

# Newton's 3 Laws of Motion

Wednesday, February 15, 2017 10:20 AM

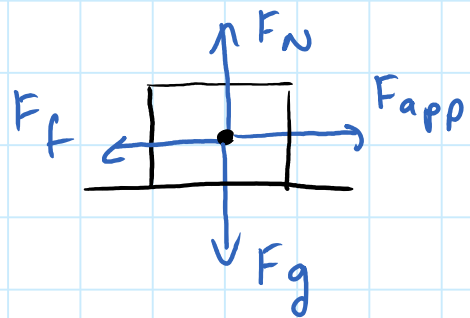
1<sup>st</sup> Law - Law of Inertia: Object in motion (at rest) tends to stay in motion (at rest) unless there is a net force acting on it.

2<sup>nd</sup> Law: if a net force is applied, the object will acc.  $F_{net} = ma$

3<sup>rd</sup> Law For every action force there is an equal but opposite reaction force

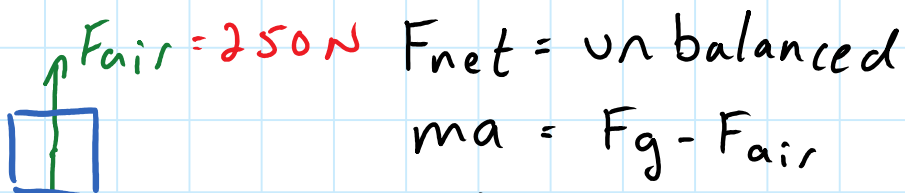
Free Body Diagram: Show all forces acting on an object.

$T, F_f, F_N, F_g, F_{app}, F_{air}$   
 $\uparrow$   $F_N$   
⊥ to surface  
 $MF_N$



Ex: A 75 kg skydiver jumps from a plane.

Determine her acc. if air resistance = 250 N



$$75(a) = 735 - 250$$

$$F_g = mg$$

$$= (75)(9.8)$$

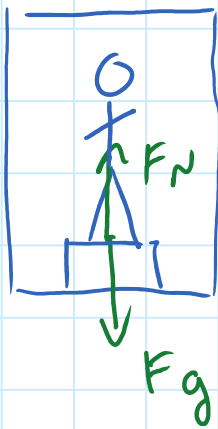
$$= 735 \text{ N}$$

$$\frac{75a}{75} = \frac{485}{75}$$

$$a = 6.5 \text{ m/s}^2$$

Ex What would a bathroom scale read if a 80kg person stood on it in an elevator that acc. down at  $1.3 \text{ m/s}^2$ ?

measures  $F_N$



$$F_{net} = F_g - F_N$$

$$a = 1.3 \text{ m/s}^2 \quad ma = mg - F_N$$

$$80(1.3) = 80(9.8) - F_N$$

$$104 \text{ N} = 784 \text{ N} - F_N$$

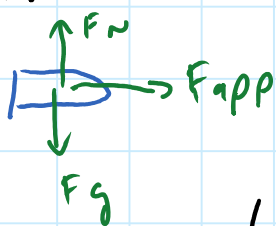
$$-784 \quad -784$$

$$-680 \text{ N} = -F_N$$

$$F_N = 680 \text{ N} \div 9.8$$

$$m = 69.4 \text{ kg}$$

What force is needed to acc a  $9.5 \text{ g}$  bullet from rest to  $500 \text{ m/s}$  in a  $0.70 \text{ m}$  long rifle barrel.



$$F_{net} = F_{app}$$

$$ma =$$

$$1.00 \text{ kg} (1.8 \times 10^5) =$$

$$.0095 \text{ kg}$$

$$v_f^2 = v_0^2 + 2ad$$

$$500^2 = 0^2 + 2a(0.7 \text{ m})$$

$$1700\text{N} = F_{app}$$

$$a = 1,8 \times 10^5 \text{ m/s}^2$$