Name:
Period:

Forces Trackstar

DIRECTIONS: Open "**Google Chrome**". Go to **trackstar.4teachers.org**. Type "**457961**" into "**View Track #**". Click "**Go**". Click "**View in Frames**".

Site #1: PHET Forces and Motion

Part 1: Net Force

1) Click on the box labeled "Net Force."
2) In the right hand corner, make sure:
   "Sum of Forces" button is checked
   "Values" button is checked
   "Sound" button has an "x"

Run the simulation by clicking the green "Go!" button. Reset the simulation by clicking the orange arrow.

3) For each simulation, predict the net force **BEFORE** you run the simulation. **AFTER** running the simulation, record the actual **net force** (**both direction and magnitude**), and explain if the forces are **balanced** or **unbalanced**. Record everything in the data table below.

Simulation	Prediction of Net Force *(zero N OR more force in one direction)*	Actual Net Force	Balanced or Unbalanced
Simulation #1: Place 2 people *(one person per side)* who are the **same size** and the **same distance** away from the cart.			
Simulation #2: Place 2 people *(one person per side)* who are the **same size** but **different distances** away from the cart.			
Simulation #3: Place 2 people *(one person per side)* who are **different sizes** and the **same distance** away from the cart.			
Simulation #4: Place 2 people *(one person per side)* that are **different sizes** and **different distances** away from the cart.			

4) To make the cart move when the people are the **SAME DISTANCE** away, the people need to be the _____ *(same/different)* sizes because _____ _____ .

Part 2: Friction

Go back to the main page and click on the "Friction" box. In the same way you ran the tug of war simulation, you will run the friction simulation.

1) Check that the following buttons are checked:
   Forces
   Sum of Forces
   Values
   Masses
   Speed
2) Change the "Applied Force" measurement. What is the minimum amount of force needed to get the box to move? _____
3) What happens to the speed of the box as time passes? _____
4) Change the Friction button to "lots". What happens to the speed over time? Why?
5) Eventually the forces become _____ *(balanced/unbalanced)* when the box is stationary.

6) Reset the friction button to the middle.
7) When you add an extra box, the mass _____ *(increases/decreases).* When this happens, you need _____ *(more/less)* force to overcome friction. Specifically you need at least _____.

Site #2: Forces at the Fun Fair

Predict: Before you begin answer the questions below:

1) I predict _____ *(Steel/Rubber)* wheels will have the most friction.
2) If I add more people to my car, I am increasing the _____ of the car.
3) If I add more people to my car, I will need to increase the _____ so that my car will travel the same distance.
4) A smooth car will have less air _____ than a boxy car.

Try it out: How can you get a car to arrive at the unloading area safely with **1 passenger**?

Cart weight: _____ Max Speed: _____

Type of wheels: _____ Design of car: _____

Try it out: How can you get a car to arrive at the unloading area safely with **8 passengers**?

Cart weight: _____ Max Speed: _____

Type of wheels: _____ Design of car: _____

5) When I increase the amount of passengers, I had to change _____ _____ because _____ _____ .

Site #3: Skydiving

1) When I increase the **mass**, it takes _____ *(more/less)* time for **air resistance** to equal gravity. Also, when I increase the **mass**, the **speed** of the object as it's falling is _____ *(faster/slower).*

2) When I increase the **size of the parachute**, it takes _____ *(more/less)* time for **air resistance** to equal gravity. Also, when I increase the **size of the parachute**, the **speed** of the object as it's falling is _____ *(faster/slower).*

3) If we were to drop our "rocket" from a **small** distance, what would be the best mass *(low/high)* and parachute size *(small/big)* to have? Why?

** What information did you collect that can help us when we build our "rocket"? Be specific!