

Unbalanced forces

Building Big Things

Unbalanced Forces

You know that when there are balanced forces, there is no change in motion. In other words, you cannot move something from one place to another if the forces applied to it are balanced. The object stays still or "at rest." So what do you need to do to move something? If something starts to move, it must be because unbalanced forces are acting on the object. Only when forces are not balanced does an object move.

Unbalanced forces result in a change of motion.

To have unbalanced forces means that the force applied in one direction is greater than the force applied in the opposite direction. When unbalanced forces are acting on an object, the object moves. Or, in science that is called "a change in motion."

When you pushed lightly on the bucket, it didn't move. It only moved when you pushed on it hard enough. To move the bucket, the force you applied had to be greater than the friction force acting in the opposite direction. One force (pushing) had to be greater than the other force (friction) before the bucket would move. When one force is greater than another, the forces are not balanced. Instead, they are unbalanced.

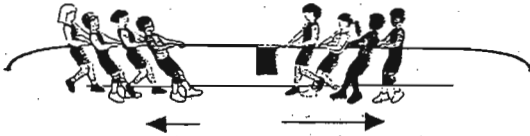
Unbalanced forces are forces that act on the same object, in opposite directions, and are not equal in size.

By applying an unbalanced force you can start an object moving, make a moving object stop, or change the direction of the motion.

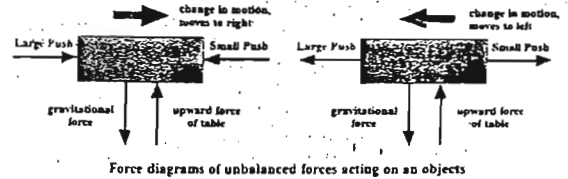
Changes in motion include, starting to move, stopping, and changing direction.

Think back to the game of tug-of-war. At the start of the game, both teams pull really hard on opposite ends of the rope. The two teams pull with balanced forces, and the flag in the middle of the rope does not move.

But after a little while, the other team begins to get tired and pulls with less force. Your team becomes excited and pulls with even more force. Your team pulls and pulls. Soon the other team is falling towards you and the flag moves to your side of the center mark. Your team wins! What happened during the game? The flag in the middle of the rope moved towards your side because there were unbalanced forces acting on the rope. The force that your team applied was greater than the force applied by the other team. When the forces became unbalanced, the flag started to move in the direction of the greater force. That direction was towards your team, so you won!

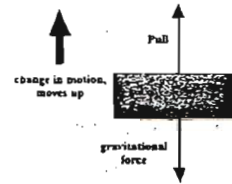


In class you pushed an object more on one side than on the other side. The force probes measured the different amounts of force that you applied to the object. The object moved across the table in the direction of the greater force. You also pulled on the object with different amounts of force, and the object moved in the direction of the greater pulling force. You drew diagrams for each situation. Your diagrams probably looked something like the following.



In these diagrams, the thin arrows represent the direction of the forces that you applied on the brick. The thin arrows are different sizes because you pushed and pulled on the object (the brick) with different amounts of force. What happened to the object this time? The object moved across the table. The thicker arrow shows the direction of the motion. It moved because you pushed on it with unbalanced forces.

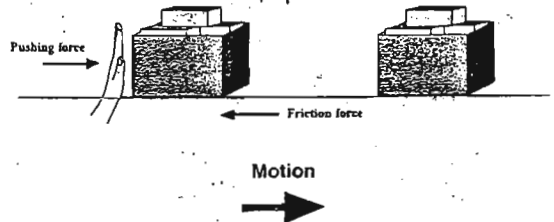
You also need to apply unbalanced forces to lift something. Think about the demonstration in class when you lifted the heavy object. What did you do to lift the object? You applied an unbalanced force that was greater than the gravitational force pulling down. When you lifted with a greater force than the gravitational force pulling down, there was an unbalanced force acting on the object. The object's motion changed in the direction of the greater force, and the object moved up.



Pulling the object upwards

The same thing also happens when you are trying to slide something heavy across the floor. One of the reasons it is so difficult is that there is a friction force acting against your pushing. This friction force balances out the force you apply. If you

want to push the box across the floor, what do you have to do? You have to push with a greater force than the force of friction acting against you. When you do this, there is an unbalanced force acting on the box. The box begins sliding in the direction of the greater force (the direction that you pushed it).



Pushing against friction with unbalanced forces

bob

Reading

Name _____ class _____
team _____ seat _____ date _____

building things
Dig

- 1- A strong man pulls a desk to the right. →
A small child pulls the desk to the left. ←

a) Draw a picture of this situation.
Include force arrows
and show direction of
motion.

b) Why will it move this way?

- 2- When an apple falls from a tree what
force pulls it down? Tell about the
balanced or unbalanced forces.

- 3- Give an example of something you
have moved. Describe all the
forces acting on it. Include
gravity and friction.

bob

parent signature

unbalanced forces