

AP Physics 1
1.3 – Speed and Velocity
1.4 – Acceleration
Assessment

Name: _____

Period: _____

Directions: Solve the following problems on separate sheets of paper. Be neat and show all of your work.

- 1) A jogger travels a route that has two parts. The first part is a displacement **A** of 2.50 km due south, and the second involves a displacement **B** that points due east.
 - a. The resultant displacement **A + B** has a magnitude of 3.75 km. What is the magnitude of **B**, and what is the direction of **A + B** relative to due south?
 - b. Suppose that **A – B** had a magnitude of 3.75 km. What then would be the magnitude of **B**, and what is the direction of **A – B** relative to due south?

- 2) Two racing boats set out from the same dock and speed away at the same constant speed of 101 km/h for half an hour. The blue boat headed 25.0° south of west, and the green boat headed 37.0° south of west. During this half hour
 - a. how much farther west does the blue boat travel, compared to the green boat, and
 - b. how much farther south does the green boat travel, compared to the blue boat.

- 3) Larry the Loser has taken up golf. Good for him! After 11 shots, he finally gets his ball to the green. During his first putt, the ball rolls 5.0 m due east. His second putt, the ball travels 2.1 m at an angle of 20.0° north of east. His third putt is 0.50 m due north. What displacement would have been needed to “hole the ball” on the very first putt?

- 4) What is the distance and displacement of race car drivers in the Indianapolis 500?

- 5) Consider the definition of speed.
 - a. What is the speed of a rocket that travels 9000 meters in 12.12 seconds?
 - b. How long will your trip take (in hours) if you travel 350 km at an average speed of 80 km/hr?
 - c. How far (in meters) will you travel in 3 minutes running at a rate of 6 m/s?
 - d. A family travels to Cape Canaveral, Florida, in 10 hours. The distance is 816 km. Calculate the average speed.
 - e. How many seconds will it take for a satellite to travel 450 km at a rate of 120 m/s?

- 6) While taking a vacation, Lisa Car travelled a total distance of 440 miles. One hundred miles were on the interstate at 65 mph and the other on country roads at 55 mph. She stopped to take a 20-minute break twice. Her total trip took 8 hours. Ignoring acceleration times, what was her average speed?

- 7) It is the classic struggle between the tortoise and the hare! In this chapter of their epic battle to defend their honor and their breed's honor, they decide to race 1000 m. The tortoise crawls the entire 1000 m at a speed of 0.2 m/s. The hare, however, runs the first 200 m at 2 m/s, stops and takes a nap for 1.3 hours, and then awakens to finish the last 800 m with an average speed of 3 m/s. Who wins the race and by how much time?
- 8) Due to continental drift, the North American and European continents are drifting apart at an average speed of about 3 cm per year. How long will it take for them to drift apart 1500 m (roughly 1 mile)?
- 9) The International Space Station orbits at a speed of 7.6×10^3 m/s. The average human eye blink lasts about 110 ms. How far does the space station travel in the blink of an astronaut's eye?
- 10) A tourist is being chased by an angry bear. He is running toward his car at a speed of 4.0 m/s. The car is a distance d away. The bear starts off 26 m behind the tourist and is running at a rate of 6.0 m/s. What is the maximum possible value for d in order for the tourist to reach the car safely?
- 11) In 1998, NASA launched Deep Space 1 (DS-1), a spacecraft that successfully flew by an asteroid designated 1992 KD. This happened millions of miles from Earth. The propulsion system of DS-1 worked by ejecting high-speed argon ions out of the rear of the engine. This new propulsion system was able to increase the velocity of DS-1 by 9 m/s per day.
- How much time (in days) would it take to increase the velocity of DS-1 by +2700 m/s?
 - What was the acceleration of DS-1 in m/s^2 ?
- 12) A car makes a trip due north for three-fourths of the time and due south one-fourth of the time. The average northward velocity has a magnitude of 27 m/s, and the average southward velocity has a magnitude of 17 m/s. What is the average velocity (magnitude and direction) for the entire trip?
- 13) A woman and her dog are out for a morning run to the river, which is located 4.0 km away. The woman runs 2.5 m/s in a straight line toward the river. The dog is unleashed and runs back and forth at 4.5 m/s between his owner and the river, until the woman reaches the river. What is the total distance run by the dog?