

Name _____
 Honors Physics
 Period _____

Date _____
 Vector/Projectiles WS #5H
 Mrs. Nadworny

(22 pts)

Vector Components

Directions – Read textbook pages 88 – 96. Solve the following problem using the graphical (scale) method and mathematical method we've learned. Show all of your work in the space provided.

1. Into how many possible components can a single vector be resolved?

- A) one B) two C) three D) unlimited

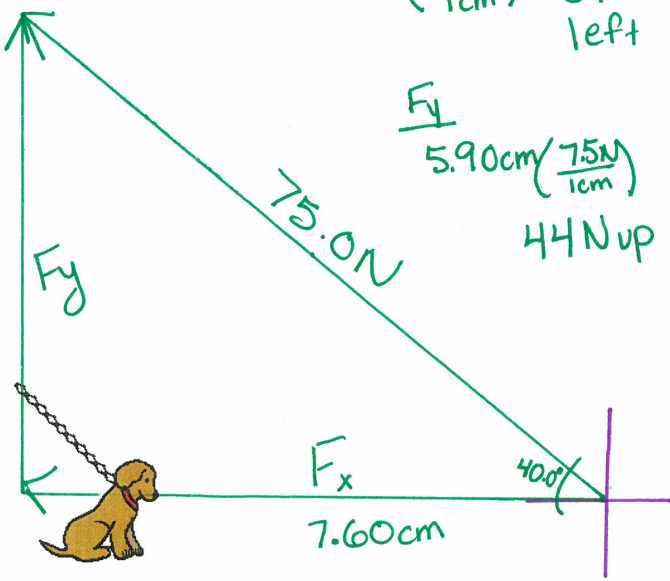
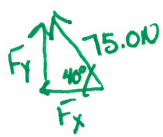
2. Which combination of three concurrent vectors could not produce a resultant of 0 N? • Add 2 smaller #
 • need to meet / beat
 • larger # for R = 0 N

- A) 4 N, 6 N, 9 N B) 3 N, 3 N, 3 N C) 2 N, 1 N, 5 N D) 7 N, 3 N, 4 N

3. A 5.0 N vector could have perpendicular components of

- A) 1.0 N & 4.0 N B) 2.0 N & 3.0 N C) 5.0 N & 5.0 N D) 3.0 N & 4.0 N

4. Fido's owner applies a 75.0 N force on the leash at a 40.0° angle to the horizon. What are the vertical and horizontal components of the force?

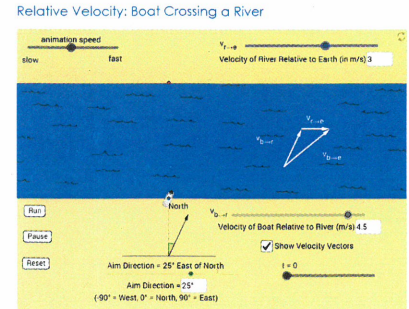
Scale Method	Mathematical Method
<p>*Redraw the vector. Picture is not to scale*</p> <p>1 cm = 7.5 N</p> <p>F_x</p> <p>$7.60 \text{ cm} \left(\frac{7.5 \text{ N}}{1 \text{ cm}} \right) = 57 \text{ N left}$</p> <p>$F_y$</p> <p>$5.90 \text{ cm} \left(\frac{7.5 \text{ N}}{1 \text{ cm}} \right) = 44 \text{ N up}$</p> <p>75.0 N</p> <p>40.0°</p> <p>7.60 cm</p> 	<p></p> <p>OR</p> <p>$F = 75.0 \text{ N}$ $\theta = 40.0^\circ$ $F_x = ?$ $F_y = ?$</p> <p>$F_x = F \cos \theta$ $= 75.0 \text{ N} \cos 40.0^\circ$ $= 57.5 \text{ N left}$</p> <p>$F_y = F \sin \theta$ $= 75.0 \text{ N} \sin 40.0^\circ$ $= 48.2 \text{ N up}$</p> <p>• givens + unknowns • 2 equations • 2 sub w/ units • 2 answers sig figed • Include direction</p>

- Draw 75 N @ 40°
- Draw in legs
- Measure legs + convert
- Include direction

Answers in size order: 48.2, 57.5

Continued on next page

Go to <https://www.geogebra.org/m/jgA3FrVvk>. It should look like this:



5. The top right corner lists the velocity of the river. Leave this set at 3 m/s. The bottom right hand corner shows the velocity of the boat. Leave this set at 4.5 m/s. In the bottom middle the Aim Direction is set to 25°. Click Run to watch the boat cross the river. The time will display in the bottom right hand corner.
6. Change the Aim Direction (launch angle) to -90° , 0° , 90° , and any two other angles (one positive and one negative).
 - a. Which angle takes the least amount of time for the boat to cross the river?

0°

- b. Explain why you think that angle takes the least time.

None of the boat's velocity is "wasted" trying to "overcome" the river.

7. Set the launch angle to 0° . Click Run to launch the boat. Record the time it takes to cross the flowing river.

11.1s

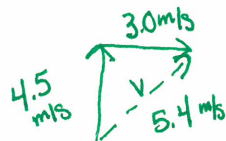
8. In the top right corner, set the velocity of the river to 0 m/s. Click Run to launch the boat. Record the time it takes to cross the stationary river.

11.1s

9. Compare your results from these two trials. Does the speed of the river affect the time it takes the boat to cross the river?

The times are the same. The river does NOT affect the time it takes the boat to cross.

10. Set the river velocity back to 3 m/s. Draw and **label** a triangle showing the two components of the velocity (boat velocity and river velocity) as well as the boat's resultant velocity.



(not drawn to scale)

11. Calculate the magnitude of the boat's resultant velocity when the river is on and **label** this value on the diagram you drew in the previous question. Show your work below.

$$a^2 + b^2 = c^2$$

$$(4.5 \text{ m/s})^2 + (3.0 \text{ m/s})^2$$

$$5.4 \text{ m/s}$$