2nd GRADE
MARCH

PUSHES AND PULLS

STATION 1: THE PUSH OF AIR

EXPERIMENT 1: Formula-1 Racing with Balloon Cars

MATERIALS:

5 Ready-made cars with balloons.

EXPERIMENT 2: A Reverse Force? Balloon Helicopter

MATERIALS:

Balloons and the 2 provided helicopter assemblies

EXPERIMENT 3: Cable Car With Rocket Propulsion

MATERIALS:

Balloon, straws, cork, adhesive tape and long piece of string

STATION 2: PUSHING AND PULLING OBJECTS.

EXPERIMENT 1: Moving a book without touching it.

MATERIALS:

- Books (from classroom)
- Cloth

EXPERIMENT 2: Blowing Ping Pong Balls

MATERIALS:

- light plastic balls
- straws

EXPERIMENT 3: Pulling a Rubber Band

MATERIALS:

- Ruler or long piece of wood
- 2 tables
- Rubber band
- Paper strips
- a small bucket and a string.

STATION 3: CLASSES OF LEVERS

EXPERIMENT 1: 1st LEVER– BALANCING A SEESAW

MATERIALS:

- A ruler
- Big battery (This will be load 1)
- middle battery (this will be load 2)
- small battery (This will be the fulcrum)

EXPERIMENT 2: 2nd CLASS LEVER

MATERIALS:

- A variety of lever-type objects such as paint sticks, plastic serving spoons, rulers, etc., so that each student will have one to use
- 200 white small pom-pons (instead of marshmallows)

EXPERIMENT 3: 3rd CLASS LEVER – CHOPSTICKS GAME

MATERIALS:

- 22 Children's chopsticks
- Lima beans
- bowls

STATION 1: THE PUSH OF AIR

(EACH CHILD WILL GET A BALLOON AND WILL KEEP IT FOR THE ENTIRE STATION. EVERYBODY BLOWS THEIR OWN BALLOON. USE DESINFECTANT WIPES, TO WIPE THE TUBES BEFORE BLOWING.

Introduce the lesson by inflating a balloon and asking the children what will happen to the balloon if you let go. Show that the moving air can be used to make things move

EXPERIMENT 1: Formula-1 Racing with Balloon Cars

5 cars can race at a time, since we have 5 cars.

MATERIALS:

5 Ready-made cars with 12 inch balloons.

BRIEF DESCRIPTION OF PROJECT: In this experiment, the rocket principle is used to power balloon race cars.

PROCEDURE:

1. Define a place to race in the classroom, set a start line and let the children know where they should be standing.
2. Attached a balloon to the race car. You can help yourself by using a straw to push the balloon through the hole.
3. Disinfect the white tube with the opening and insert it into the balloon.
4. Inflate the balloon attached to the race car by blowing through the opening at the back of the car.
5. Place a finger on the hole to prevent the air form escaping.
6. Explain to them they have to wait until everybody's balloon is ready. So they should twist or pinch the balloon until everybody is ready.
7. Wait until all cars are ready and place the cars at the same time on a smooth area of open floor.
8. Count: Ready, set, go and let the cars go at the same time.

   Ask question such as "which direction will it move? What is the best surface to test it out on? How can we make it go further? Why does it eventually stop?

The escaping air generates a reaction force. Like being propelled by a rocket, the cars will race across the floor. The air flows through jets (or nozzles) in a steady direction out of the balloons. This causes the cars to move straight forward. If the cars turn, it is because the wheels are not straight.

Try racing the cars. Which is fastest? Which one runs the farthest? Who can steer the

straightest, directly toward a finish line?

Let the kids take turns.

EXPERIMENT 2: A Reverse Force? Balloon Helicopter

BRIEF DESCRIPTION OF PROJECT: We will use a balloon to power a helicopter.

MATERIALS:

9 inch Balloons and the provided helicopter assembly

PROCEDURE:

Take the helicopter wings out of the box and make sure that the wings are well connected to the middle part.

Disinfect the yellow pipe with disinfectant wipes.

Connect the balloon to the yellow pipe.

Blow up the balloon (only half).

Pinch the balloon on the top so that the air does not escape.

Connect the yellow pipe to the wings.

Finally let it go and the wings will fly.

WHY?

It is obvious that the helicopter works, but why? Doesn't it contradict what we have learned until now about rocket propulsion? The balloon opening points upward. Andy by now we should know that a reaction force towards the ground should result.

But the helicopter flies upward. Look carefully at were the air really comes out. Some of the air flows directly from the balloon into the whistle that makes the loud sound. The rest of the air, however, flows through the three rotor blades (or wings) and out through the tips (There is a whole at the end of each wing). This produces the rotating motion.

Additionally, the air flows out from the tips of the rotor blades (this is the hole that is at the end of each wing). If you look careful the air flows downwards. That is the reason why the helicopter rises in the air. So this helicopter motion can be understood on the basis of the reaction principle just like we saw in the balloon race car and cable car experiments.

EXPERIMENT 3: CABLE CAR WITH ROCKET PROPULSION

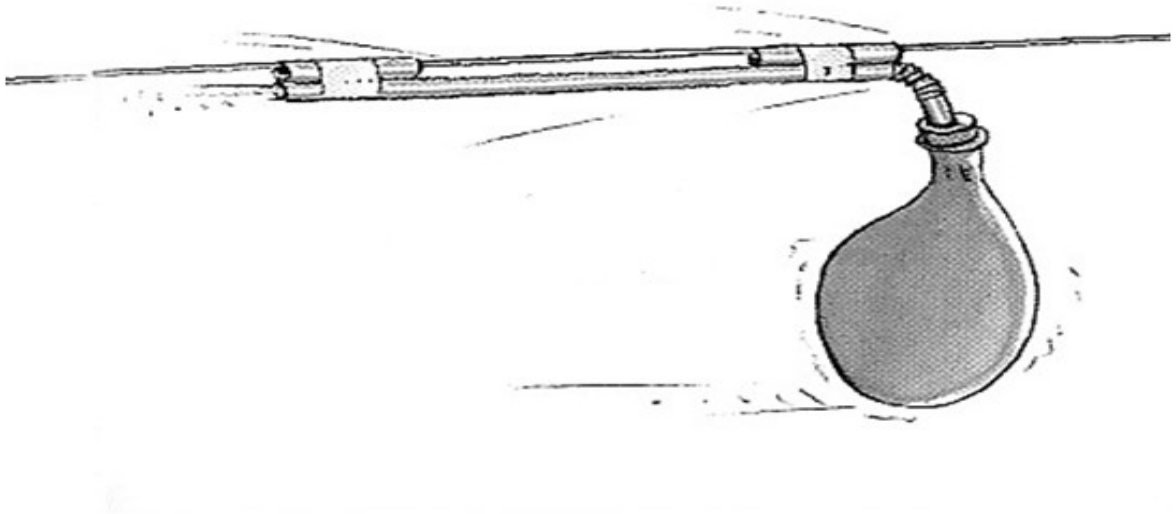
We can build four cable cars.

BRIEF DESCRIPTION OF PROJECT: We will let a balloon travel on a string, as cable cars do.

MATERIALS:

Balloon, straws, cork, adhesive tape and long piece of string

PREPARTAION: (THIS IS ALREADY DONE FOR YOU)



From one of the two straws in the experiment kit, cut two pieces that are each about 2 cm (3/4 in) long. Attached these pieces with some adhesive tape to each end of the other straw.

Put the provided cork in the mouth of the balloon onto the bent end of the long straw.

Now you still need the cable for our cable car. For this, pull a strong piece of string through the shorts straw pieces and tie the ends of the string onto two chairs in the classroom or let two children hold it straight.

The string should be fairly tight and not sloped too much.

Procedure:

Inflate the balloon through the long straw. Then, let go and the air will flow out again to give the cable car a reaction force. It will glide along the string.

If the children want to inflate themselves, use another straw to help. Just place the bent end of the straw into the long straw. This way each child can keep their straw for station 2 and they will not share it. After they are done, tell them to put their straws in their desks to use it again in station 2

STATION 2: PUSHING AND PULLING OBJECTS.

EXPERIMENT 1: Moving a book without touching it.

MATERIALS:

- Book
- Cloth

PROCEDURE:

Introduce the lesson by placing a heavy book, or several books on a cloth on the floor. Ask the children how they could move the books without touching it with their hands. (e.g. Use other body part, poke it with an object, lift board, drag the cloth) Discuss words that describe the push or pulls actions. You could also use another small child instead of the books.
For example slide, drag etc.

EXPERIMENT 2: Blowing Ping Pong Balls (they need to keep their straws for station 1)

MATERIALS:

- light plastic balls
- straws

BRIEF DESCRIPTION OF PROJECT: Applied force is a push or a pull that is applied by someone or something else on to another object causing an action in that object. By blowing on light plastic balls through straws we can apply a force and see its effects.

PROCEDURE:
1. Divide the group in pairs. Have the children sit a few feet apart, facing each other.
2. Place a ball in between each pair of children.
3. Give each child a straw.
4. Explain in simple terms applied force. Remember that the definition of "force" is a push or a pull.
5. Have the children take turns blowing through the straws while aiming them at the balls. They can blow the balls back and forth to each other.
6. Have them vary how hard they blow and note the different reaction of the ball.

Questions for the kids:

1. Is this a "push" or a "pull" that you are applying to the balls? It is a push
2. What happens when you blow harder i.e. apply more force to the balls?

After they are ready, tell them to put the straws on their desks. They will need them again in station 1.

EXPERIMENT 3: Pulling a Rubber Band

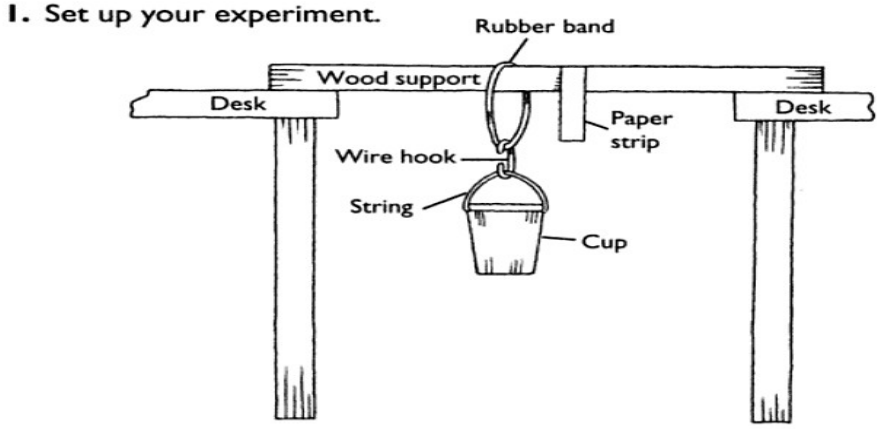
MATERIALS:

Ruler or long piece of wood
2 tables
Rubber band
Paper strips
a small bucket and a string.

Introduce the lesson by stretching a rubber band in your hands. Ask "What make the band longer?" Ask the children to describe what has happened to the band (e.g. stretched, changed shape).

BRIEF DESCRIPTION OF PROJECT

Demonstrate what happened when marbles are added to the cup. Show the basic idea of the experiment and discuss the idea of making it a fair test. (e.g. Use marbles of the same size, place marbles into cup carefully and not by throwing)



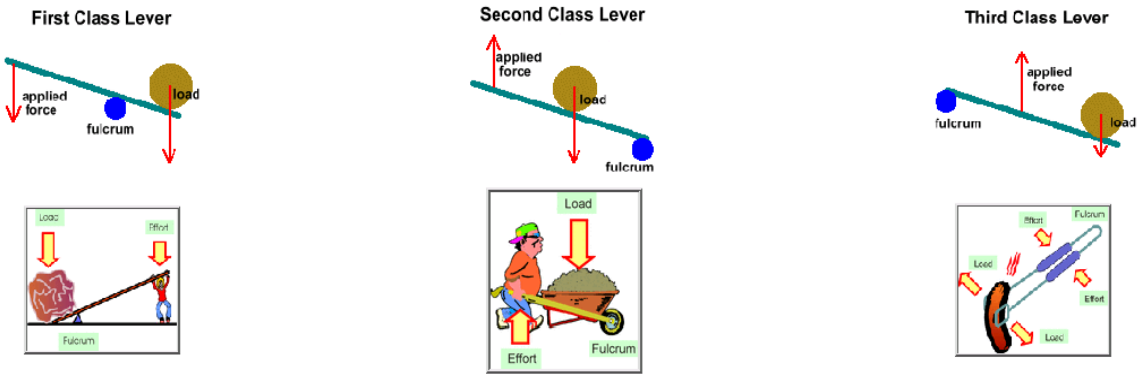
PROCEDURE:

1. Set up your experiment as shown above. You can use a ruler as wood support
2. Hang the cup from the band. Cut a strip of paper the same length as the rubber band. Write 0 marbles on your strip of paper.
3. Add 10 more marbles to your cup. Cut a strip of paper showing the new length of the band. Write 10 marbles on your strip of paper.
4. Add 10 more marbles to your cup. Cut a strip of paper showing the new length of the band. Write 20 marbles on your strip of paper.
5. Do this again and again until you have 50 marbles in your cup and six strips of paper.
6. Stick your paper strips side by side on a piece of paper.
7. Use your results chart to answer this question.
   a. estimate how long the paper tip would be if you had 60 marbles in the cup
   b. Estimate how long the rubber band would be if you had 25 marbles in the cup

STATION 3: CLASSES OF LEVERS

GENERAL BACKGROUND INFORMATION

Classes of Levers - First, Second and Third



First Class Levers: The first class lever is the one you may be most familiar with. It uses a fulcrum in between, and the applied force and load are at opposite ends. Like in a see- saw.

The diagram above shows a first class lever set up to move a heavy load with a small applied force. The force must be applied over a long distance, in order to make the heavy load move just a small amount.

By adjusting how far the fulcrum is from the load, you can control the mechanical advantage. The closer it is to the load, the more force is applied.

Second Class Lever: The second class lever is one where the fulcrum is at one end, and the applied force at the other. The load that is to be moved is between them.

This lever is different in how it works ... it causes the load to move in the *same direction* as the force you apply.

Just as with a first class lever, how close the load is to the fulcrum determines by how much your force will be multiplied. If you want to move a very large load with a small applied force, you must put the load very close to the fulcrum.

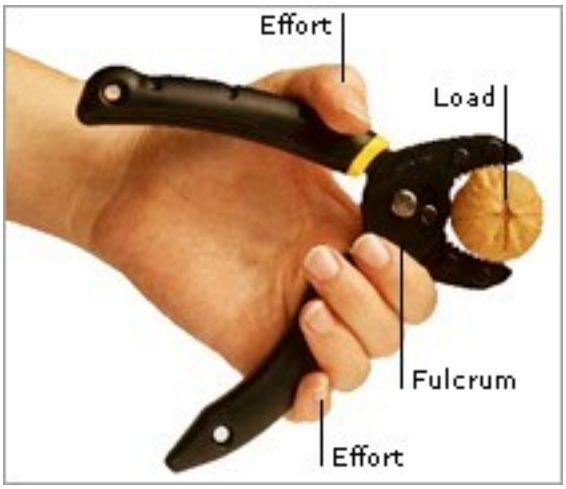
Third Class Lever: The third class lever is the strangest ... and the one you use the most!

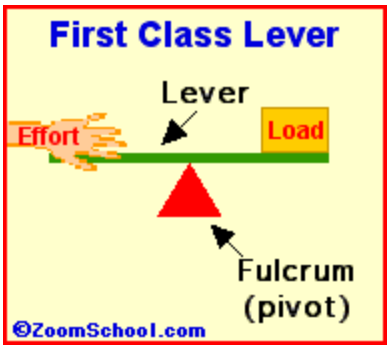
The fulcrum is once again at one end of the lever, but this time the *load* is at the other end, and you apply a force in between.

This lever can *not give any mechanical advantage*. Regardless of where you apply the force, the force you apply must always be greater than the force of a load.
If you were using this lever to lift an object at a distance, it would require less force to just stand above it and lift it up ... using the lever will require *more* force!

So why use a third class lever at all?
The answer lies in the fact that the load moves in the same direction as the force you apply, which is convenient. So is the application of force *between* the load and the fulcrum

EXPERIMENT 1: 1st LEVER- BALANCING A SEE SAW





MATERIALS:

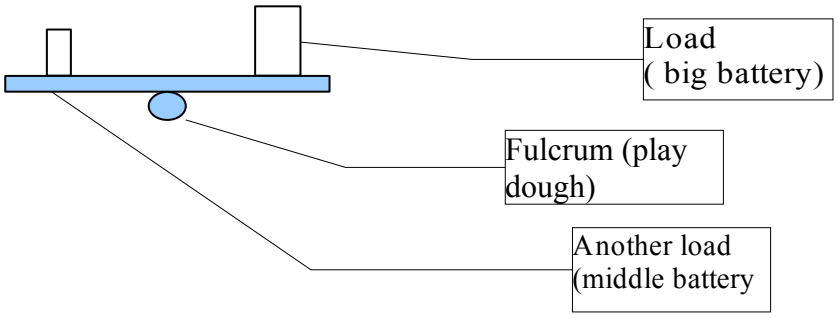
- A ruler
- big battery (This will be load 1)
- middle battery (this will be load 2)
- clay or play dough

PROCEDURE:

Build a seesaw by placing some clay or play dough on the table and placing a ruler on top of it. (SEE DRAWING BELOW)

Then use the other two batteries as weights.

Put one on each end and try balancing the two batteries.



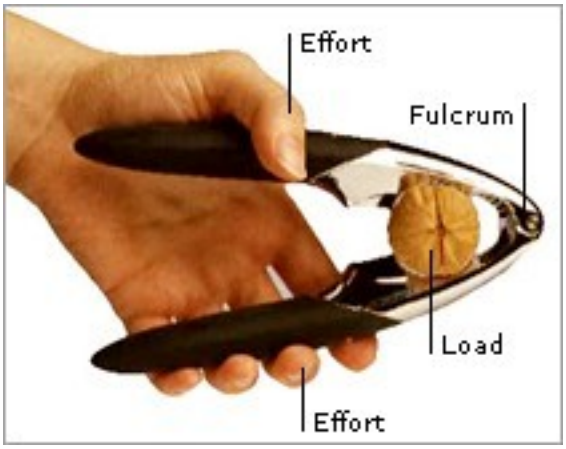
Ask the students if they have an idea on how to balance the two batteries. One way is by placing the bigger load closer to the fulcrum (this is your small battery)

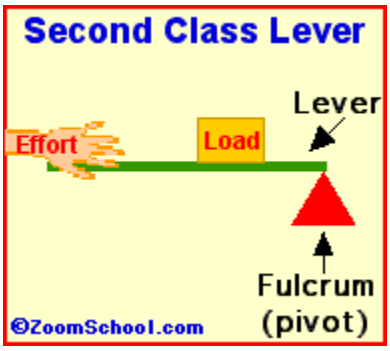
Another way is by moving the fulcrum closer to the load.

Can you think of any other object that uses the first class lever?

Scissors, pliers, nail clippers, scale.

EXPERIMENT 2: 2nd CLASS LEVER





LIST OF MATERIALS:

- A variety of lever-type objects such as paint sticks, plastic serving spoons, rulers, etc., so that each student will have one to use
- 200 Pom-pons.

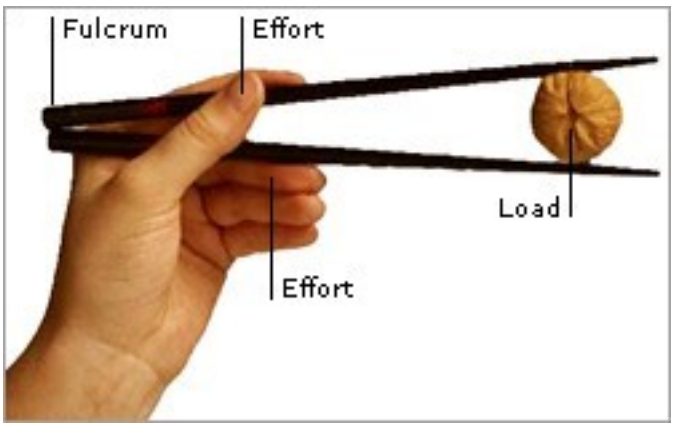
BRIEF DESCRIPTION OF PROJECT:

1. Give each student a couple of pom-pons
2. Give each student a lever-type object.
3. Tell the students that they will be launching their pom-pons at a target (a mark on the board, a book on the floor, a parent volunteer),and that they must follow two rules: 1. The pom-pons must touch the object before it goes into the air but cannot be touched with your hand; and 2. The object must be touching the desk as you launch the pom-pons (i.e. you cannot hit the pom-pon with the lever).
4. Instruct the students to set up their tools to launch the pom-pons.

Accept any way they choose as long as it follows the rules. Most students will choose to use their tool like a lever. Do not use the word lever when talking about the rules to the students until after the launch is over.

After the launch, ask the students to describe how they used their tool to launch the pom-pon. After the students answer, have them identify the simple machine they used; they should begin to see they are using tools as levers. If no student used their tool as a lever, show them how a simple lever can be used to launch the pom-pon by putting a ruler on the edge of the desk, setting the marshmallow on the end of the ruler, and hitting the free end of the ruler to launch the pom-pom into the air.

EXPERIMENT 3: 3rd CLASS LEVER – CHOPSTICKS GAME



BACKGROUND INFORMATION:
In chopsticks, the effort is between the fulcrum and the load. The effort is reduced by this lever, but the movement is magnified. With small movements of the hand, you can pick up anything from a grain of rice to a large nut—but you can't crack the nut.

MATERIALS:

- Children's chopsticks
- Lima beans
- bowls

PROCEDURE:
1. Make teams. (Don't make the teams too big, 4-5 people is best. If you have extra people, have a cheering section!)

2. Line up each team on one side of a table, team members standing or sitting next to each other.

3. Give each player a bowl and a set of chopsticks.

4. Put a bowl full of baby Lima beans to the left of the first player on each team.

When the referee says "Go!" the player at the start (left) of the line starts taking pinto beans from the bowl to her/his left and put them in the bowl in front of her/him. The next player will take beans from the bowl on her/his left and put them into his/her own bowl, and so on until the bowl in front of the last person is full of beans.