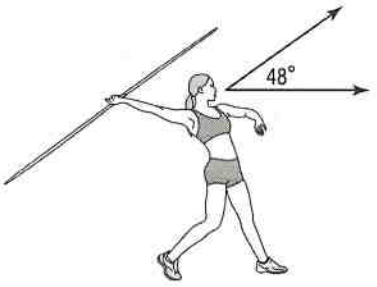
NAME _____ DATE _____ PERIOD _____

8-2 Word Problem Practice

Vectors in the Coordinate Plane

1. **TRACK** Monica is throwing the javelin in a track meet. While running at 4 meters per second, she throws the javelin with a velocity of 28 meters per second at an angle of 48°.



   a. What is the resultant speed of the javelin?

   30.8 m/s

   b. What is the resultant direction of the javelin?

   42.5°

2. **TRANSPORTATION** Jordyn is riding the bus to school. The bus travels north for 4.5 miles, east for 2 miles, and then 30° north of east for 1.5 miles. Express Jordyn's commute as a linear combination of unit vectors **i** and **j**.

   $3.3\hat{i} + 5.25\hat{j}$

3. **HIKING** Amel is hiking in the forest. He hikes 2 miles west and then hikes 3.4 miles north. If he would have hiked diagonally to reach the same ending point, how much shorter would his hike have been?

   1.5 mi

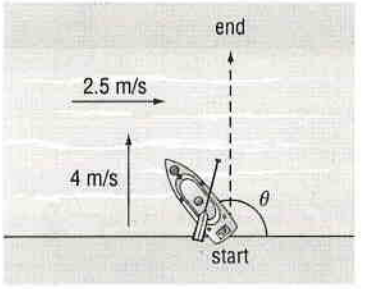
4. **AIRPLANES** An airplane is traveling 300 kilometers per hour due east. A wind is blowing 35 kilometers per hour 75° south of west. What is the resulting speed of the airplane?

   292.9 km/h

5. **FLYING** To reach a destination, a pilot is plotting a course that will result in a velocity of 450 miles per hour at an angle of 30° north of west. The wind is blowing 50 miles per hour to the north. Find the direction and speed the pilot should set to achieve the desired resultant.

   24.2° N of W
   427 mph

6. **KAYAKING** Walter is kayaking across a river that has a current of 2.5 meters per second. He is paddling at a rate of 4 meters per second perpendicular to the shore.



   a. What is the resultant velocity of the kayak?

   4.7 m/s

   b. At what angle will Walter be moving with respect to the shore?

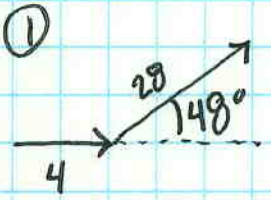
   58°

   c. If Walter wants to land directly in front of his starting point, at what angle with respect to the shore should he kayak?

   122°

Lesson 8-2

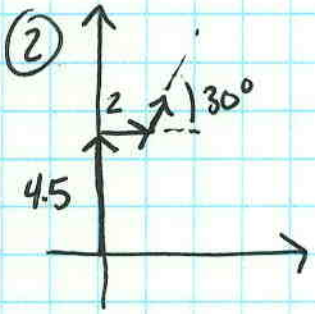
8.2 WPP

① 

$\vec{M} = \langle 4, 0 \rangle$
$\vec{J} = \langle 28\cos 48°, 28\sin 48° \rangle$
$= \langle 18.736, 20.808 \rangle$
$\vec{R} = \langle 22.736, 20.808 \rangle$

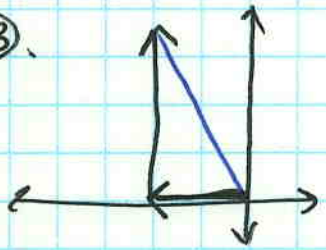
ⓐ Speed $|\vec{R}| = \sqrt{22.736^2 + 20.808^2} = \boxed{30.820 \text{ m/s}}$

ⓑ direction $\theta = \tan^{-1}\left(\frac{20.808}{22.736}\right) = \boxed{42.465°}$

② 

$\vec{V_1} = \langle 0, 4.5 \rangle$ $\vec{V_3} = \langle 1.5\left(\frac{\sqrt{3}}{2}\right), 1.5\left(\frac{1}{2}\right) \rangle$
$\vec{V_2} = \langle 2, 0 \rangle$
$\vec{V_3} = \langle 1.3, .75 \rangle$

$\vec{R} = \langle 3..3, 5.25 \rangle = \boxed{3.3\uparrow + 5.25\uparrow}$

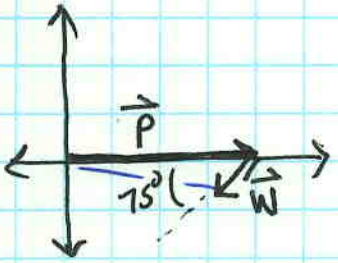
③. 

$\vec{V_1} = \langle -2, 0 \rangle$
$\vec{V_2} = \langle 0, 3.4 \rangle$
$\vec{R} = \langle -2, 3.4 \rangle$

$|\vec{R}| = \sqrt{-2^2 + 3.4^2} = 3.945 \text{ mi}$

Hike = 2 + 3.4 m = 5.4 mi

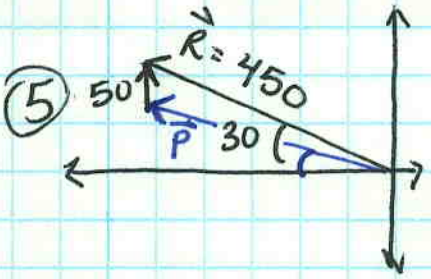
The hike is 1.455 miles shorter.

④ 

$\vec{P} = \langle 300, 0 \rangle$
$\vec{W} = \langle -35\cos 75°, -35\sin 75° \rangle$
$= \langle -9.057, -33.807 \rangle$
$\vec{R} = \langle 290.943, -33.087 \rangle$

$|\vec{R}| = \sqrt{290.943^2 + (-33.087)^2} = \boxed{292.818 \text{ km/hr}}$

⑤



Plane + Wind = $\vec{R}$

$\vec{R}$ - wind = plane

$\vec{R} = \langle -450\cos 30°, -450\sin 30° \rangle$

$\vec{R} = \langle -389.711, 225 \rangle$

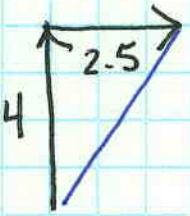
$-\langle 0, 50 \rangle$

$\vec{P} = \langle -389.711, 175 \rangle$

$|\vec{P}| = \sqrt{389.711^2 + 175^2} = \boxed{427.200 \text{ mph}}$

$\theta = \tan^{-1}\left(\frac{175}{389.711}\right)$ $\boxed{\theta = 24.182° \text{ North of West}}$ -or- 155.818 from the horizontal

⑥



$\vec{R} = \langle 2.5, 4 \rangle$

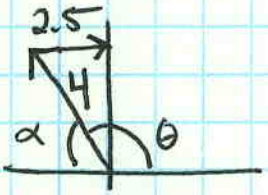
ⓐ $|\vec{R}| = \sqrt{2.5^2 + 4^2} = \boxed{4.717 \text{ m/s}}$

ⓑ $\theta = \tan^{-1}\left(\frac{4}{2.5}\right) = \boxed{57.995°}$

ⓒ (Book method)

Walter must offset his trajectory by 58°, therefore his angle is 122°.

(my method) assume the new vector is at the angle & Walt has to still Row at 4m/s.



$\vec{River} \langle 2.5, 0 \rangle$

$\vec{W} = \langle -2.5, 3.122 \rangle$

$4^2 = 2.5^2 + y^2$

$y = 3.122$

$\alpha = \tan^{-1}\left(\frac{3.122}{-2.5}\right)$

$\alpha = 51.313°$

$\theta = 128.687°$