

# Friction Flipped Lesson

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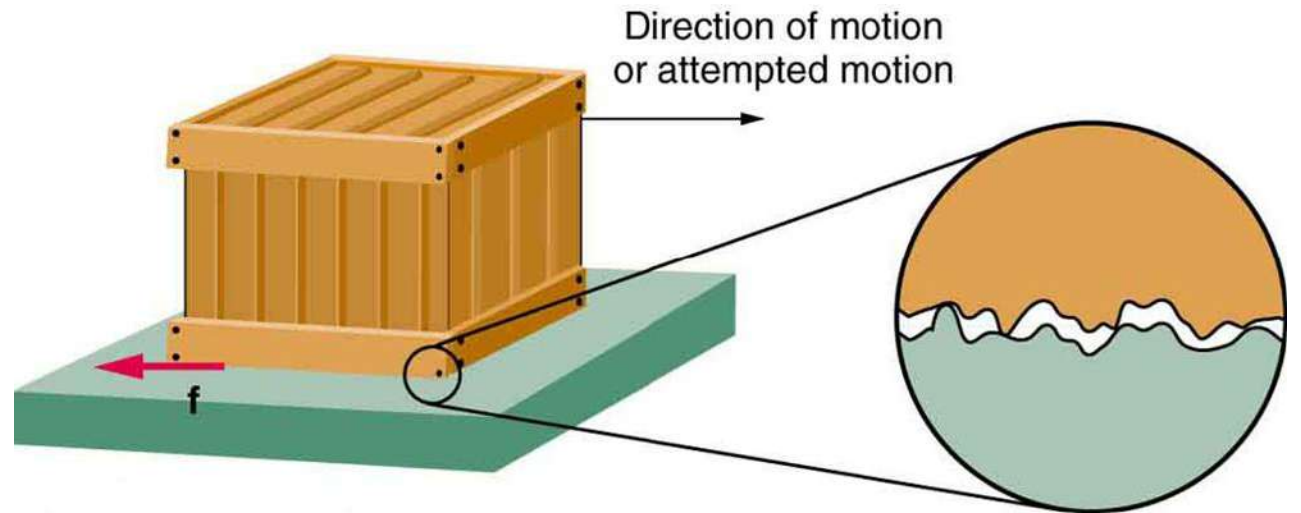
by Ms. Logan

# Friction: What causes it?

Friction: A force present whenever an object moves or attempts to move that opposes motion.

- Affected by:
  - Material of surfaces
  - Normal Force

Recent debates and developments on friction: Is it caused by rough surfaces or electromagnetic bonding?



# Two Types of Friction

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## 1. Static Friction:

- Present when the object is not moving
- Minimum force needed to overcome a threshold to begin motion

## 2. Kinetic Friction:

- Occurs when objects are in motion
- Always less than static friction.

# Formulas

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## STATIC FRICTION

$$F_s = \mu_s F_N$$

$F_s$  = static friction

$\mu_s$  = coefficient of static friction

$F_N$  = normal force

## KINETIC FRICTION

$$F_k = \mu_k F_N$$

$F_k$  = kinetic friction

$\mu_k$  = coefficient of kinetic friction

$F_N$  = normal force

# How do I calculate Normal Force?

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On a flat surface...

Normal Force = Weight

Weight =  $m * g$

# Problem

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Gabe is pushing a refrigerator box that has a mass of 135 kg. If the coefficient of static friction is 0.47, what minimum force does he need to move the box?