Describing Acceleration **Ch9 Physics**
Science 10 Notes

Uniform Motion

- Objects with uniform motion have equal displacements in equal time intervals.
- Many objects do not have uniform motion
- Objects with non-uniform motion will have:
  - different displacements in equal time intervals **OR**
  - Take different amounts of time to travel equal displacements **OR**
  - Have continuously changing velocity

Acceleration $\vec{a}$

- Defined as the rate of change of velocity
- Measured as m/s / s or m/s^2
- Change in velocity can be due to a change in speed and/or a change in direction.
- Acceleration is a vector and can be positive, negative or 0.
- Objects with zero acceleration are not changing velocity and have uniform.

* positive acceleration is like pushing something forward.
* negative acceleration is like pushing something backwards

Positive and Negative Acceleration

- A positive change in velocity will result in positive acceleration
- Acceleration opposite the direction of motion is sometimes called deceleration, even if the object is moving in a negative direction.

Eg. A car has v_f of +4m/s and a v_i of +2m/s. Is the acceleration positive or negative? Is the car slowing down or speeding up?

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

$= +4\,m/s - (+2\,m/s)$

$= +2\,m/s.$

$\vec{\Delta v}$ is ⊕ so $\vec{a}$ is ⊕

initial speed = 4 m/s
final speed = 2 m/s
car is slowing down or decelerating

* a car is moving forward. you push from the front of the car.

the car has negative acceleration

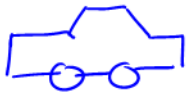
Accelerating and Decelerating

- *Accelerating* and *decelerating* describe what is happening to the speed
- Decelerating does not describe a vector.
- Deceleration occurs when the sign of your velocity is opposite the sign of your acceleration.

Examples:

1. A car has a positive velocity so it is moving forward. Its acceleration is positive, therefore, it is accelerating.
2. A car has positive velocity (it is moving forward). Its acceleration is negative, so it is decelerating because its speed is ~~increasing~~ decreasing
3. A car is moving backwards, so its velocity is negative. It will be *accelerating* if it has negative *acceleration* because the acceleration is in the same direction as the velocity.
4. A car is moving backwards. What must happen for it to be decelerating? it must have positive acceleration because decelerating is when $\vec{\Delta v}$ and $\vec{a}$ have opposite signs.

$\vec{v_i}$ → positive velocity



← $\vec{a}$ is negative

it is considered "decelerating" because the acceleration will make it slow down

← $\vec{v_i}$ negative, car is moving backwards

← $\vec{a}$ acceleration is in same direction as initial motion, which makes the car speed up.

Examples

A car has v_i = -5m/s and v_f = -3m/s.

a) Is change in velocity positive or negative?

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

$= (-3\text{m/s}) - (-5\text{m/s}) = +2\text{ m/s}.$

b) Is acceleration positive or negative?

positive, it's the same as sign on $\vec{\Delta v}$

c) Is speed increasing or decreasing?

decreasing : initial speed = 5m/s
final speed = 3m/s

d) Is this accelerating or decelerating?

it is decelerating because speed is lower or $\vec{\Delta v}$ and $\vec{a}$ have opposite signs.