

Procedures

As we discussed earlier, our goal, is to send the bouncy ball to Ms. Bucket in a discreet manner while also being 6 ft away from her respecting social distancing norms, and how we're going to do that, is by having the ball bounce first before it gets to her, and also be 6ft apart while we do it. With that, let's get started. I (Mr. Ball) shall guide you in this process, but the primary thinker is going to be you.

1. Gather all the materials from the lists on the main page and any additional materials you may want for the car
2. Have 1 cup for the Borax Solution and another for the full Ball Mixture and label them with the trial number
3. Mr. Ball Suggests to use this example ball ingredient combination as a good starting point
 - a. Pour 4 ounces (120ml) of warm water and 1 teaspoon into the Borax Solution cup
 - b. Stir this until the Borax is fully dissolved
 - c. Pour 1 tablespoon of glue into the Ball Mixture cup
 - d. Add .5 teaspoon of the Borax Solution and 1 tablespoon cornstarch to to Ball Mixture cup containing the glue
 - e. Wait 10-15 seconds so the ingredients can interact on their own
 - f. Stir the mixture together with a spoon until you can't stir any more
 - g. Take the mixture out of the cup and knead and roll it between your hands
 - h. Once it feels less sticky, roll between your hands until it is as smooth and round as you want it to be
 - i. Example from <https://sciencebob.com/make-your-own-bouncy-ball/>
4. Try making a few different balls by mixing different combinations of ingredients.
 - a. A similar process as in the example above should be used (Mr. Ball hint: Try adjusting the amount of cornstarch)
 - b. Record the amount you put of each ingredient in the table below
 - i. You don't have to complete the entire table, but doing multiple different trials is important to find a combination that makes the bounciest ball.
 - ii. After each ball is made, drop it from a the height of your the table you will be using and record the height it bounces back up
 - iii. After testing the ball, put it into the corresponding trial Ball Mixture cup so you can differentiate it with others

- c. The 1st Borax Solution can be used multiple times- when you vary the other ingredient amounts and if you want to add more borax, you can simply add more and dissolve it.
- d. Some suggestions for different trials: (Mr. Ball's Suggestion: Try to answer these questions by trying out what the question asks.)
 - i. Note: Less can be interchanged with more in the below list
 - ii. What happens when you add more baking soda?
 - iii. What happens when you use more glue?
 - iv. What happens when you use more Borax when making the Borax Solution?
 - v. What happens when you use more Borax Solution?
 - vi. What happens when you use more corn starch?
 - vii. What happens when you do a combination of these things?

Trial #	Water	Borax	Borax Solution	Glue	Corn Starch	Baking Soda	Bounce Height

5. Choose the best ball that you made.
 - a. What happens when you drop it from a height lower than the table? Does it bounce lower?
 - i. Yes No

- b. Take a piece of the cardboard you have and cut into a rectangle for a ramp for the ball. With the ramp hanging off the edge of the table, put the ball onto the ramp and let it roll off at these approximate angles: 30, 45, and 60 degrees.

- i. Record the x and y distance the ball travels and bounces for each. It may be useful to focus on one dimension at a time

Angle	x distance before bounce	x distance after bounce	y distance after bounce
30			
45			
60			

- c. Try this again, but this time with flicking the ball from the edge of the table instead of just letting it drop. Also try it with no ramp and the ramp at 0 degrees.

Angle	x distance before bounce	x distance after bounce	y distance after bounce
No ramp			
0			
30			
45			
60			

6. What will make the car go farther and faster with the same force you provide it- if it's heavier or lighter?
- a. Try pushing 2 objects of similar size but different weights to get a clear picture.
Which is better
- i. Lighter Heavier
7. How can you make the wheels move at the same time? Think about toy cars that you have seen before.
- a. There is always a rod between the wheels called an axle.

8. Build your car with the materials you have keeping in mind the last 2 steps as well as how you will power it- with rubber bands, balloons or both.
 - a. How does a blown up balloon vs a rubber band transmit the power?
 - b. If powering the car by rubber band, does the car go farther when the rubber band is stretched and wrapped more?
 - c. If powering the car by balloon, how does the position of the hole affect its speed and direction?
9. Once you are done building your car, power it at the start 4 feet away from the ball.
 - a. You can have the ball either just pushed off the table or pushed into a ramp that will guide it before it falls.
 - i. Stop the car with either your hands or chairs once it has hit the ball so that it does not crash to the floor and potentially break.
 - ii. Keep in mind your results from 5b and 5c.
 - iii. Also consider how you might combine ideas to make the ball go farther/bounce higher depending on what you need as remember it needs to travel 6 feet with a bounce that ends in it reaching the height of the basket. We want this to happen since we're trying to follow the current social distancing norms, and also be discreet.
 - b. If your wheels have trouble with traction on the floor, consider adding something to make it more "grippy." Think about what makes tires and sneakers able to have good traction. (Mr. Ball's hint: What are tyres made of?)
 - c. Remember that this is not something that will work the first time- trial and error in tweaking your car and how the ball is being released is important and necessary for success.

With that, we should be all wrapped up here. Congratulations on a fine job well done. Ms. Bucket called, she said that she's very happy with her bouncy ball, but doesn't know where it came from, which means we were successful. I truly couldn't have done this without you, and I'm extremely grateful for your help. Well, I'll miss working with you, but all good things

come to an end, thus, signing off, Mr. Ball. (Mr. Ball suggests: Get some ice cream, chocolate, or cake, you deserve it.)