



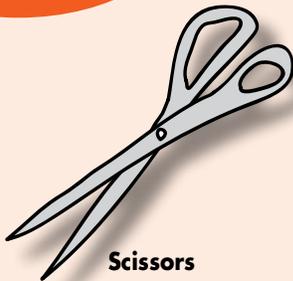
## Tube Whackers

Check out the video for this activity at [kidsciencechallenge.com](http://kidsciencechallenge.com)

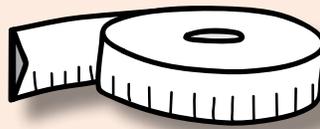
### Find What You Need...

- Golf club tubes (6 for basic six-note version; 9 more for the full-note version). They are available at golf and sporting goods stores and online for about \$1/tube; search "golf club tube protectors".
- Scissors
- Measuring tape or yard stick

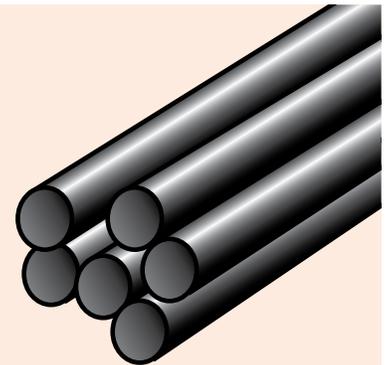
We recommend  
that an adult  
help lead this activity.



Scissors



Measuring Tape or Yard Stick



Golf Club Tubes

### How could you control air vibrations to create different musical notes?

Musical instruments make sounds in different ways, but they all begin with a material that's vibrating. Instruments such as flutes and clarinets make sound when a column of air inside the instrument vibrates. Changing the length of the column can change the frequency of the vibration. The frequency (how fast something is vibrating) determines the pitch, or how high or low a sound is heard. The higher the frequency, the higher the pitch of the sound we hear.

Musical notes are sounds of a certain pitch. A series of notes, that goes up or down in a particular order, is called a scale.

Using plastic golf protector tubes, you can make instruments that play different notes. Changing the length

of the tube changes the frequency of the vibrations that the tube makes when you whack it. We've figured out the correct lengths to make the notes of four different scales. Choose which scale you want to play, then create your instruments!

### Fact:

If you play a woodwind instrument  
such as a flute or clarinet,  
you vibrate a column of air  
with your breath.

## Activity Instructions:

1. Choose how many tubes you will start with: 6, 8, 11, or 15. Check the chart below, and find the instructions for the number of tubes that you chose.
2. Ask an adult to cut the tubes to the lengths indicated on the chart below. For example, if you want to start with a six-note scale, use only the measurements in bold above the dividing line.

**Note:** The measurements on the chart are very precise. But it's fine to be up to  $\frac{1}{4}$  inch off. You will still play a recognizable scale.

3. If your golf protector tubes have a wire around one end, remove that wire when you cut the tube. Otherwise it may rattle when you play.
4. Play your tubes! Hold a tube in each hand, and slap the sides of the tubes against any suitable solid object, such as a wall or floor, or your leg. Play them in order, either from shortest to longest, or longest to shortest. You could be a one-person band and play each note in the scale. Or, form a group with several people playing two tubes each.

### Tube Length Chart

Note	Length (in)	Length (cm)
<b>G3</b>	<b>33 3/4"</b>	<b>85.7cm</b>
<b>A3</b>	<b>30"</b>	<b>76.2cm</b>
B3	26 5/8"	67.6cm
<b>C4</b>	<b>25 1/8"</b>	<b>63.8cm</b>
<b>D4</b>	<b>22 5/16"</b>	<b>56.7cm</b>
<b>E4</b>	<b>19 3/4"</b>	<b>50.2cm</b>
F4	18 5/8"	47.3cm
<b>G4</b>	<b>16 1/2"</b>	<b>41.9cm</b>
<b>A4</b>	<b>14 5/8"</b>	<b>37.1cm</b>
B5	12 15/16"	32.7cm
<b>C5</b>	<b>12 1/16"</b>	<b>30.6cm</b>
<b>D5</b>	<b>10 3/4"</b>	<b>27.3cm</b>
<b>E5</b>	<b>9 1/2"</b>	<b>24.1cm</b>
F5	8 15/16"	22.7cm
<b>G5</b>	<b>7 7/8"</b>	<b>20.0cm</b>

This chart gives lengths for a total of 15 notes forming a diatonic scale (seven notes per octave) over two octaves with C as the home note.

### You don't have to make all 15 tubes.

Choose one of these options:

**6 tubes** – 1-octave five-note scale (pentatonic).

Cut to the lengths in bold print above the dividing line in the chart.

**8 tubes** – 1-octave seven-note scale (diatonic).

Cut to all the lengths above the dividing line.

**11 tubes** – 2-octave pentatonic. Cut to all the lengths in bold.

**15 tubes** – 2 octaves diatonic. Cut to all the lengths in the chart.

Even though the notes of this scale run from G to G, the notes are those of a C scale, with C as the tonal center.

## Conclusions

What made the sounds in your golf tube instruments? What made the sounds different? Does the sound change if you bang the tubes against different objects? How are your instruments like a clarinet or flute? How are they different?

## Brain Buster:

There are many instruments that work by vibrating a column of air in a tube. Could you make a different kind? Research to get ideas, then see what you can create. Then enter the Kids' Science Challenge. If you make a working model of your idea, this would make a great Science Fair project, too



Kids' Science Challenge  
Science Projects  
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