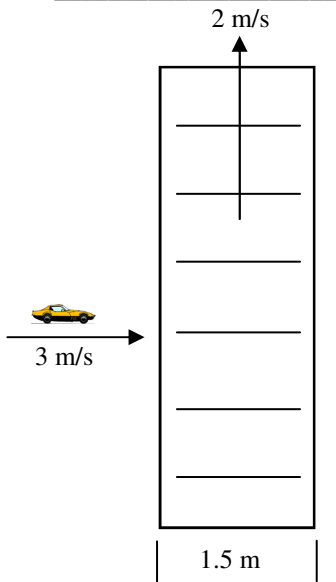
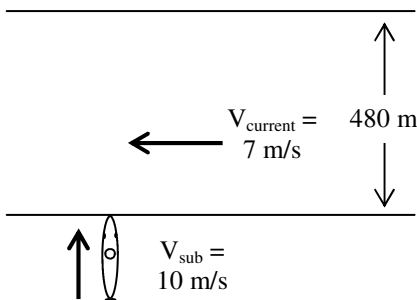


Name: _____

Relative Motion Example



1. A toy car has a velocity of 3 m/s. It crosses a 1.5 m wide conveyor belt that is moving 2 m/s.
 - A. How long does it take for the car to cross the walkway?
 - B. How far up has the car moved in this time?
 - C. Find the car's total displacement (magnitude and direction).
 - D. What is the car's total speed when it is on the conveyor belt?
 - E. If the car wanted to go straight across, what would its direction need to be?

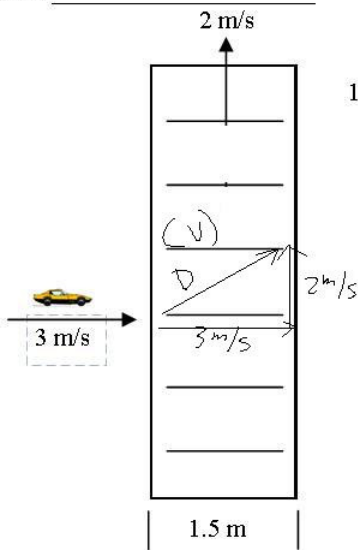


2. A submarine on patrol comes across an underwater canyon that has a consistent current flowing thru it to the west.
 - A. If the sub enters the air stream directly perpendicular to the current, what is its velocity and direction relative to the ground?
 - B. If the canyon is 480 m wide, how long does it take the sub get across? (*Hint: Is this an x or y-direction question? Then use only the information for that direction to solve.*)

- C. How far along the canyon (west) has the sub drifted by the time it has crossed? (*Again: x or y question?*)
 - D. At what direction must the sub have to aim to get directly across the canyon. (*Directly across the canyon is Lazy's path.*)
-

Name: _____

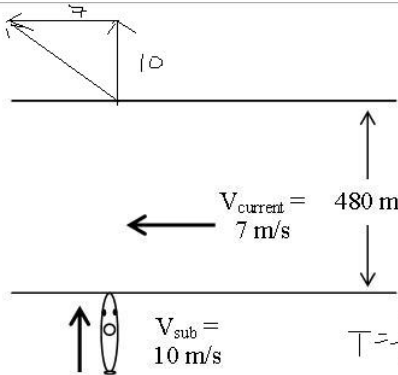
Relative Motion Example



1. A toy car has a velocity of 3 m/s. It crosses a 1.5 m wide conveyor belt that is moving 2 m/s.
 - A. How long does it take for the car to cross the walkway?
 $x: s = d/t \quad t = d/s = 1.5/3 = 0.5 \text{ sec}$
 - B. How far up has the car moved in this time?
 $y: d = st = 2(0.5) = 1 \text{ m}$
 - C. Find the car's total displacement (magnitude and direction).
 $1.5^2 + 1^2 = H^2$
 $H = 1.8 \text{ m}$
 - D. What is the car's total speed when it is on the conveyor belt?
 $4 + 9 = 13 \quad \sqrt{13} = 3.6 \text{ m/s}$
 - E. If the car wanted to go straight across, what would its direction need to be?

$$\sin \theta = \frac{d}{H} = \frac{2}{3}$$

$$\theta = \sin^{-1}\left(\frac{2}{3}\right) \quad \theta = -41.8^\circ$$



2. A submarine on patrol comes across an underwater canyon that has a consistent current flowing through it to the west.
 - A. If the sub enters the air stream directly perpendicular to the current, what is its velocity and direction relative to the ground?
 $7^2 + 10^2 = H^2 \quad H = 12.7 \text{ m/s}$
 - B. If the canyon is 480 m wide, how long does it take the sub to get across? (Hint: Is this an x or y-direction question? Then use only the information for that direction to solve.)

$$T = \frac{d}{s} = \frac{480}{10} = 48 \text{ sec}$$

- C. How far along the canyon (west) has the sub drifted by the time it has crossed? (Again: x or y question?)

$$D = st = 7(48) = 336 \text{ m}$$

- D. At what direction must the sub have to aim to get directly across the canyon. (Directly across the canyon is Lazy's path.)

$$\theta = \sin^{-1}\left(\frac{7}{10}\right) = 44.4^\circ$$