Weekly Agenda – Week 9 Quarter 1

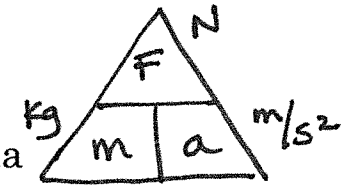
Foundations Physical Science – **Name:**_____

Weekly Learning Outcomes
-I can… 1. Define Newton's 3 Laws of motion 2. Calculate force of a mass using the acceleration. 3. Calculate momentum. 4. Calculate weight.

Date	*Activities*	*What's Due*
Monday 10/16	*Parent teacher conferences* *Homework:*	
Tuesday 10/17	*Parent teacher conferences* *Homework:*	
Wednesday 10/18	-Finish "Understanding Car Crashes" *No conferences* *Homework: Second & Third Law of Motion Problems* (p.1-3)	*-Week 8 Packet*
Thursday 10/19	-Circle Time -Weight & Momentum Notes (p.4-6) -Weight Quick Lab (p.7-8) -Weight and Momentum problems (p.9-12) *Homework: Weight & Momentum problems* (p.9-12)	*-Second & Third Law of Motion problems* (p.1-3)
Friday 10/20	-Review Weight and Momentum problems (p.9-12) *Homework: Flex*	*-Weight & Momentum problems* (p.9-12)

TEST NEXT WEEK!!!!

Newton's Second Law of Motion Practice Problems F=ma



When solving these problems, look at what the question is asking you to know how to solve it. If it is asking for **mass**, then use **m= F/a (units =kg)**. If it is asking for **force**, then use **F=ma (units= Newton's)**. If it is asking for **acceleration**, then use **a= F/m (units = distance/time)**.

1. A car with a mass of 1500 kg accelerates when the traffic light turns green. If the net force on the car is 4000 Newton's, what is the car's acceleration?

2. A boy pushes forward a cart of groceries with a total mass of 40.0 kg. What is the acceleration of the cart if the net force on the cart is 60.0 N?

3. What is the upward acceleration of a helicopter with a mass of 5000 kg if a force of 10,000 N acts on it in an upward direction?

4. An automobile with a mass of 1200 kg accelerates at a rate of 3 m/sec^2 in the forward direction. What is the net force acting on the automobile?

5. A 25-N force accelerates a boy in a wheelchair at 0.5 m/s^2. What is the mass of the boy and the wheelchair (combined together)?

6. A 20-N force acts on an object with a mass of 2.0 kg. What is the objects acceleration?

7. A box has a mass of 150 kg. If a net force of 3000 N acts on the box, what is the boxes acceleration?

8. What is the acceleration of a 1000 kg car subject to a 500 N net force?

9. What force is necessary to accelerate a 1250 kg car at a rate of 40 m/s^2?

10. What is the mass of an object if a force of 34 N produces an acceleration of 4 m/S^2?

11. A baseball accelerates downward at 9.8 m/s^2. If the gravitational force is the only force acting upon the ball and is 1.4 N, what is the baseball's mass?

12. An object at _____ stays _____. (2 answers)

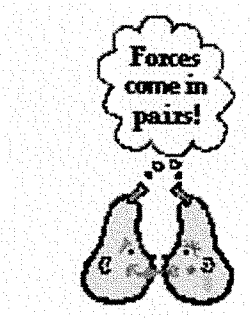
 Name: _____

Newton's Third Law

Read from **Lesson 4** of the **Newton's Laws** chapter at **The Physics Classroom**:

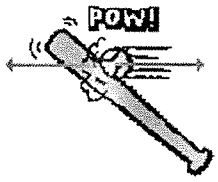
http://www.physicsclassroom.com/Class/newtlaws/u2l4a.html
http://www.physicsclassroom.com/Class/newtlaws/u2l4b.html

MOP Connection: Newton's Laws: sublevel 12



A force is a push or pull resulting from an interaction between two objects. Whenever there is a force, there are two objects involved - with both objects pushing (or pulling) on each other in opposite directions. While the direction of the pushes (or pulls) are opposite, the strength or magnitudes are equal. This is sometimes stated as Newton's Third Law of motion: *for every action, there is an equal and opposite reaction.* A force is a push or a pull and it always results from an interaction between two objects. These forces always come in pairs.

1. For each stated *action force,* identify the *reaction force.*

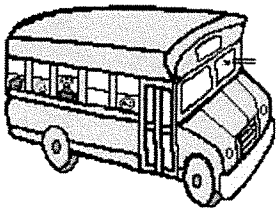


Bat hits ball.

_____

Man pushes car.

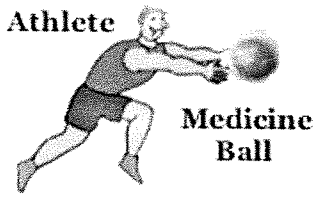
_____

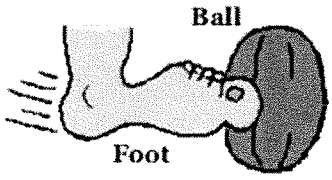


Bus hits bug.

_____

2. Identify by words the action-reaction force pairs in each of the following diagrams.



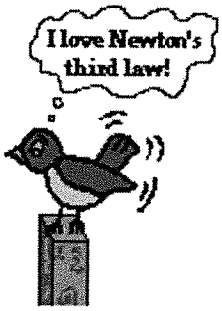


3. TRUE or **FALSE**:

As you sit in your seat in the physics classroom, the Earth pulls down upon your body with a gravitational force; the reaction force is the chair pushing upwards on your body with an equal magnitude.

If False, correct the answer.

4. Shirley Bored sits in her seat in the English classroom. The Earth pulls down on Shirley's body with a gravitational force of 600 N. Describe the reaction force of the force of gravity acting upon Shirley.



5. Use Newton's third law (law of action-reaction) and Newton's second law (law of acceleration: $a = F_{net}/m$) to complete the following statements by filling in the blanks.

   a. A bullet is loaded in a rifle and the trigger is pulled. The force experienced by the bullet is _____ (less than, equal to, greater than) the force experienced by the rifle. The resulting acceleration of the bullet is _____ (less than, equal to, greater than) the resulting acceleration of the rifle.

   b. A bug crashes into a high speed bus. The force experienced by the bug is _____ (less than, equal to, greater than) the force experienced by the bus. The resulting acceleration of the bug is _____ (less than, equal to, greater than) the resulting acceleration of the bus.

   c. A massive linebacker collides with a smaller halfback at midfield. The force experienced by the linebacker is _____ (less than, equal to, greater than) the force experienced by the halfback. The resulting acceleration of the linebacker is _____ (less than, equal to, greater than) the resulting acceleration of the halfback.

   d. The 10-ball collides with the 14-ball on the billiards table (assume equal mass balls). The force experienced by the 10-ball is _____ (less than, equal to, greater than) the force experienced by the 14-ball. The resulting acceleration of the 10-ball is _____ (less than, equal to, greater than) the resulting acceleration of the 14-ball.

FPS – Mass, Weight, and Momentum Notes

Name_____ Period_____

I can...
Relate mass and weight. *Predict and calculate momentum.*

Mass, Weight, and Momentum - Notes

Bellwork – The acceleration due to gravity on the Earth is about 9.8 m/s^2 and on the moon it is about 1.6 m/s^2. If you were on the Earth and then went to the moon, how would your *mass* change? How would your *weight* change?

_____

_____

_____

_____

_____

1. ***What is an object's mass?***

_____

2. ***What is an object's weight?***

_____

_____

_____

_____

3. ***How do we measure weight?***

The same way we measure _____ with the unit _____, since 1 _____ equals 1 _____.

4. ***How do we calculate weight?***

Using the formula:

5. Let's calculate a woman's weigh who's mass is 62 kg and she is on Earth. What is her weight?

_____

6. What is her weight on the moon? (acceleration due to gravity = 1.6 m/s^2).

_____

7. ***What is momentum?***

_____

_____

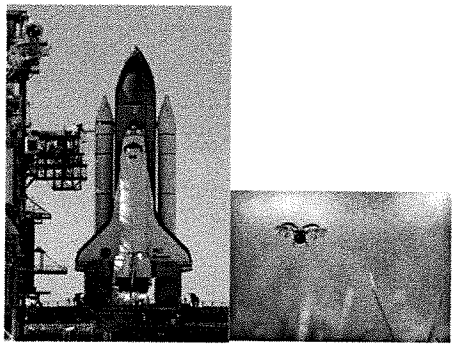
_____

8. Let's compare the following objects' momentums.
The large rocket ship has a huge mass but is not moving. The insect has a tiny mass by is moving. Which has the higher momentum?

_____

Why?

_____



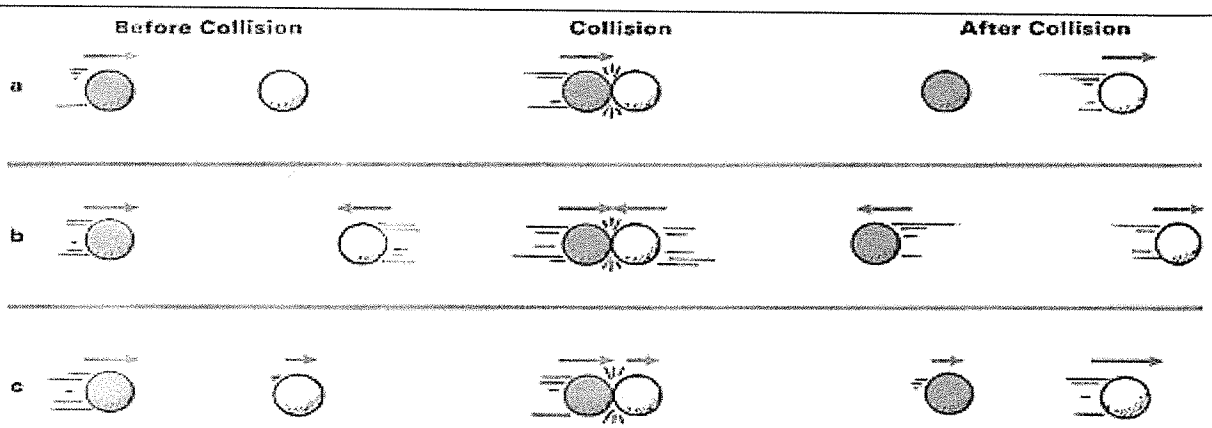
9. We can calculate momentum with the following formula.

10. ***So what is the unit for momentum?***

_____

11. *What happens to momentum when objects collide?*

_____ states that in a _____ system (which means no _____ acting on the system), the _____ of the system does not change. Momentum is _____.



In all cases, momentum is conserved. Can you think of any other examples?

Practice Questions

Try these on your own or with a neighbor and then we will check our answers!

1. How is mass different from weight?

2. CHALLENGE! A steel ball is the same size as a wooden ball, but weighs twice as much. If both ball are dropped from an airplane, which of them will reach **terminal velocity** more quickly? (Hint: remember that terminal velocity is a specific moment between two forces.)

3. A woman has a mass of 55 kg on Earth.
   a. What is the woman's mass on the moon?_____
   b. What would be the woman's weight on the moon where the acceleration due to gravity is 1.6 m/s^2? _____

4. If both an eagle and a bumblebee are traveling at 2.2 m/s, which has more momentum? Explain.

5. Why does a stationary but very massive object have no momentum? Explain.

Mass vs. Weight Inquiry Lab

Introduction:

Are mass and weight the same thing?

Which one does your bathroom scale measure?

Which one depends on how hard gravity pulls on you?

Which is measured in kg and which is measured in newtons?

Scientists define mass as the amount of stuff (matter) in an object. Weight is defined as the force of gravity between you and the Earth.

In this lab we are going to be exploring the ways mass and weight are measured and the units (labels) for them. By the end you should be able to answer the questions and the beginning of the intro. Pay attention to how the balance and spring scale work and the units they have on them.

Materials:

One triple beam balance and one 5 newton spring scale per group. Three or four objects to be massed and weighed.

Hypothesis:

If you could take your balance and spring scale to the Moon, which would read the same, for your objects, as here on Earth and which would read differently?

Procedure:

1. Get your materials. Before you start to measure your objects you need to zero out you balance and spring scale as per the teacher's instructions.
2. Mass all of your objects and record the data on the data table below.
3. Repeat using your spring scale.
4. Make sure that you put the correct units on your data table

Data:

Objects	Mass ( )	Weight ( )

Analysis:

1. Which measurement involved gravity?
2. Which measurement used a known object to measure against?
3. What would a bathroom scale measure?
4. When you go to the doctor's and they put you on their scale, are they finding your mass or your weight?
5. If you found your weight was 475 N, what would your mass be? (Hint: 1 kg = 10 N.)
6. Which measurement would change if you went to Mercury? Why?
7. If you were given a quantity of known masses (paint cans, bricks etc), describe how you would find your mass.

Conclusion:

1. Write a 50 word conclusion showing the difference between mass and weight.

2. Graph Weight (y) vs. mass (x) and find the slope.

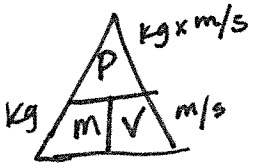
slope = _____ m/s^2

8

Freshman Physics Name:_____ Per:___
MS- Momentum Practice Problems Due Date:_____

Which is more difficult to stop: A tractor-trailer truck barreling down the highway at 35 meters per second, or a small two-seater sports car traveling the same speed?

You probably guessed that it takes more force to stop a large truck than a small car. In physics terms, we say that the truck has greater *momentum*.



We can find momentum using this equation:

momentum = mass of object × velocity of object

Velocity is a term that refers to both speed and direction. For our purposes we will assume that the vehicles are traveling in a straight line. In that case, velocity and speed are the same.

The equation for momentum is abbreviated like this: ***p=m×v***

*M*omentum, symbolized with a *p*, is expressed in units of kg·m/sec; *m* is the mass of the object, in kilograms; and *v* is the velocity of the object in m/sec.

Use your knowledge about solving equations to work out the following problems. Be sure to show all your work with units:

1. If the truck has a mass of 2,000 kilograms, what is its momentum? (v = 35 m/s) Express your answer in kg·m/sec.

2. If the car has a mass of 1,000 kilograms, what is its momentum? (v = 35 m/s)

3. An 8-kilogram bowling ball is rolling in a straight line toward you. If its momentum is 16 kg·m/sec, how fast is it traveling?

4. A beach ball is rolling in a straight line toward you at a speed of 0.5 m/sec. Its momentum is 0.25 kg·m/sec. What is the mass of the beach ball?

5. A 4,000-kilogram truck travels in a straight line at 10.0 m/sec. What is its momentum?

6. A 1,400-kilogram car is also traveling in a straight line. Its momentum is equal to that of the truck in the previous question. What is the velocity of the car?

7. Which would take more force to stop in 10 seconds: an 8.0-kilogram ball rolling in a straight line at a speed of 0.2 m/sec or a 4.0-kilogram ball rolling along the same path at a speed of 1.0 m/sec?

8. The momentum of a car traveling in a straight line at 20 m/sec is 24,500 kg·m/sec. What is the car's mass?

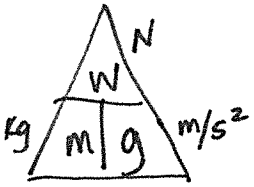
9. A 0.14-kilogram baseball is thrown in a straight line at a velocity of 30 m/sec. What is the momentum of the baseball?

10. Another pitcher throws the same baseball in a straight line. Its momentum is 2.1 kg·m/sec. What is the velocity of the ball?

11. A 1-kilogram turtle crawls in a straight line at a speed of 0.01 m/sec. What is the turtle's momentum?

NAME _____ Period _____

Physical Science
Mass and Weight



Use the following formula to solve for weight:

Weight (W) = Mass (m) x gravity (g) **W = mg**

Mass is measured in kilograms (kg)
Gravity on earth is a constant: 9.8 m/s^2 = g
Weight is measured in Newton's (1 N = 1 kg • m/s^2)

Answer the following questions – show **ALL WORK** and **UNITS**

1. Define Mass –

2. Define Weight –

3. Describe what will happen (if anything) to mass and weight when you go to the moon.

   a. Why would this happen?

4. Find the weight of a 60 kg astronaut on earth

   a. Find the weight of the same object on a planet where the gravitational attraction has been reduced to 1/10 of the earth's pull. Show all work.

5. A backpack weighs 8.2 newtons and has a mass of 5 kg on the moon. What is the strength of gravity on the moon? (Be careful with units, remember 1N= 1 kg • m/s^2)

6. A physical science test book has a mass of 2.2 kg
   a. What is the weight on the Earth?

   b. What is the weight on Mars ($g = 3.7\ m/s^2$)

   c. If the textbook weights 19.6 newtons on Venus, What is the strength of gravity on Venus?

7. Of all the planets in our solar system, Jupiter has the greatest gravitational strength.
   a. If a 0.5 kg pair of running shoes would weigh 11.55 newtons on Jupiter, what is the strength of gravity there?

   b. If he same pair of shoes weighs 0.3 newtons on Pluto, what is the strength of gravity on Pluto?

   c. What does the pair of shoes weigh on earth?