


Weight, Normal Reaction, & Tension

IB PHYSICS | FORCES

Types of Forces | Weight

Newton's 2nd Law:

$$\mathbf{F} = \mathbf{m} \times \mathbf{a}$$


Weight:

$$\mathbf{F}_g = \mathbf{m} \times \mathbf{g}$$

$\mathbf{F}_g \rightarrow$ Force of Gravity (weight) [N]

$\mathbf{m} \rightarrow$ mass [kg]

$\mathbf{g} \rightarrow$ Acceleration due to Gravity $\rightarrow 9.81 \text{ m s}^{-2}$

Mass vs Weight

Mass

Amount of matter

Metric Units	
Mass	kg
Weight	N

Weight

Force due to gravity

Types of Forces | Weight

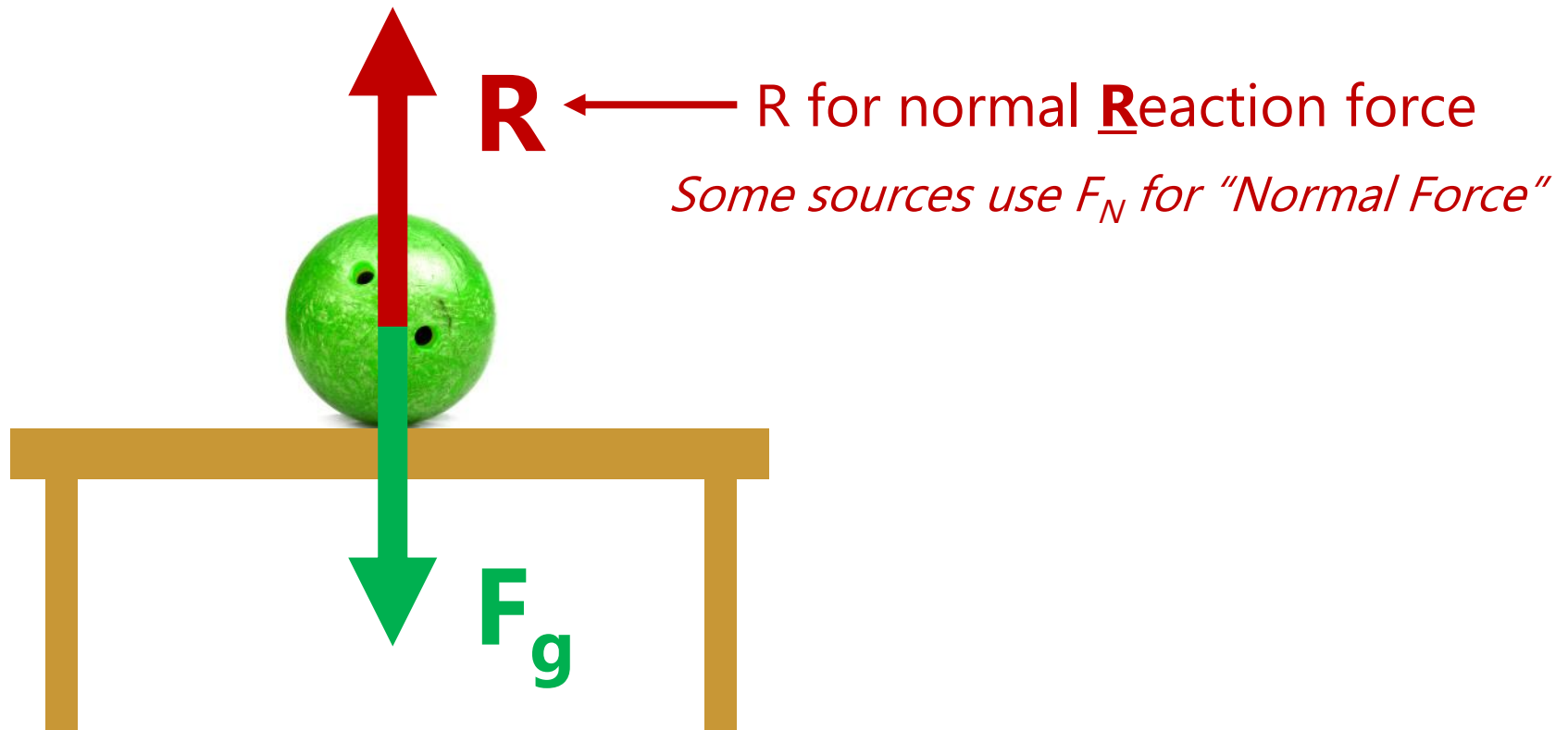
What is your mass in kilograms? (1 kg = 2.2 lbs)

$$m = 165 \text{ lbs} \times \frac{1 \text{ kg}}{2.2 \text{ lbs}} = 75 \text{ kg}$$

What is your weight in Newtons?

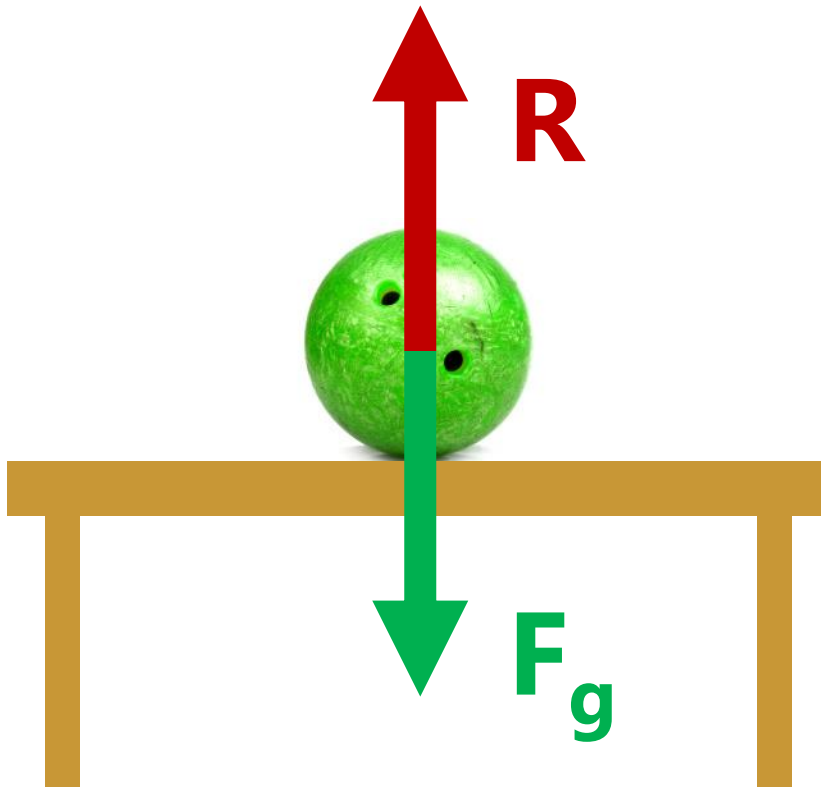
$$F_g = mg = (75)(9.81) = 736 \text{ N}$$

Types of Forces | Normal Reaction

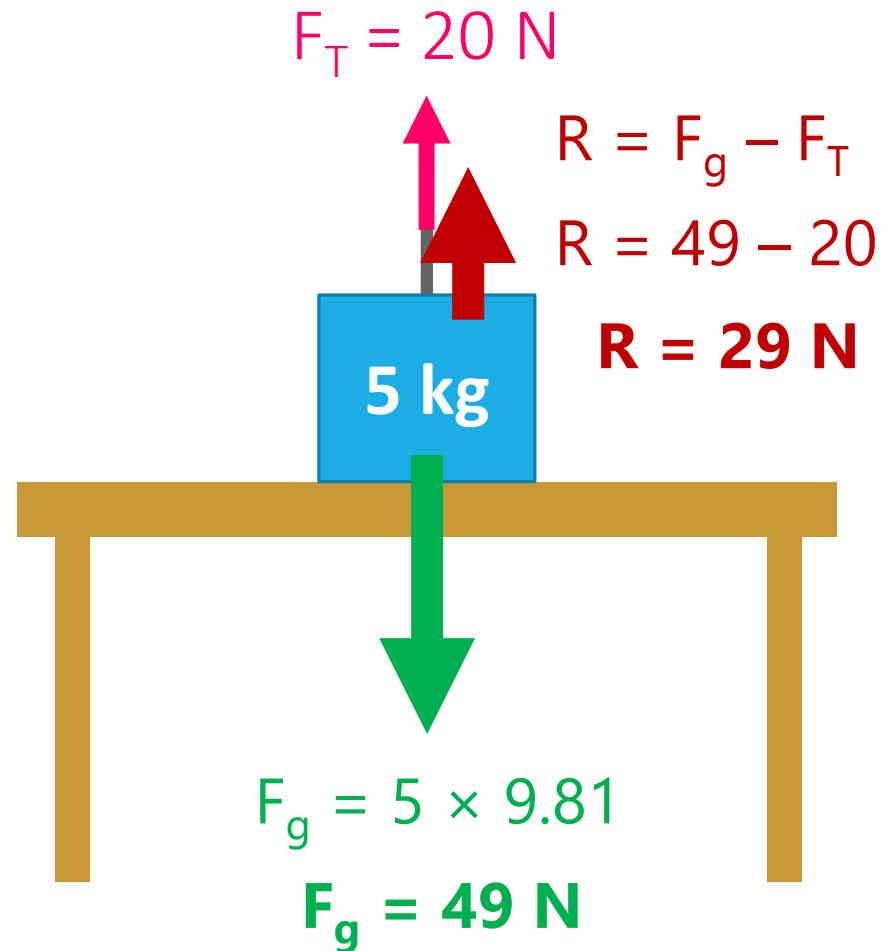
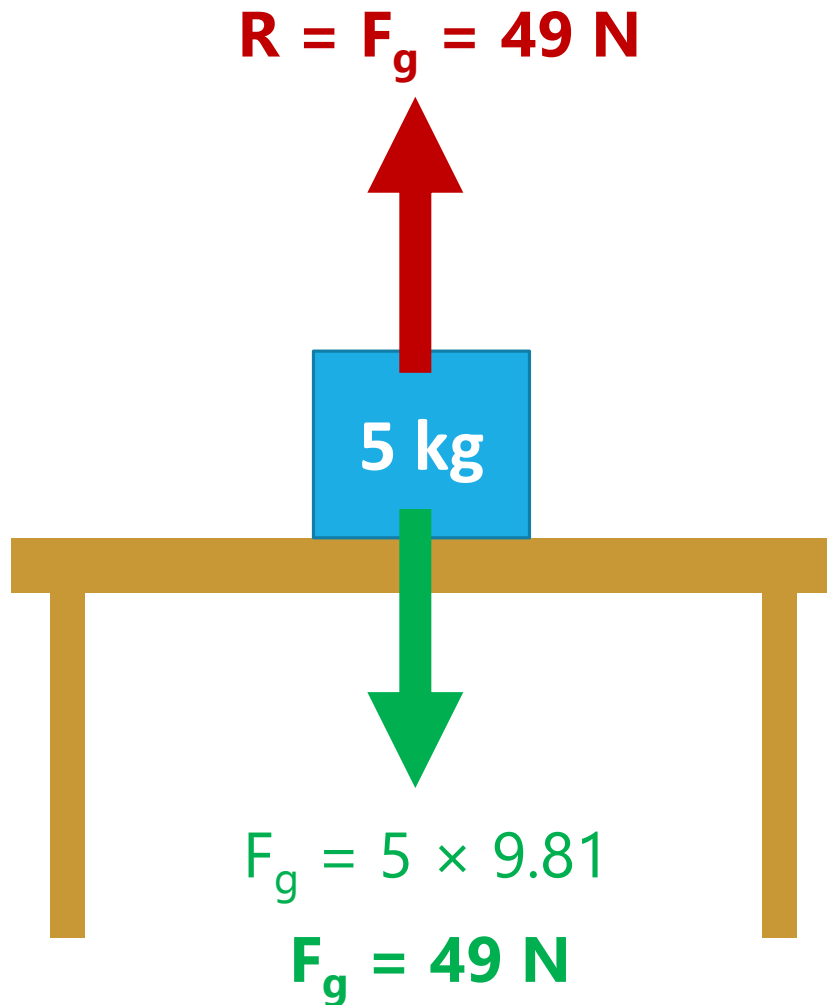


Types of Forces | Normal Reaction

*Always perpendicular to the surface applying the force



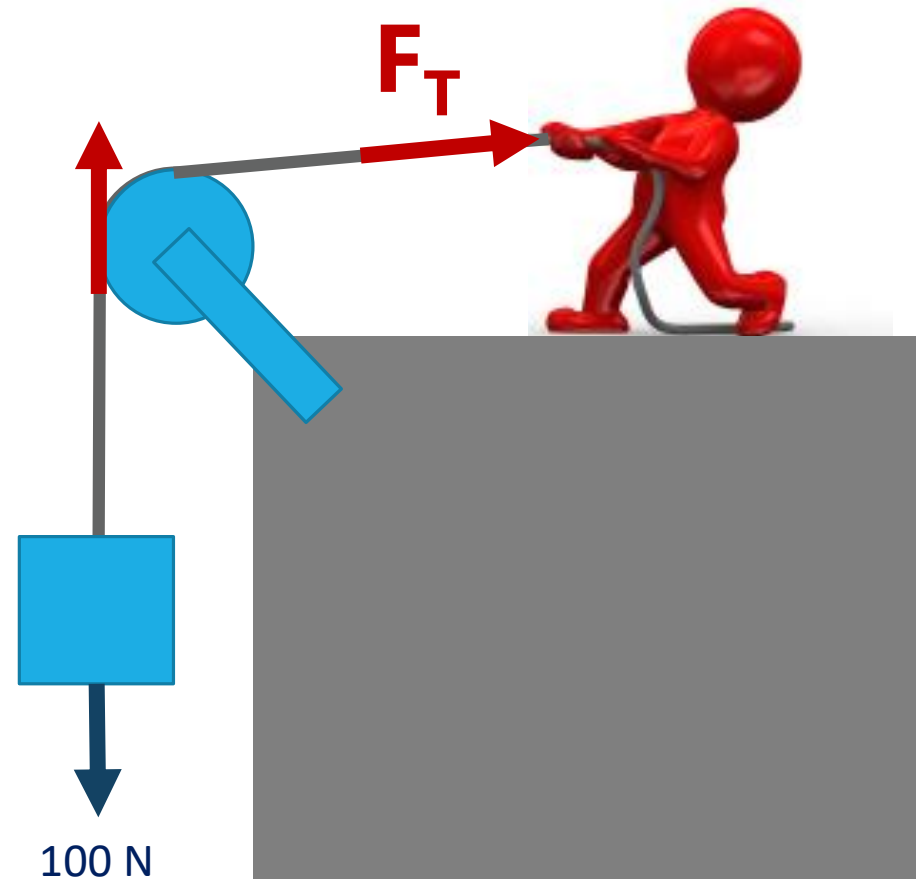
Normal Force Depends on Scenario



Types of Forces | Tension



*Always pulls in the direction of the rope or chain



Lesson Takeaways

- ☐ I can calculate the weight of an object
- ☐ I can describe the difference between mass and weight
- ☐ I can use Newton's third law to describe how to find the normal reaction force with force pairs
- ☐ I can use a diagram to identify the direction of tension force acting on an object