



PRESSURE

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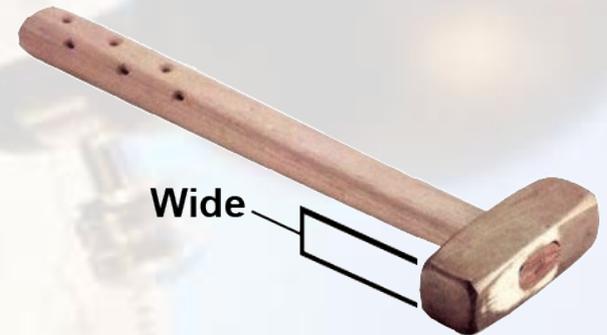
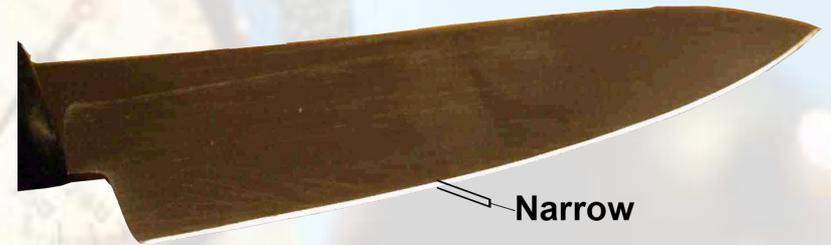
CHOOSE!

- What would you use to cut a steak:
 - . . . a sledge hammer,
 - . . . or a knife?
- Why?
 - The sledge hammer is **dull**.
 - The knife is **sharp**.
- But, what does this mean?



BEING SHARP

- The knife has a narrow edge.
 - This gives the edge a small surface area.
- The sledge hammer has a wide edge.
 - This gives the edge a large surface area.
- When a force is applied by a sharp knife, the force is concentrated in a small area.



DEFINING PRESSURE

- Pressure = force per unit area



$$P = \frac{F}{A}$$

- The smaller the area on which a force is exerted, the greater the pressure is.
- This explains why sharp or pointy objects cut into things easily.

UNITS OF PRESSURE

- The units of pressure are based on the definition of pressure.
- Force is measured in newtons (N)
- Area is measured in m^2
- Pressure is measured in Pascals (Pa)

- **$1 \text{ Pa} = 1 \text{ N} / m^2$**



CALCULATING PRESSURE: EXAMPLE 1

A U.S. quarter has a surface area of 0.000462 m^2 and a weight of 0.0556 N . Calculate the pressure exerted by a quarter on the surface where it is resting.

- **Step 1:** List the variables.

- $A = 0.000462 \text{ m}^2$
- $F = 0.0556 \text{ N}$
- $P = ?$

- **Step 2:** Substitute into the equation.

- $$P = \frac{F}{A} = \frac{0.0556 \text{ N}}{0.000462 \text{ m}^2} = 120. \text{ Pa}$$



CALCULATING PRESSURE: EXAMPLE 2

Determining pressure when you know the mass instead of the weight



An olympic plate with a mass of 20.4 kg has a surface area of 0.156 m². Calculate the pressure it exerts on the surface where it is resting.

- **Step 1:** Determine the weight in Newtons.
 - $(20.4 \text{ kg}) \times (9.8 \text{ m/s}^2) = 200 \text{ N}$
- **Step 2:** Substitute values into the equation.
 - $P = \frac{F}{A} = \frac{200 \text{ N}}{0.156 \text{ m}^2} = 1282 \text{ Pa} \approx 1300 \text{ Pa}$