PHYSICS

Linear Motion Notes

- **Motion is Relative**
  - **You move ______________ relative to the floor, but 30 km/sec relative to the Sun.**
  - **If you drive at 60 mph and pass a car going 45 mph, your speed relative to the other car is ______?**
- **Speed = _______________**
  - **_____________________ Speed is the speed at any one moment.**
  - **_____________________ Speed is the speed for the time of the whole trip (total distance / time).**
- **Velocity is the _____________ and the __________________ of an object in motion.**
  - **Does a car on a circular track going 20 mph have a constant velocity?**
  - **Can a car on a circular track going at a constant speed have a constant velocity?**
- **Acceleration is the change in velocity over time.**
  - **Acceleration = change in ________________ / _________________**
  - **Remember that *change in velocity* can be a change in ______________ or _______________.**
- **Galileo's Inclined Planes**
  - **Galileo put bells on a track at distances 1, 4, 9, 16. When a ball rolling down the track hit each bell they sounded as if keeping a steady beat. Why? ____**
  - **How to calculate *Velocity* (if you know *acceleration* and *time*).**

    a = v / t so …

    v = ___________
  - **How to calculate *Distance* (if you know *acceleration* and *time*).**

    v = d / t so …

    d = v t and therefore …

    d = (a t) t … but since the velocity goes from 0 to the final v, the average velocity is ½ the final velocity, … so …

    d = _____________
- **Free Fall**
  - **If an object is falling in a gravitational field, then the acceleration is due to Gravity and the formula above becomes …**
    d = _____________ … where g is the gravitational acceleration (either 10 m / sec^2 or 32 ft / sec^2).
  - **Since v = a t, and a = g = 10 m / sec^2, a free falling object increases in speed ____________ m / sec each sec.**

PHYSICS

Linear Motion Worksheet

- **Motion is Relative**
  - **Convert 30 km/sec to mph.**
  - **If you drive at 60 mph and pass a car backing up at 5 mph, your speed relative to the other car is ______________ mph?**
- **Speed = distance / time**
  - **A cheetah can run 100 m in about 4 sec. How fast is this in mph?**
  - **Another cheetah runs 50 m in 2 sec. Is he/she [faster, slower, the same]?**
  - **My daughter and I biked from the Mississippi River to the West Coast (about 1,000 miles). What Average Speed would we have to go to get there in 20 days if we rode 5 hours a day?**
- **Velocity is the speed and the direction of an object in motion.**
  - **A car goes 30 miles in ½ hour. What is the velocity in mph?**
  - **How far can I drive in three days averaging 40 mph? Can I make it cross country (3,000 miles)?**
- **Acceleration is the change in velocity over time.**
  - **Acceleration = change in velocity / time**
  - **What is my acceleration if I'm going 32 ft/sec after 1 second's time; but I'm going 64 ft/sec after 2 second's time?**
  - **How fast is a penny going if I drop it from an airplane and it falls for 3 seconds?**
- **Galileo's Inclined Planes**
  - **Galileo put bells on a track at distances 1, 4, 9, 16. What is a second way to test out this 1, 4, 9, 16?**
  - **How to calculate *Velocity* (if you know *acceleration* and *time*). $v = a\,t$**
    So, how fast are you going at the end of one minute if you had a rocket engine that could accelerate you 12 mph per sec?
  - **How to calculate *Distance* (if you know *acceleration* and *time*). $d = \frac{1}{2} a\,t^2$**
    So, how far has a turtle gone if it is accelerating 2 mph per hour if he starts out at 6AM and travels till noon?
- **Free Fall**
  - **$d = \frac{1}{2} g\,t^2$ … where g is the gravitational acceleration (either 10 m / sec^2 or 32 ft / sec^2).**
    So, how tall is a building that makes a penny fall four seconds to reach the ground?
  - **Since v = a t, and a = g = 10 m / sec^2, a free falling object increases in speed 10 m / sec each sec.**
    So, how fast in m / sec is a sky diver going 10 seconds after jumping out of the plane?
    What are some factors that can affect this? What will happen, eventually?