

# CHAPTER 5: LECTURE 2: INTRODUCTION TO FORCES

1 pt cc  
printing

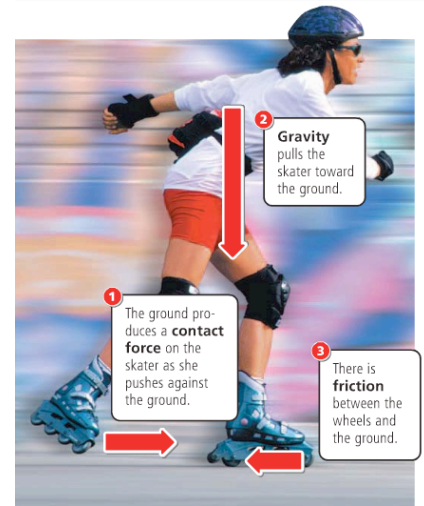
**What does motion have to do with forces?** You'd be surprised at how closely these two concepts go together. Suppose I asked you to move a heavy desk in the classroom. How would you move it? Get on one side & start pushing. Grab the legs & start pulling. Either way, you would be using force.

## What is a force?

- A \_\_\_\_\_ or \_\_\_\_\_
- Change the \_\_\_\_\_ of all objects
- Anytime you see something moving, you can be sure that a force created its motion.
- Without forces, sports, dancing, driving... *everything* would be impossible.
- Some forces, like \_\_\_\_\_, are present when things are not moving.

## Types of Forces

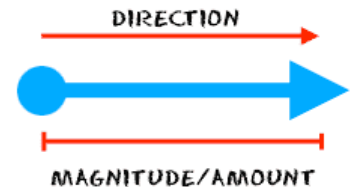
1. \_\_\_\_\_ force: created between two touching objects (holding a pencil, hugging someone, etc)
2. \_\_\_\_\_: force of attraction between two objects, Earth's gravity pulls on all objects
3. \_\_\_\_\_: a force that resists motion between two surfaces that are pressed together
4. The \_\_\_\_\_ force. It is the support force exerted upon an object, which is in contact with another stable object. For example, if a book is resting upon a surface, then the surface is exerting an upward force upon the book in order to support the weight of the book.



## Units

- \_\_\_\_\_ (\_\_\_\_\_)
- 1 newton = accelerating a 1 kg object at 1 m/s each second
- 1 pound = \_\_\_\_\_ newtons

$$1 \text{ N} = 1 \frac{\text{kg} \cdot \text{m}}{\text{s}^2}$$



## Forces have \_\_\_\_\_ & \_\_\_\_\_

- Like velocity, force is a \_\_\_\_\_.
- That means it has \_\_\_\_\_ (magnitude) & direction.
- Magnitude = \_\_\_\_\_ or \_\_\_\_\_ of the force
- Measured in Newtons

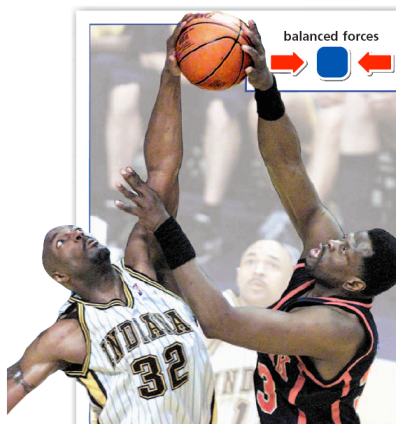
**Force Vectors:** A vector is an arrow used to show the direction & size of a force. The arrow points in the direction of the force. The length or thickness of the arrow represents the size or magnitude of the force. A smaller force of 5 N would have a small skinny arrow. A larger force of 500 N would have either a long arrow or a thick one.

**Combining Forces:** Usually, more than one force is exerted on an object at the same time. The sum of all forces acting on an object is called the \_\_\_\_\_ force. You need to look at the net force in order to figure out if/how an object will move.

## BALANCED FORCES

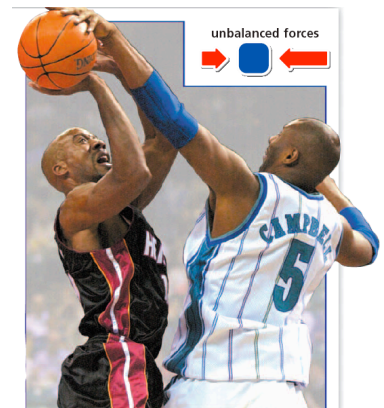
- Net force = \_\_\_\_\_
- \_\_\_\_\_ change in motion
- (object is not moving)

List 3 examples of balanced forces:



## UNBALANCED FORCES

- There is a \_\_\_\_\_ force acting on an object.
- Causes a change in motion
- Possible to add the forces together to find the size & direction of the net force.

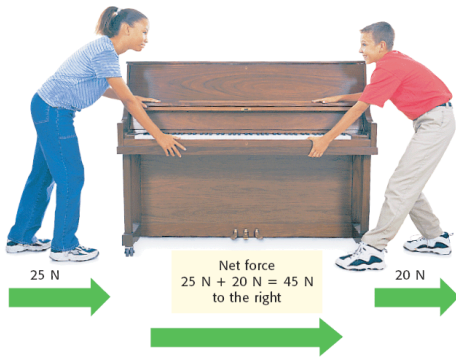


# UNBALANCED & BALANCED FORCES

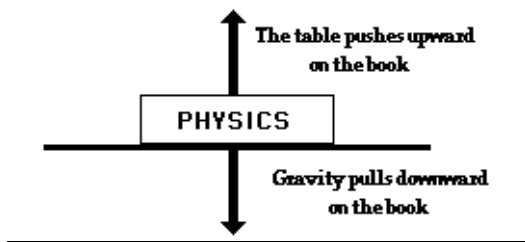
If the forces are moving in the \_\_\_\_\_ direction, \_\_\_\_\_ the forces.

If the forces are moving in \_\_\_\_\_ directions, \_\_\_\_\_ the forces.

## Forces in the Same Direction

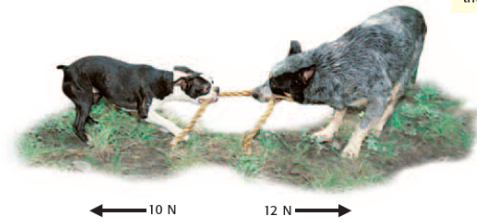


The forces on the book are balanced.



You Try It: Calculating Net Force

- |                                                              |                                                            |
|--------------------------------------------------------------|------------------------------------------------------------|
| 1. $15\text{ N}$ $25\text{ N}$<br>$\rightarrow$ $\leftarrow$ | 4. $2\text{ N}$ $14\text{ N}$<br>$\leftarrow$ $\leftarrow$ |
| 2. $8\text{ N}$ $12\text{ N}$<br>$\rightarrow$ $\rightarrow$ | 5. $3\text{ N}$ $3\text{ N}$<br>$\rightarrow$ $\leftarrow$ |
| 3. $18\text{ N}$ $22\text{ N}$<br>$\leftarrow$ $\rightarrow$ | 6. $7\text{ N}$ $7\text{ N}$<br>$\leftarrow$ $\rightarrow$ |



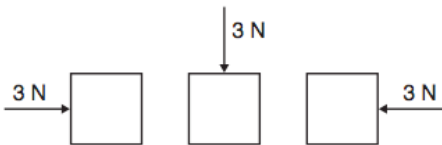
Net force  
 $12\text{ N} - 10\text{ N} = 2\text{ N}$   
to the right

The forces on the person are balanced.



### Sample Test Question #1

A force is acting on each of the objects below.

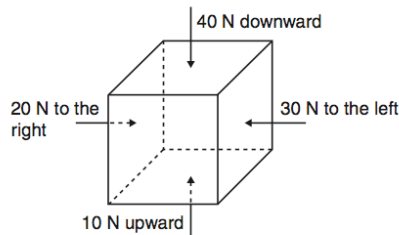


What can be concluded about these forces?

- A They are the same because they point toward the objects.
- B They are the same because they have the same magnitude.
- C They are different because they have different magnitudes.
- D They are different because they have different directions.

### Sample Test Question #2

15 Four forces are acting on a box, as shown below.



This box will increase in speed

- A downward and to the left.
- B downward and to the right.
- C upward and to the left.
- D upward and to the right.

### Sample Test Question #3

Four forces are acting on a plane; lift, drag, thrust, and weight. Using the values in the picture, what is the net force (direction & size) acting on the plane?

