



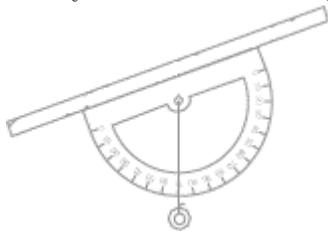
Rocket Launch: Normal Distribution

1 Length and Objectives

This lesson is roughly 90-120 minutes. The objective of this lesson is give students an engaging introduction to the Normal Distribution. The students will be collecting data for rocket distance and then as a class they will create a bar graph to represent their data collected.

2 Materials

- You will need to create a PVC rocket Launcher. Here is a link to a guide of how to construct one <https://www.youtube.com/watch?v=31Cv3ht5Wz0>
- Standard printer paper and/or Construction paper
- Masking tape
- Bike pump with PSI gauge
- An open field with at least 100 yards of open space to launch
- A way to measure the distance of the rockets, measuring wheels or measuring rope would work fine.
- A way to measure the angle of launch. A protractor with a weight attached works nicely.



3 Grade Levels and Topics

- This activity is designed for students in a high school level statistics course.
- Bar Graphs to represent data
- Normal distribution





4 Procedure

1. Students will first create their rocket. It is important that everyone's rocket is similar.
 - (a) Roll the paper around the pipe so that it is tight, yet loose enough to slide off. Tape the paper along the entire seam outside of its body.
 - (b) Check your work by sliding your rocket body on and off of the tube. It shouldn't fall right off, but should slide easily.
 - (c) Next slide your rocket's body so the top is even with the top of the PVC pipe. Tape the top of the rocket's body so that when you blow air into the other side of the PVC pipe it will start to launch your rocket. Be careful not to tape the rocket to the pipe! You eventually want the pipe gone from your rocket!
 - (d) Check your work. Put your rocket on the pipe, put your hand in front of your rocket. GENTLY blow into the pipe if your rocket does not start to launch look for air leaks along the outside of the body and the top of the rocket. Tape up any leaks.
 - (e) Get some card stock and draw a fin shape of your choosing, we recommend a polygon. Remind the kids that they want their fins to be congruent shapes. Cut out your first fin and use it as a template to draw 1-3 more congruent figures. Cut these out.
 - (f) Pick a side of your polygon fin to make a small fold. Fold the same side of each fin the same amount. Use a small amount of tape to tape the small folded bit of your fin onto the rocket's body.
 - (g) Here's the MOST important step. Get a marker and name your rocket! Your rocket is now ready to be launched!
2. Now it is time to launch the rockets.
3. You can play with the launcher beforehand to see which angle and psi will work well in the space you have.
4. Now have all the students launch their rockets at all the same psi and launch angle. Remember to discuss safety, no one should be near the launchers or in front of the launchers when they go off.
5. All of the students should now collect their rockets and record the distance that each rocket went.
6. Have each student tell you the distance that their rocket went and mark it on the board or a place where everyone can see.
7. Once all the data is written down, have the students represent that data with a bar graph.
8. As long as all of the launch angles and psi were the same, the students should come up with a bar graph resembling the Normal Distribution.

