

Name Key

Vector Applications

Set up the following word problems and find the missing information. Show all work.

1. Two people are trying to collectively push a box across a room towards the door. Person A pushes with a force of 330 newtons at a 35° from standard position. Person B pushes with a force of 300 newtons at a -15° from standard position.

a. Who contributes more force towards the door?

B

$$V_A = 270.32i + 189.28j$$
$$V_B = 289.78i - 77.65j$$

b. By how much?

$$19.46$$

c. What is the total force contributed to push this box?

$$\text{Total Force} \rightarrow 571.12 \text{ Newtons}$$

$$\text{Just towards door} \rightarrow 560 \text{ Newtons}$$

2. Burt and Ernie meet up to fly a toy helicopter. At full power the airplane can fly 100 km per hour in calm air. Burt has the controls and he makes the helicopter take off heading $N45^\circ E$. After he feels comfortable with the controls he turns on full power. A steady wind begins to blow from north to south at a speed of 32 kilometers per hour. In what direction and what speed is the helicopter traveling now?

$$\text{Speed} = 80.61 \text{ km/hr}$$

$$\text{Direction} = 28.699^\circ \text{ from standard}$$

$$\text{OR } N 61.301^\circ E$$

3. A ship is traveling at a speed of 60 miles per hour with a bearing of 60° on the river with negligible water velocity. When the ship reaches a certain point, it encounters water flow with a velocity of 10 miles per hour in the direction $S 45^\circ E$. What are the resultant speed and direction of the ship?

$$\text{Speed} = 63.329 \text{ mph}$$

$$\text{Direction} = 21.227^\circ \text{ from standard position}$$

$$\text{OR - bearing } 68.773^\circ$$

$$\text{OR - } N 68.773^\circ E$$

4. A commercial jet is flying from Miami to Seattle. The jet's velocity with respect to the air is 580 miles per hour and its bearing is $N28^{\circ}W$. The wind is blowing from the southwest with a velocity of 60 mph. What is the speed of the jet with respect to the ground? In what direction is the jet flying?

$$\text{Speed} \approx 565.377 \text{ mph}$$

$$\text{Direction} = 123.825^{\circ} \text{ from SP}$$

$$\text{- OR - } N 33.824^{\circ} W$$

→ going SW

~~$$\text{Speed} = 600.29 \text{ mph}$$~~

~~$$\text{Direction} = 112.515^{\circ}$$~~

~~from SW (going NE)~~

5. A plane is flying $N20^{\circ}W$ at a speed of 325 miles per hour. A wind is blowing in the direction of $N50^{\circ}W$ at 40 miles per hour. Find the plane's actual speed and direction.

$$\text{speed} = 360.197 \text{ mph}$$

$$\text{Direction} = 113.183^{\circ} \text{ from SP}$$

$$\text{- OR - } N 23.183^{\circ} W$$

6. Two forces act on an object with magnitudes of 37 pounds and 42 pounds at angles of -40° and 91° , respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces

$$\text{Magnitude} = 33.075 \text{ pounds}$$

$$\text{Direction} = 33.407^{\circ}$$