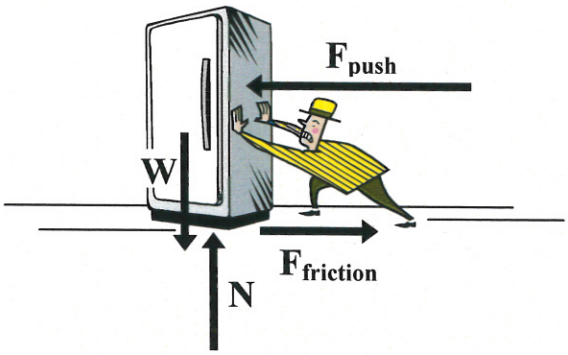
Name _____

Balanced and Unbalanced Forces Worksheet

Examine the forces acting on the freezer in the diagram and answer questions 1 – 3.



1. Are any of the forces acting on the freezer balanced?

   If so, which ones?

2. Are any of the forces acting on the freezer unbalanced?

   If so, which ones?

3. Describe the motion of the freezer.

4. Two men of equal strength have a tug-of-war. Draw the forces that are acting onto the picture.

Which man will win the tug-of-war? **Left** or **Right**

5. Another man joins each end of the rope. Does this affect the result of the tug-of-war? If not, why not? _____

_____

6. Another man joins the team on the left. Which team will win the tug-of-war now? Why?

_____

_____

In the picture for Question 6 above, each man pulls with a force of 10 Newtons.

7. How much force do the team on the left pull with? _____ Newtons
8. How much force do the team on the right pull with? _____ Newtons

9. Explain the result of the tug-of-war using the values for the forces in each team.

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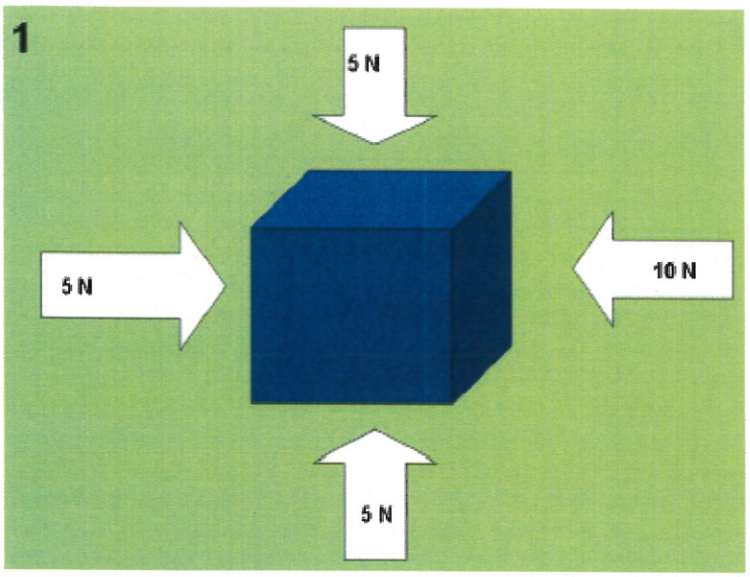
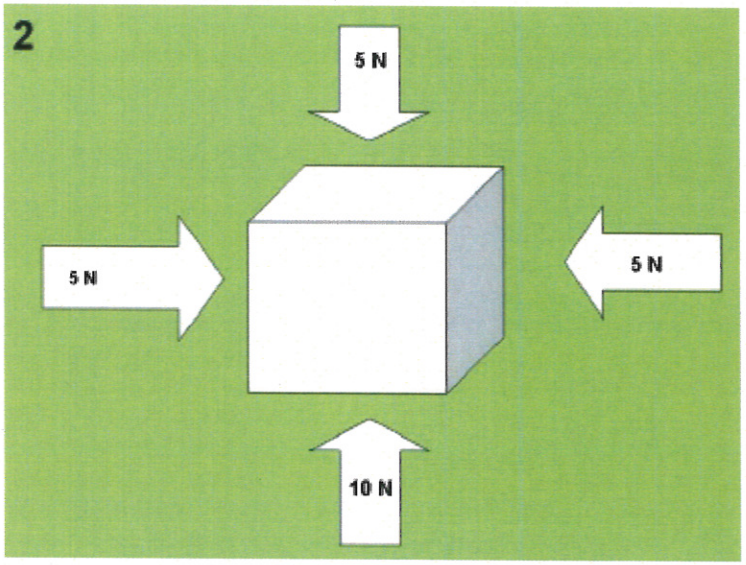
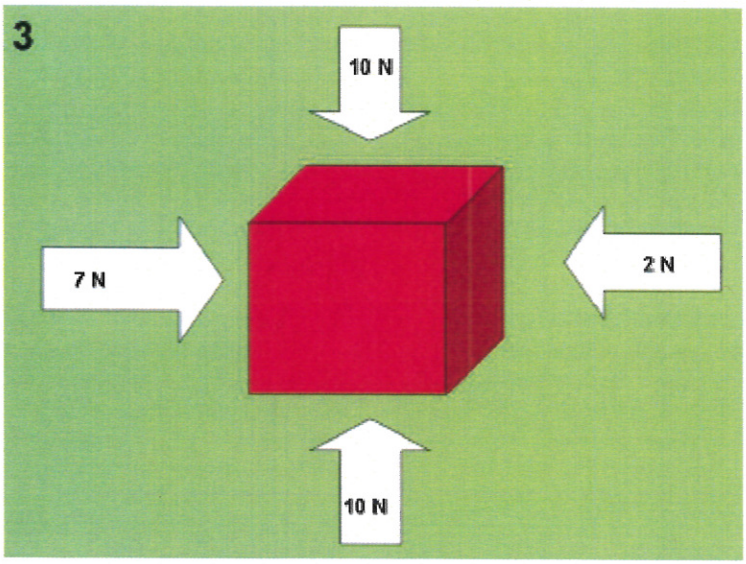
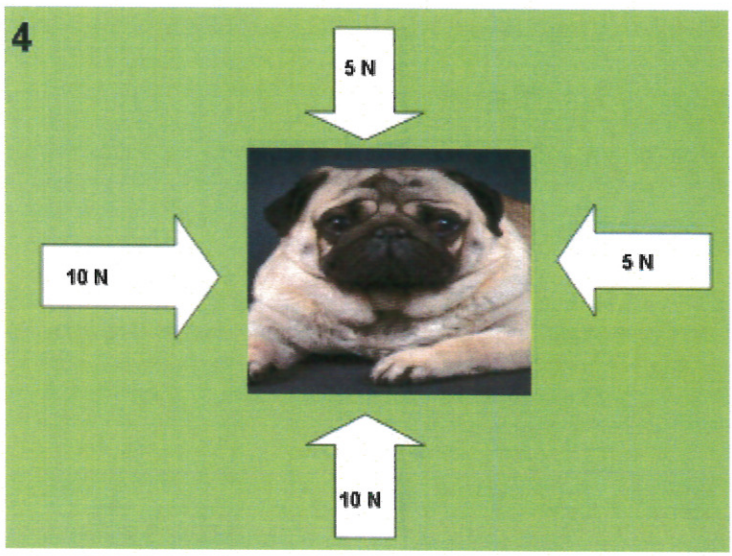




1. direction: _____ force: ____

2. direction: _____ force: ____

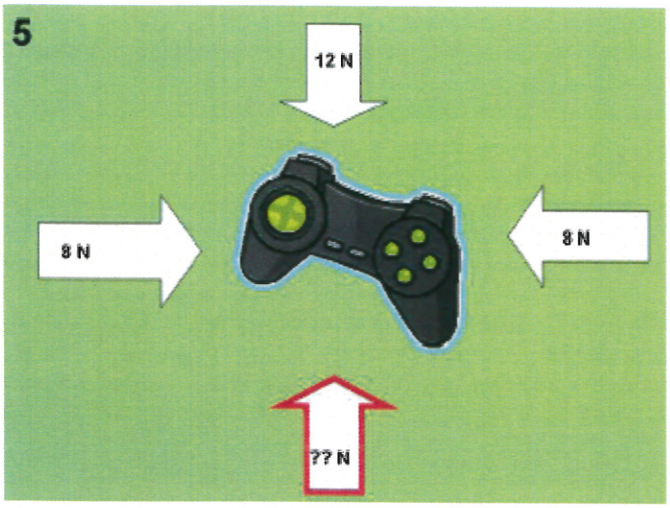




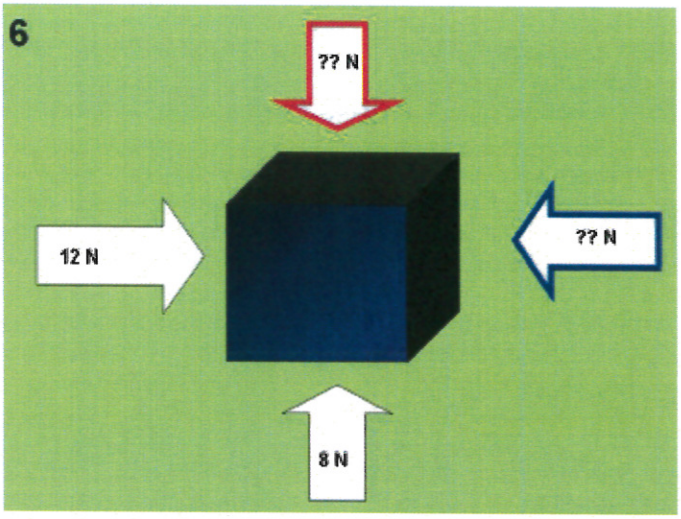
3. direction: _____ force: ____

4. direction: _____ force: ____
direction: _____ force: ____

Fill in the missing values to balance the object:



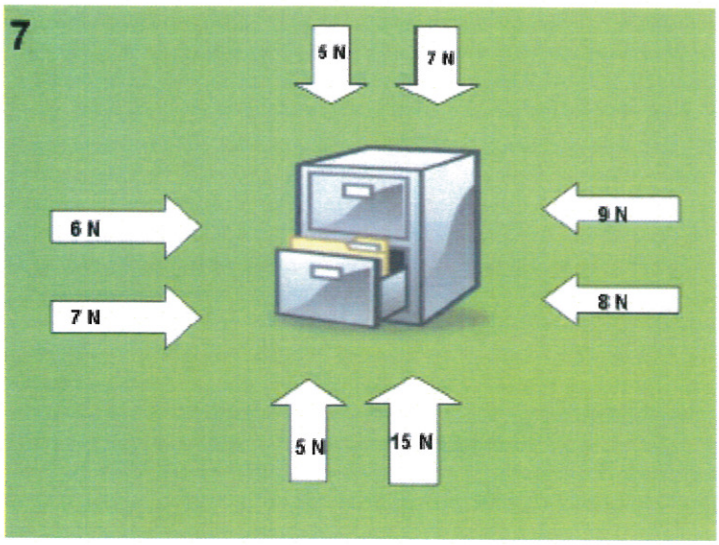
5. direction: _____ **force:** ____



6. Red _____

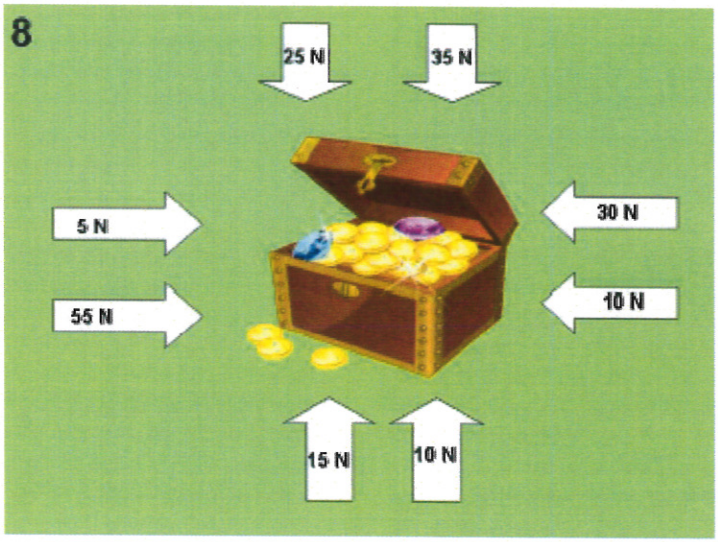
Blue _____

Which direction will the box move and what is the net force?



7. direction: _____ **force:** ____

direction: _____ **force:** ____

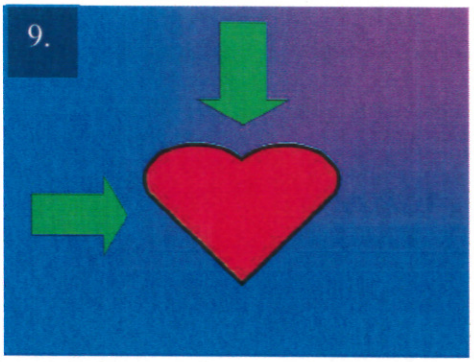


8. direction: _____ **force:** ____

direction: _____ **force:** ____

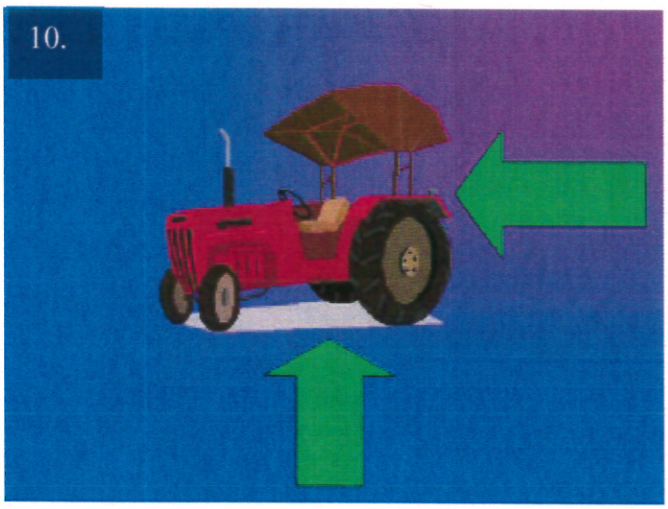
9.

What direction will the object go? (Draw an arrow.)



9. _____

10.



10 _____

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:

_____

_____

_____

_____

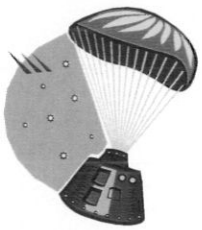
_____

_____

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.

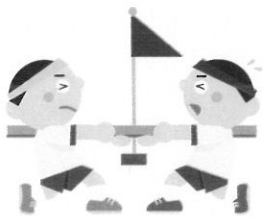
More than one force can act on an object at a time. The forces can push or pull in any direction. What happens to the object when the forces act depends on two things:

→ 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.



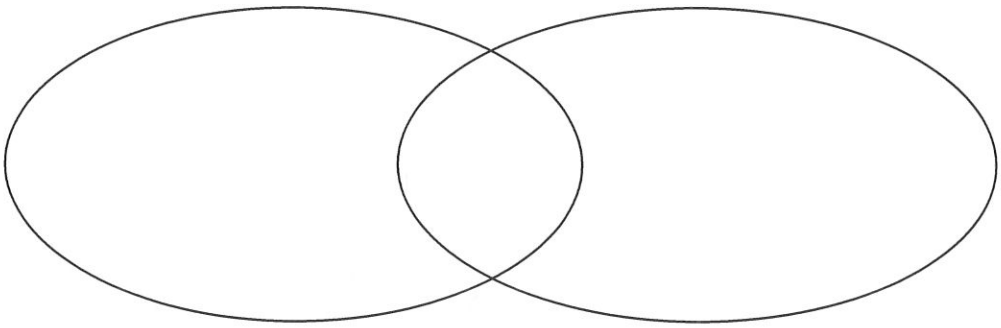
If the effects of the forces don't cancel each other, if one force is stronger than others, the forces are **unbalanced forces**. **Unbalanced forces cause a change in motion**; speed and/or direction.

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

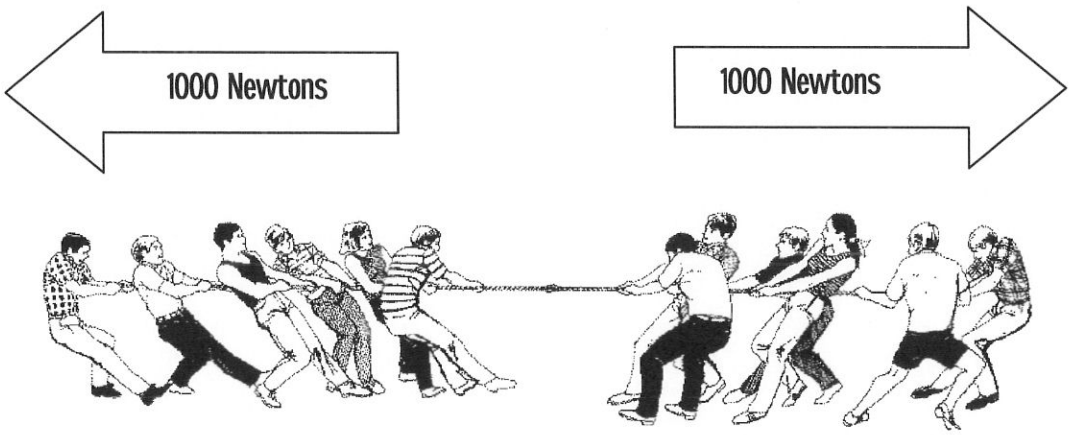
When two unequal forces act in **opposite directions** on an object, the net force is the **difference** of the two forces

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

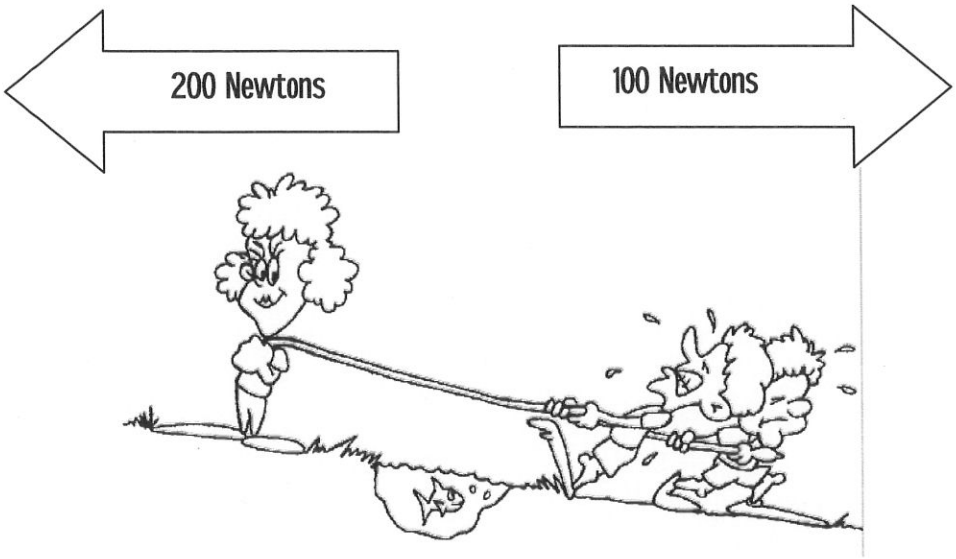
Balanced Force Unbalanced Force



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
b. velocity
c. change in position
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