

Adding Vectors

Name _____ Date _____ Class _____ EN _____

1. A plane can travel with a speed of 80 mi/hr with respect to the air. Determine the resultant velocity of the plane (magnitude only) if it encounters a

- a. 10 mi/hr headwind.
- b. 10 mi/hr tailwind.
- c. 10 mi/hr crosswind.

- d. 60 mi/hr crosswind.

River Boat Problems

Example:

A motorboat traveling 4 m/s, East encounters a current traveling 7.0 m/s, North.

- a. What is the resultant velocity of the motorboat?
- b. If the width of the river is 80 meters wide, then how much time does it take the boat to travel shore to shore?
- c. What distance downstream does the boat reach the opposite shore?

Answer:

a. The resultant velocity can be found using the Pythagorean theorem or by Drawing a vector diagram. The resultant is the hypotenuse of a right triangle with sides of 4 m/s and 7 m/s. It is

$$[(4 \text{ m/s})^2 + (7 \text{ m/s})^2] = c^2$$
$$c = \mathbf{8.06 \text{ m/s}}$$

Its direction can be determined from the vector diagram.

b. The time to cross the river is $t = d / v = (80 \text{ m}) / (4 \text{ m/s}) = \mathbf{20 \text{ s}}$

c. The distance traveled downstream is $d = v \cdot t = (7 \text{ m/s}) \cdot (20 \text{ s}) = \mathbf{140 \text{ m}}$

2. A motorboat traveling 5 m/s, East encounters a current traveling 2.5 m/s, North.

a. What is the resultant velocity of the motor boat?

b. If the width of the river is 80 meters wide, then how much time does it take the boat to travel shore to shore?

c. What distance downstream does the boat reach the opposite shore?

3. A motorboat traveling 6 m/s, East encounters a current traveling 3.8 m/s, South.

a. What is the resultant velocity of the motor boat?

b. If the width of the river is 120 meters wide, then how much time does it take the boat to travel shore to shore?

c. What distance downstream does the boat reach the opposite shore?