



Who says all the fun has to happen at The Tech Interactive? This data exploration activity can be done with a smartphone and items around your home.



Introduction

Can you track the mystery sound? Use your super sleuth sound skills to see if you can match a sound maker with its graph in this data-matching activity. This two-person experiment explores the sound sensor on the Arduino Science Journal app. Investigate the sounds and vibrations of different objects and try to match them to their corresponding recorded graphs in the app. Challenge each other's data science skills in this fun game and exploration of sound!

Experiment

Match a graph of a sound recording in the Science Journal app to the item that made that noise.

Subject:

Data science, Sounds

Ages:

6+

Time:

15 minutes

Key concepts:

Data literacy,
experimentation,
forming hypotheses,
sounds



SCIENCE JOURNAL

This activity uses the [Arduino Science Journal app](#), which lets you use your phone's sensors to create experiments and record data on the world around you. If you haven't used it before, download the app and play with it first.

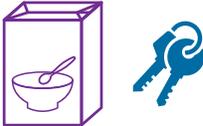
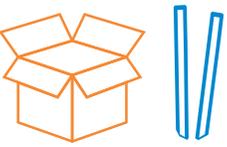
Materials

- Smartphone with the Arduino Science Journal app
- Variety of items that make sound (see below)
- Paper and writing utensil (*optional*)



Things you can use to make sounds

Start by hunting around your home for items that can create different types of noises. Look for things that make fun combinations or patterns of short or long, soft or loud sounds. Test them out on the Arduino Science Journal app as you search to see how their sounds appear on the graphs. Check out the ideas here, but use whatever you have on hand — be creative!

Crinkle	Rattle	Bang	Squeak	What other sounds can you make?
<ul style="list-style-type: none"> • Crumpled paper • Present bows and wrapping paper 	<ul style="list-style-type: none"> • Keys • Boxes of cereal/pasta • Homemade maracas (coins and candy tins) 	<ul style="list-style-type: none"> • Drums • Boxes, pots and pans, plastic bottles/bins • Wooden spoons, chopsticks 	<ul style="list-style-type: none"> • Pet toys • Baby toys • Horns 	<ul style="list-style-type: none"> • Whoopie cushions • Bells • Musical instruments 



Explore

Try using Arduino Science Journal to play with the different sounds first. Turn the sound sensor on as you make noises with the things you found. See what kind of graphs they make.

- Notice how a bigger sound will create a bigger peak.
- Try moving closer and further away from the sound and see how the graph changes.
- You may notice that some objects sound different but make the same kind of graphs. For example, you might not see any differences in the graphs for hitting a drum hard and banging loudly on a box.

Instructions

Step 1: Getting started

Ask a friend or family member to join you for the activity. Decide who will be the “Sleuth” and who will be the “Scientist.”



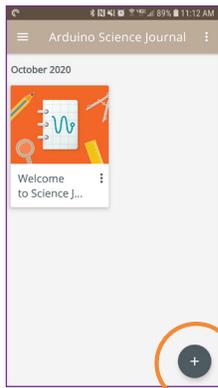
Sleuth: Leave the room and go far enough away so you can not hear the sound makers. If you're in a small space or can't leave the area, try covering your ears, or putting on headphones with music to block the sound.



Scientist: Make sure you have the phone and sound makers ready to record.

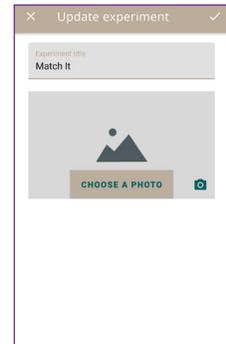
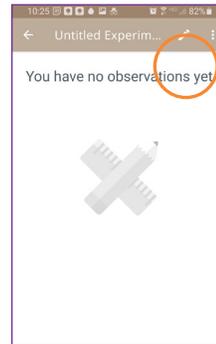
Step 2: Scientist creates the sound recordings.

- 1 **Open the Arduino Science Journal app** and start a new experiment.

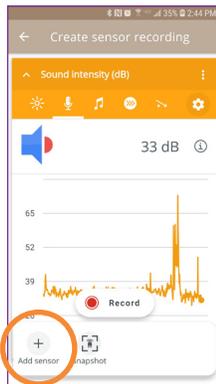


Tap the + icon to start a new experiment.

- 2 **Rename it Match It.** (This will help you organize your data and experiments.)



- 3 **Add the Sound Intensity (dB) sensor** to the experiment.



Tap the + icon to add a sensor.

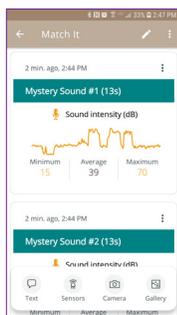
- 4 **Create three recordings, each** of a different sound maker.

- Try to keep each sound maker the same distance away from the phone while recording.
- Make sure the recordings are long enough for the sleuth to be able to see a pattern on the graph. We recommend each recording be at least 10-15 seconds.

Tap the Record button to record.



- 5 **Name the recordings** Mystery Sound #1, #2, and #3. You may want to write down which item matches which graph to avoid confusion.



Step 3: Make and test a hypothesis.

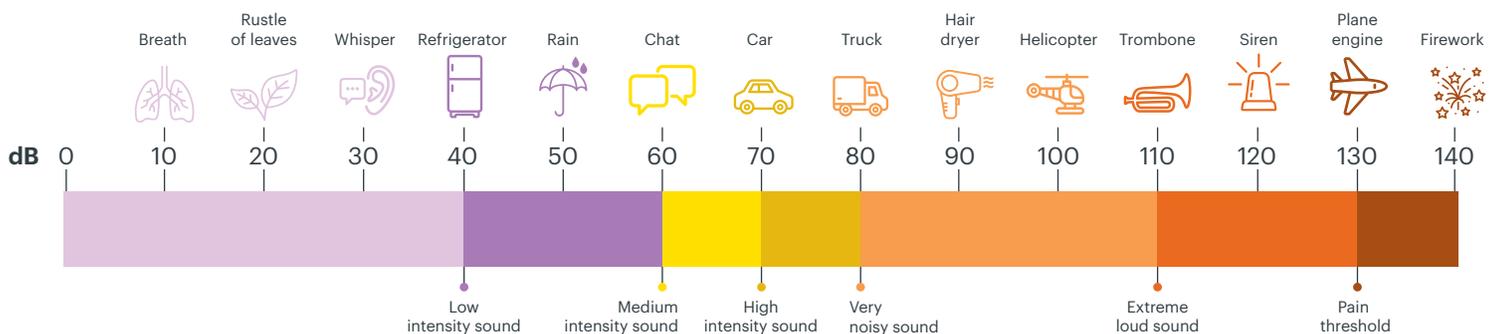
 Sleuth	 Scientist
<ul style="list-style-type: none"> • Look at the graph for Mystery Sound #1 and try to describe it. • Make a hypothesis, or an educated guess, on which sound maker is featured on the graph based on what you know about the data. 	<p>Ask questions to help the sleuth interpret the data.</p> <ul style="list-style-type: none"> • How long were the sounds? Was there a pattern to them? • Was it a soft, medium or loud sound? • How do the graphs show this?
<p>Test the sound maker you predicted by recording it.</p>	<p>Help the sleuth record the sound maker they hypothesized was Mystery Sound #1.</p> <ul style="list-style-type: none"> • Make sure they are recording the sound maker the same distance from the phone. • Name the recording after the item they tested.
<ul style="list-style-type: none"> • Compare this graph to the graph for Mystery Sound #1. If the graphs are the same, check if it's a match! • Repeat making hypotheses and experimenting until you have figured out all three Mystery Sounds. 	<p>Review the results!</p> <ul style="list-style-type: none"> • Help confirm if they <i>Matched It</i> correctly! <p>Mis-matched graphs?</p> <ul style="list-style-type: none"> • Did the sleuth guess the sound correctly, but the graphs aren't identical? This might be because of noises in the background (ambient noise).
<p>Once the sleuth has figured out all three sounds, try trading roles!</p>	

Keep Experimenting

- **Sound Scavengers:** Looking for more of a challenge? Turn this activity into a sound-based scavenger hunt. Instead of having the soundmakers narrowed down to items you collected, the scientist records different sounds around the house. Challenge the sleuth to find them using the sound sensor graph.
- **Out and About:** Try taking this activity outside! The scientist can gather items from nature and see what kinds of sounds they can make. Don't forget to consider how ambient noises around you (wind, traffic, birds, people etc) might show up on the recordings.

How does the sound sensor work?

When you record the Sound Intensity, or volume, using the Science Journal app, the sound sensor feels the tiny vibrations of sound and graphs how loud they are in decibels. Compare the decibel readings of everyday sounds using the chart below.



Share Your Results! Keep us posted about your design challenges on social media with **#TheTechatHome**.

 **The Tech Interactive at Home**

thetech.org/athome
