Acceleration Equations

$$\text{Ave. acceleration} = \frac{\Delta \text{velocity}}{\text{time}} = \frac{v_f - v_i}{t}$$

$$v_f^2 = v_i^2 + 2*a*d$$

$$d = v_i*t + \frac{1}{2}*a*t^2$$

What does d represent? _____

What does t represent? _____

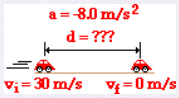
What does v_i represent? _____

What does v_f represent? _____

What does a represent? _____

$$v_f^2 = v_i^2 + 2*a*d$$

I am in a hurry to get to school in the morning. As I approach the stoplight moving with a velocity of 30.0 m/s, the light turns yellow. I can't afford a ticket for running a red light so I apply the brakes and skid to a stop. If my acceleration is -8.00 m/s², how far does my vehicle move during the skidding process.

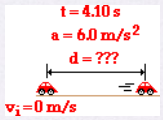


Check your Understanding

- A bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. Determine the acceleration of the bike

$$d = v_i*t + \frac{1}{2}*a*t^2$$

As I wait at a stoplight I am worried that I will be late for school. When the light finally turns green, I accelerate from rest at a rate of a 6.00 m/s² for a time of 4.10 seconds. How far does my vehicle move during this time?



Check your Understanding

- A car starts from rest and accelerates uniformly over a time of 5.21 seconds for a distance of 110 m. Determine the acceleration of the car.

Object in Motion-Free Fall

- A free falling object is an object that is falling under the sole influence of gravity. Any object that is being acted upon only by the force of gravity is said to be in a state of **free fall**.
- All free-falling objects (on Earth) accelerate downwards at a rate of 9.8 m/s/s (often approximated as 10 m/s/s for *back-of-the-envelope* calculations)

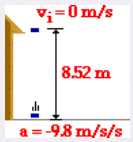
If the velocity and time for a free-falling object being dropped from a position of rest were tabulated, then one would note the following pattern.

Time (s)	Velocity (m/s)
0	0
1	9.8
2	19.6
3	29.4
4	39.2
5	49.0

Observe that the velocity-time data above reveal that the object's velocity is changing by 9.8 m/s each consecutive second. That is, the free-falling object has an acceleration of approximately 9.8 m/s/s.

After failing a test the SDSU student drops her chemistry book from her dorm window located 8.52 meters above the ground. Determine the time required for the book to reach the ground.

$$d = v_i * t + \frac{1}{2} * a * t^2$$



Check your Understanding

- A stone is dropped into a deep well and is heard to hit the water 3.41 s after being dropped. Determine the depth of the well.

2 STEP Example

- A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the car and the distance traveled.