

A weightlifter is shown in the background, performing a squat. The lifter is wearing a red singlet with the word "Rizzi" on the chest, white knee wraps, and white shoes. They are holding a barbell with red weights. The word "Force" is overlaid in large, red, stylized letters across the center of the image.

Force

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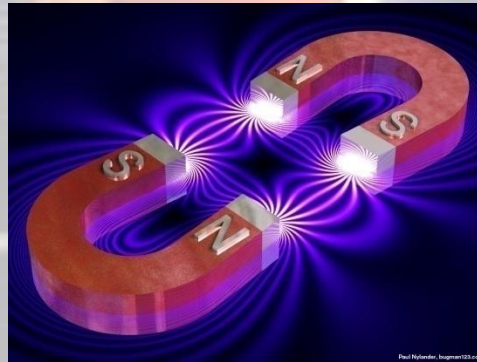
Definition

- Force = push or a pull



- Examples

- Magnetism



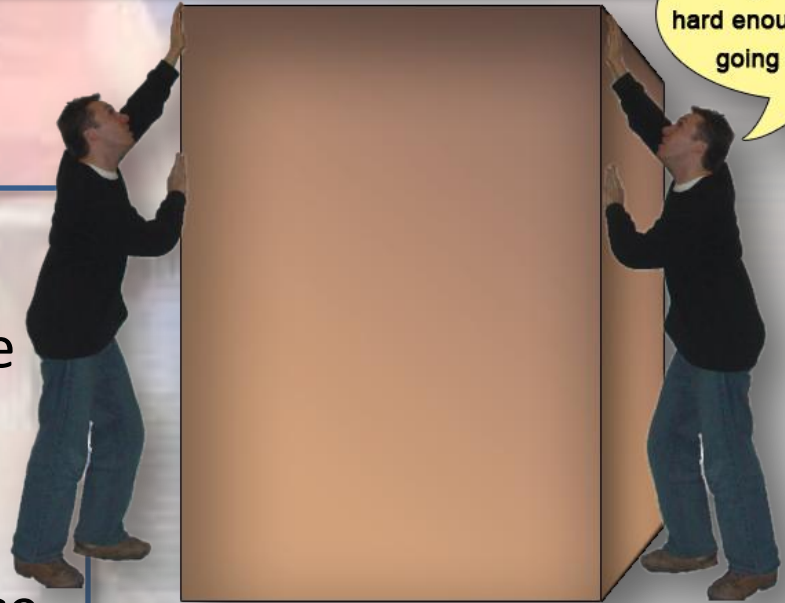
- Gravity

- Units of force = **Newton**s



Combining Forces

- More than one force can act on an object at a time
- Net force = the combination of all the forces acting on an object
 - The net force determines how an object's motion changes.
 - The net force for forces acting in the same direction is the sum of the forces.
 - The net force for forces acting in opposite directions is the difference between the forces.



Are you sure you're pushing hard enough? This isn't going anywhere.



Sample Problems

- What is the net force when two people push the same box, one with a force of 500 N east, and the other with a force of 350 N west?
 - The net direction is east.
 - The size of the force is: $500\text{ N} - 350\text{ N} = 150\text{ N}$

Answer: **150 N east**
- What is the net force when two people drag a sled, one with a force of 235 N north, and the other with a force of 410 N north?
 - The direction is north.
 - The size of the force is: $235\text{ N} + 410\text{ N} = 645\text{ N}$

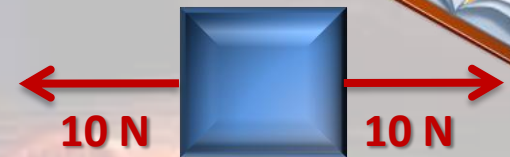
Answer: **645 N north**



Balanced and Unbalanced Forces

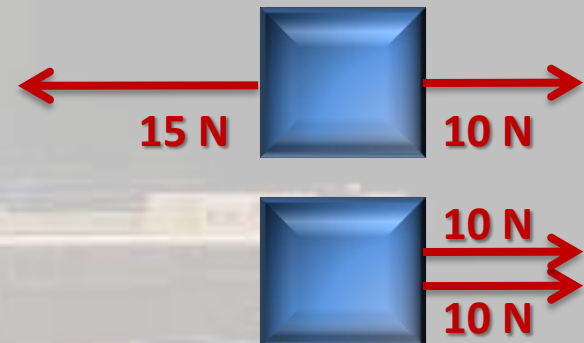
- Balanced forces = Two or more forces exerted on an object that cancel each other and do not change the object's velocity.

- The net force is zero



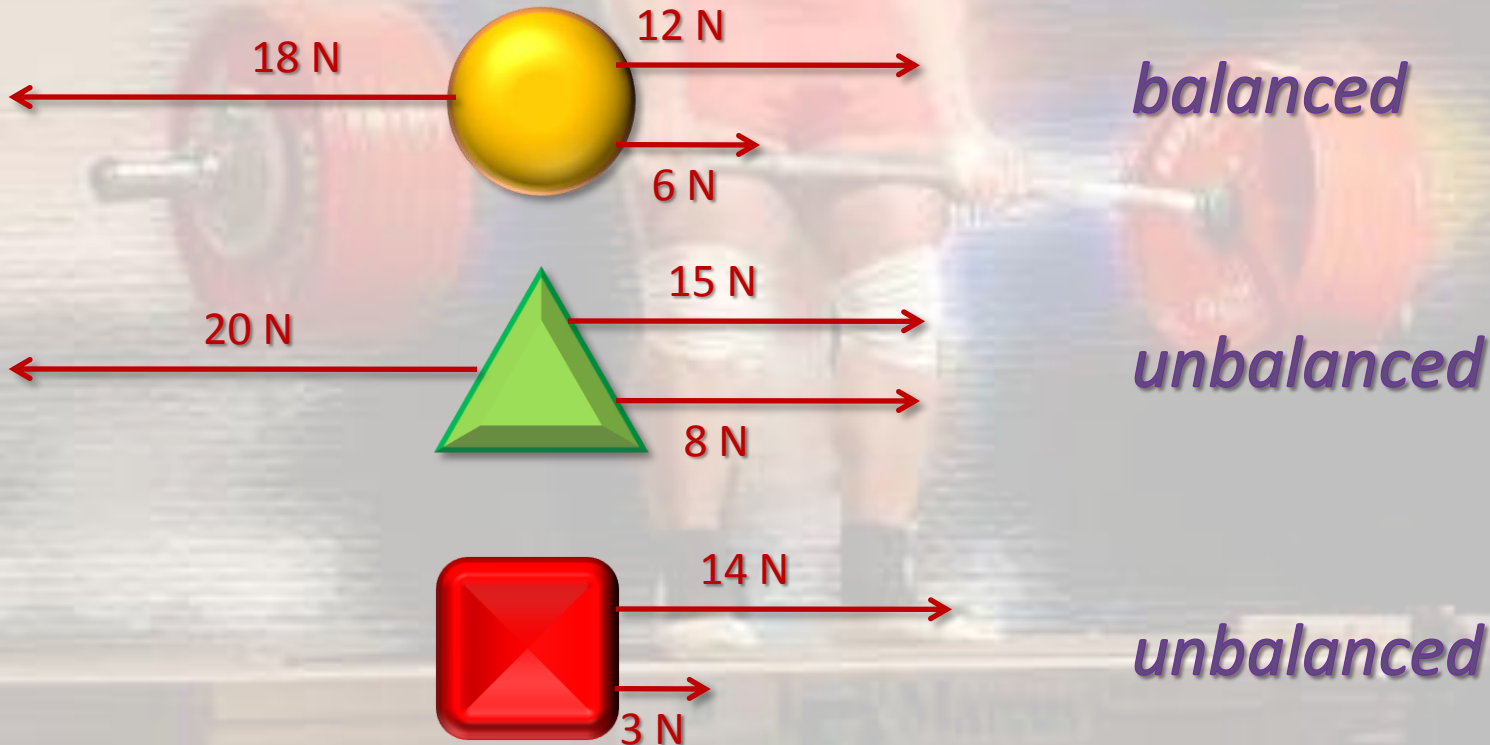
- Unbalanced forces = Two or more forces exerted on an object that don't cancel each other and result in a change in the object's velocity.

- The net force is NOT zero



Practice

- In each case pictured below, are the forces *balanced* or *unbalanced*?



Forces at Angles

- You push a cabinet with an unbalanced force of 3 N south. It moves south.
- You push a cabinet with an unbalanced force of 4 N east. It moves east.
- The effect of both forces together is to move the cabinet at an angle.

