Acceleration Due to Gravity **Ch9 Physics**
Science 10 Notes

What is Gravity

Gravity is a force that acts on objects. It is a force that pushes down.

The force of gravity is constant which means that acceleration due to gravity is also constant.

Acceleration due to Gravity (g)

- g = $9.8\ m/s^2$ [down] or g = $-9.8\ m/s^2$

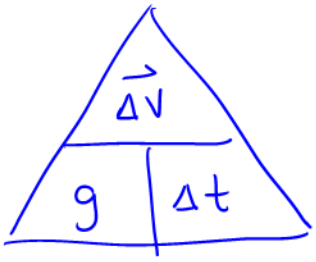
  * note the sign and the direction

- While gravity is constant, there are ways to reduce the ***effective*** acceleration due to gravity:
  - Lift is a force that pushes the object up
    - Examples: - hot air balloons, hot air rises
  - Drag is a force that ~~acts~~ pushes acting opposite to motion.
    - Examples: - like air resistance/friction
      - parachutes create air resistance reducing acceleration from gravity

Calculations Involving *g*

We can use the same triangle that we do for acceleration, velocity and time intervals, keeping in mind that here, $\vec{a}$ is replaced with g.

- Remember that the positive direction is up
- Acceleration due to gravity is always down and is therefore a negative value.



Practice Problems:

1. What is the change in velocity of a hailstone that falls for 3.0 s?

$\vec{\Delta v} = g \cdot \Delta t$

$= (-9.8\ m/s^2) \times (3.0\ s)$

$= -29.4\ m/s$

2. A ball is thrown up into the air. How much time does it take to go from 16m/s [up] to 2.0 m/s [up]?

$\vec{\Delta v} = \vec{v_f} - \vec{v_i}$

$= +2\ m/s - (+16\ m/s)$

$= -14\ m/s$

$\Delta t = \dfrac{\vec{\Delta v}}{g}$

$= \dfrac{-14\ m/s}{-9.8\ m/s^2}$

$\Delta t = 1.43\ s$

3. A rock is thrown up into the air with an initial velocity of 14m/s [up]. What will be the velocity after 0.61 seconds?

$\vec{\Delta v} = g \cdot \Delta t$

$= (-9.8\ m/s^2) \times (0.61\ s)$

$\vec{\Delta v} = -6\ m/s$

$v_i = 14\ m/s$

$\vec{\Delta v} = v_f - v_i$

$v_f = +8\ m/s$

4. A brick falls from the top of a chimney. What is the velocity of the brick after 1.5 s?

$\vec{v_i} = 0$

$\vec{\Delta v} = g \cdot \Delta t$

$= (-9.8\ m/s^2)(1.5\ s)$

$\vec{\Delta v} = -14.7\ m/s$

$v_f = -14.7\ m/s$

or

$14.7\ m/s$ [down]

5. A ball is thrown straight up into the air at 12m/s. How long does it take for the ball to reach its maximum height?

$\vec{v_i} = +12\ m/s$

$\vec{v_f} = 0\ m/s$

$\vec{\Delta v} = -12\ m/s$

$\Delta t = \dfrac{\vec{\Delta v}}{g}$

$= \dfrac{-12\ m/s}{-9.8\ m/s^2}$

$\Delta t = 1.2\ s$

*max height when it slows to 0m/s.

6. A rock is thrown downward from a roof at 11m/s. What is the velocity of the rock after 0.75 s?

$v_i = -11\ m/s$

$\vec{\Delta v} = g \cdot \Delta t$

$= (-9.8\ m/s^2)(0.75\ s)$

$= -7.35\ m/s$

$\vec{v_f} = -18.35\ m/s$

or

$18.35\ m/s$ [down]