Name: _____.

Newton's Third Law Activities

Station 1: Sequential Spring Scales

A 10 N weight is hanging off the side of the table. Without reading the spring scales, predict the reading on each of the spring scales: Scale 1: _____ Scale 2: _____

Now check the spring scales. Draw free body diagrams for the forces on each weight and each scale.

Justify your observations based on the free body diagrams and Newton's Third Law.

Station 2: The Bathroom Scale

One member of the group stands on the bathroom scale. Convert the "mass" displayed by the scale into Newtons:

Draw a free body diagram for the forces acting on the person and a free body diagram for the forces acting on the scale.

The student on the scale now pushes down on the counter while continuing to stand on the scale. What is the force now displayed on the scale (again, convert to Newtons). Based on this observation, what force does a bathroom scale actually measure?

Station 3: Twist on Tug-of-War

The strongest member of the group sits on the dynamics platform and holds one end of the rope. Another member of the group stands in front of the dynamics platform and holds the other end of the rope. Both people pull on the rope (don't jerk the rope!). Describe the motion of the students.

Compare the force that the student sitting on the platform exerts on the rope with the force that the student standing exerts on the rope.

Draw a free body diagram for the forces on the student on the platform and a free body diagram for the forces on the student standing.

Explain your observations of each student in the context of Newton's First and Third Laws.

Station 4: Medicine Ball Propulsion
One member of the group sits on the dynamics platform. Another member of the group stands a bit behind the dynamics platform. The person sitting on the platform throws the medicine ball forward as hard as they can. Describe the motion of the student on the platform.

Explain your observations in the context of Newton's Third Law.

Station 5: Computerized Force Comparison
One member of the group holds one force sensor; another member holds another force sensor. A third member starts the data acquisition and both members gently pull on their force sensors such that tension is created in the string but the force sensors don't move. Draw a free body diagram for the forces on one of the sensors and compare the force vs. time graphs of the two force sensors:

Now both members gently pull on their force sensors such that the force sensors both move with a nearly constant velocity. Draw a free body diagram for the forces on one of the sensors and compare the force vs. time graphs of the two force sensors:

Now both member gently pull on their force sensors such that the force sensors accelerate and change direction. Draw a free body diagram for the forces on one of the sensors and compare the force vs. time graphs of the two force sensors:

Explain the graphs for all three scenarios in the context of Newton's Third Law.

Station 6: WALL-E and the Fire Extinguisher
Watch the video on the laptop (it keeps looping). What is the force that is accelerating WALL-E?

What is the paired force corresponding to this force?

Why can a rocket propel a ship in space but a propeller-based airplane cannot?