

Forces and Friction



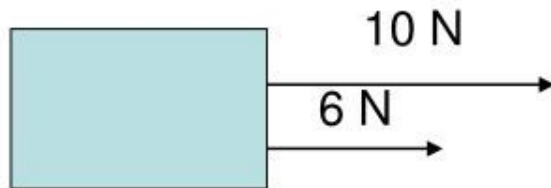
Forces

- A push or pull on an object.
- Measured in the unit called Newtons (N)
- May cause acceleration [changes in motion]



Net Force

- The sum of all forces acting on an object.
- When all the forces are in the same direction add them.



The net force on this box is 16 N right.



Net Force

- When the forces are in opposite directions subtract them and take the direction of the larger force.



The net force on this box is 3 N right.



Net Force

When the net force on an object is not zero, we say that the forces on that object are **unbalanced**.



The net force on this box is 3 N right.



Net Force

When the net force on an object is zero, we say that the forces on that object are **balanced**.



The net force on this box is 0 N.



Balanced Forces

- All forces acting on an object are equal and opposite
- The net force on the object equals 0 N



Balanced Forces: Effect on motion

There is no change in motion:

- So if an object is moving, it keeps moving at the same speed in a straight line.
- If an object is NOT MOVING it remains that way.



Unbalanced Forces

- All forces acting on an object do not add up to zero.



Unbalanced Forces: Effect on motion

There is a change in motion:

- So if an object is moving, it speeds up, slows down or changes direction.
- If an object is NOT MOVING it will start to move.



Friction

- Force that slows down motion. Friction opposes motion between any 2 objects in contact.
 - There is friction between any two surfaces in contact if there is potential that one could move.
 - Friction is in the direction opposite the direction of motion.



Friction

- There are different types of friction:
 - **Static friction:** friction between objects that aren't moving, this force must be overcome to move an object.
 - **Kinetic friction:** Friction between 2 objects that are moving relative to each other.
 - **Sliding friction:** friction between 2 objects when one object is sliding past the other.
 - **Kinetic rolling friction:** Friction that occurs when one object is rolling over another object.



Friction

- Generally rolling friction is the lowest, so if you have a heavy box to move, put it on wheels.
- Static friction is what you have to overcome if you start pushing a heavy object across the floor.



Friction: Helpful or harmful?

- Friction can be both helpful and harmful.
- Friction between the wheels of a bike and the road, keep the bike from slipping all over the road, BUT
- Friction between the moving parts of the bike make it go slower, BUT
- Without friction the brakes would not cause the bike to stop.



Friction: Helpful

- Friction keeps you from slipping when you walk. (Don't run on an icy sidewalk- low friction surfaces can be dangerous.)
- Friction between your paper and pencil help you write.
- Friction helps you wash the dishes with a sponge.
- Friction is how brakes work.



Friction: Harmful

- Friction between moving parts in a car engine causes the temperature in a car engine to rise and the engine parts to wear out.
- Friction slows you down (on a skateboard, bike, even running).

