11.1 Measuring Motion

1.) How is a frame of reference used to describe motion?
2.) What is the difference between speed and velocity?
3.) What do you need to know to find the speed of an object?
4.) How can you study speed by using graphs?
What is Motion?

- an object's change in position relative to a reference point

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Frame of reference

- a system for specifying the precise location of objects in space and time

*Remember motion HAS to be COMPARED to a FRAME of REFERENCE!
When we describe motion, we need to know two important factors!

1.) Direction

• When an object changes ___________ with respect to a frame of reference, the object is in ___________.

  Direction can be described as:

2.) Distance

• We measure the __________ of the path that an object took.

Let's say we walked around the block with a string. The distance would be the total number of feet, yards, etc... of string that followed us!
3.) Displacement

- the change in _______ of an object
- difference between the _______ point and _________ point.
- Direction must also be given!

Distance:
Displacement:
4.) Speed & Velocity

• Speed describes how _______ an object moves
• Formula: speed =

• Velocity is the speed of an object in a ___________ _________
• Velocity can be described as negative (left or down) or positive (___ or ______)

Speed tells us ___ _____ and velocity tells us both ___ ______ and ___________!
Combing Velocities

- When we combine velocities we not only have to combine the SPEED but ALSO the DIRECTION!

If you are riding in a bus traveling east at 15 m/s, you and all the other passengers are traveling at a velocity of 15 m/s east relative to the street. But suppose that you stand up and walk at 1 m/s toward the back of the bus. Are you still moving at the same velocity as the bus relative to the street?
Calculating Speed

- Review of Speed Formula:

- The SI unit for speed is ______ per ______ (m/s)

- **Average Speed** is the distance traveled by an object divided by the time the object takes to travel

- **Instantaneous Speed** is the speed at that EXACT moment

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Graphing Motion

- To graph motion, we can plot the distance on the ________________ axis and the time on the ___________ axis.

\[ \text{Speed} = \frac{\text{Distance}}{\text{Time}} \]

\[ \text{Slope} = \frac{\text{Rise}}{\text{Run}} \]

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