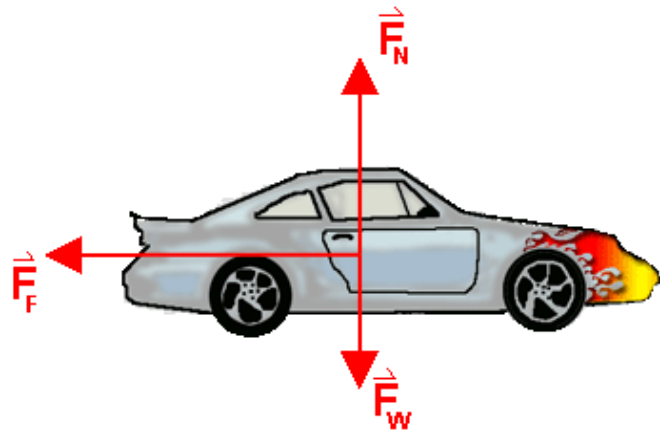


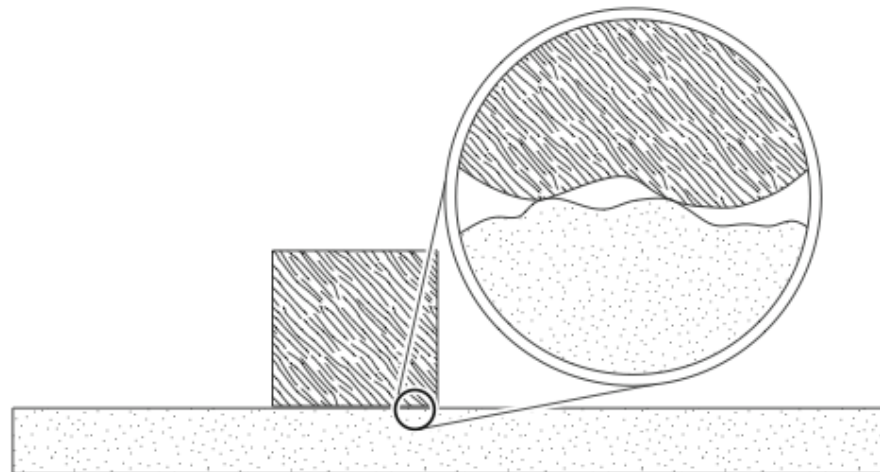
Frictional Forces

How does friction affect motion?



What Causes Friction?

- **Friction** is the force that **opposes** the **motion** between two **surfaces** that **touch**. Put another way, it is resistance to movement that is caused by two surfaces sticking together.
- The **surface** of any object is **rough**.
 - Even an object that feels **smooth** is covered with tiny **hills** and **valleys**.
 - The **contact** between the hills of valleys of two surfaces causes them to **stick**, resulting in friction.



What Causes Friction?

- The **amount of friction** depends on:
 - **Roughness** of the surfaces
 - The texture of a surface may be "sticky".
 - **Force** pushing the surfaces together.
 - Gravity is pulling the upper object downward.



Types of Friction

- **Static** friction occurs when force **applied** to an object is **not strong enough** to cause the object to **move**.



Types of Friction

Kinetic Friction:

Sliding Friction: resistance of an object being pushed or pulled across another surface.

Rolling Friction: resistance of a round object being rolled across another surface.

Fluid Friction: opposes the motion of objects traveling through a fluid (air or water)



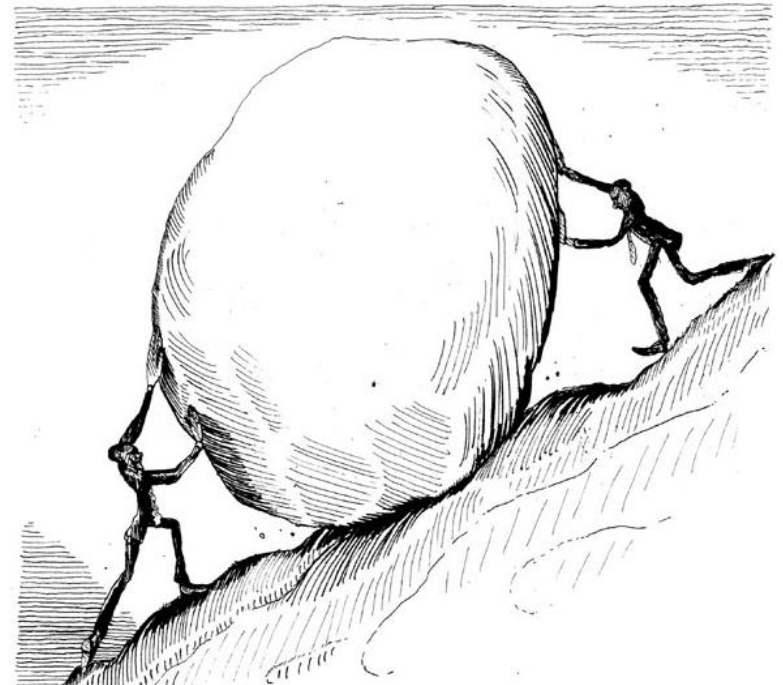
Factors Affecting Friction

- Friction increases as surfaces are made **rougher**.
- Friction increases when the **force** between two objects is **increased**.
 - This can be the weight of an object, or an applied force.



Affecting Friction

- To reduce the amount of friction, apply a lubricant between two surfaces.
 - Motor oil, water, and grease are examples.
- Friction can also be reduced by rolling, rather than pushing, an object.



Conservation of Energy

- When you exert a force to move an object, much of your energy is wasted pushing two *surfaces* along one another, but that energy doesn't just disappear.
- The law of conservation of energy states that it can't be created or destroyed. Friction converts useful kinetic energy into thermal energy, or heat.



Quick Review

1. The weight of an 100 N object is holding it still. How much force would you have to exert on it to overcome its static friction?
2. Which creates less friction: rolling a large bolder, or pushing it?
3. Which will cause more friction: dress shoes or tennis shoes?
4. Explain why your hands get hot when you rub them together.
5. Tile saws pump a jet of water over the blade while it is in motion. Why do you think that they were designed this way.