

Honors Physics - Chapter 3 Practice Problems

- 1) An ostrich cannot fly, but it is able to run fast. Suppose an ostrich runs east for 7.95 s and then runs 161 m south, so that the magnitude of the ostrich's resultant displacement is 226 m. Calculate the magnitude of the ostrich's eastward component and its running speed.
- 2) Kangaroos can easily jump as far 8.0 m. If a kangaroo makes five such jumps westward, how many jumps must it make northward to have a northwest displacement with a magnitude of 68 m? What is the angle of the resultant displacement with respect to north?
- 3) The landing speed of the space shuttle *Columbia* is 347 km/h. If the shuttle is landing at an angle of 15.0° with respect to the horizontal, what are the horizontal and the vertical components of its velocity?
- 4) The longest delivery flight ever made by a twin-engine commercial jet took place in 1990. The plane covered a total distance of 14,890 km from Seattle, Washington to Nairobi, Kenya in 18.5 h. Assuming that the plane flew in a straight line between the two cities, find the magnitude of the average velocity of the plane. Also, find the eastward and southward components of the average velocity if the direction of the plane's flight was at an angle of 25.0° south of east.
- 5) The fastest propeller-driven aircraft is the Russian TU-95/142, which can reach a maximum speed of 925 km/h. For this speed, calculate the plane's resultant displacement if it travels east for 1.50 h, then turns 135° northwest and travels for 2.00 h.
- 6) Florence Griffith-Joyner of the United States set the women's world record for the 200 m run by running with an average speed of 9.37 m/s. Suppose Griffith-Joyner wants to jump over a river. She runs horizontally from the river's higher bank at 9.37 m/s and lands on the edge of the opposite bank. If the difference in height between the two banks is 2.00 m, how wide is the river?
- 7) A Snorkel fire engine is designed for putting out fires that are well above street level. The engine has a hydraulic lift that lifts the firefighter and a system that delivers pressurized water to the firefighter. Suppose that the engine cannot move closer than 25 m to a building that has a fire on its sixth floor, which is 25 m above street level. Also assume that the water nozzle is stuck in the horizontal position (an improbable situation). If the horizontal speed of the water emerging from the hose is 15 m/s, how high above the street must the firefighter be lifted in order for the water to reach the fire?
- 8) In 1991, Doug Danger rode a motorcycle to jump a horizontal distance of 76.5 m. Find the maximum height of the jump if his angle with respect to the ground at the beginning of the jump was 12.0° .