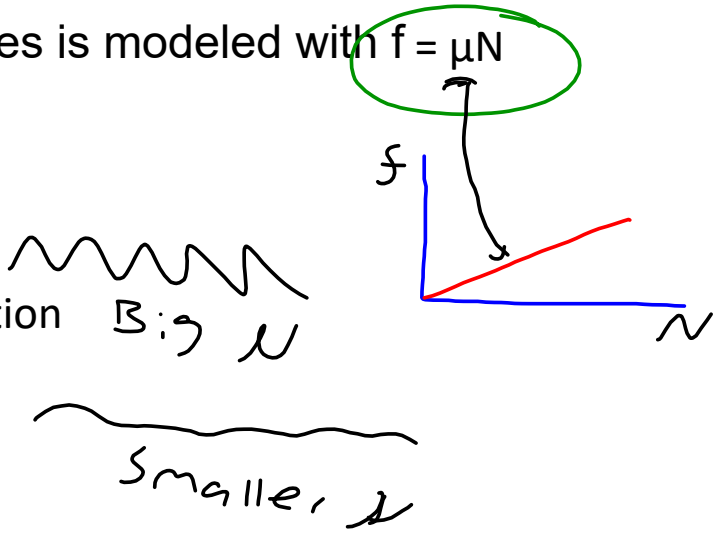
Friction

All friction between surfaces is modeled with $f = \mu N$

Where:

- f is the frictional force
- μ is the coefficient of friction
- N is the normal force



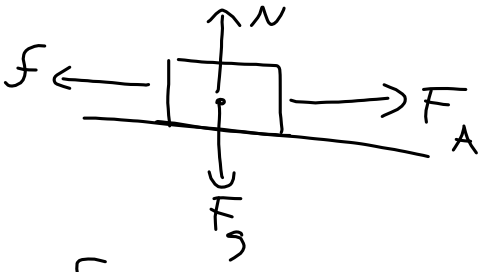
Coefficient of Friction (μ) "mu"

- Is a measure of the texture of a surface
- Compares the frictional force to the normal force
- Is unitless
- Smoother surfaces have a smaller value
- Rougher surfaces have a larger value

$$\mu = \frac{f}{N} \quad \frac{[N]}{[N]}$$

Example.

You are pushing a 30 kg box across the floor at constant speed with a force of 150 N. What is the coefficient of friction?



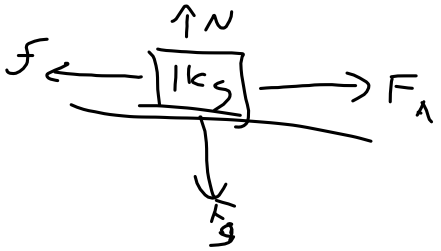
$N = F_g = mg = (30\,kg)(9.8\,m/s^2)$
$= 294\,N$

constant speed
⇓
0 acceleration
⇓
0 Net Force

$f = F_A$

$\mu = \frac{f}{N} = \frac{150\,N}{294\,N} = 0.51$

You are pushing the a 1 kg toy car across the floor, causing it to accelerate at 2 m/s^2. If you are pushing with a force of 5 N, what is the coefficient of friction?



$N = F_g = mg$
$= (1\,kg)(9.81\,m/s^2)$
$= 9.81\,N$

$\Sigma F = ma$

$F_A - f = ma$

$F_A - ma = f$

$5\,N - (1\,kg)(2\,m/s^2) = f$

$3\,N = f$

$\mu = \frac{f}{N}$

$= \frac{3\,N}{9.81\,N}$

$= 0.31$

Homework:

Friction and forces sheet:

Q.1-10 for practice

Textbook pg.144 Q.5-7