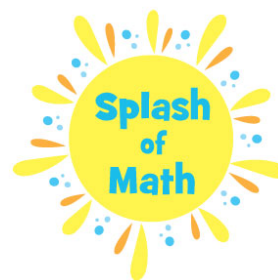


Let's Get Loud

Grades 3-5



The Big Idea

You'll use rubber bands to generate different sounds, then make a pan flute out of milkshake straws. Finally, you'll get to yell into a decibel-meter and find out how loud you are - using math the whole time to create funky music!

Supplies

In your kit:

- ★ Milkshake straws: 150+
- ★ Masking tape
- ★ Measuring tape: 1

To print:

- ★ Straw Measuring Guide, 1 copy per kid plus 1 for coach. See last page of directions. Also posted on directions website.

You provide:

- ★ Large cups, 1 per kid
- ★ Markers: 1 per kid
- ★ Rubber bands: 1 per kid
- ★ Scissors: 1 per kid

Optional:

- ★ Free keyboard/piano app or tuned instrument
- ★ Free sound meter app, like Decibel X for iPhone, for bonus activity on page 3.

Key Prep

- ★ Print 1 copy per kid of the Straw Measuring Guide. Be sure to print in landscape orientation, not portrait!
- ★ Make a couple of pan flutes to use as an example during the activity.

What's the Math?

- ★ Measuring length
- ★ Comparing and sequencing lengths
- ★ Simple relationships between variables

Kickoff

"Did you know no one can hear you yell in outer space? That's because there's no air! When we make sound, we're actually rippling the air in waves. Today we're going to explore 2 math ideas about sound: the pitch, how high or low the sound is, and the volume, how loud it is."

Rubber Band Band (10 minutes)

"The strings of a guitar or piano play different musical notes because they're pulled to different thicknesses. We can see how this works with a rubber band."

1. Give each kid 1 rubber band. Have them hook each end over their thumbs. You can demonstrate this for the kids.
2. Ask the kids to pull the rubber band taut and strum the top of the band with an index finger. Then continue to expand and relax the rubber band while strumming to explore the difference in sound.
 - ? "What happens to the sound? Why?" **Discuss.** Kids should notice that the sound of the note is changing. When the band is pulled tight and thin, it produces a higher pitch than when the band is relaxed and thicker.
 - ? "In math, the way 2 or more things change with each other – like the pitch and the tautness of the rubberband - is called their correlation. When the temperature outside goes up, what else goes up?" **Discuss.** Answers include thirst; eagerness to go swimming. "And what goes down?" **Discuss.** Answers include layers of clothing.

Be the Pied Piper (30-40 minutes)

"Now we're going to use this idea to make our own pan flutes! In instruments that use air to play, like pipe organs, clarinets, horns or flutes, the length of the tube determines the pitch."

1. Hand each kid (or ask them to gather from a pile) 8 straws, a copy of the Straw Measuring Guide, a marker, a cup and scissors. For kids who may not understand how a ruler works, take a few minutes to review the Straw Measuring Guide.
2. Have the kids mark 1 straw for each of the 8 lengths shown on the Straw Measuring Guide. Be sure the kids draw an X on the part of each straw past the marking to indicate the piece they'll throw out.
3. Then, kids cut each straw at the line they drew, and put completed flute pieces into the cup to keep track of them.
4. The kids test the sounds of their straws: they hold each straw with one end pointing up and blow gently across the top.
 - ? "How does the sound change when you cover one end with your finger?" **Discuss.** It drops by 1 octave!
5. Give each kid a length of masking tape and ask them to tape over the ends of the straws where they made cuts.
6. Then, kids put the straws in order of length from longest to shortest, with the longest on the left. The top open ends should all be lined up.



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7. Help kids tape across and around the straws to hold them together. Ask the kids to write their names across the band of tape on one side.
8. Now kids blow across the top to make music!

Extra challenge (optional)

- ★ If you have a tuned instrument handy (guitar, keyboard, smartphone app), you can use that to identify the notes the kids' pan flutes play and then write the notes on the other side of the tape.

Wrap Up

"Did you ever realize there was so much math in musical instruments? It's just like the math you see in class when your teacher asks you to measure and compare lengths so you can put them in size order."

Bonus, if you have time: Be Loud (10 minutes)

"Did you know that you can use numbers to measure noise? Sound is measured in decibels. Let's use a sound meter to find out how loud YOU are!"

1. Extend one measuring tape to its full length and lay it on the floor. Divide the kids into 2 teams, 1 at each end of the measuring tape.
2. Open up the suggested free sound meter app and stand with 1 of the teams. Ask the opposing team to start reciting the alphabet while your team watches the meter and records the decibel level.
3. Switch the meter to the other team and repeat. Compare readings to see who talked louder!
4. Next, gather both teams at 1 end of the measuring tape. Stand with the kids while holding the meter. Ask 1 volunteer to stand at the other end and start reciting the alphabet while walking toward the meter.

? "What happened to the decibel reading as talker got closer?"

- ★ "Unlike an inch which is always the same amount, a sound's decibels change with distance: they drop as you stand farther from the noise, and rise as you stand closer."

- ★ **Party Fun Fact:** when you go up 10 decibels, you double the loudness of a sound.

Quick Straw Measurement Guide

Each number on this ruler measures 1 inch. Between the numbers, there are lines dividing the inches into smaller parts. The shortest lines along the bottom of the ruler divide each inch into its smallest parts called sixteenths ($\frac{1}{16}$). Along the top and bottom, the lines grow increasingly longer to indicate larger parts, like eighths ($\frac{1}{8}$), quarters ($\frac{1}{4}$), and halves ($\frac{1}{2}$).

Now that you understand the marks on a ruler, you can use the dotted lines below to help you measure, mark and cut your pan flute straws. Be sure to draw an X on the part of each straw past the marking to help you keep track of the pieces to throw out!

