Weekly Agenda – Week 8 Quarter 1

Foundations Physical Science – **Name:**____________________________

Weekly Learning Outcomes
-I can… 1. Define Newton's 3 Laws of motion 2. Calculate force of a mass using the acceleration. 3. Consider inertia of matter for objects in motion. 4. Construct diagrams representing the forces on a free-body.

Date	*Activities*	*What's Due*
***Monday* 10/9**	-Newton's Laws Reading -Newton's Laws Google Quizzes on shakerscience.weebly.com *No conferences* *Homework: TAG Sheets* & Vocab (p.1-3)	*-Week 6 Packet*
***Tuesday* 10/10**	-Review Unit 2 Test -Newton's Laws Lab (p.4-9) *Homework: Newton's Laws Lab questions* (p.4-9)	*-TAG Sheets* & Vocab (p.1-3)
***Wednesday* 10/11**	-Notes on Calculating Forces -Drawing Free-body diagrams } (p.10-13) -Free-body Simulation Lab (p.14-19) *No conferences* *Homework: Free-Body Simulation Lab* (p.14-19)	*-Newton's Law's Lab questions* (p.4-9)
***Thursday* 10/12**	-Circle Time -Stations Group Review (separate) *Homework: Forces in Motion practice* (separate) ~~*& TAG Sheet*~~	*-Free-Body Simulation Lab* (p.14-19)
***Friday* 10/13**	-QUIZ on Newton's Laws & Forces -Red Bull Stratosphere video *Homework: Flex*	*-Forces in Motion practice* ~~*& TAG Sheet*~~ (separate)

FPS Chapter 12 Vocabulary (Section 1-3)

Name:_________________________________ Period:_______

1. Static Friction
2. Sliding Friction
3. Rolling Friction
4. Fluid Friction
5. Air resistance
6. Gravity
7. Terminal velocity
8. Projectile motion
9. Inertia
10. Mass
11. Weight
12. Momentum
13. Law of Conservation of Momentum

FPS – T.A.G. Sheet – Chapter 12

Name______________________________ Period__________

I can…
Describe Newton's first law of motion and its relation to inertia. *Describe Newton's second law of motion and use it to calculate acceleration, force, and mass.* *Relate the mass of an object to its weight.*

Section 12.2 – page 363-369	
Title of the Section ______________________________ ______________________________	Describe any image in the section .

5. State Newton's first law in your own words. MUST NOT be the definition in the book.

____

____

6. Which equation state Newton's second law?

____

____

7. How is mass different from weight?

____

____

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____

FPS – T.A.G. Sheet – Chapter 12

Name______________________________ Period__________

I can…
Explain how action and reaction forces are related according to Newton's third law of motion. *Calculate the momentum of an object.* *Describe what happens when momentum is conserved during a collision.*

Section 12.3 – page 372-377

Title of the Section ____________________________________ ____________________________________	Describe any image in the section .

8. Using Newton's Third law, explain what is meant by action and reaction pairs.

____

____

9. State in words the formula for momentum.

____

____

10. If an eagle and a bumble are traveling at 8km/hr, which has more momentum? EXPLAIN.

____

____

11. How much momentum does a building have? Explain.

____

____

Name: ______________________
Partners: ____
Date: __________
Period: ______

Newton's Laws Activities

Dominoes Dash (1st Law of Motion)

Background Information:

Isaac Newton's 1st law of motion, also called the Law of Inertia, states that objects at rest stay at rest and objects in motion will remain in motion until pushed or pulled by a force. When objects are not moving they are said to be at rest.

Average speed is the rate of motion calculated by dividing the distance traveled by the amount of time it takes to travel that distance. Average speed = total distance traveled / travel time or $s = d / t$.

Materials: 28 dominoes, meter stick, stopwatch, and a calculator.

Procedure:

1. Set up all 28 dominoes with equal spacing between them. Set the dominoes in a straight line to cause a chain reaction when the first domino is pushed.
2. Measure the length of the domino row from the first to the last domino in centimeters (cm). Record this data in the table.
3. Use the stopwatch to measure the time it takes for the entire row of dominoes to fall after the first domino is pushed until the last is down in seconds (sec). Record the data in the table.
4. Calculate the speed at which the dominoes fell. Record the data in the table.
5. Set up another row of a different length. Repeat steps 3 – 4.
6. Repeat for a total of 5 trials.

Data:

Speed of Falling Dominoes		
Length of domino row (cm)	Time to fall (sec)	Average speed of falling dominoes (cm / sec)

Data Analysis:

Make a line graph to show the relationship between the length of the domino row and the time it takes to fall. Put the length of the row on the X-axis and the time to fall on the y-axis .

Title: ____

Data Analysis:

What relationship do we see between the variables? In other words, how does the independent variable affect the dependent variable?

____

____

____

Conclusions:

1. What effect does distance have on the speed of a moving object?

____

____

2. What effect does time have on the speed of a moving object?

____

____

3. What was the independent variable in this experiment? Why?

____

____

4. What was the dependent variable in this experiment? Why?

____

____

5. What are the controlled variables (constants) in this experiment?

____

____

6. Why did we use a line graph to display the data?

____

____

7. How does this activity relate to Newton's 1st Law of Motion (Law of Inertia)?

____

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____

Marble Motion (2nd Law of Motion)

Background Information:

Isaac Newton's 2nd law of motion, also called the Law of Acceleration, states that the acceleration of an object is proportional (similar) to the force that's applied to it, and inversely proportional (opposite) to the mass of the object. In other words, if the force remains constant (the same) as the mass of an object increases, its acceleration will decrease and vice versa. Force is calculated by multiplying mass times acceleration or $F = m \times a$

Materials: ping pong ball, small marble, golf ball, softball, straw, and tray with raised side to capture moving balls

Procedure:

1. Set ball over marked area of the tray and apply force by blowing through a straw on the ball to reach the other side of the tray with the raised side. Record the acceleration rate on the table as slow, medium, or fast by placing a check on which applies.
2. Apply **the same force** (blow with the same force) on the next ball and record your observation.
3. Repeat the same procedure with the other balls and record your observations.

Data:

Balls and their weights in grams (g)	Acceleration Rate of the Balls		
	Slow speed	**Medium speed**	**Fast speed**
Ping Pong g			
Marble g			
Golf ball g			
Softball g			

Data Analysis:

Make a bar graph to show the relationship between the weight of the balls and the acceleration rate. Put the weight of the balls on the x-axis and the acceleration rate on the y-axis (slow, medium, fast). Mark slow, medium, and fast rates at equal distances on the graph.

Title: ____

Conclusions:

1. What was the independent variable in this experiment? Why?

____

____

2. What was the dependent variable in this experiment? Why?

____

____

3. What are the controlled variables (constants) in this experiment?

____

____

4. Why did we use a bar graph to display the data?

____

____

5. How does this activity relate to Newton's 2st Law of Motion (Law of Acceleration)?

____

____

____

Balloon Rockets (3rd Law of Motion)

Background Information:

A rocket's movement depends on Newton's third law of motion, also termed Law of Action/Reaction, which states that for every action there is an equal and opposite reaction. When a rocket blows out ga: in one direction (action force), the rocket is pushed in the opposite direction (reaction force). In other words, when there is a force on one thing in one direction, another force is acting on something else in another direction. The gas pushes against the rocket and the rocket pushes back just as hard against th gas.

Materials: fishing string stretched across a room, straw, medium size balloon, and tape.

Procedure:

1. Blow up a balloon, but do not tie it.
2. Surround a long piece of scotch tape around one straw located on the fishing line and attach to one end of the inflated balloon. Add tape around the other straw and tape it to the other end c the balloon in order to secure the inflated balloon to the hanging string.
3. Slide the balloon-straw system down at equal distances to your other classmates.
4. Release the balloon. Record your observations.
5. Obtain same balloon and blow it up half-way and repeat steps 2-4.

Data:

Draw your observation of the experiment.

Questions:

1. What is the action force in this experiment?

   ____

2. What is the reaction force in this experiment?

   ____

3. What happened when the amount of force (amount of air in the balloon) was changed?

   ____

4. How does this activity relate to Newton's 3rd Law of Motion (Law of Action/Reaction)?

   ____

   ____

   ____

5. Explain how bumper cars at an amusement park apply the third law of motion.

   ____

   ____

   ____

FPS – Newton's Laws Math Review

Names____ Period__________

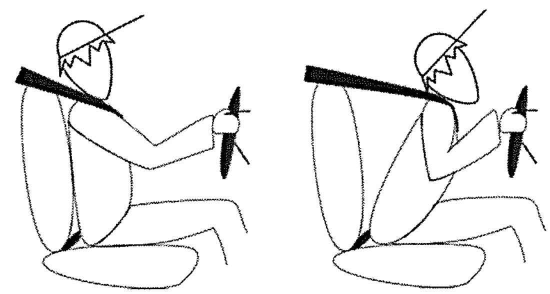
I can…
Define and distinguish between Newton's three laws of motion.
Make calculations using Newton's Second law.
Construct and interpret action-reaction pairs using Newton's Third Law.

Newton's Laws Review

Newton's first law – the Law of Inertia states ______________________________

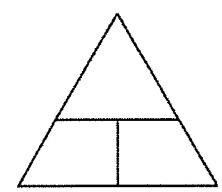
____.

What is happening in the image?



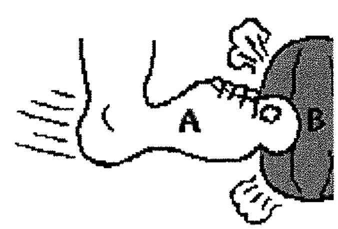
Newton's second law – F = ma

What is the acceleration if the force applied on a 5 kg ball is 50 N?



Newton's third law – Action-Reaction pairs

Everything occurs in action-reaction pairs. Come up with an example.



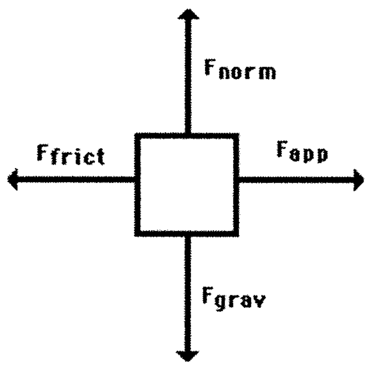
FPS – Free Body Diagrams

Name______________________________ Period__________

I can…
Interpret free-body diagrams. *Solve for net force and determine direction and magnitude.* *Construct a Free-body diagram from a scenario description.*

Remember…?

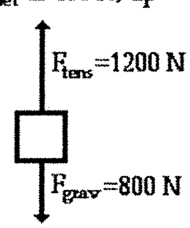
What are free-body diagrams?



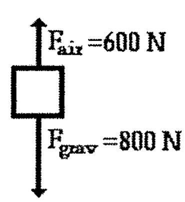
What are the forces involved in a free-body diagrams?

How do we know the overall force?

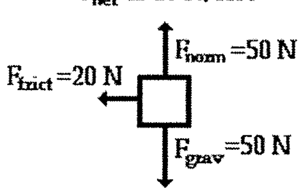
F_{net} is 400 N, up



F_{net} is 200 N, down

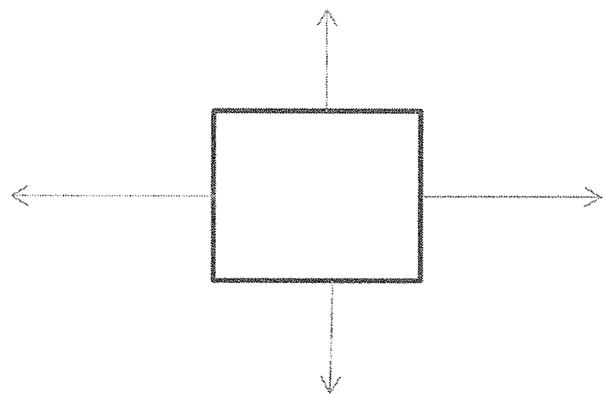


F_{net} is 20 N, left



Drawing Free-Body Diagrams

1. To draw free-body diagrams, we draw a ____________________ and ______________ to show the forces on that free-body. We also label gravity as _________, friction as _________, applied force as _______, and normal force as _________. Label the free-body below.



2. Create a free-body diagram for each of the following scenarios. You may not be able to label exact magnitudes of force, but use the size and directions of arrows to represent estimates.

   a) A book is at rest on a table-top.

   b) A girl is suspended motionless from a bar which hangs from the ceiling by two ropes.

   c) An egg is free-falling from a nest in a tree. Neglect air resistance.

   d) A flying squirrel is gliding (no wing flaps) from a tree to the ground at constant velocity. Consider air resistance.

e) A rightward force is applied to a book in order to move it across a desk with a rightward acceleration. Consider frictional forces.

f) A college student rests a backpack upon his shoulder. The pack is suspended motionless by one strap from one shoulder.

g) A skydiver is descending with a constant velocity. Consider air resistance.

h) A force is applied to the right to drag a sled across loosely-packed snow with a rightward acceleration.

i) A football is moving upwards towards its peak after having been booted by the punter.

j) A car is coasting to the right and slowing down.

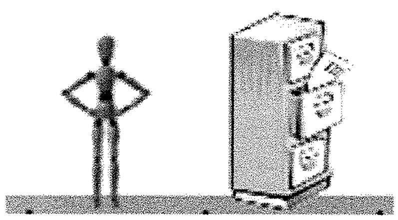
FPS – Forces on a Free-Body Simulation Lab

Name________________________________ Period___________

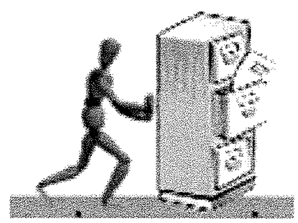
Pre- lab Practice

Joe needs to push a file cabinet across the room. He begins by just looking at it. (**Scene 1**) He then begins pushing on the file cabinet. At first, the file cabinet does not move. (**Scene 2**) Then the file cabinet begins to slide. (**Scene 3**)

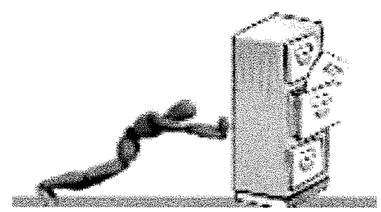
Scene 1:
Joe not pushing



Scene 2:
Joe pushing but cabinet not moving



Scene 3:
Joe pushing and cabinet moving



1. Use free-body diagrams or arrows to describe all the forces you think are acting on the cabinet in each scene.

2. Why do you think the file cabinet moves in **scene 3** but not in **1** or **2**?

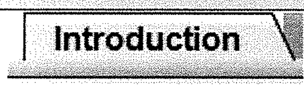
3. If the floor were covered with ice, how would the motion of the cabinet change?

1. *Grab a computer*
2. *Go to* ***http://shakerscience.weebly.com***
3. *Mouseover* **Foundations Physical Science**→*Mouseover* **Unit 3**→ *Click* **Week 8** → *Click* ***"Free-Body Simulation Lab"***

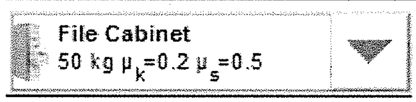
I can…
Create and interpret free-body diagrams. *Analyzes forces to predict changes of motion.*

Work with your partner(s) to answer the following questions.

Part One: Balanced and Unbalanced Forces

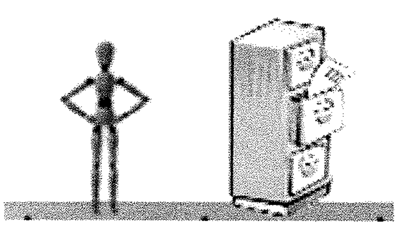
1. 

Play with the "Introduction" tab by applying forces in each direction and change in the objects. Describe what you are noticing below.

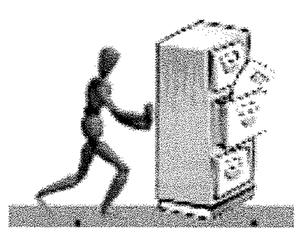
2. Change your object to the filing cabinet. 

Using the simulation this time to help you, add arrows to the file cabinet in the images below. Label your arrows!

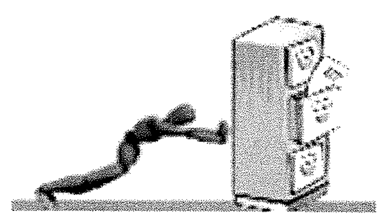
Scene 1:
Joe not pushing



Scene 2:
Joe pushing but cabinet not moving



Scene 3:
Joe pushing and cabinet moving



3. Describe what is necessary to start the file cabinet moving.

4. Compare the **Applied Force** arrow and the **Friction Force** arrow when the cabinet is stationary and when the cabinet is moving.
   - What is similar? ____
     ____
   - What is different? ____
     ____

5. In which scene(s) are the forces **balanced**?

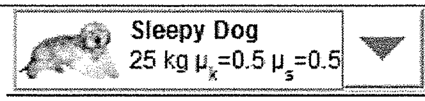
6. In which scene(s) are the forces **unbalanced**?

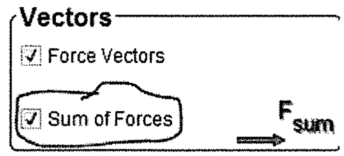
Part Two: Applied, Friction, and Net force

7. Still on the Introduction tab, we will examine friction. Describe what happens to the **Friction Force** arrow as you apply more and more force in one direction.

8. What happens to the Friction Force arrow once the cabinet starts moving?

9. What happens to the Friction Force when an object is stopped?

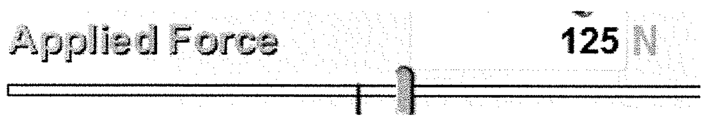
10.Change the object to a **Sleepy Dog**. 



Check the box that says "Sum of Forces".

Describe anything you notice that is different about moving this object.

11. In the Applied Force textbox, type in 125 Newtons of force.



Describe what happens to the motion of the dog. (Hint: be specific about the velocity.)

12.Sketch the free-body diagram of the dog to the right. Label all arrows.

13. Press the pause button, and then type in 200 Newtons of force to the applied force and press enter. With the motion still paused, what has changed?

14. Sketch the free-body diagram of the dog now. Label all arrows. Include a net force arrow.	
15. Can you find 3 different ways to change the net force on the dog? List the ways below.	

Part Three: Forces and Changes in Motion
16. In the same tab and still working with the **Sleepy Dog**, we will examine changes in speed. Apply a small about of force. How much does the dog's speed change? 17. Apply a large about of force. How much does the dog's speed change? 18. Using your answers to #16 and #17, make a statement about the **relationship between applied force and an objects change in speed**.

Post-Lab Individual Work

Work on the following problems *on your own*. When you are done, text in your response to the poll on the board.

1. Jill is moving a sleepy dog at a constant velocity. Sketch the free-body diagram.

2. Jill then begins moving the sleepy dog at a rightward acceleration. Consider friction. Sketch the free-body diagram.

3. Comparing #1 and #2, list all the things about the motion and forces that changed.

4. If the floor were covered in ice, how would the motion and forces on the object change?

5. The sleep dog weighed about 25 kg. What would change if Jill were moving a 3 kg book?

6. How useful for your learning was this science activity, compared to other science class activities? (circle)

   More useful   About the same   Less useful

7. How enjoyable was this science class activity, compared to other science class activities? (circle)

   More enjoyable   About the same   Less enjoyable