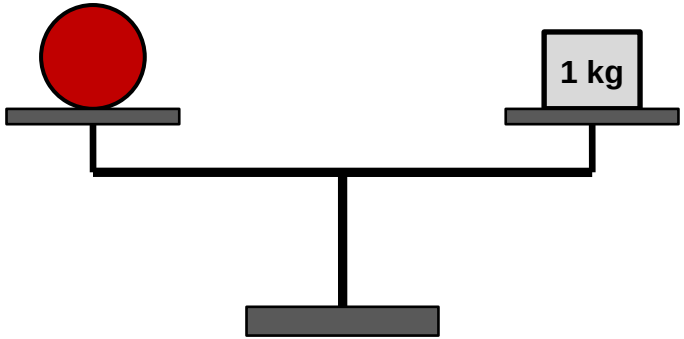
Essential Question

Would you weigh the same on the Moon?

Mass and Weight

Mass

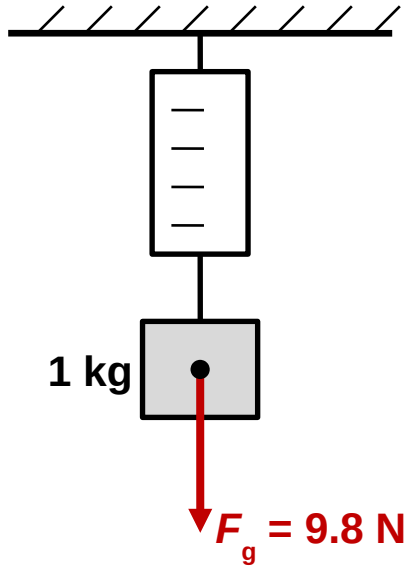
- Amount of matter in an object
- Measured in kilograms (kg)
- Same everywhere



a balance reads the same on the Moon

Weight

- Gravity's pull on an object
- Measured in newtons (N)
- Changes with location



a spring scale measures weight

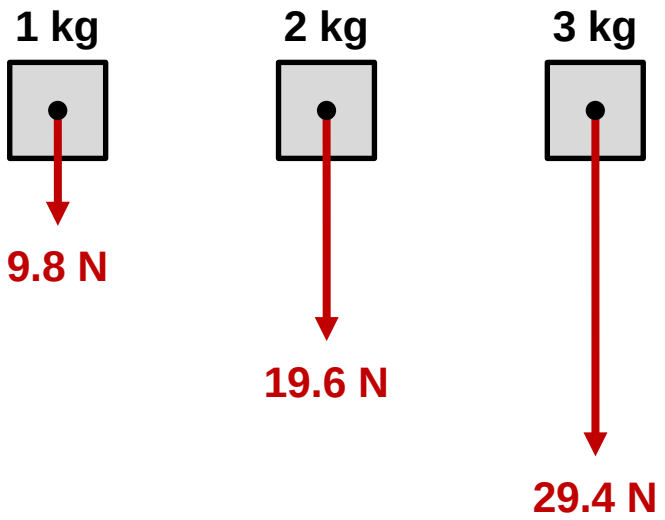
Calculating Weight

$$F_g = mg$$

F_g weight (N)	m mass (kg)	g 9.8 m/s^2 on Earth

The Value of *g*

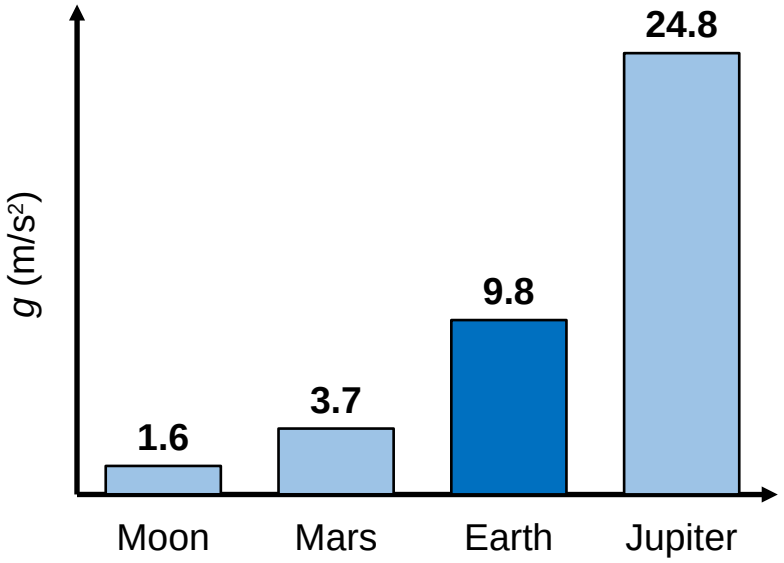
- Strength of gravity at a location
- Earth: $g = 9.8\ m/s^2$
- Each kg weighs 9.8 N on Earth



double the mass, double the weight

Weight on Other Worlds

- Different worlds, different *g*
- Your mass stays the same
- Your weight changes



same mass, different weight

Mass vs. Weight

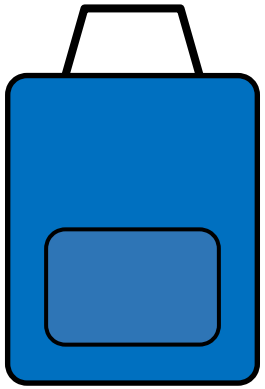
Mass
kilograms (kg)
amount of matter
measured with a balance
same everywhere

Weight
newtons (N)
pull of gravity, a force
measured with a spring scale
depends on location

$F_g = mg$ *connects them*

Example: Weight of a Backpack

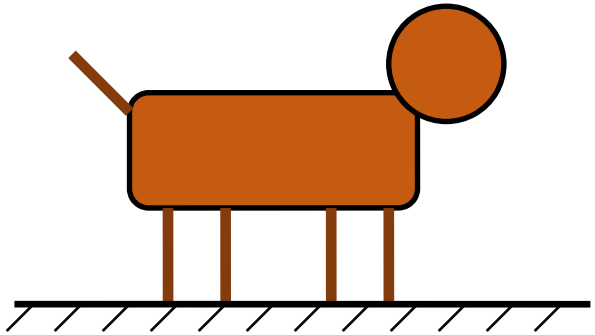
What is the weight of a 5.0 kg backpack on Earth?



5.0 kg

Example: Finding Mass

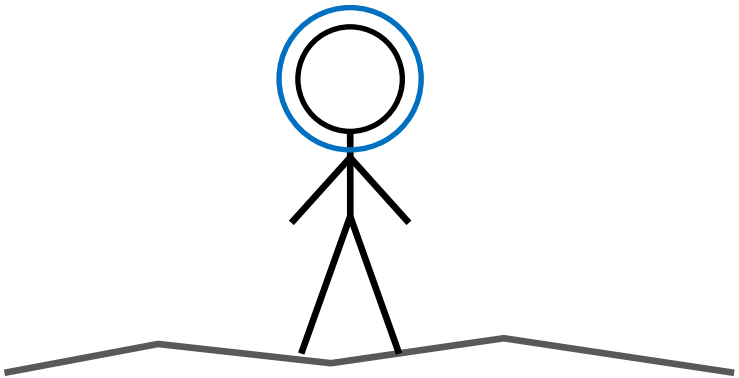
A dog weighs 147 N on Earth. What is its mass?



147 N

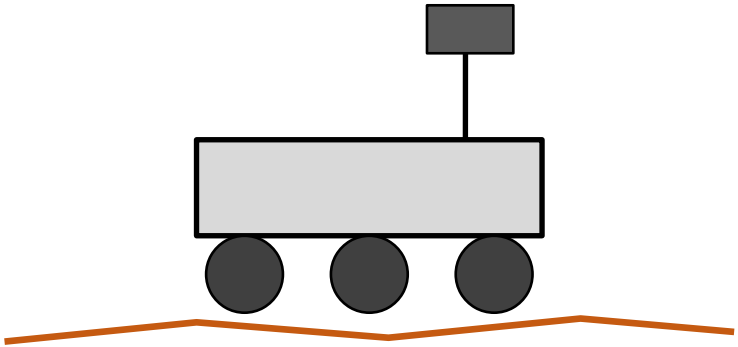
Example: Weight on the Moon

An astronaut has a mass of 70.0 kg. What are her mass and her weight on the Moon, where $g = 1.62\ m/s^2$?



Example: Finding *g* on Mars

A 900. kg rover weighs 3,330 N on Mars. What is the value of *g* on Mars?



900. kg

Mass and Weight

Big Ideas

- Mass: amount of matter, in kg, same everywhere
- Weight: gravity's pull, in N, depends on location
- $F_g = mg$, with $g = 9.8$ m/s^2 on Earth
- Rearrange: $m = F_g/g$ and $g = F_g/m$