Name: _____

Linear Motion Notes

Linear motion - motion along a _____ path.

Motion is relative! This means that the motion is in relation to something _____. It depends upon the point of view. Therefore, we need a frame of _____ when describing motion.

Scalar quantities: _____ only.
Vector quantities: both magnitude and _____.
Speed is a scalar quantity. 55 mph, 10m/s, etc.
Speed is how _____ an object is moving. Distance covered per amount of time. mi/hr, m/s
Instantaneous speed is speed at any given _____ of time. A car's speedometer will tell you instantaneous speed.
Average speed - distance of a trip over a period of time. Ex: Driving from the school to the Upper Peninsula.

What is the speed of a car that travels 50 miles in 1 hour?

Distance is how far an object travels and is also a _____ quantity. 5m, 10mi, etc.
Velocity is a vector quantity: 55 mph east, 10 m/s right, etc. Velocity is speed in a given _____. Formula: $v = \frac{d}{t}$

What is the velocity of a car that travels 50 miles in 1 hour east?

Constant velocity - an object doesn't move faster or slower in a given amount of time. This also means _____ and _____ do not change!
Changing velocity - A change in speed or direction. $\Delta v = v_f - v_o$
A car traveling 50mi/hr speeds up to 60mi/hr. It's change in velocity is what?

Displacement is a _____ quantity due to the addition of a direction. 40m north, 2 blocks west, etc.

Acceleration is the rate at which velocity changes. This is a vector quantity. Formula: $a = \frac{\Delta v}{t}$

A ball is rolled from rest to 10m/s in 2s. What is the acceleration? Pay close attention to the units!

Deceleration - the slowing down of an object or negative acceleration since it is losing speed. Is a car that goes around a corner at a constant speed accelerating?

In a car what do we use to control the acceleration of the vehicle?

Free Fall - the motion of an object only impacted by gravity. This ignores air resistance as the object falls! On Earth, all objects fall at a rate of $9.8m/s^2$ which we will round to $10m/s^2$. The units are squared because the object falls with a velocity per unit of time. In other words, it falls 10m/s every second. In a vacuum, we can simulate free fall with no air resistance on Earth to see that objects fall at the same rate. A rock and a feather fall at the same rate, this can be easily seen in a vacuum.
Formulas: $v = at$ $v = gt$

What is the velocity of an orange that falls from a tree after 1s? 2s?

What if we wanted to measure the distance that an object falls? We would use this formula: $d=\frac{1}{2}gt^2$

How far will the orange in our previous example fall after 1s? 2s?

What if we needed to figure out the amount of time it took the orange to fall? We would use this formula: $t = \sqrt{\frac{2d}{g}}$

Using our orange example again, how long will it take the orange to hit the ground falling from a height of 40m? 100m?