2nd Grade –Push, Pull, and Friction

Push

2.P.4A.1 Analyze and interpret data from observations and measurements to compare the effects of different strengths and directions of pushing and pulling on the motion of an object.
2.P.4A.2 Develop and use models to exemplify the effects of pushing and pulling on an object.

Page 1:

- Color the empty spaces in <u>each line</u> with the correct color codes to make the Ozobot move slow or fast. Use the Ozobot codes from the code sheet.
- Once the codes are colored, place a block on the page in the square of the line you will be testing.
- Turn the Ozobot on and place the pushing hat on top of the Ozobot and place it on the line to test.
- Observe how the Ozobot pushes the block.
- Test each line making note of which ones are the quickest and complete the chart below. You can test each line more than once if you need to.

	Was the speed FAST, MEDIUM, or SLOW? Circle the fastest speed. Put a square around the slowest speed.
Snail Dose	
Fast	
Turbo	
Slow	
Cruise	
Nitro Boost	

Page 2:

- Now that you have experimented with pushing your object, choose someone to race against
- Choose three of your speeds from above and add them to the right line on page 2
- Your friend can add their three speeds to the left line on page 2
- Each of you place a block on the paper in the square
- Turn on your Ozobots and place the push hat on them
- Say, "on your mark, get set, go!" and race your Ozobots. See who has the fastest combination of speeds.

Pull

2.P.4A.1 Analyze and interpret data from observations and measurements to compare the effects of different strengths and directions of pushing and pulling on the motion of an object.
2.P.4A.2 Develop and use models to exemplify the effects of pushing and pulling on an object.

Page 1:

- Color the empty spaces in <u>each line</u> with the correct color codes to make the Ozobot move slow or fast. Use the Ozobot codes from the code sheet.
- Once the codes are colored, place the pulling hat on top of the Ozobot
- Place 1 cube behind the Ozobot
- Turn the Ozobot on and place it EACH line to test
- Observe how the Ozobot pulls 1 cube and mark your observations in the chart below using the words FAST, MEDIUM, SLOW, or NO if the Ozobot can't pull the weight of the cubes
- Test each speed by adding a cube each time

	1 cube	2 cubes	3 cubes	4 cubes	5 cubes	6 cubes
Snail Dose						
Fast						
Turbo						
Slow						
Cruise						
Nitro Boost						

Which speed was able to pull the most cubes? _____

Why? _____

Friction

2.P.4A.4 Conduct structured investigations to answer questions about the relationship between friction and motion of objects.

2.P.4A.5 Define problems related to the effects of friction and design possible solutions to reduce the effects of friction on the motion of an object.

1. Connect the Sphero or BB8 to the correct iPad
2. Open the Sphero app or the BB8 app
3. Click PLAY
4. Orient the Sphero to where you are standing using the arrows button
5. Adjust the speed by clicking the turtle (slower) or the rabbit (faster). Start with the speed at 20%
6. Drive the Sphero over each of the items to see if there is friction between the item and the Sphero. Note the amount of friction by writing FAST, MEDIUM, SLOW, NO in each cell.
   - FAST means that the Sphero was able to move quickly over the object so there was little friction between the Sphero and the surface
   - MEDIUM means that the Sphero was able to move at a regular speed over the object so there was a medium amount of friction between the Sphero and the surface
   - SLOW means that the Sphero moved very solely over the object so there was a lot of friction between the Sphero and the surface
   - NO means that there was too much friction for the Sphero to able to move over the surface.
7. Adjust the speed to 60% and test the Sphero and then to 100% and test the Sphero.

	20% Speed	60% speed	100% speed
Plastic Bag			
Construction Paper			
Styrofoam			
Bubble Wrap			
Carpet			
Fabric			
Cardboard			

PUSHING

	Was the speed FAST, MEDIUM, or SLOW?
Snail Dose	
Fast	
Turbo	
Slow	
Cruise	
Nitro Boost	

Circle the fastest speed. Put a square around the slowest speed.

PULLING

Write FAST, MEDIUM, SLOW or NO if the Ozobot can't pull the cubes

	1 cube	2 cubes	3 cubes	4 cubes	5 cubes	6 cubes
Snail Dose						
Fast						
Turbo						
Slow						
Cruise						
Nitro Boost						

Which speed was able to pull the most cubes? _____
_____

Why? _____
_____

FRICTION

Note the amount of friction by writing FAST, MEDIUM, SLOW, NO in each cell.

FAST means that the Sphero was able to move quickly over the object so there was little friction between the Sphero and the surface

MEDIUM means that the Sphero was able to move at a regular speed over the object so there was a medium amount of friction between the Sphero and the surface

SLOW means that the Sphero moved very solely over the object so there was a lot of friction between the Sphero and the surface

NO means that there was too much friction for the Sphero to able to move over the surface.

	20% Speed	60% speed	100% speed
Plastic Bag			
Construction Paper			
Styrofoam			
Bubble Wrap			
Carpet			
Fabric			
Cardboard			

What is your definition of friction? _____

_____

Which surface produced the LEAST amount of friction between it and the Sphero? _____

Why? _____

Which surface produced the MOST amount of friction? _____

Why? _____

How did speed change the way the Sphero moved over the surfaces? _____

_____