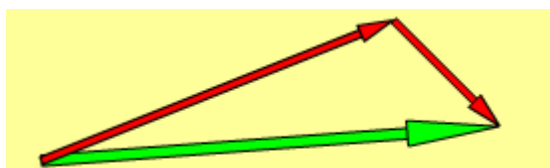


Vector Activity

Procedures: Go to <http://www.colorado.edu/physics/phet>, click on “Simulations,” and look for “Math Tools.” Click on the “Vector Addition” sim.

To get a vector, grab an arrow from the bucket. The length of the vector is found in the $|R|$ box. The angle of the vector is in the θ box. Place the vectors you wish to add **head to tail**. To get the resultant vector, hit the big “SUM” button. Move the green sum vector so that the tail touches the tail of your first vector.



Data: Answer the following questions using the simulation. *For each question, draw (and label with size and direction) the vectors you used in the sim. Use a protractor and ruler to draw the vectors accurately, and label the sum vector.*

1. You go for a walk and take 20 steps in the north direction (90°). Use the simulation to represent your path. Draw and label your vector on your lab write-up.
 - a) Explain why this vector could also represent traveling at 20 mph in the north direction.
 - b) Next, you turn left and walk 10 steps to the west. Add the two vectors using the “sum” button. How far from where you started did you end up?
 - c) In math, $2+3=3+2$. What is this property called? Does this property hold for vector addition? Try it with the scenario above by first walking 10 steps west and then walking 20 steps north. Compare the result to the sum in part b).
2. You are going for a drive, but a detour takes you out of the way of your destination. You drive north for 10 miles, turn right and drive east for 5 miles, turn to the north and drive for 3 miles, drive west for 10 miles, and arrive at your destination.
 - a) How far from where you started did you end up?
 - b) If you wanted to travel directly to your destination without following the streets (“as the crow flies”), what angle would you take? What direction would a compass read?
 - c) Now try adding the vectors in a different order. For example, start with the 5 miles east, then 3 miles north, etc., as long as you add all four vectors. Compare the result to the sum in part a). Draw the vectors in the order you used.

Use the above technique on the simulation to find the resultant of each displacement pair:

Note: Remember to give magnitude and direction

3. 35 km due east, then 50.0 km due south.

Resultant = _____

4. 500.0 mi at 75° east of north, then 1500 mi at 20° west of south.

Resultant = _____

5. 67 km at 55° north of west, then 46 km at 25° south of east.

Resultant = _____

Use the above technique on the simulation to find the resultant of each displacement pair:

Note: Remember to give magnitude and direction

6. 60.0 km due south, then 90.0 km at 15° north of west, and then 75 km at 45° north of east.

Resultant = _____

7. 1700 mi due north, then 2400 mi at 10° north of east, and then 2000.0 mi at 20° south of west.

Resultant = _____

8. 75 km at 25° north of east, then 75 at 65° south of west, and then 75 km due south.

Resultant = _____

9. 12 mi at 58° north of east, then 16 mi at 78° north of east, then 10.0 mi at 45° north of east, and then 14 mi at 10° north of east.

Resultant = _____

10. 10.0 km at 15° west of south, then 27 km at 35° north of east, then 31 km at 5° north of east, and then 22 km at 20° west of north.

Resultant = _____