

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## PHYSICS

### Balanced and Unbalanced Forces Review

A **free body diagram** is a simple drawing that shows an object of interest and all of the external forces that act upon that object. Forces on a free body diagram are represented as vector arrows. The **lengths of the arrows** are proportional to the magnitude of the force. The **arrow points** in the direction force's influence.

In this worksheet, you will evaluate free body diagrams and decide forces acting upon them are balanced or unbalanced forces. The **force vector arrows** are the blue arrows. The **initial velocity** of the object is the green arrow.

Fill in the chart for each free body diagram.

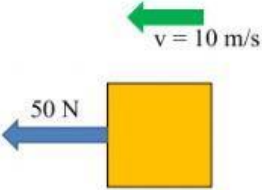
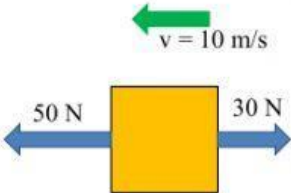
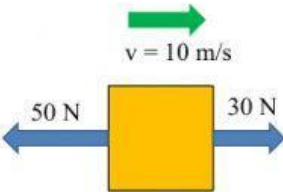
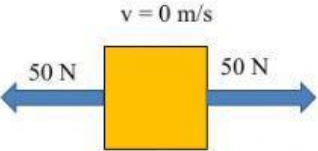
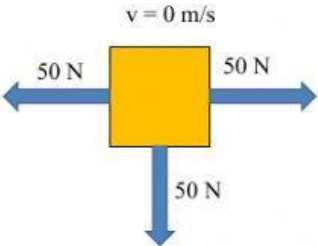
1. Are the forces balanced and unbalanced?
2. In which direction is the net force? Use geographic coordinates and directions. The directions are geographic directions: North, East, South, West, NE, SE, NW, SW, or no motion/no direction.
3. What will happen to the motion of the object?
  - Start from rest, begin to move
  - Get faster with time
  - Get slower with time
  - Change direction
  - Continue to move with the same velocity
  - Remain motionless (static equilibrium)

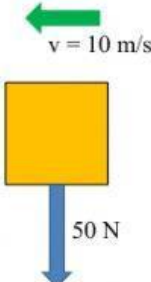
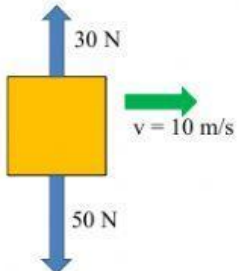
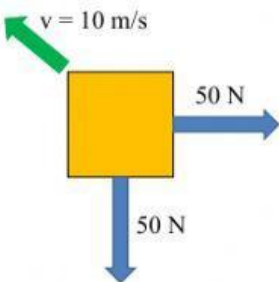
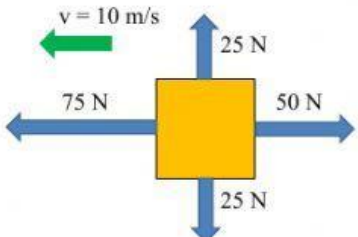
If forces are **balanced**, forces are equal in magnitude and opposite in direction. Forces acting on the object cancel each other out. The net force is zero. No acceleration will happen. The object will keep its original state of motion.

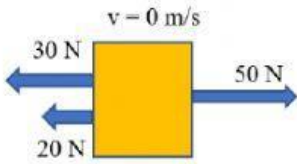
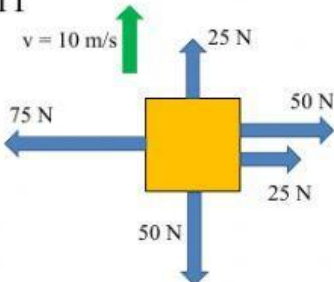
- Moving object will continue to move in same direction with same speed.
- Stationary object will continue to be stationary.

If forces are **unbalanced**, forces are not equal in magnitude and/or no opposite in direction. Forces acting on the object will not cancel each other out. One force will be leftover. The net force  $> 0$  and in a direction. Acceleration will happen.

- Net force in same direction as the original motion → get faster with time
- Net force in opposite direction as original motion → get slower with time
- Net force in oblique direction as original motion → change direction.
- Net force acting on a stationary object → object will start to move and get faster with time.

Free body diagram	Balanced or unbalanced forces?	What is the direction of the net force?	What will happen to the object's motion?
<p>#1</p> 	Unbalanced forces. (forces do not cancel out)	To the west. (one force, 50 N, to the west)	The object will accelerate to the west. The velocity will increase, get faster with time.
<p>#2</p> 			
<p>#3</p> 			
<p>#4</p> 			
<p>#5</p> 			

Free body diagram	Balanced or unbalanced forces?	What is the direction of the net force?	What will happen to the object's motion?
<p>#6</p> 			
<p>#7</p> 			
<p>#8</p> 			
<p>#9</p> 			

Free body diagram	Balanced or unbalanced forces?	What is the direction of the net force?	What will happen to the object's motion?
<p>#10</p> 			
<p>#11</p> 			
<p>#12</p> 