

Pre-Calculus Objective 1.03 Vectors

1. A pilot flies a plane due west for 150 miles, then turns 42° north of west for 70 miles. Find the plane's resultant distance and direction from the starting point.
2. A ferry shuttles people from one side of a river to the other. The speed of the ferry in still water is 25 mi/h. The river flows directly north at 9 mi/h. If the ferry heads directly west, what are the ferry's resultant speed and direction?

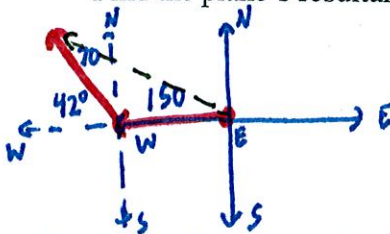
Resulting speed = _____

Describe the direction (include angle and compass direction(bearing)):
3. To find the distance between two points A and B on opposite sides of a lake, a surveyor chooses a point C which is 720 feet from A and 190 feet from B. If the angle at C measures 68° , find the distance from A to B.
4. Without the wind, a plane would fly due east at a rate of 150 mph. The wind is blowing southeast at a rate of 50 mph. The wind is blowing at a 45° angle from due east. How far off of the due east path does the wind blow the plane?

Pre-Calculus Objective 1.03 Vectors

N 13.054°W is the same as 13.054° west of north

1. A pilot flies a plane due west for 150 miles, then turns 42° north of west for 70 miles. Find the plane's resultant distance and direction from the starting point.



$$\langle 150 \cos 180^\circ, 150 \sin 180^\circ \rangle + \langle 70 \cos 138^\circ, 70 \sin 138^\circ \rangle$$

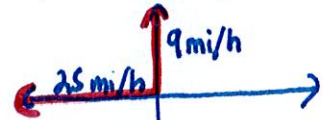
$$\langle -202.020, 46.839 \rangle$$

Distance $\rightarrow \sqrt{A^2 + B^2}$
 $\rightarrow 207.378 \text{ miles}$

Direction $\rightarrow \tan \theta = \frac{B}{A} = \frac{-13.054^\circ}{+180}$
N 13.054°W
 166.946°

2. A ferry shuttles people from one side of a river to the other. The speed of the ferry in still water is 25 mi/h. The river flows directly north at 9 mi/h. If the ferry heads directly west, what are the ferry's resultant speed and direction?

Resulting speed = **26.571 mi/h** $\sqrt{(-25)^2 + 9^2}$



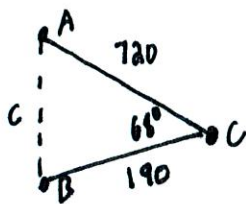
Describe the direction (include angle and compass direction(bearing)):

$\tan \theta = \frac{9}{-25}$
 $\theta = -19.799^\circ$

$\theta = 160.201^\circ$
N 70.201°W

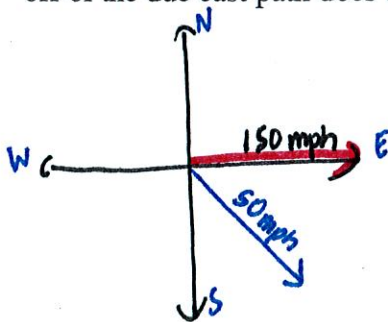
$\vec{F} = \langle 25 \cos 180^\circ, 25 \sin 180^\circ \rangle$
 $\vec{W} = \langle 9 \cos 90^\circ, 9 \sin 90^\circ \rangle$
 $\vec{F} + \vec{W} = \langle -25, 9 \rangle$

3. To find the distance between two points A and B on opposite sides of a lake, a surveyor chooses a point C which is 720 feet from A and 190 feet from B. If the angle at C measures 68°, find the distance from A to B.



$c^2 = a^2 + b^2 - 2ab \cos C$
 $c^2 = 720^2 + 190^2 - 2(720)(190) \cos 68^\circ$
 $c = \mathbf{672.315 \text{ ft.}}$

4. Without the wind, a plane would fly due east at a rate of 150 mph. The wind is blowing southeast at a rate of 50 mph. The wind is blowing at a 45° angle from due east. How far off of the due east path does the wind blow the plane?



$\vec{P} = \langle 150 \cos 0^\circ, 150 \sin 0^\circ \rangle$
 $\vec{W} = \langle 50 \cos -45^\circ, 50 \sin -45^\circ \rangle$

$\vec{P} + \vec{W} = \langle 185.355, -35.355 \rangle$

$\tan \theta = \frac{B}{A}$

$\theta = -10.799^\circ$

10.799° south of east