Phet Forces and Free Body Diagrams Lab

Directions: Go to the Phet Link: https://phet.colorado.edu/en/simulation/forces-and-motion-basics
- **Select "Download"**
- **When the APP opens select "Net Force"**
- **Choose the "Sum Forces" and "Sound" on**

Net Force Section
1. Think back to the discussion for solving for Fnet. How do you solve for a Net Force?

2. Select one blue 50N person and a 50N red person. Move them up to the rope. Draw a Free Body Diagram with vector arrows, labels and a box below.

3. What is the sum of the forces and direction for problem #2? Explain.

4. Select one blue 150N person, 100N blue person, two 50N red people. Move them up to the rope. Draw a Free Body Diagram with vector arrows, labels and a box below.

5. What is the sum of the forces and direction for problem #4? Explain.

6. Select 5 people red or blue. Move them up to the rope. Draw a Free Body Diagram with vector arrows, labels and a box below.

7. What is the sum of the forces and direction for problem #6? Explain.

8. Explain how a Free Body Diagram allows you to solve force problems.

Motion
At the bottom of the APP change the window to MOTION.
- **Check the boxes for Forces, Values, Masses and Speed**

9. Under the "Applied Forces" arrow to 50 N. Watch and observe the person. Describe in detail what occurs with forces and what happens to the speed?

10. Select the reset button. Add the girl on top of the box. There is a mass of 90kg. Under the "Applied Forces" arrow to 50 N.Watch and observe the person. Describe in detail what occurs with forces and what happens to the speed?

11. Now add in additional 100N of "Applied Forces." Describe what happens with forces and what happens to the speed?

12. Select a combination of 3 objects and an "Applied Force" of your choosing. Describe what happens with forces and what happens to the speed?

<u>**Friction**</u>
At the bottom of the APP change the window to Friction.
- **Check the boxes for Forces, Values, Masses and Speed**

13. Under the "Applied Forces" arrow to 50 N. Watch and observe the person. Describe in detail what occurs with forces and what happens to the speed?

14. Now add in additional 100N of "Applied Forces" for a total of 150N.
    a. Describe what happens with forces and what happens to the speed?

    b. What is the friction force?

    c. What is the sum of the forces?

    d. Describe the speed.

15. Change the friction to the maximum amount.
    a. What is the friction force?

    b. What is the sum of the forces?

    c. Describe the speed.

16. Now you select. Choose the following:
    a. Friction force= _____
    b. Applied force=_____
    c. Sum of the forces=_____
    d. Acceleration=_____
    e. Describe what happens with forces and what happens to the speed?

    f. What is the friction force?

    g. What is the sum of the forces?

h. Describe the speed and acceleration.

Conclusion

17. How does friction, acceleration, speed and net force relate to each other? Explain.

18. Describe an example of friction, speed and net force in your life.

19. Draw a Free Body Diagram of your example and explain how the forces interact with each other.

20. Describe an example where you want to solve for a balanced Fnet= 0N. Be specific and detailed.

21. Describe an example where you want unbalanced Fnet. Be specific and detailed.