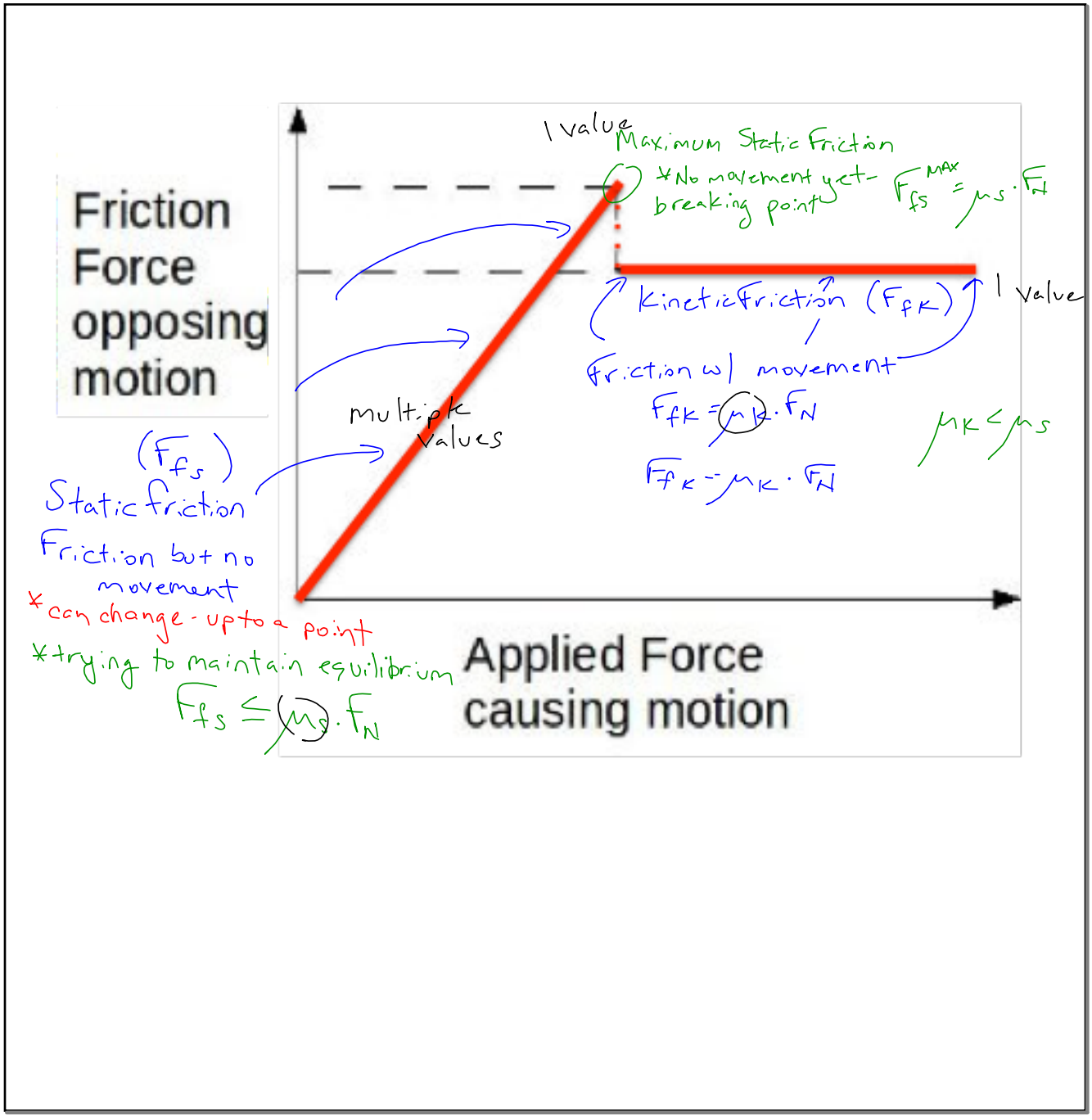
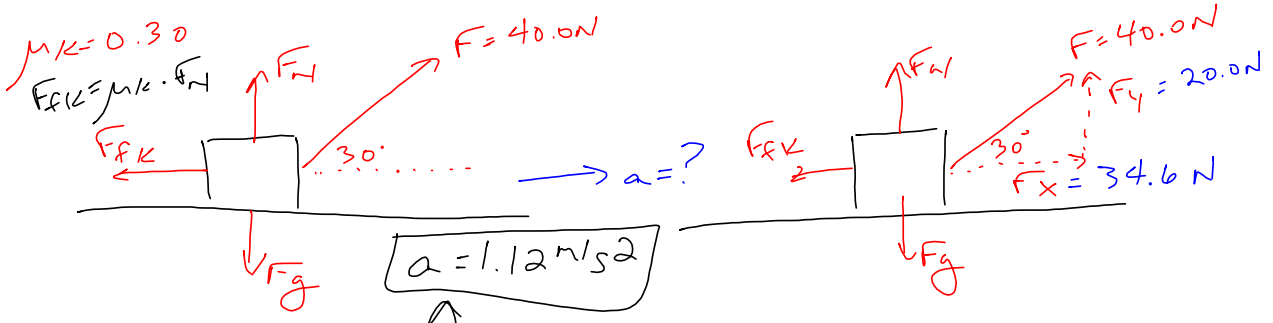

Friction Force opposing motion
1 value
Maximum Static Friction
*No movement yet- breaking point
$F_{fs}^{MAX} = \mu_s \cdot F_N$
1 value
Kinetic friction (F_{fK})
Friction w/ movement
$F_{fK} = \mu_K \cdot F_N$
$\mu_K < \mu_s$
multiple values
(F_{fs})
Static friction
Friction but no movement
*can change - up to a point
*trying to maintain equilibrium
$F_{fs} \leq \mu_s \cdot F_N$
Applied Force causing motion

Example 8

You are asked to drag a 10.0 kg box across the floor. You exert a force of 40.0 N directed upwards by an angle of 30.0°. Friction slows down your progress with a coefficient of kinetic friction of 0.30.

What is the acceleration of the box along the floor?



$\Sigma F_x = F_x - F_{fK}$

$ma = F_x - F_{fK}$

$(10.0)\cdot a = 34.6 - \mu_K \cdot F_N$

$(10.0)\cdot a = 34.6 - (0.30)(78.0)$

$(10.0)\cdot a = 34.6 - 23.4$

$(10.0)\, a = 11.2$

$\Sigma F_y = F_N + F_y - F_g$

$0 = F_N + F_y - F_g$

$F_g = F_N + F_y$

$F_N = F_g - F_y$

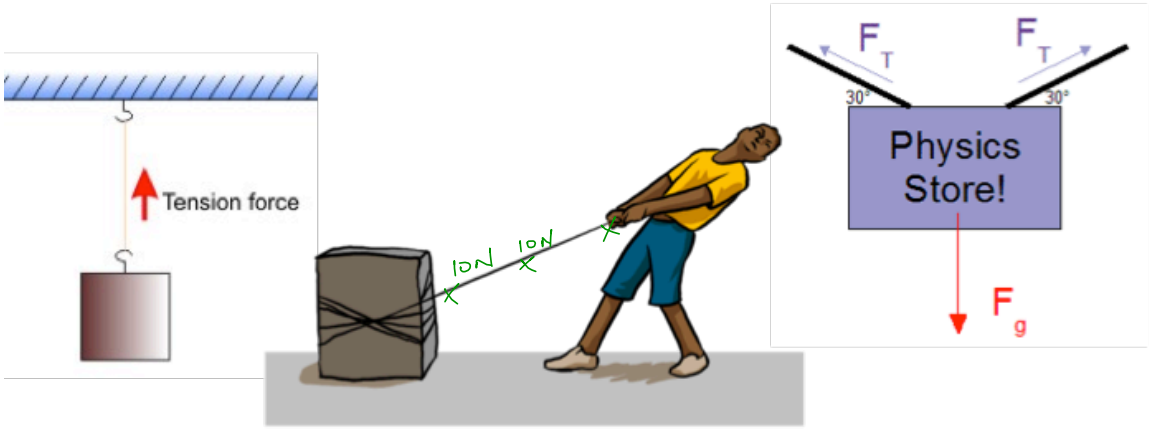
$F_N = mg - F_y$

$F_N = (10.0)(9.8) - 20.0$

$F_N = 98 - 20.0 = 78\,N$

Additional Forces

- Force applied via a cord, rope, chain, etc. is a force of…. TENSION!



- The force of tension is **the same** throughout each rope or cord.

Example 9

You are trying to drag not one but **two** suitcases through the airport for your European graduation adventure. Your first suitcase has a mass m_1 = 25.0 kg while your second has a mass m_2 = 20.0 kg. The two are connected together by a rope that you use to exert a horizontal force of 50.0 N. The floor is pretty slick in the airport, so virtually frictionless.

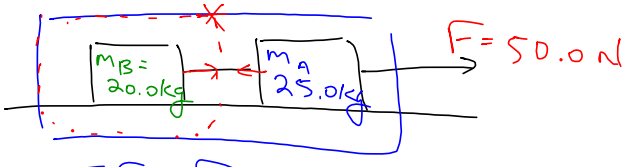
Equilibrium or Non-equilibrium ΣF_x: $\Sigma F_x = ma$

Equilibrium or Non-equilibrium ΣF_y: $\Sigma F_y = 0$

A. Draw a FBD

B. What is the acceleration of the system?

C. What is the force of tension in the rope between the suitcases?

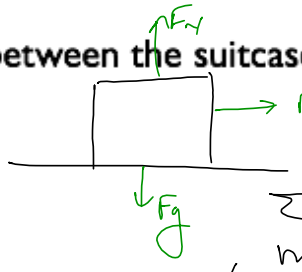


$\Sigma F_x = F$

$ma = F$

$(m_A + m_B) \cdot a = F$

$a = 1.11 m/s^2$



$a = 1.11 m/s^2$

$\Sigma F_x = F_T$

$ma = F_T$

$(20.0)(1.11) = F_T$

$F_T = 22.2 N$