

# Problems

Name \_\_\_\_\_

ON A SEPARATE SHEET OF PAPER, solve the following motion problems using our models for speed, velocity and acceleration or by using our combined kinematic equation models.

**NOTE: In all falling problems, assume that the acceleration is  $9.8 \text{ m/s}^2$ .**

1. A boat moves 15.0 km across a lake in 30 min at a constant speed. What was the average speed of the boat in km/hr?
2. If the Sun is a distance of  $1.5 \times 10^{11} \text{ m}$  from the Earth, how long, in minutes, does it take sunlight to reach the Earth if it moves at a constant speed of  $3 \times 10^8 \text{ m/s}$ ?
3. How many meters away is a cliff if an *echo* is heard 0.5 s after the original sound?  
(Assume the sound travels at a constant 343 m/s)
4. In a safety car test, a car traveling at 65 mph crashes directly into a wall, coming to a complete stop. If the collision time is 0.25 s, what is the acceleration of the car in m/s?
5. How much time is needed for a car to accelerate from 8.0 m/s to a speed of 22 m/s if the acceleration is  $3.0 \text{ m/s}^2$ ?
6. Sound travels at a constant 1,140 ft/s in the warm air surrounding a thunderstorm. How far away was the lightning discharge if thunder is heard 4.63 s after the lightning flash?
7. A rifle is fired straight up. The bullet leaves the rifle with an initial velocity of 724 m/s. After 5.0 s, the velocity is 675 m/s. At what rate has the bullet decelerated?
8. An object is observed to fall from a bridge, striking the water below 2.50 s later.
  - (a) With what velocity did it strike the water?
  - (b) What was its average velocity during the fall?
  - (c) How high is the bridge?
9. A ball dropped from a window strikes the ground 2.0 s later. How high is the window above the ground?
10. The east coast of South America and the west coast of Africa look as though they would fit together like the pieces of a jigsaw puzzle. With a bit of rearranging, most of the other continents can be put together too. This was one of the first clues to **continental drift**. Current measurements from satellites show North America and Europe to be drifting apart at the rate of about 4 cm/yr. If the average distance between them is 7000 km, how long ago (*in years*) were the two continental plates connected?