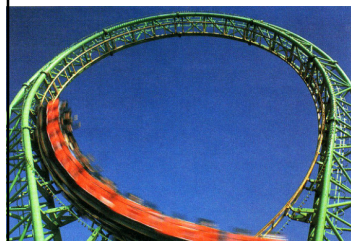


Newton's 2nd Law



Mr. Sudbury

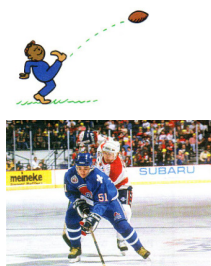
Acceleration Review

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time interval}} \quad a = \frac{V_f - V_i}{t}$$

- ▶ Acceleration is any change in velocity, speeding up, slowing down, or changing direction.
- ▶ We know what acceleration is, what causes acceleration?

Force Causes Acceleration

- ▶ Acceleration is caused by a net force acting on an object.
- ▶ The acceleration produced by the force is resisted by the mass of the object that has inertia and doesn't want to accelerate.



Newton's Second Law

- ▶ *The acceleration produced by a net force on an object is directly proportional to the magnitude of the net force, is in the same direction as the net force, and is inversely proportional to the mass of the object.*

$$\text{acceleration} = \frac{\text{net force}}{\text{mass}}$$

$$a = \frac{F}{m}$$

Newton's 2nd Law

- ▶ The net force produced is the product of the mass and the acceleration.

$$F = m a$$

- ▶ This is an INVERSE relationship between acceleration & mass.
 - If **mass** goes up, then **accel** goes down...
 - If **accel** goes up, then **mass** goes down...

Newton's 2nd Law problems

- ▶ What net force is required to accelerate a car at a rate of 2 m/s² if the car has a mass of 3,000 kg?

Newton's 2nd Law problems

- ▶ A 10 kg bowling ball would require what force to accelerate down an alleyway at a rate of 3 m/s²?

Newton's 2nd Law problems

- ▶ What is the mass of a falling rock if it produces a force of 147 N?

Newton's 2nd Law problems

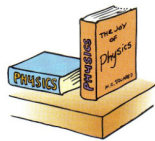
- ▶ What is the acceleration of softball if it has a mass of 0.5 kg and hits the catcher's glove with a force of 25 N?

Newton's 2nd Law Demonstrations

- ▶ Pulling a cart.
- ▶ Dropping balls.

Pressure

- ▶ When a force is applied to a surface, it creates pressure on that surface.
- ▶ Pressure is the force per unit area.



$$\text{pressure} = \frac{\text{force}}{\text{area of application}}$$

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

- ▶ If the same person wore both pairs of shoes, which one applies more pressure on the ground?



Pressure

- ▶ Bed of nails

