

# Newton's Laws

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

## Net Force

**Aim:** to investigate Newton 3<sup>rd</sup> Law

**Materials:**

- ✓ PHET Online Simulator ([https://bit.ly/phetforce\\_motion](https://bit.ly/phetforce_motion))
- ✓ Worksheet

**Method:**

- ✓ Go to [https://bit.ly/phetforce\\_motion](https://bit.ly/phetforce_motion)
- ✓ Choose the first tab (Net Force)



- ✓ Enable all three options on the top right to run the following tests

**Test 1:**

1. Put each side with one "little guy"
2. Press Go!
3. Write down your observation below.  
Why would this happen?



Both of the "little guys" pull with the same Force, in opposite direction. Sum of Forces = 0 N.

As a result, the trolley is not moving, Speed = 0. Forces are balanced.

**Test 2**

1. Click return to reset and add an extra "medium guy" on the red team
2. Press Go!
3. Write down your observation below. Why would this happen?

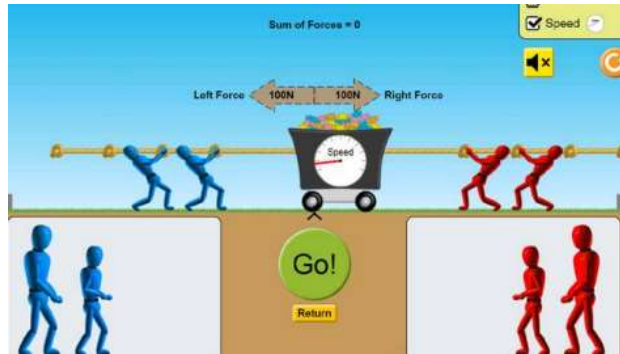


## Newton's Laws

The "blue" guy is pulling with the Force =50 N to the left and two "red" guys are pulling to the right with the Force = 100 N. The sum of Forces = 50 N to the Right. The trolley moves to the right, with some Speed. Forces are not balanced. Red Wins!

### Test 3

1. Click return to reset and press Go! (no changes from Test 2)
2. Wait for 3-4 seconds. Press Pause. Add a "medium guy" on blue team. (Same as figure)
3. Click Go! again.
4. Write down your observation. Why would this happen?



At the beginning the "blue" guy is pulling with the Force =50 N to the left and two "red" guys are pulling to the right with the Force = 100 N. The sum of Forces = 50 N to the Right. The trolley moves to the right, with some Speed. Forces are not balanced. When the "medium" guy was added, the Net Force = 0 N. The system is balanced; however, the trolley still moves to the right and red wins. Constant velocity implies the net force is zero.

### Test 4

1. Repeat Test 2 (i.e. one little guy vs two little guy)
2. Click Go!
3. Wait for 3-4 seconds. Press Pause.
4. Add a "big guy" to the blue team. Press Go!
5. Write down your observation. Why would this happen?

At the beginning the "blue" guy is pulling with the Force =50 N to the left and two "red" guys are pulling to the right with the Force = 100 N. The sum of Forces = 50 N to the Right. The trolley moves to the right, with some Speed. Forces are not balanced. When the "big" guy was added, the Net Force = 100 N to left. The system is unbalanced; the trolley start to move to the left and blue wins.

### Conclusion

- ✓ When the sum of force equal to zero,  
then the system is balanced **Net Force =0** and **speed = 0** (Test 1),  
or the system is balanced **Net Force =0** and moving with the uniform speed (Test 3)
- ✓ When the sum of force is greater than zero, then the system is unbalanced (Test 4)

## Newton's Laws

- ✓ This is known as Newton's **3<sup>rd</sup>** Law.
- ✓ **Word Bank:** (Net force / Resultant force/ Balanced force / Unbalanced Force)

Zero sum of force = **Balanced Force**

Non-zero sum of force = **Unbalanced Force**

Sum of force = **Net Force = Resultant Force**