Bellwork

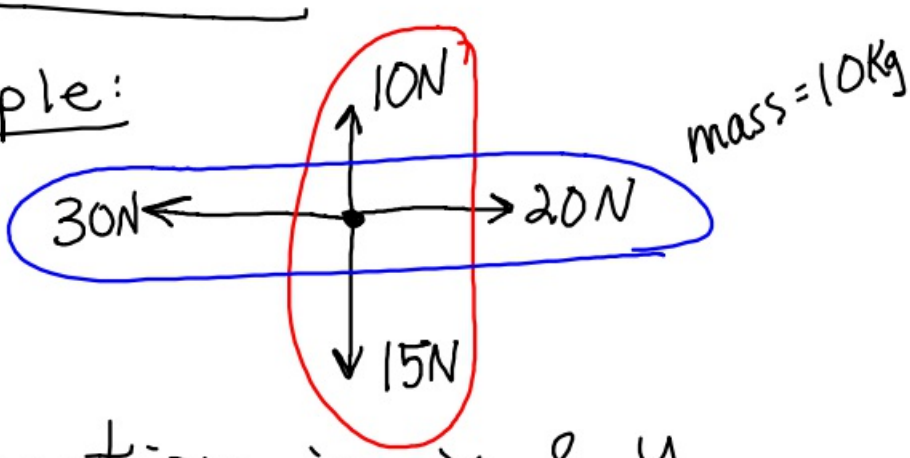
An object moving left is slowing down at a rate of $2\ m/s^2$ due to friction. Should I plug in $+2\ m/s^2$ or $-2\ m/s^2$ into "a" when I use $\Sigma F = ma$?

Moving Right Velocity ⊕
& Slowing Down acceleration ⊖

Moving Right Velocity ⊕
& Speeding up acceleration ⊕

Using $\Sigma F = ma$ in 2 dimensions:

Example:



Find acceleration in x & y direction

$$\Sigma F_y = m a_y$$

$$10N - 15N = (10Kg)\, a_y$$

$$-0.5 \frac{m}{s^2} = a_y$$

$$\Sigma F_x = m a_x$$

$$+20N - 30N = (10Kg)\, a_x$$

$$-1 \frac{m}{s^2} = a_x$$

Formulas for Friction

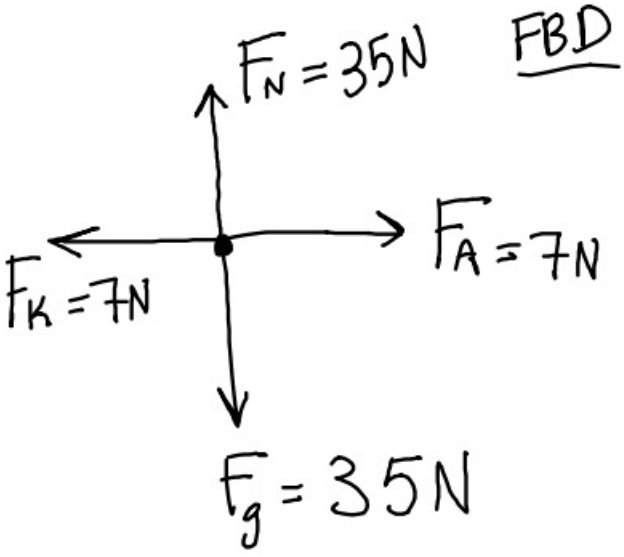
Kinetic Friction: $F_K = \mu_K \cdot F_N$

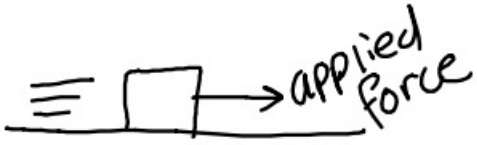
Maximum Static Friction: $F_s = \mu_s \cdot F_N$

$F_g = 35N$

$\mu_k = 0.2$

horizontal/
constant speed
↳ Forces are
balanced





NO acceleration in y-direction, therefore $F_g = F_N$

$\Sigma F_y = m a_y$ ($a_y = 0$)

$F_N - F_g = 0$

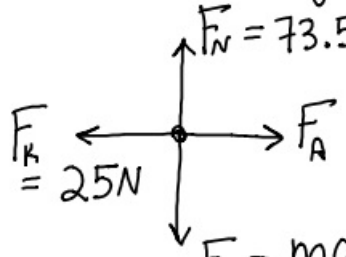
$F_N - 35N = 0$

$F_N = 35N$

$F_K = ?$ $\quad F_K = \mu_k \cdot F_N$

$F_K = (0.2)(35N) = \boxed{7N}$

② $7.5\,kg = m$ $\quad \mu_K = ?$



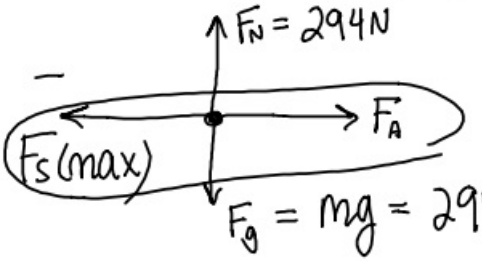
$a_y = 0$, therefore $F_g = F_N$

$$F_K = \mu_K F_N$$

$$25N = \mu_K (73.5N)$$

$$\boxed{0.34 = \mu_K}$$

$F_A = ?$ Box is about to move but still @ rest



$\Sigma F_y = ma_y$ ($a_y = 0$)

$F_g = F_N$

"therefore"

$$\Sigma F_x = ma_x$$

$$F_A - F_{S(max)} = m(0)$$

$$F_A - F_{S(max)} = 0$$

$$F_A = F_{S(max)}$$

$$F_A = \mu_S \cdot F_N = (0.75)(294N)$$

$$\boxed{F_A = 221N}$$