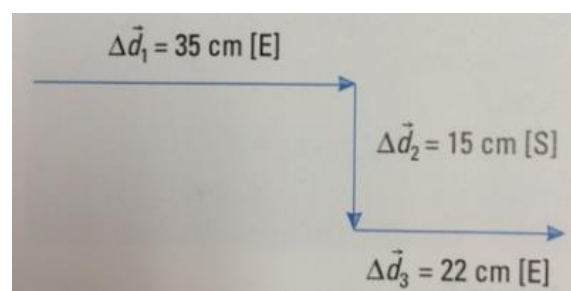


Vectors in Two Dimensions and Relativity Worksheet

1. Can the magnitude of the displacement of an object from its original position ever exceed the total distance moved? Explain.
2. Cheetah's, the world's fastest land animals, can run up to about 125 km/h. A cheetah chasing an impala runs 32 m [N], then suddenly turns and runs 46 m [W] before lunging at the impala. The entire motion takes only 2.7 seconds.
 - a. Determine the cheetah's displacement (use a scale diagram first and verify with trig)
 - b. Determine the cheetah's average speed for this motion.
 - c. Determine the cheetah's average velocity.

3. Air molecules travel at high speeds as they bounce off each other and their surroundings. In 1.50 ms, an air molecule experiences the motion shown to the right. For this motion, determine the molecules



- a. average speed
- b. average velocity

4. A student starts at the westernmost position of a circular track of circumference 2.00×10^2 meters and runs halfway around the track in 13 s. Determine the student's
 - a. Average speed
 - b. Average velocity (assume two significant digits)
5. A ship is moving forward at 10.0 m/s. A passenger is walking on the deck. What are his velocities, as measured by an observer at rest on the shore, if the passenger walks
 - a. With a velocity of +2.0 m/s toward the front of the ship?
 - b. With a velocity of -2.0 m/s toward the rear?
6. As you travel at a constant 95 km/h, a car that you know to be 3.5 m long, passes you in 1.8 s. How fast is it going relative to Earth?
7. Determine the velocity of a canoe relative to the shore of a river if the velocity of the canoe relative to the water is 3.2 m/s [N] and the velocity of the water relative to the shore is 2.3 m/s [E]
8. A blimp is travelling at a velocity of 22 km/h [E] relative to the air. A wind is blowing from the north at an average speed of 15 km/h relative to the ground. Determine the velocity of the blimp relative to the ground.
9. A police officer clocked a driver going 20 km/h over the speed limit just as the driver passed by a slower car. He arrested both drivers. The judge agreed, saying "If the two cars were next to each other, they must have been going the same speed." Is the judge correct? Explain in words and with a distance-time graph.