Motion at constant acceleration

- **For motion at constant acceleration *a* , with no initial speed, the displacement after time *t* is:**

$$\Delta x = v_{average} t = \left(\frac{0 + at}{2} \right) \times t = \frac{at^2}{2}$$

For braking (motion with negative acceleration *a*) , if it takes time *t* to stop, the initial speed is *–at = |a|t* (note that since we take absolute value, initial speed is positive), the displacement after time *t* is:

$$\Delta x = v_{average} t = \left(\frac{|a|t + 0}{2} \right) t = \frac{|a|t^2}{2}$$

Homework

Problem 1.

Suppose that you are trying to reproduce an experiment of Galileo by dropping a rock from certain tower. The time of its free fall turns out to be t=5.0 seconds.
a) How tall is the tower?
b) What will be the time of the rock's fall if it is dropped from half the tower's height?

Problem 2.

When driving a car at night with low beam headlights on, the driver can see the road up to 30 meters ahead. The driver suddenly sees a deer crossing the road ahead within the headlight reach. He immediately slams the brakes and the car starts braking at acceleration is -5 m/s^2. What is the maximal speed the car can travel so that the car will not hit the deer? Convert your answer to miles per hour.