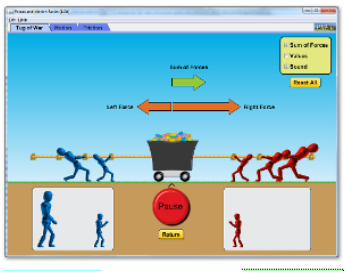
Name_____Date_____Period_____

Forces and Motion: Basics



GETTING STARTED:

1) Go to:
http://phet.colorado.edu/en/simulation/forces-and-motion-basics

2) Click Run Now!

Part 1: (TUG OF WAR)

Make sure all of the boxes in the upper right hand corner are checked.

1. Create a scenario on the rope pull which in which the forces are **BALANCED**.
    a. Draw a picture of the **VECTOR ARROWS** and the **NET FORCE** (SUM OF FORCES) **ARROW** in the space below.
    b. What is the **NET FORCE** on the cart?

2. Create a scenario on the rope pull in which the forces are **UNBALANCED**.
    a. Draw a picture of the **VECTOR ARROWS** and the **NET FORCE** (SUM OF FORCES) **ARROW** in the space below.
    b. What is the **NET FORCE** on the cart?_____

PART 2: (MOTION)

1. Click on the Motion Tab.
2. Play around with the simulation so that you know how to use it.
3. Make sure that all of the boxes in the upper right hand corner are checked (Force, Value, Masses, Speed)
4. ***There is no FRICTION in this scenario.***

PART 2: (MOTION Continued)

I. <u>Refrigerator 1:</u>

a. Place the refrigerator on the skateboard.

b. **APPLY** a force of approximately 100 N.

c. Once the skateboard is moving let go.

d. Answer the following questions.

1) What happens to the **SPEED** of the Skateboard/Refrigerator when there is no longer a force being applied?

2) Are the forces acting on the Skateboard/Refrigerator **BALANCED** or **UNBALANCED**?

3) What are the **FORCES** acting on the Skateboard/Refrigerator?

4) Will the Skateboard/Refrigerator ever stop moving? Why or why not? **EXPLAIN**!

II. <u>Refrigerator 2:</u>

a. Reset the simulation and click all of the boxes again.

*b. Place the refrigerator on the skateboard and **APPLY** a force of approximately 100 N.*

*c. This time, **DO NOT** stop applying the FORCE to the refrigerator/skateboard.*

d. Answer the following questions.

1) What happens to the **SPEED** of the Skateboard/Refrigerator when the **FORCE** is continuously applied?

2) Are the forces acting on the Skateboard/Refrigerator **BALANCED** or **UNBALANCED**?

3) Will the Skateboard/Refrigerator ever stop changing? Why or why not? **EXPLAIN**!

PART 3: (FRICTION)

a) *Click on the Friction Tab.*

b) *Play around with the simulation so that you know how to use it.*

c) *Make sure that all of the boxes in the upper right hand corner are checked (Forces, Sum of Forces, Values, Masses, Speed)*

d) *Play around with the simulation so you know how it works.*

1) How does the presence of **FRICTION** affect the movement of the objects in the simulation?

2) **BEFORE** the object starts moving, what do you notice about the **FRICTION FORCE** and the **APPLIED FORCE? (Are the FORCES BALANCED or UNBALANCED?)**

3) **AFTER** the object starts moving**,** what do you notice about the **FRICTION FORCE** and the **APPLIED FORCE? (Are the FORCES BALANCED or UNBALANCED?)**

4) Place 1 50kg box on the ground. How much **FORCE** is required to put the box in **MOTION**?

5) Place the 2nd 50 kg box on top of the 1st. **PREDICT** how much **FORCE** will be required to put the box in **MOTION.**_____

Try it.

6) What was the **ACTUAL FORCE REQUIRED**?_____

7) How are these 2 **FORCES related?** _____
_____

8) Can you use this information to **PREDICT** how much force is required to move the **REFRIGERATOR**?
Predicted force to move Refrigerator_____

Actual force required to move refrigerator_____

CHALLENGE:

What is the MASS of the PRESENT? EXPLAIN how you got your answer.