Unit 4: Forces

What does the word "force" mean in everyday terms. Create a sentence with the word force.

When you hear the word "force" in science, what do you think of?

Using the Big 7 forces and your notes from yesterday (also on the side board), <u>list</u> all the forces acting on the object in the different scenarios.

- An egg is dropped from the top of a building. There is no air resistance.
- A book is sitting on a desk
- A cart is being pushed by two students to the right. There is friction.
- A ball is thrown up straight in the air. There is air resistance.

How to Create a Free Body Diagram

- 1) Read the problem.
- 2) List all forces acting on the object. Use your definitions for support!
- 3) Create a shape to represent the object (square, circle, rectangle, etc)
- 4) Draw **and** label arrows to represent the forces. Arrows should coming out of the object.

An egg is dropped from the top of a building. Neglect air resistance.

A book is sitting on a desk

Net Force = Total Force on an object

Right/Up = Positive

Left/Down = Negative

Add/subtract the forces







Using your notes from last week.

Create a free body diagram for the situation.

- 1. A car is stuck in the mud and is being moved by three people.
- 2. A ball is thrown up straight in the air. There is air resistance.
- 3. A cart is being pushed up a ramp.

Physics Essentials

Create a free body diagram for the following situations... (remember to list your forces first!)

- A ball is kicked on the ground to the right. There is friction.
- A paper falls off a desk. There is air resistance.
- A box is pushed 10N to the right. There is no friction.
- Alex pushes a box to right with 50 N and Isaac pushes to the left with 50 N.

Create a Free Body Diagram for each of the situations and answer the questions.

- 1) A box is pushed to the left with a force of 10 N and to the right with a force of 5 N. What is the net force? Is the force balanced or unbalanced?
- 1) A car is pushed to the right with a force of 100N but friction has a force of 400 N. What is the net force on the car? Will it move?

Agenda Today

- 1) Organize Binder
- 2) Review Calendar Changes
- 3) Review Concepts Learned
- 4) Net Force Practice

2.1 Force Net Force

The net force depends on the magnitudes and directions of the applied forces.



BALANCED FORCES vs. UNBALANCED FORCES

- Balanced forces are
 Unbalanced forces always equal to ZERO and DO NOT cause motion.
 - **ALWAYS** cause motion and NEVER equal to zero.



Net Force

- 1) Create a FBD of the situation
- 2) Make sure your forces are labeled
- 3) Subtract to find net force. Right is positive, left is negative.
- 4) Is the force balanced or unbalanced?





A box is pushed with 10 N to the left and 50 N to the left. Create a FBD to represent the situation and find the net force on the box.

Create a FBD with forces that shows a balanced force.

Create a FBD that shows unbalanced forces.

Which one will move, a balanced or unbalanced force? Why?

Mass vs. Weight

https://www.youtube.com/watch?v=gjfLI7aJKmQ

Mass vs. Weight Lab: http://sciencespot.net/Media/gravlab.pdf

What is Newton's First Law?

What is Newton's Second Law?

Think about how seatbelts work... what does Newton's Laws have to do with why seatbelts are important.



Newton's Laws

https://www.youtube.com/watch?v=08BFCZJDn9w

https://www.youtube.com/watch?v=qu_P4lbmV_I

Newton's 1st and 2nd Law Stations

Essentials of Physics Do Now

Choose 1 Newton's 1st Law Station

- How does it show that an object at rest will stay at rest?
- Choose 1 Newton's 2nd Law Station
- How does it show that acceleration will increase with force?

Newton's Second Law

F = ma

Let's rewrite it...

What else could acceleration be?

F = ma

If there is no acceleration... use 9.8 m/s

A box has a mass of 10 kg and accelerates at 5 m/s^2. What force is acting on the box?

Write down your givens

Write down your unknown

What equation will you use?

Plug in and solve

Answer with units!

A dog has a mass of 25 kg. What is dog's weight?

A 40 kg box is pushed with an acceleration of 3 m/s^2. What is the force on the box?

If I push the box with a greater acceleration, what will happen to the force on the box? Why?

Newton's Third Law

https://www.youtube.com/watch?v=e1lzB3 6aHD4



Newton's Third Law



Rocket Engine Thrust



For every action, there is an equal and opposite re-action.



Every action has an equal and opposite reaction



Newton's Third Law Stations

Together as a class...

Stations #8: Balloon Races

Stations #11: Soda Can Sprinkler

Draw the forces acting on the object(s) in the situation.







For each situation, determine which of Newton's Laws relates to the situation and WHY:

- 1. A magician pulls a tablecloth out from under dishes and glasses on a table without disturbing them.
- 2. Rockets are launched into space using jet propulsion where exhaust accelerates out from the rocket and the rocket accelerates in an opposite direction.
- 3. A picture is hanging on a wall and does not move.
- 4. Pushing a child on a swing is easier than pushing an adult on the same swing, because the adult has more inertia.

Today's Goals

You can do either (or both for extra credit)

- Newton's Laws Challenges
- Mass vs. Weight Lab

Today in Class

- Organize Binder
- Finish any unfinished activities
- Work on your review
- Get your binder checked (optional)
- Work on something for another class

Physic Ess

No Do Now

- Turn in your binder to the front of the room next to Ms. Logan's Desk
- You need a pencil and calculator for this test

Momentum

https://www.youtube.com/watch?v=e1lzB36aHD4

Physics Essentials

- 1) Complete your 2 content elements for momentum
- 2) Organize your binder
- 3) Work on any incomplete assignments

Your Unit 4 Test and Binder Check is TUESDAY!

- 1) What is the equation for momentum?
- 2) What is the abbreviation for momentum (what letter stands for momentum)?
- 3) What is the unit for momentum?

Physics Essentials

- 1) 2 Momentum Challenges
- 2) Organize Binder
- 3) Finish ALL incomplete binder assignments
- 4) Work on your review

Physics Essentials

1) Turn in your Do Now Stamp Sheet for March

2) Take out your binder and organize

If a 1000 kg car moves at 12 m/s, what is it's momentum?

A dog has 230 kgm/s of momentum and has a mass of 42 kg. What is the speed of the dog?

- Get a sticky note from up front
- If you need to organize your binder write
 "Organize Binder" first
- Write down ALL work you need to complete (Including Content Notes)
- Then write, Review Sheet

White Board Practice

Draw a FBD... A ball rolling across a table to the right. There is friction.

Draw a FBD... A binder falls off a desk. There is no air resistance.

Draw a FBD and find the Net Force... A box is pulled with 50 N to the right and 10 N to the left.

Draw a FBD and find the Net Force... A tug of war competition has one team pulling 600 N to the left and 280 to the right.

How much more force must the team on the right pull with to win?

What are each of Newton's Laws?

Describe a situation that explains Newton's 1st or 3rd law

A 40 kg box is pushed with a force of 439 N. What is the acceleration of the box?



What has more mass? An elephant or a mouse running at the same speed? Why?

A car has a momentum of 80,000 kgm/s and has a speed of 30 m/s. What is the mass ofthe car?

Work independently to catch up on your binder and then do the review on Google Classroom.

Test and Binder Check is tomorrow!

Physics Essentials

- Make sure your binder is fully organized
- Turn your binder
- Make sure you have a pencil and calculator

Phys Ess: No Do Now

- 1) If you did not do your Unit 4 Binder Check, place it on the front desk
- 2) Get a computer
- 3) Load your Women in Science online poster.
- 4) Choose your situation from below:
 - a) Completed and turned in
 - b) Completed and not turned in
 - c) Incomplete and not turned in

Peer Review

You must peer review 2 or more online posters from a different table

Revise and submit if need! I will give your feedback during class as well if you would like.



What new ideas do you have for your model?