Physics 11

**Section 2.4: Acceleration**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Vector or Scalar? | Symbol and Units | Description/Formula |
| Distance | Scalar | $d$ m | How far something traveled ***along the path it took.*** |
| Displacement | Vector | $\rightharpoonaccent{d}$ m | * Change in position.
* Straight arrow from start to finish.
 |
| Speed | Scalar | $v$ m/s | $$v\_{av}=\frac{d}{∆t}$$ |
| Velocity | Vector | $\rightharpoonaccent{v}$ m/s | $$\rightharpoonaccent{v}\_{av}=\frac{\rightharpoonaccent{d}}{∆t}$$ |
| Acceleration | Vector | $\rightharpoonaccent{a}$ \_\_\_\_\_\_\_\_\_ |  |

**\***The formulas above are for *average* speed/velocity/acceleration or for when speed/velocity/acceleration is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

We describe acceleration as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of velocity.

We describe velocity as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Example:**

A car starts from rest and accelerates at 15 m/s2 for 3 s. What is its top speed?

**The Direction of Acceleration:**

The direction of acceleration is the direction of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the object.

All vectors have direction. If an object moves along a straight line (i.e. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) then we say a vector’s direction is

* Positive if it’s \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Negative if it’s \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Example:** Fill out the table below by putting + or – in each box.

|  |  |  |
| --- | --- | --- |
|  | Velocity | Acceleration |
| A car sitting at a stop light hits the gas |  |  |
| From rest, you back out of your driveway |  |  |
| A car hits the brakes and comes to a stop |  |  |
| You drop a rock off a cliff |  |  |
| You throw a rock straight up (while the rock is in your hand) |  |  |
| You throw a rock straight up (after the rock leaves your hand) |  |  |

**Example:** Sketch velocity-time graphs of the following situations:

|  |  |
| --- | --- |
| A hockey player skating at full speed comes to a sudden stop. | A football is kicked straight up, then falls back down. |
| A swimmer swims the length of a pool at a constant speed, then quickly turns around and swims back. | A skydiver jumps from a stationary hot air balloon, speeds up to terminal velocity, falls for a while, then pulls the chute and slows down. |