PH 221 Week 1

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This material is borrowed/adapted from PH 201 Tutorial 1 for Fall 2020 and the *Learning Introductory Physics with Activities* textbook.
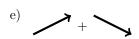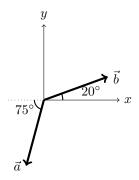
Activity 1

Add or subtract the following vectors.

Activity 2

In the following figure, the magnitudes of the vectors are $|\vec{a}| = 5$ and $|\vec{b}| = 5$. Assume that $\vec{c} = \vec{a} + \vec{b}$ and $\vec{d} = \vec{a} - \vec{b}$.

Determine the magnitude of the vectors $\vec{c}$ and $\vec{d}$. What is the angle to each vector from the positive x-axis?

Activity 3

A semi-truck travels 11 km in 7.5 minutes.

a) What does the ratio (11 km)/(7.5 min) tell you about the truck's motion?

b) What does the ratio (7.5 min)/(11 km) tell you about the truck's motion?

c) Find the truck's average speed in miles per hour, then in meters per second. Can you tell what type of road (school zone, residential area, freeway, German Autobahn, etc.) the truck should be traveling on?

d) Find the time in seconds it takes the truck to travel one meter.

Activity 4

Maria hikes 15.0 km at an angle of 30.0° north of east and then hikes 15.0 km southeast (an angle of 45.0° south of east). Let Maria's starting point be the origin of your coordinate system, the east-west axis be horizontal, and the north-south axis be vertical with east and north the positive directions.

a) Draw a sketch, approximately to scale, showing the coordinate axes, Maria's two displacements, and her total displacement.

b) Find the east (x) and north (y) components of Maria's two displacements.

c) Find the east (x) and north (y) components of Maria's total displacement.

d) Find the magnitude and direction of Maria's total displacement.

e) Check your answer to (d) against your sketch. Do they agree?

Activity 5

Three vectors add together to equal 0. One vector has magnitude 3 and points in the positive x-direction; a second vector has magnitude 5 and points at 120° from the positive x-axis. Determine the third vector as a magnitude and direction.