

Velocity and Acceleration Problem Set

1. A cross-country runner runs 5.0 km east along the course, then turns and around and runs 5.0 km west along the same path. She returns to the starting point in 45 minutes. What is her average speed? What is her average velocity?
2. Top-fuel drag racers are able to accelerate at 12.5 m/s^2 from rest to $1.00 \times 10^2 \text{ m/s}$ before crossing the finish line. How much time does it take them to complete the race?
3. A race car accelerates from rest at $+7.5 \text{ m/s}^2$ for 4.5s. How fast will it be going at the end of that time?
4. A race car starts from rest and is accelerated uniformly to $+41 \text{ m/s}$ in 8.0 s. What is the displacement of the car?
5. A jet plane traveling at $+88 \text{ m/s}$ lands on a runway and comes to rest in 11.0 s.
 - a. What was its acceleration?
 - b. How far does it travel before it stops?
6. An accelerating lab cart passes through two photo gate timers 3.0 m apart in 4.2 s. The velocity of the cart at the second timer is 1.2 m/s.
 - a. What is the velocity at the first gate?
 - b. What is the acceleration?

7. A camera is accidentally dropped from the edge of a cliff and 6.0 s later hits the ground.
 - a. What was its velocity just before it hit the ground?

 - b. How high was the cliff?

8. A toy rocket is shot straight up into the air with an initial speed of 45.0 m/s.
 - a. How long does it take to reach its highest point?

 - b. How high does the rocket get?

9. A rock is thrown vertically upward with a velocity of 21 m/s from the edge of a bridge 42 m above a river. How long does the rock stay in the air?

10. A platform diver jumps vertically with a velocity of 4.2 m/s. The diver enters the water 2.5 s later. How high is the platform above the water?