Acceleration

Note Title 8/24/2011

The world would be a very boring place if objects only traveled one velocity.

Fortunately, this is not the case!

we have ACCELERATION to thank for this...

acceleration describes a change in velocity

OR

$$\text{acceleration} \equiv \frac{\Delta \text{velocity}}{\text{time}}$$

this is often in your book. it means "defined as"

$$a = \frac{v_f - v_i}{t}$$

the same

Because velocity is used, acceleration needs direction.

Mr. Torpe's car can go from 0-60 mi/hr in 6.2 seconds! what is his acceleration?

$V_i = 0$ mi/hr $V_f = 60$ mi/hr $\Delta V = 60$ mi/hr

$t = 6.2$ seconds $(V_f - V_i = \Delta V)$

$$a = \frac{\Delta V}{t} = \frac{60 \text{ mi/hr}}{6.2 \text{ sec}} = 9.7 \frac{\text{mi/hr}}{\text{sec}}$$

We have 9.7 and the units tell us that the car will change

9.7 mi/hr per second (Forward)

$t = 0$ s	1 s	2 s	3 s
$V = 0$ mi/hr	9.7 mi/hr	19.4 mi/hr	29.1 mi/hr
	+9.7	+9.7	+9.7 etc.

Can you accelerate faster than a jet?

Jet 800 m/s → 1000 m/s in 90 seconds $a = \frac{\Delta V}{t} = \frac{1000 - 800 \text{ m/s}}{90 \text{ s}} = 2.2 \text{ m/s/s}$

Kulak (on bike) 0 → 20 m/s in 3 seconds $a = \frac{\Delta V}{t} = \frac{20 - 0 \text{ m/s}}{3 \text{ s}} = 6.7 \text{ m/s/s}$

* Notice here that $V \neq a$

Large numbers with V do not guarantee Large numbers with acceleration

Quick Check: List 3 ways you can accelerate in your car.

① hit the gas! accel is positive

② Brakes! a is negative

③ Turn! change in direction

PRACTICE:

a rollercoaster moves from 5 m/s to 35 m/s in 5 seconds.

a) what is the coaster's acceleration?

b) If the acceleration is constant, how fast is it at 3 seconds

Not changing