

Name _____



Forces

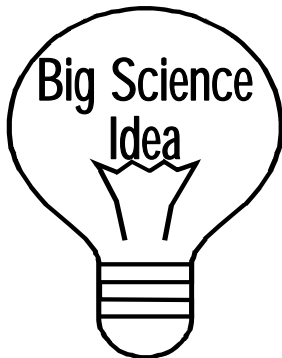
When you ride a bike, your foot **pushes** against the pedal. The push makes the wheels of the bike move.

When you drop something, it is **pulled** to the ground by gravity.

A **PUSH** or a **PULL** is a **FORCE**. So, a good definition for *force* is a *push or pull in a particular direction*.

Forces affect how objects move. They may cause motion; they may also slow, stop, or change the direction of motion of an object that is already moving.

Give an example of a pushing force AND a pulling force at school:



Forces can affect motion in several ways:

- They can make objects start moving
- They can make objects move faster
- They can make objects move slower
- They can make objects stop moving
- They can make objects change direction
- They can make objects change shape

Since force cause changes in the **speed** or **direction** of an object, we can say that forces cause changes in **velocity**, so....
Forces cause acceleration!

List 3 examples of acceleration:

FORCE FACTS:

- Forces are measured in Newtons (N)
- Forces usually act in pairs
- Forces act in a particular direction
- Forces usually cannot be seen, but their effects can



Label the force in each picture as a push or pull. Then describe whether the force is causing a change in speed or direction or both.

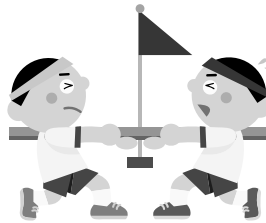
More than one force can act on an object at a time. The forces can push or pull in any direction. What happens to the object when the forces act depends on two things:

- How strong the forces are
- The direction of the forces

When more than one force acts on an object, the forces combine to form a **net force**. The combination of all the forces acting on an object is the net force.

Forces may work together or they may be opposite forces.

Two or more opposite forces are **balanced forces** if their effects cancel each other and they **do not cause a change in an object's motion**. If two forces of equal strength act on an object in opposite directions, the forces will cancel, resulting in a net force of zero and no movement.



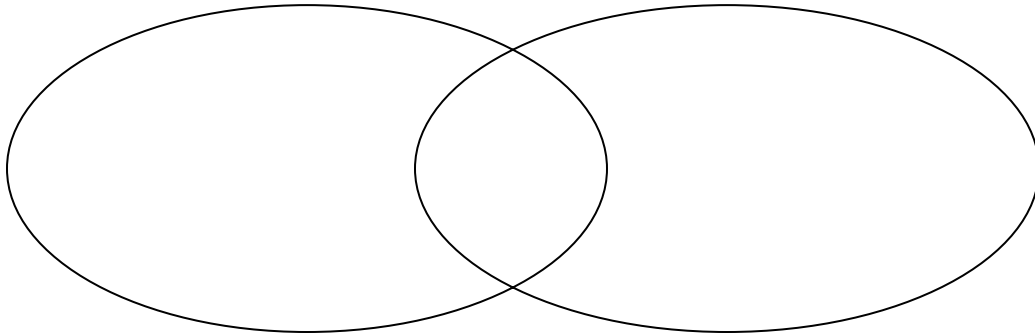
If the effects of the forces don't cancel each other, if one force is stronger than others, the forces are **unbalanced forces**. **Unbalanced forces cause a change in motion**; speed and/or direction.

When two forces act in the **same direction** on an object, the net force is equal to the **sum** of the two forces.

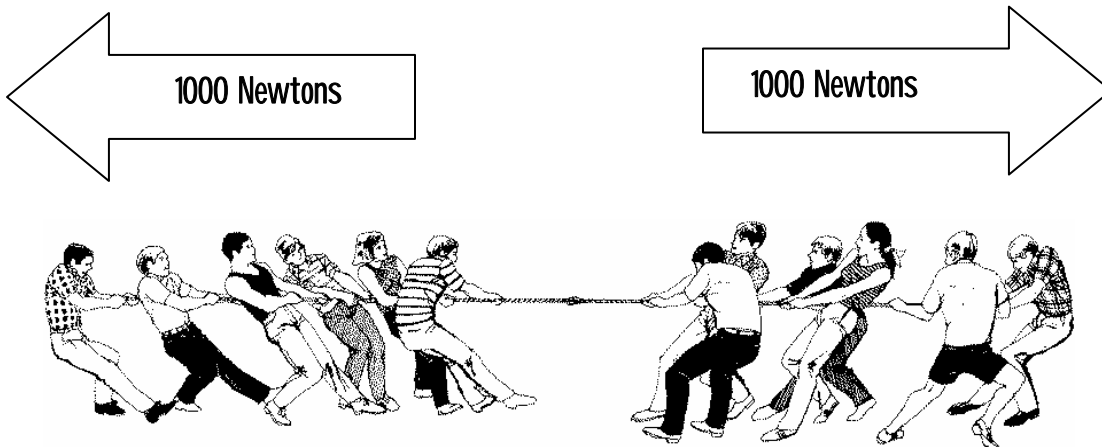
When two unequal forces act in **opposite directions** on an object, the net force is the **difference** of the two forces

Use the Venn Diagram to compare and contrast balanced and unbalanced forces.

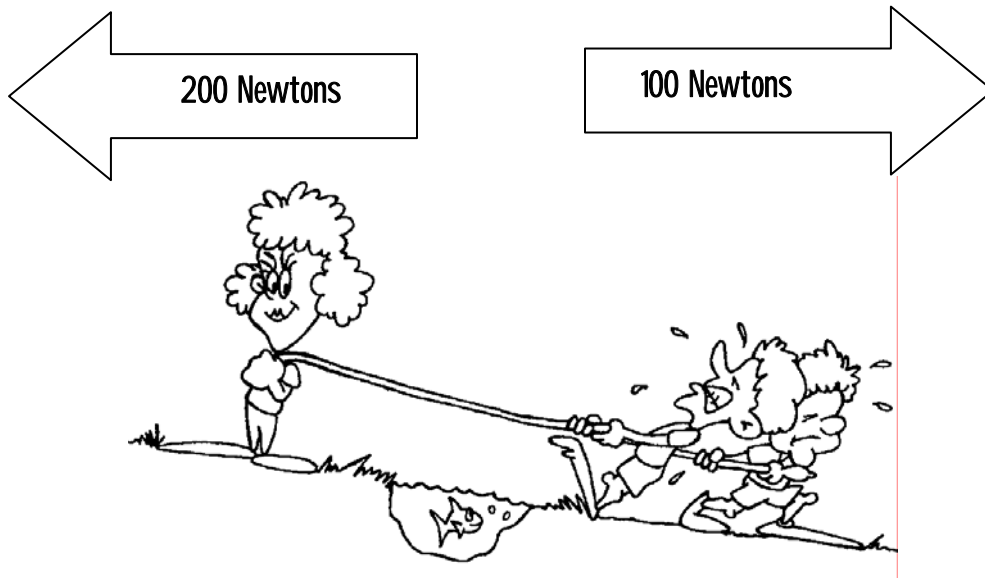
Balanced Force Unbalanced Force



Circle the best answer:



1. The forces shown above are **PUSHING / PULLING** forces.
2. The forces shown above are **WORKING TOGETHER / OPPOSITE FORCES**.
3. The forces are **EQUAL / NOT EQUAL**.
4. The forces **DO / DO NOT** balance each other.
5. The resultant force is **1000 N TO THE RIGHT / 1000 N TO THE LEFT / ZERO**.
6. There **Is / Is NO** motion.



7. The forces shown above are **PUSHING / PULLING** forces.
8. The forces shown above are **WORKING TOGETHER / OPPOSITE FORCES**.
9. The forces are **EQUAL / NOT EQUAL**.
10. The forces **DO / DO NOT** balance each other.
11. The stronger force is pulling to the **RIGHT / LEFT**.
12. The weaker force is pulling to the **RIGHT / LEFT**.
13. Motion is to the **RIGHT / LEFT**.

Use your textbook to answer the following questions. Circle the best answer.

14. When you look out your window and see a skateboarder in front of your house, and two minutes later you look up and see her several houses away, you can use this information to describe her ____.

- | | |
|-------------|-----------------------|
| a. speed | c. change in position |
| b. velocity | d. acceleration |

15. It takes 1.0 h to drive 20 km through a city during rush hour. Your ____ speed is 20 km/h.
- a. constant
 - b. average
 - c. instantaneous
 - d. accelerating
16. If an object starts to accelerate, ____.
- a. a balanced force is acting on it
 - b. gravity is acting on it
 - c. velocity is acting on it
 - d. an unbalanced force is acting on it
17. The tendency to resist a change in an object's motion is ____.
- a. inertia
 - b. an unbalanced force
 - c. a balanced force
 - d. work
18. When forces are balanced, the total force ____.
- a. is greater than the sum of the forces
 - b. is zero
 - c. is negative
 - d. is equal to the largest force
19. Newton's first law of motion explains ____.
- a. inertia
 - b. force
 - c. balanced forces
 - d. unbalanced forces
20. The reaction force occurs ____ the action force.
- a. before
 - b. after
 - c. at the same time as
 - d. either a or b
21. A soccer ball takes 20 s to roll 10 m. What is the average speed of the soccer ball?
- a. 200 m/s
 - b. 5 m/s
 - c. 2 m/s
 - d. 0.5 m/s
22. When an object is at rest, what is its speed?
- a. 2 m/s
 - b. 3 m/s
 - c. 1 m/s
 - d. 0 m/s

23. Which describes how velocity changes with time?
- a. acceleration
 - b. average speed
 - c. gravity
 - d. inertia
24. A person in a head-on car collision who is not wearing a seat belt continues to move forward at the original speed of the car because of ____.
- a. friction
 - b. inertia
 - c. gravity
 - d. weight
25. What is the term for speed at any instant in time?
- a. instantaneous speed
 - b. variable speed
 - c. constant speed
 - d. average speed
26. Newton's first law of motion states that an object stays at rest unless a(n) ____ acts on it.
- a. balanced force
 - b. unbalanced force
 - c. gravitational force
 - d. strong force
27. Which one of the following objects has the greatest inertia?
- a. baseball
 - b. bowling ball
 - c. pencil
 - d. toothpick
28. A force is which one of these?
- a. a push
 - b. a pull
 - c. a push or pull
 - d. none of these
29. Force is measured in which units?
- a. kilograms
 - b. degrees
 - c. newtons
 - d. m/s^2
30. A force is exerted on a box and an equal and opposite force is exerted by the box. What explains this?
- a. conservation of energy
 - b. Newton's first law of motion
 - c. Newton's second law of motion
 - d. Newton's third law of motion