Force and motion lab

8 Exploratory Stations

Lab explanation and expectations

- This is a rotating station lab
- You will be timed. When the timer goes off, move to the next station in numerical order. For example, if you start at Station 5, your next rotation is to Station 6.
- You will start at the station that matches your table number. At the final rotation, you should have completed all of the lab stations.

Behavior expectations: PROWL!

If you are not following PROWL for labs, I will have you sit out and come in during advisory to complete it on your own.

In your Journal:

- Write down stations 1-8 leaving room to answer 2-4 questions for each station (put 4 stations on a page)

Station1	Station 5
Station 2	Station 6
Station 3	Station 7
Station 4	Station 8

Station 1

- Ball

1. Place the ball on the counter, where the “X” is.
2. Write in your journal: Is this an example of balanced or unbalanced force? Why?
3. GENTLY push the ball so that it goes across the counter to the taped line.
4. Draw the movement in your journal.
5. Write in your journal: Is this movement an example of balanced or unbalanced force? Why?

Station 2

- Car

1. With your lab partner, push the car back and forth GENTLY between the two of you.
2. What direction did the car go in? Explain why you think the car went on the path that it did (Using new vocabulary words on forces).
3. Now explain what makes the car stop? Would the car eventually stop on it's own? How?

Station 3

- Dominoes

1. Set up the dominoes in a row so that they will touch each other when they fall.
2. Write in your journal: How are you going to make the dominoes fall?
3. Knock the dominoes over. Was this an example of an unbalanced or balanced force?
4. Draw your domino set up in your journal and draw arrows to show the direction of movement.

Station 4

- Velcro Paddle and Ball

With a lab partner: play catch 2 or 3 times.

Write in your journal answers to these:

1. What is the force that makes the ball stop?
2. Is there a different force making the ball go towards the ground? What is it called?
3. When the paddle stops the ball, is that force moving in the same direction as the ball?

Station 5

- Spring Scale

One person holds the spring scale while another person puts weights on the scale.

Write these down in your journal:

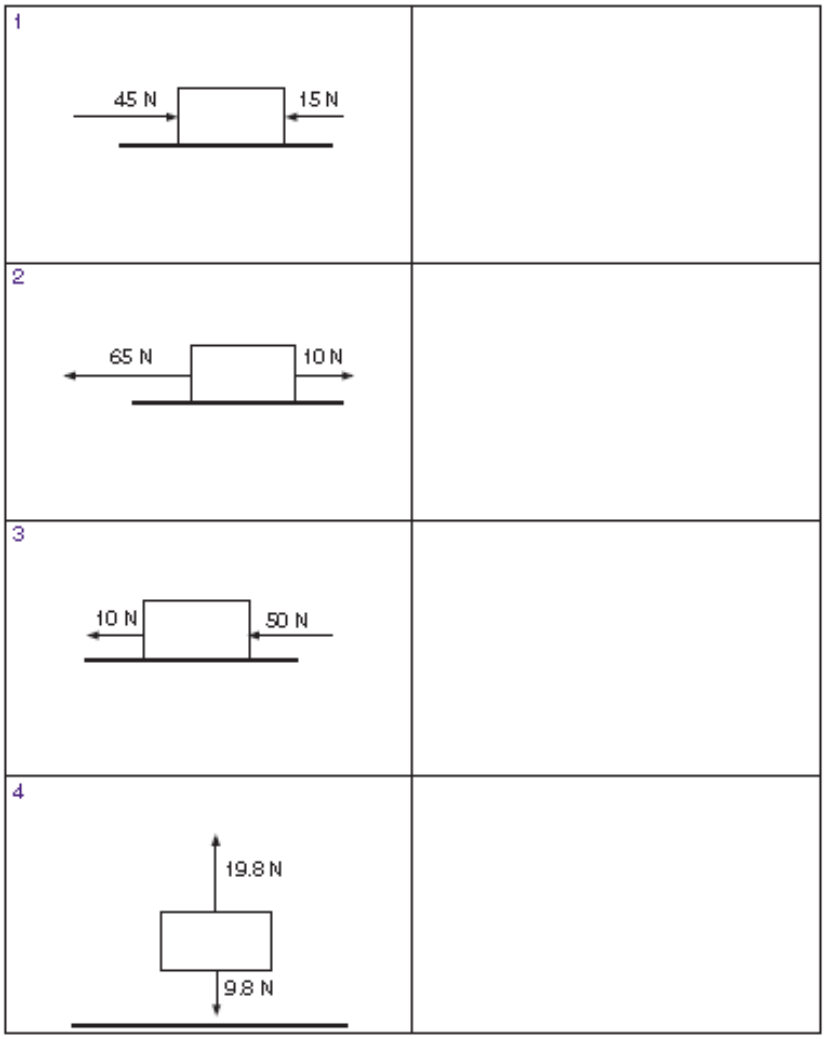
1. What does the spring scale measure?
2. Write down the Force in Newtons (N) for each weight.

Weight:	Force (N):
1. 100g	
2. 200g	
3. 500g	

Station 6

- Work these problems –

1. Draw the boxes and arrows, including the forces in Newtons.
2. Show your math work!



Station 7

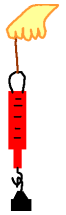
- Video station - Watch this Eureka video and then answer these questions (in complete sentences).

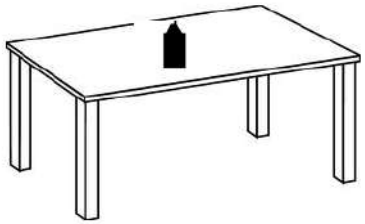
1. Force depends on mass and what?

2. What does the gravity of Earth cause?

3. How much is the force of gravity acting on the average apple?

(Alternative) Station 7





- Spring Scale #2

Procedure:

1. Place the object on the table,

Use the spring scale to measure how much force is on an object at rest. (Do not lift the object off of the table)

2. Draw the object at rest, then show the forces at work on the object and label the arrows

3. What is the net force of an object at rest?

Write in your journal: "The net force of an object at rest is _____ because _____."

Station 8

- Tug of War!
- View the picture and then sketch it in your journal:

Tabitha  Zach

- Tabitha and Zach are playing tug-of-war. If Zach pulls the rope to the right with a force of **800N** and Tabitha pulls the rope to the left with a force of **800N**, what will happen to the flag in the middle of the rope?
- Write the sentence and fill in the blanks: "The flag will _____ because _____ .

Lab wrap up – Day 2

- Let's discuss what you did yesterday
- Station 1: Ball

1. Ball standing still: Is this an example of balanced or unbalanced force? Why?
3. After you pushed the ball: Is this movement an example of balanced or unbalanced force? Why?

Station 2

- Car:

1. When you pushed the car, what happened?
2. What direction did the car go in? Explain why you think the car went on the path that it did (Using new vocabulary words on forces). The car went in the direction you pushed it. Why? The car was balanced (not moving), then an unbalanced force (your hand) made the car move.
3. Now explain what makes the car stop? Would the car eventually stop on it's own? How? The car stops because the forces of gravity and friction cause the car to loose momentum. The car could also hit another object that causes it to stop, this is also an unbalanced force.

Station 3

- Dominoes

1. How did you set up the dominoes?
2. How did you make the dominoes fall?
3. When you knocked the dominoes over: Was this an example of an unbalanced or balanced force?
   Unbalanced
4. Did you: Draw your domino set up in your journal and draw arrows to show the direction of movement.

Station 4

- Velcro Paddle and Ball

With a lab partner: play catch 2 or 3 times.

What were your journal answers to these:

1. What is the force that makes the ball stop? You
2. Is there a different force making the ball go towards the ground? What is it called? Gravity
3. When the paddle stops the ball, is that force moving in the same direction as the ball? No, you can tell it is in the opposite direction because the ball changes directions and then stops

Station 5

- Spring Scale

One person holds the spring scale while another person puts weights on the scale.

Write these down in your journal:

1. What does the spring scale measure?

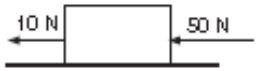
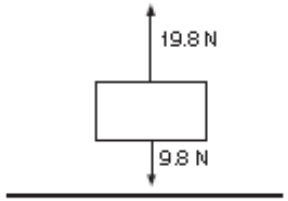
2. Write down the Force in Newtons (N) for each weight.

Weight:	Force (N):
1. 100g	100N
2. 200g	200N
3. 500g	500N

Station 6

- Work these problems –

1. Draw the boxes and arrows, add the forces in Newtons.
2. Show your math work!

1 	Opposite directions: 45N-15N = 30N to the right
2 	Opposite directions: 65N-10N = 55N to the left
3 	Same direction: 50N+10N = 60N to the left
4 	opposite directions: 19.8N-9.8N = 10N to the up

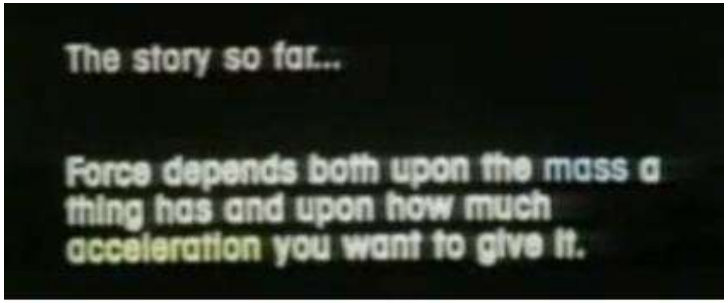
Station 7

- Video station - Watch this Eureka video and then answer these questions (in complete sentences).

1. Force depends on mass and what? See below

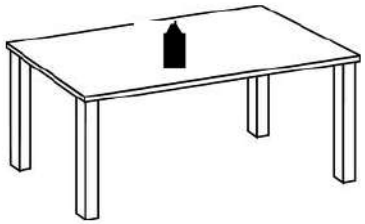
2. What does the gravity of Earth cause? It causes all objects to fall to the earth.

3. How much is the force of gravity acting on the average apple? The standard: 1N



(Alternative) Station 7

- Spring Scale #2



Procedure:

1. Place the object on the table,

Use the spring scale to measure how much force is on an object at rest. (Do not lift the object off of the table)

2. Draw the object at rest, then show the forces at work on the object and label the arrows

3. What is the net force of an object at rest?

Write in your journal: "The net force of an object at rest is __0N__ because _all forces are balanced, there isn't any movement__ ."

Station 8

- Tug of War!
- View the picture and then sketch it in your journal:

Tabitha  Zach

- Tabitha and Zach are playing tug-of-war. If Zach pulls the rope to the right with a force of **800N** and Tabitha pulls the rope to the left with a force of **800N**, what will happen to the flag in the middle of the rope?
- Write the sentence and fill in the blanks: "The flag will not move_ because __The resulting forces are the same, they are balanced_____ .

Videos – if there is extra time

- Show the first 3 Eureka videos on Forces.
- Eureka videos:

1. Inertia: http://www.youtube.com/watch?v=HRq-v4Gmzxg
2. Mass: http://www.youtube.com/watch?v=-LBSMy8gBGA
3. Speed: http://www.youtube.com/watch?v=DzDBe7ScDeM
4. Gravity: http://www.youtube.com/watch?v=fl7TQwPcJyI