Free Fall Acceleration

Name: _____ Period : _____ Date: _____

1. A physics student throws a softball straight up into the air with a speed of 17.5 m/s. The ball is in the air for a total of 3.60 s before it is caught at its original position. How high does the ball rise?

2. A surface probe lands on a highland region of the planet Mercury. A few hours later the ground beneath the probe gives way and the probe falls, landing below its original position with a velocity of 11.2 m/s downward. If the free-fall acceleration near Mercury's surface is 3.70 m/s^2 downward, what is the probe's displacement?

3. An archer fires an arrow directly upward, then quickly runs from the launching spot to avoid being struck by the returning arrow. If the arrow's initial velocity is 85.1 m/s upward how long does the archer have to run away before the arrow lands?

4. The Sears Tower in Chicago is 443 m tall. Suppose a book is dropped from the top of the building. What would be the book's velocity at a point 221 m above the ground? Neglect air resistance.

5. The tallest roller coaster in the world is the Desperado in Nevada. It has a lift height of 64 m. If an archer shoots an arrow straight up in the air and the arrow passes the top of the roller coaster 3.0 s after the arrow is shot, what is the initial speed of the arrow?

6. The Westin Stamford Hotel in Detroit is 228 m tall. If a worker on the roof drops a sandwich, how long does it take the sandwich to hit the ground, assuming there is no air resistance? How would air resistance affect the answer?

7. A flowerpot falls from a window sill 25.0 m above the sidewalk. How long does it take for the flowerpot to hit the ground?

8. A small fish is dropped by a pelican that is rising with a constant velocity of +0.50 m/s.
    a. After 2.5s, what is the velocity of the fish?
    b. How far below the pelican is the fish after 2.5s?