GOOD

Newton's 2nd Law of Motion

If the net force not zero, objects will change speed and/or direction.

BETTER

Newton's 2nd Law of Motion

$$\text{speed change factor} = \frac{Fnet}{m}$$

copy the best version into your notebook

BEST

Newton's 2nd Law of Motion

$$accel = \frac{Fnet}{m}$$

Newtons

kilograms

N/kg = m/s/s

ABOUT THE UNITS

A Newton is really a kilogram-meter per second squared

$$\left(kg \cdot \frac{m}{s^2}\right)$$

So what are the real units of acceleration?

$$\frac{Newtons}{kg}$$

In the second law, you divide Newtons by kilograms to get acceleration

$$\frac{\left(kg \cdot \frac{m}{s^2}\right)}{kg}$$

But a Newton is really a kilogram-meter per second squared

$$\frac{\left(\cancel{kg} \cdot \frac{m}{s^2}\right)}{\cancel{kg}}$$

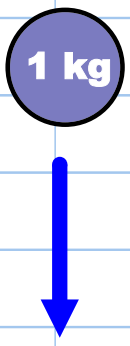
kilograms cancel

$$\frac{m}{s^2}$$

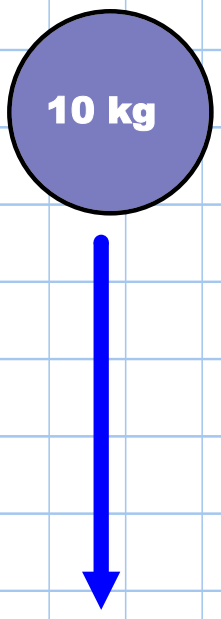
accel is in meters per second squared

SHOULD HEAVIER OBJECTS FALL FASTER?

What does the 2nd Law predict if air drag is not a factor?



W = (1 kg)(9.8 N/kg)
= 9.8 N



W = (10 kg)(9.8 N/kg)
= 98 N

$$accel = \frac{Fnet}{m}$$

$$accel = \frac{9.8N}{1kg}$$

$$accel = 9.8m/s^2$$

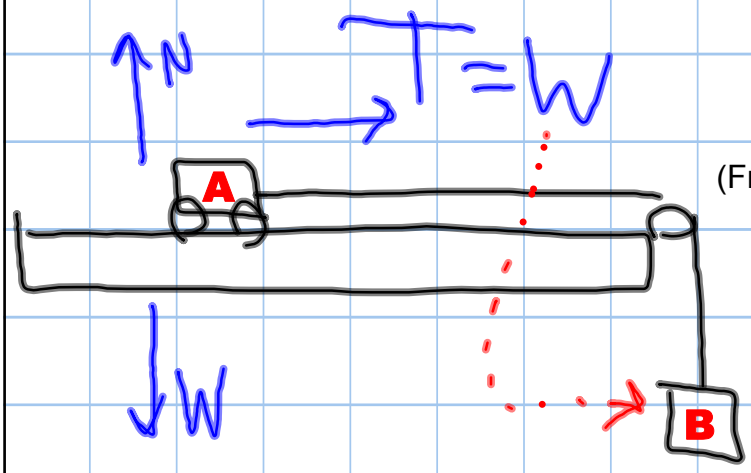
$$accel = \frac{Fnet}{m}$$

$$accel = \frac{98N}{10kg}$$

$$accel = 9.8m/s^2$$

NO! If air drag is not a factor, all objects accelerate at 9.8 m/s^2

Side note: when we tell you the gravitational field strength is 9.8 N/kg, that automatically means that the acceleration due to gravity is 9.8 m/s^2



(Friction in the Pasco Cart wheels is very low)

We calculated the following in our notebooks, then we checked our answers against the Motion Sensor results on the real Pasco Track

mass of A = 0.5 kg
mass of B = 0.2 kg

answer: accel = 2.8 N/kg = 2.8 m/s/s