

Balancing Forces

A force is a push or a pull. In a game of tug-of-war, if both teams pull with the same force, there will be no change in motion. If one team pulls harder than the other, unequal forces will set one team in motion!

Objective

Test the idea of balance and explore how the balance of forces is related to motion with a game of tug-of-war.

Materials

- a thick, long rope
- a rag to indicate a center line
- 7 or 9 friends — some big and some small
- a safe area that has grass and also some pavement
- an adult to act as referee

Safety Notice: All applicable laboratory safety rules must be followed. Students should not perform any experimental activity without the teacher's supervision and express permission. Students must follow safety guidelines and wear appropriate protective gear.

Procedure

1. Split up into two equal teams, making sure each group has kids of about the same size.
2. Place the rag on the grass as a center line. Lay the rope out on the grass crossing the middle of the center line and put one team on each end of the rope.
3. Both teams should pick up the rope, making sure each kid gets a good grip.
4. Have the adult stand in the middle and give the 'go' signal. Each team should pull on the rope, trying to pull the other team across the center line.
 - Describe what you think will happen if the teams are equal in number and size. What does this have to do with a balance of forces?

- Was your prediction correct? Write down what happened.

5. Now try changing the balance and see what happens. The most obvious way to do that is to put more kids on one team. What do you predict will happen?

- Describe what happened. Were forces balanced?

6. Now take the rope to the edge of the grass, and place the center line where the pavement meets the grass. Return to your original, even teams. One team should be standing on the grass and the other on the pavement.

- What do you think will happen?

7. Have the adult give the 'go' signal. Describe what happens. Was your prediction correct? How did the forces change?

Conclusions

- How did changing the surface the teams stood on change the balance of forces? Can you think of other ways to change the balance between the teams?
