



Ground Control to Major Fun

Grade Levels

This activity is meant for grades 3-7.

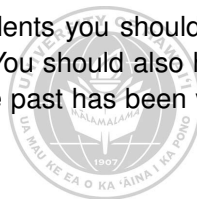
Objectives and Topics

In this activity students will be asked to convert between feet and yards. They will also be asked to find averages of sets of real data, based on their own launched rocket.

Materials and Resources

- A large area to launch rockets. We recommend a field or an open area near a long corridor. Rockets launch around 30-50 feet.
- Rocket launchers.
- A bike pump or other means of pumping air into the launchers. Make sure it has a pressure gauge on it!
- Paper of various weights, we recommend construction paper and a couple of sheets of card stock.
- Tape, we recommend masking tape.
- A couple of pvc pipes of the same diameter as your launcher with some duct tape wrapped around the body, make sure not to tape the top and bottom (about a foot long).
- Markers.
- A means of measuring long distances in any desired units.

Before you begin this activity with the students you should make sure you have both working launchers and working bike pump and pressure gauge. You should also have the area the students will be launching in pre-marked off. Ways we have done this in the past has been varied and depended entirely on the space we worked in here are some of the examples:





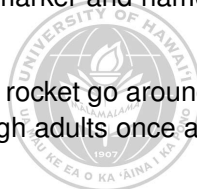
Once we launched near a side walk and marked off yards in tape along the sidewalk. Another time we had a piece of string that was flagged with bits of tape to mark off the yards. If you use this method get small heavy objects to lay upon the string at intervals to help keep the string in place. Another time we launched along a corridor whose poles were exactly 4 yards apart, we had the students measure in number of poles, then convert to yards then convert again to feet. Another useful method would be to place an object (like a gardeners flag or cones) to mark off your distances. Note your marked off interval does not need to be every yard but it does need to be one consistent interval.

Introduction and Outline

Have a pre-made rocket ready to explain to your audience the parts of the rocket, the body tube, the fins, the nose (note we recommend not building a coned nose as it is VERY time consuming and does not really effect the rockets since they are not going very far.) demonstrate to the kids how to build a rocket using these easy steps:

- Grab the pvc pipe that has been taped and a sheet of construction paper.
- 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.
- Check your work by sliding your rocket body on and off of the tube. It shouldn't fall right off, but should slide easily.
- Next slide you 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 you rocket!
- Check your work. Put your rocket on the pipe, put your hand in front of your rocket. GENTLY blow into the pipe if you 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.
- 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.
- 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.
- Here's the MOST important step. Get a marker and name your rocket! You're rocket is now ready to be launched!

After you have demonstrated how to build a rocket go around to help the kids build their own. Each student should have their own rocket. If you have enough adults once about 4 kids have built a rocket you should start





launching them. (Unless you are breaking this activity into a two-day lesson: day one build a rocket, day two launch the rockets and collect data.)

When you are launching the rockets it is important to go over safety with the students. Kids get VERY worked up over this activity, because let's face it it's REALLY fun. Make sure everyone stays behind the launchers when they are pressurized. Make sure you shoot ALL of the rockets at the same angle all day as this is one of the variables the students are ruling out. Only let the students whose rockets have been shot go retrieve them, AFTER you've given the all clear signal. Remind the students that when they get their rocket they then need to find out how far their rocket has gone. Your instruction on this will vary depending on how you are measuring. It should have them walking perpendicularly to a laid out measurement of sorts. Make sure each student gets to launch their rocket at least three times.

If a student's rocket blows up have them build a new one. However if they got in at least three launches then it's not too big of a deal.

Also note that if there is more time this activity can be extended to include mean/median/mode and various plots and charts for older students. Advanced classes may also investigate the effect of launch angle.





Ground Control to Major Fun Worksheet

Here are some things to think about while building your rocket:

- Is your rocket taped up enough to withstand being shot?
- Do you want to add fins? Why? How many?
- If it was going to break when shot, where do you think your rocket would break?
- Did you build the body too tightly? (Note the rocket may not launch if it is too tight.)
- Did you build the body too loosely? (Note the rocket will not build enough pressure to take off.)
- Put your name on your rocket, or give it a name! (That way it won't get lost.)

Before you can shoot your rocket you must answer the following:

Make a guess as to how far in feet you think your rocket will go.

Convert your guess into yards.

Assuming we keep the angle the same, list at least two variables that could affect the distance your rocket will go.





Rocket Name:

Rocket Launch Table

	Approximate Distance in Yards	Converted Distance in Feet
Launch 1		
Launch 2		
Launch 3		
Launch 4		
Launch 5		

Discussion Questions:

Find the average distance of your rocket in yards.

Find the average distance of your rocket in feet.

How did you find the average distance of your rocket in feet? Did you the average, or did you convert the average you found before? Will these two methods give the same result? try the other method. What did you find?

Do you think your average is a good guess for how far your rocket will go? Why or why not?

Compare your average with other students. How did your rocket's distance compare to theirs?

Why do you think the averages were the same/different?

With the whole class, plot your average distance on the number line. Find the class average.

How does this compare with your rocket's average?

