

Gravity, Acceleration, and Distance

The distance covered by a freely falling body is calculated by the following formula:

$$d = \frac{at^2}{2}$$

where d = distance
 a = acceleration
 t = time

Example: How far will an object fall in 5 seconds?

$$d = \frac{(9.8 \text{ m/s}^2)(5 \text{ s})^2}{2} = 122.5 \text{ m}$$

Example: What is the average velocity of a ball that attains a velocity of 39.2 m/s after 4 seconds?

$$v_a = \frac{v_f - v_i}{2} = \frac{39.2 - 0}{2} = 19.6 \text{ m/s}$$

Solve each problem.

- How far will a rubber ball fall in 10 s? _____
- How far will a rubber ball fall in 20 s? _____
- How long will it take an object dropped from a window to fall a distance of 78.4 m? _____
- What is the final velocity of the ball in problem 1? _____
- What is the average velocity of the ball in problem 1? _____
- An airplane is traveling at an altitude of 31,360 m. A box of supplies is dropped from its cargo hold. How long will it take to reach the ground? _____
- At what velocity will the box in problem 6 be traveling when it hits the ground? _____
- What is the average velocity of the box in problem 6? _____