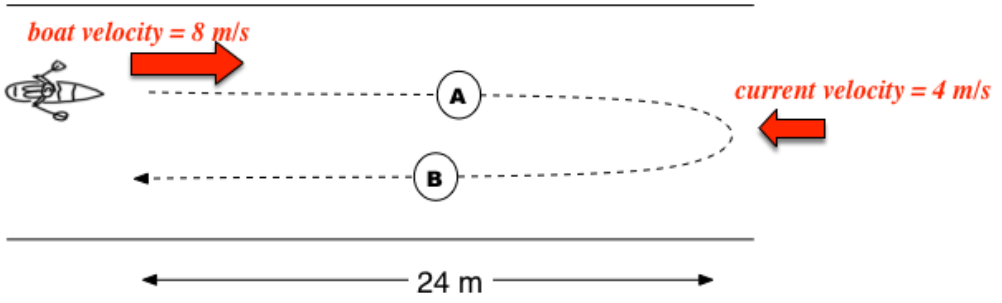
Vi = -10 m/s
a = 0
Δx = -60 m
t = ?

$\Delta x = V_i t + 1/2at^2$

$-60 = (-10)t + 0$

6 s = t

Calculate the time for each leg of the journey



A The boat travels 24 m against the current.

Resultant Velocity V = _____.

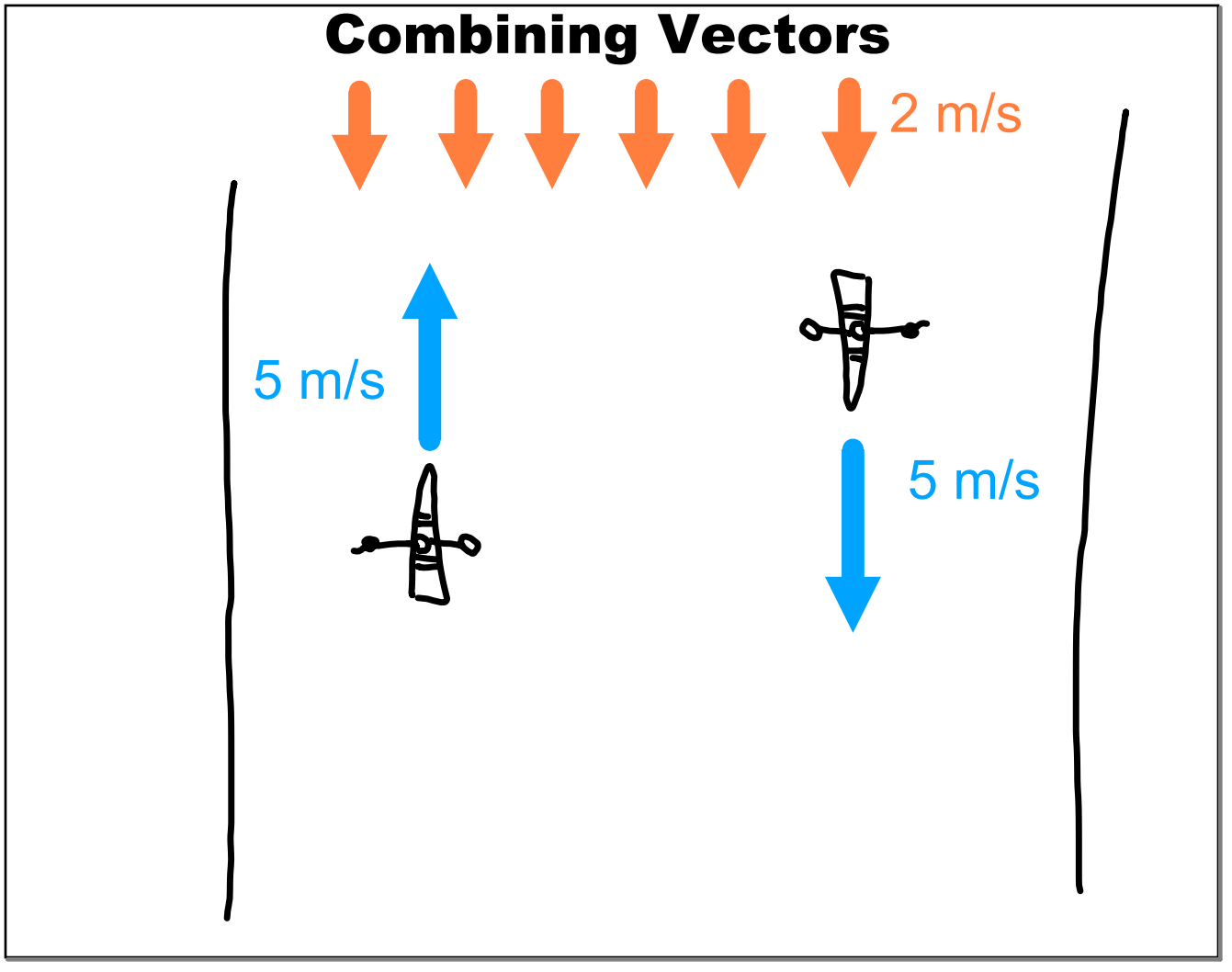
B The boat travels 24 m with the current.

Resultant Velocity V = _____.

Try it yourself!

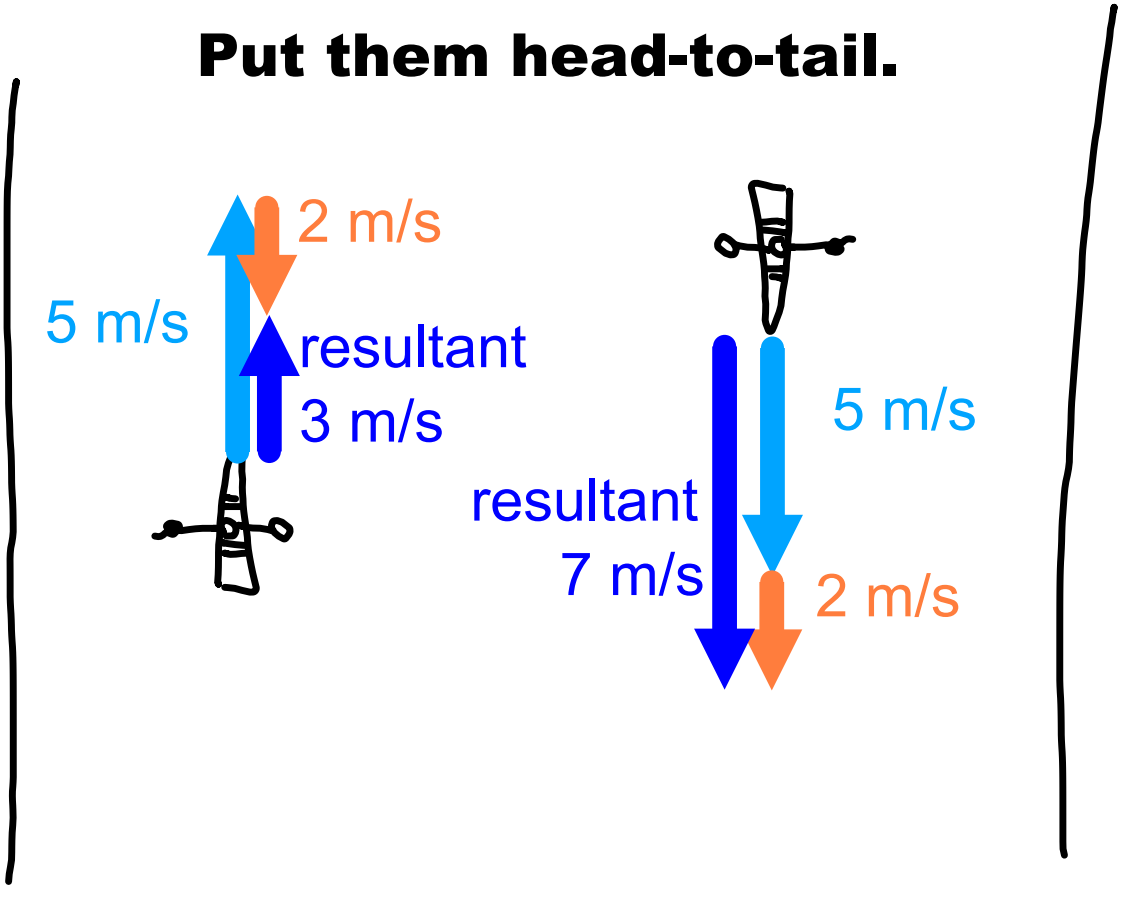
t = 6 s

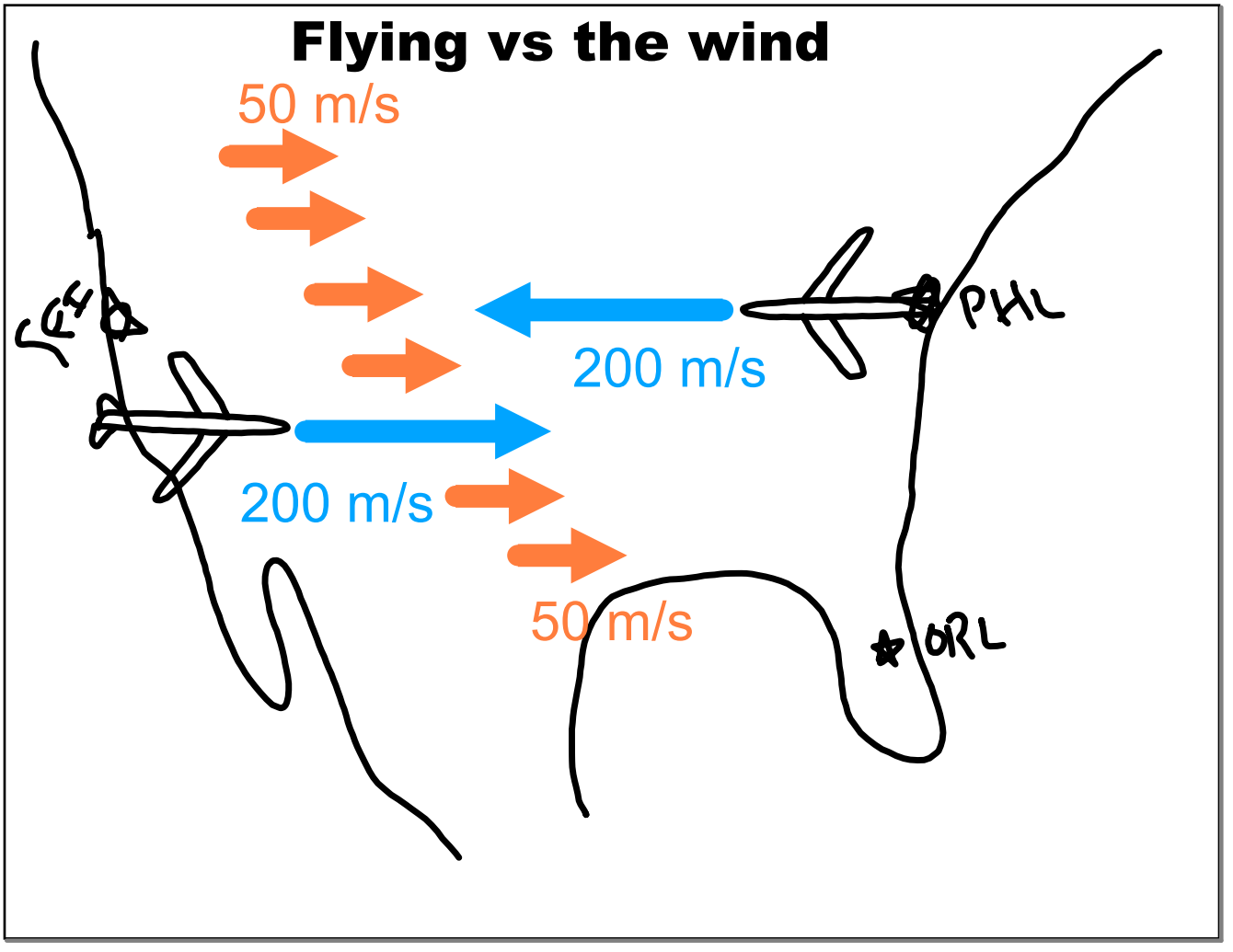
t = 2 s

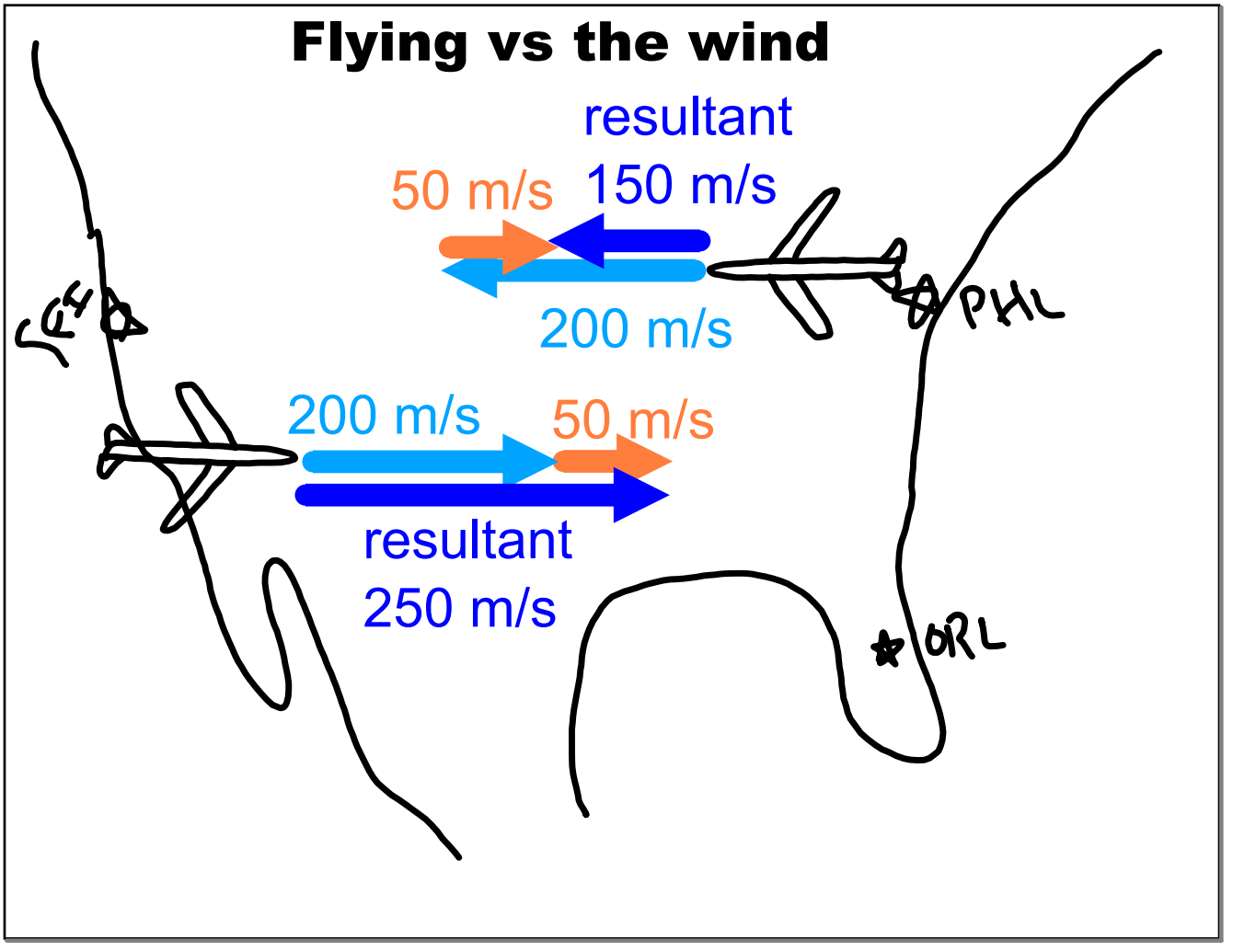

Combining Vectors
2 m/s
5 m/s
5 m/s

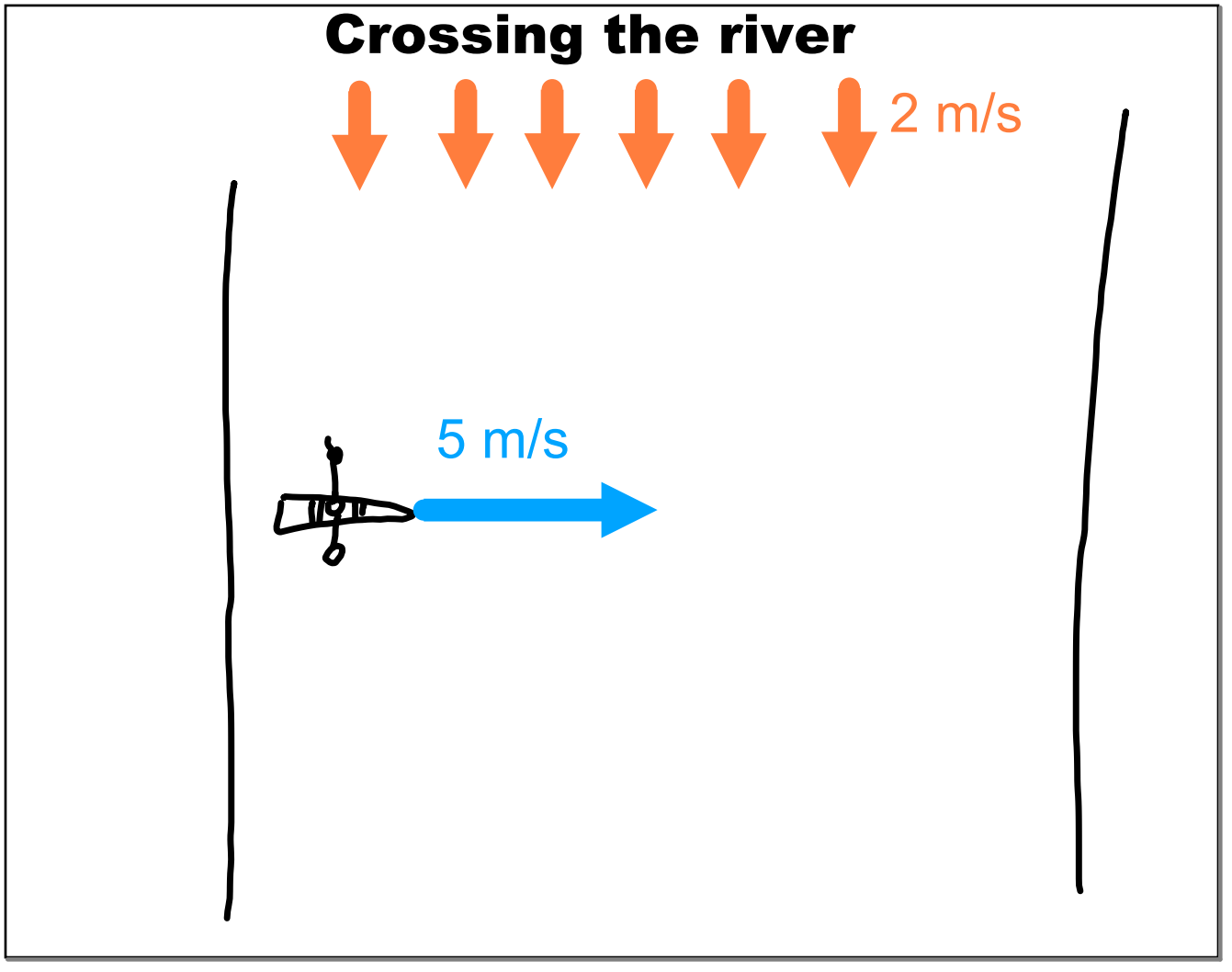
Combining Vectors:

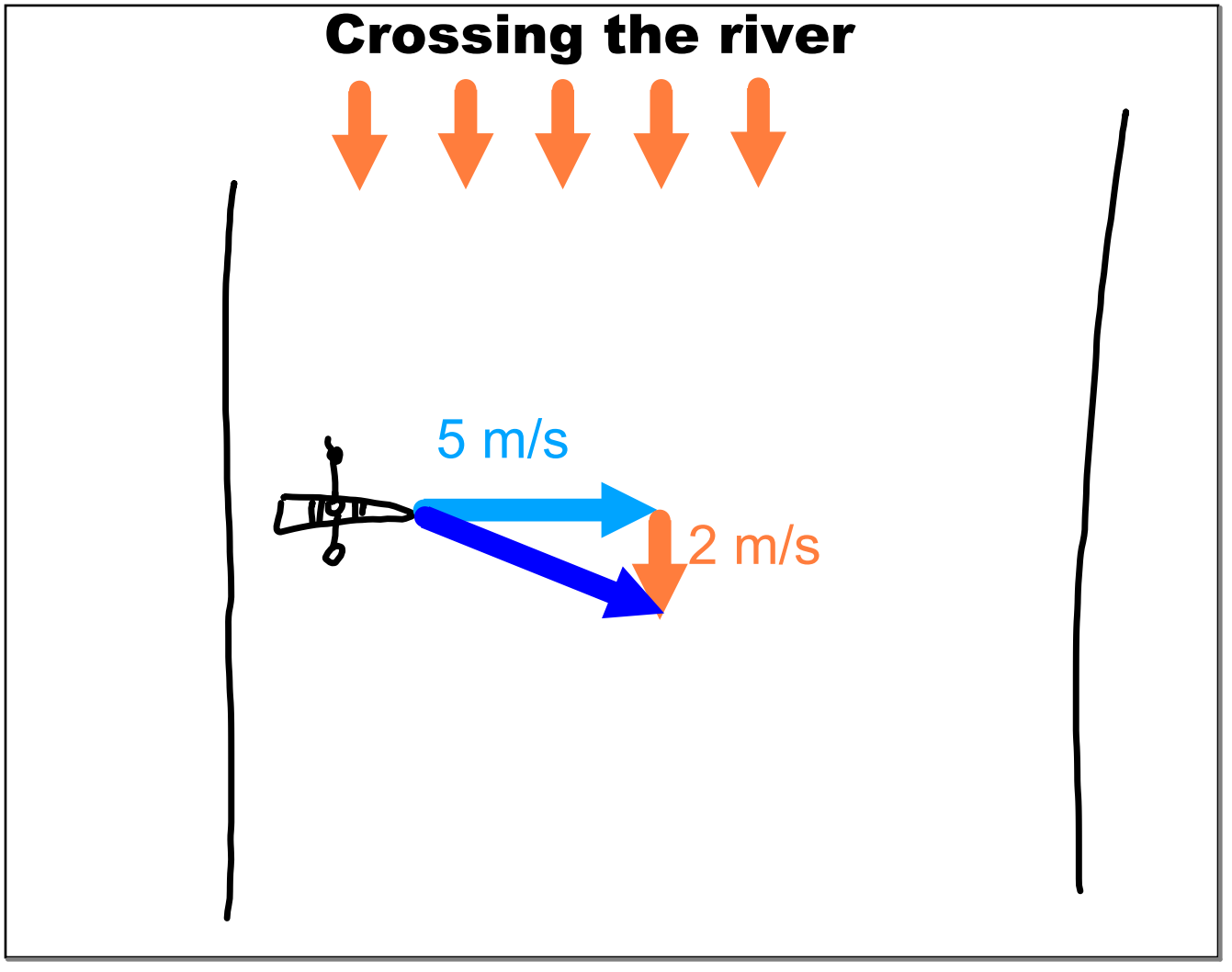
Put them head-to-tail.

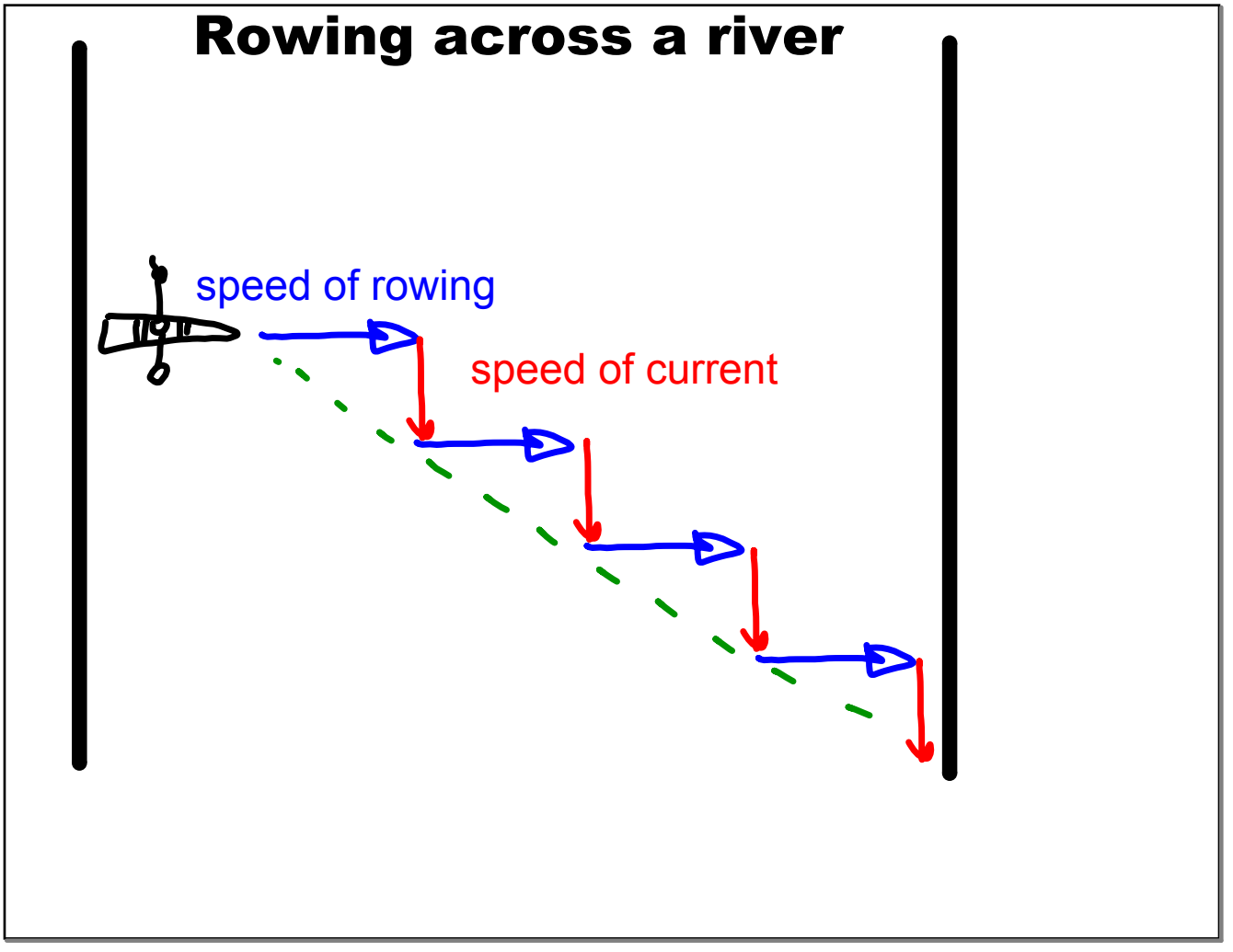


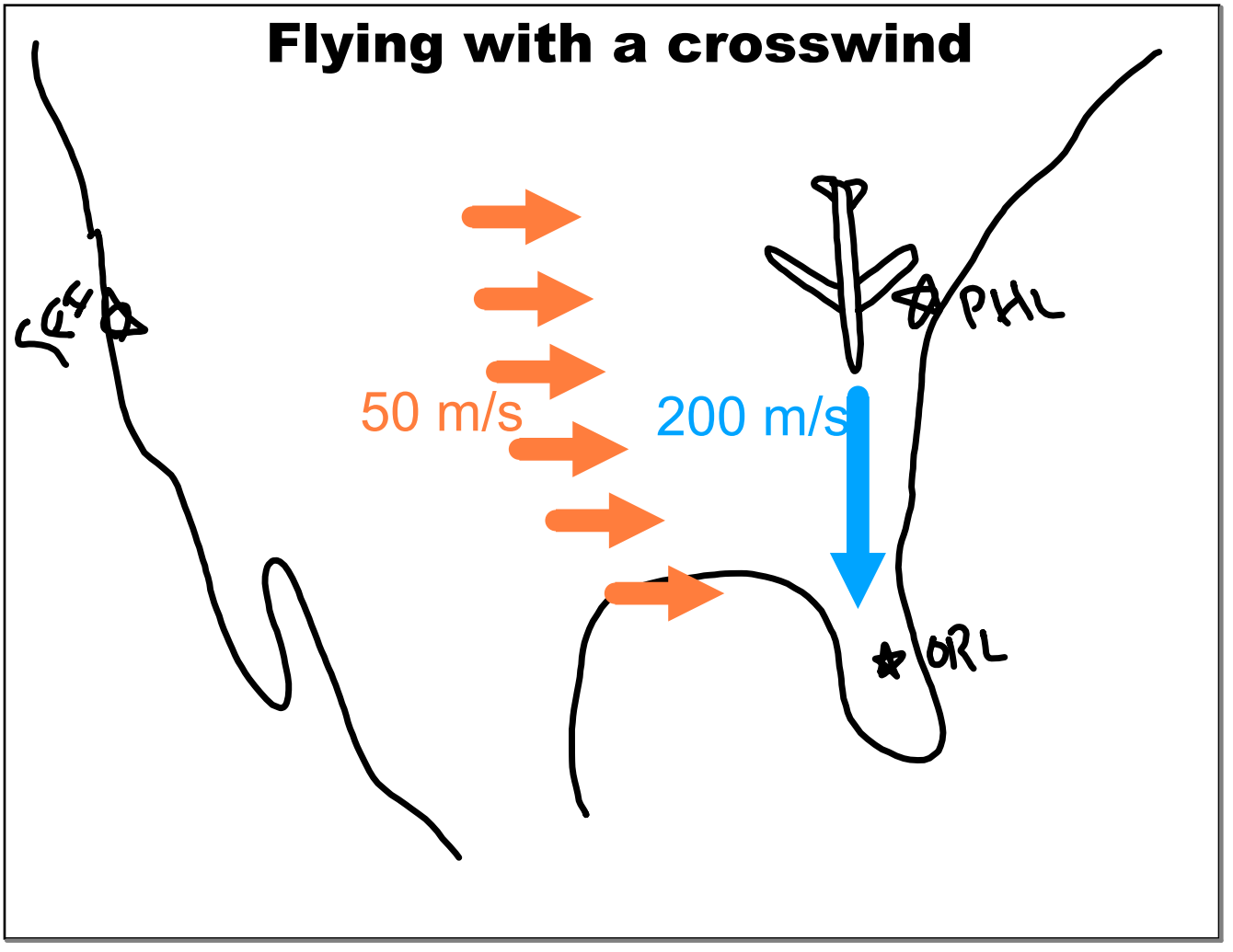

Flying vs the wind
50 m/s
PHL
200 m/s
200 m/s
50 m/s
ORL

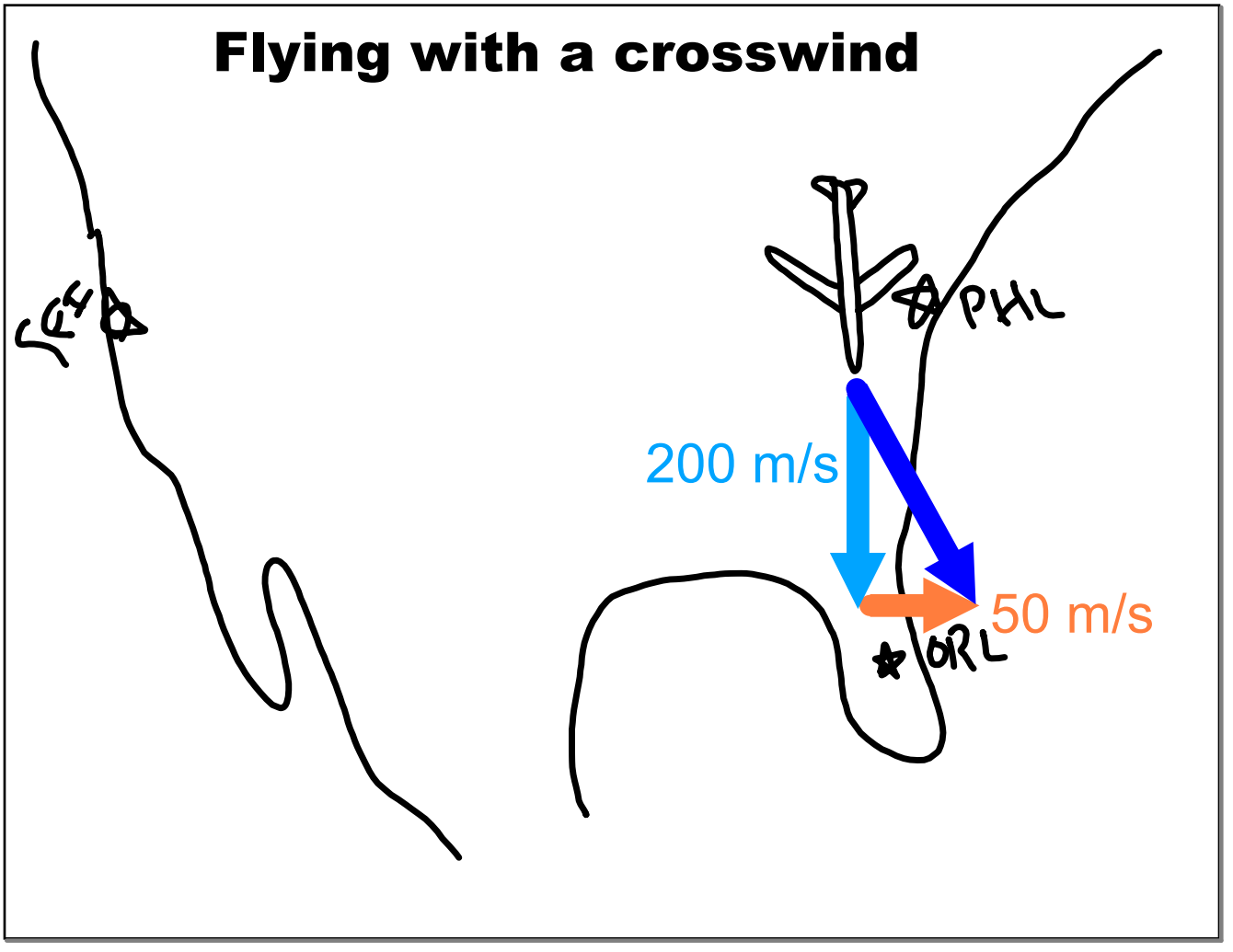

Flying vs the wind
resultant
150 m/s
50 m/s
200 m/s
PHL
200 m/s
50 m/s
resultant
250 m/s
ORL


Crossing the river
2 m/s
5 m/s

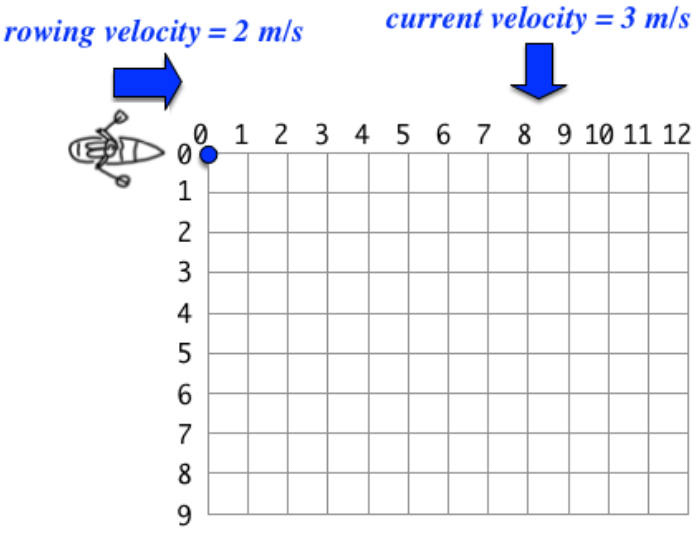

Crossing the river
5 m/s
2 m/s


Rowing across a river
speed of rowing
speed of current


Flying with a crosswind
PHL
50 m/s
200 m/s
ORL


Flying with a crosswind
SFB
PHL
200 m/s
50 m/s
ORL

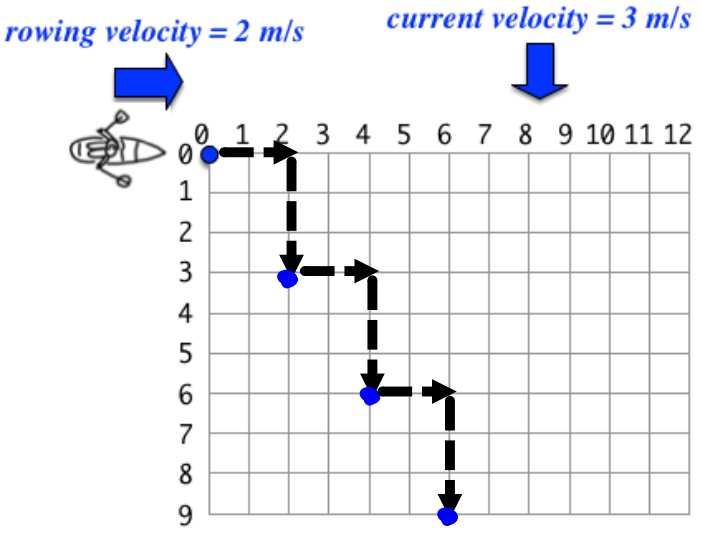
2. Vx and Vy



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

Then solve for how far down the current carries the boat

2. Vx and Vy



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

Then solve for how far down the current carries the boat

$V_{xi} = 2$ m/s
$a = 0$
$\Delta x = 12$ m
$t = ?$

$\Delta x = V_{xi}t + 1/2at^2$

$12 = (2)t + 0$

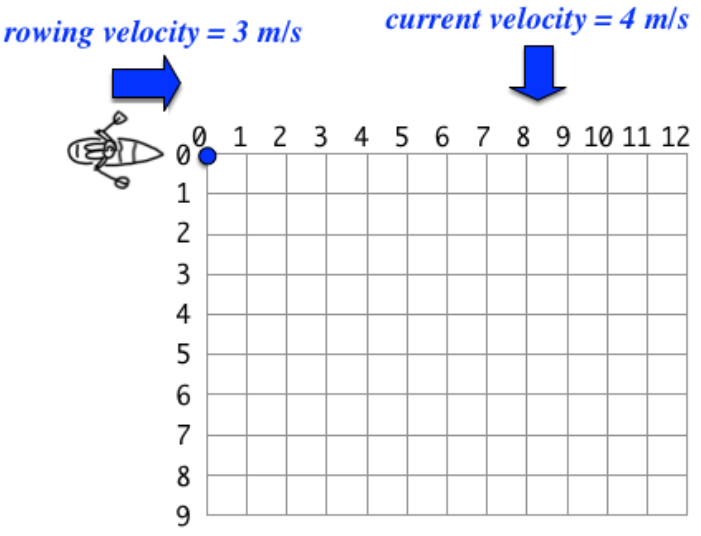
$6 \text{ s} = t$

$V_{yi} = -3$ m/s
$a = 0$
$t = 6$ s
$\Delta y = ?$

$\Delta y = V_{yi}t + 1/2at^2$

$= (-3)(6) + 0$

$= -18$ m



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

Then solve for how far down the current carries the boat

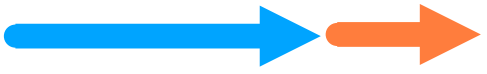
Try it!

$t = 4$ s

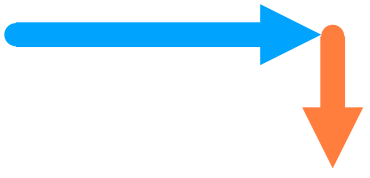
$\Delta y = -16$ m

How to combine vectors

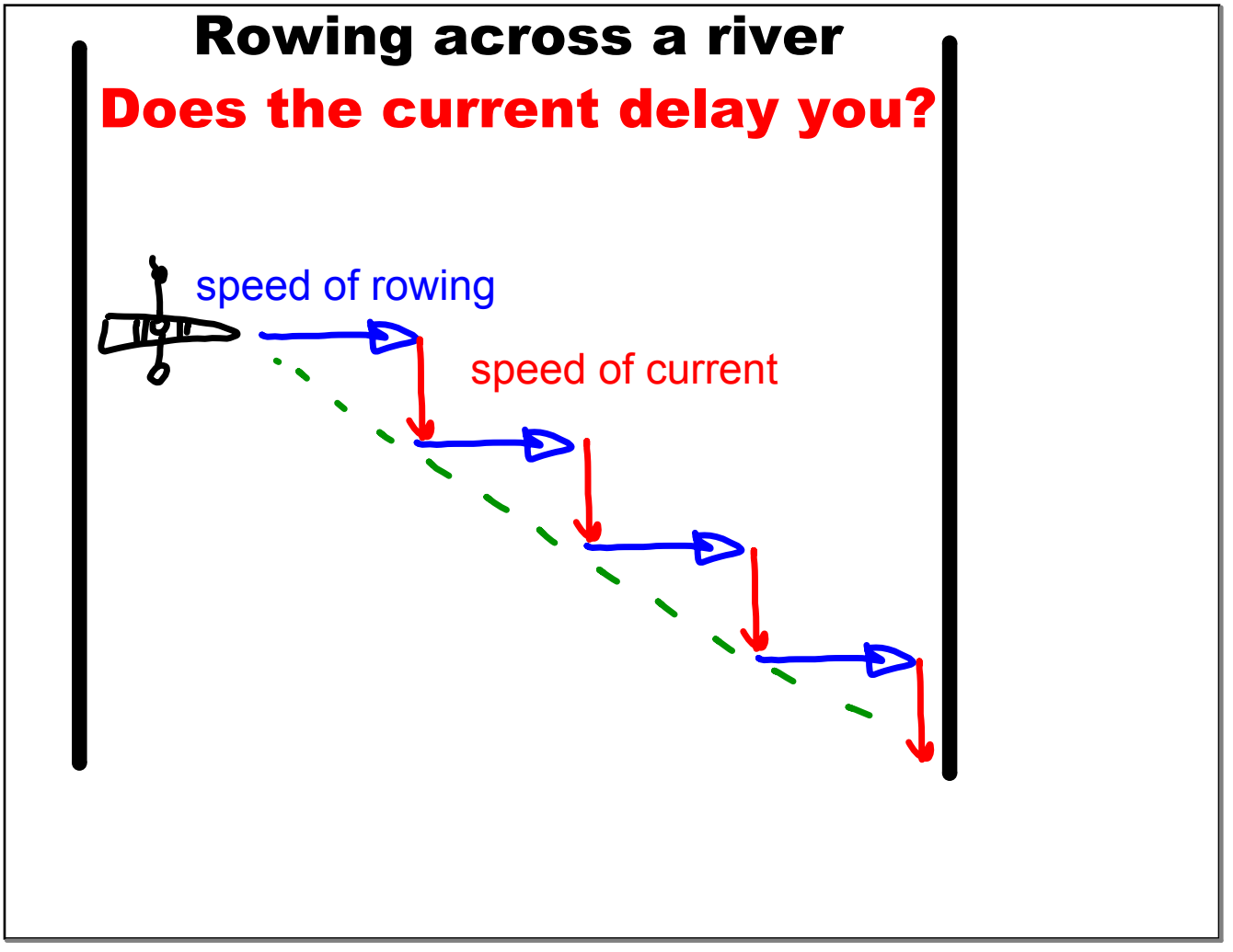
subtract



add



don't add or subtract; they both happen (hypotenuse)


Rowing across a river
Does the current delay you?
speed of rowing
speed of current