

Name: _____

MYSTERY science

4th Grade

with Anchor Layer

Student Booklet

MYSTERYscience Worksheets

NGSS Grade 4 Unit

Waves of Sound Mysteries:



Mystery 1

How far can a
whisper travel?



Mystery 2

What would happen
if you screamed in
outer space?






Mystery 3

Why are some
sounds high and
some sounds low?

See-Think-Wonder Chart

Name: _____

MYSTERY science

	See What did you observe? 	Think How can you explain what is happening? 	Wonder What questions do you have? 	
Metal Plate				
Speaker Dish				
Ruben's Tube				

Seeing Sound

Name: _____

Metal Plate

Directions: Use labels and symbols to show how the pattern on the Metal Plate changes and how the device makes sound waves visible. Use the lines below to help you explain the device.

No Sound



Sound



Explanation: _____

Seeing Sound

Name: _____

Speaker Dish

Directions: Use labels and symbols to show how the pattern in the Speaker Dish changes and how the device makes sound waves visible. Use the lines below to help you explain the device.

No Sound



Sound



Explanation: _____

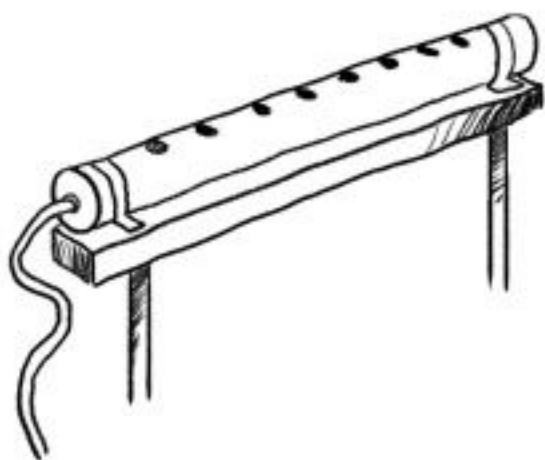
Seeing Sound

Ruben's Tube

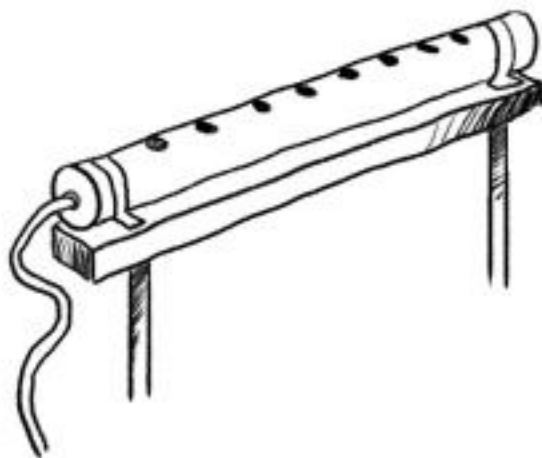
Name: _____

Directions: Use labels and symbols to show how the pattern on Ruben's Tube changes and how the device makes sound waves visible. Use the lines below to help you explain the device.

No Sound



Sound



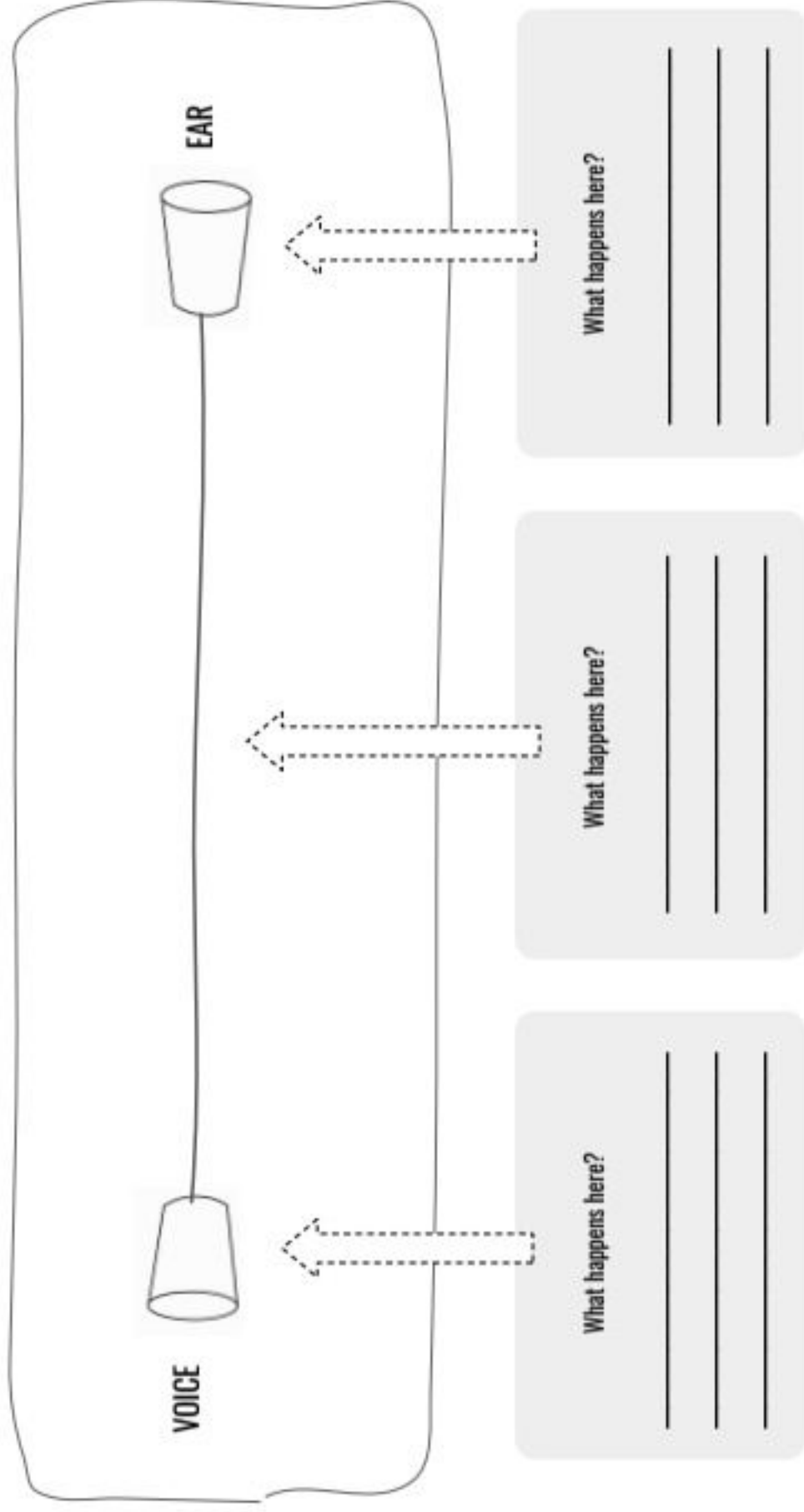
Explanation: _____

Paper Cup Telephone

Name: _____

1. EXPLAIN HOW IT WORKS

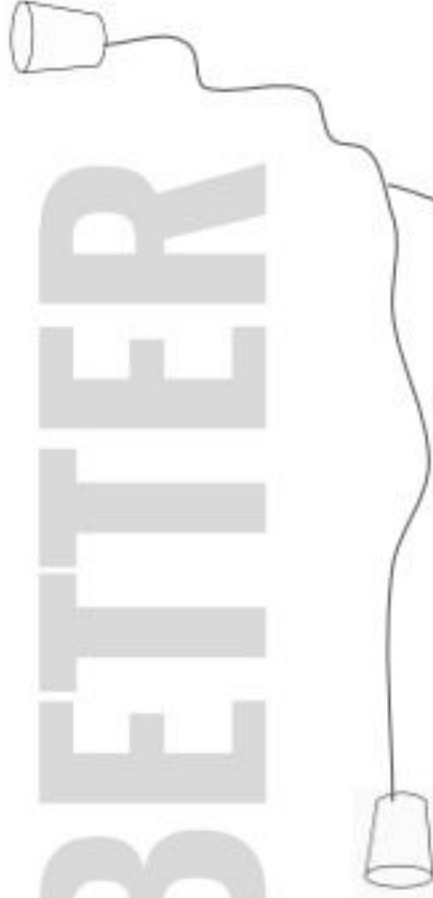
How do you think the paper cup telephone works? Draw and describe what happens to the sound as it goes from cup to cup.



2. DISCUSS:

Name: _____

HOW COULD YOU CHANGE YOUR PAPER CUP TELEPHONE TO MAKE IT BETTER?



Write 2 ideas to
test down here

3. EXPERIMENT!

The 2 experiments you decided on:	Try your experiment. What did you notice?
<p>Here's what we'll do: _____</p> <p>Here's what we think will happen: _____</p>	
<p>Here's what we'll do: _____</p> <p>Here's what we think will happen: _____</p>	

If you need more space, use the back of the page.

Waves of Sound

Mystery 1: How far can a whisper travel?

Name: _____

Date: _____

End of Mystery Assessment

1. When you talk into your paper cup telephone, the person on the other end can feel the bottom of their telephone vibrate. **Why do you think this happens? Show your idea by drawing and using words:**

2. How could you find out if sound vibrations travel through other materials?

3. Think about all the sounds and noises around you each day. Besides human voices, what are some other examples of things that create sound vibrations? Make a list below:

- _____
- _____
- _____
- _____
- _____

Waves of Sound

Name: _____

Date: _____

Mystery 2: What would happen if you screamed
in outer space?

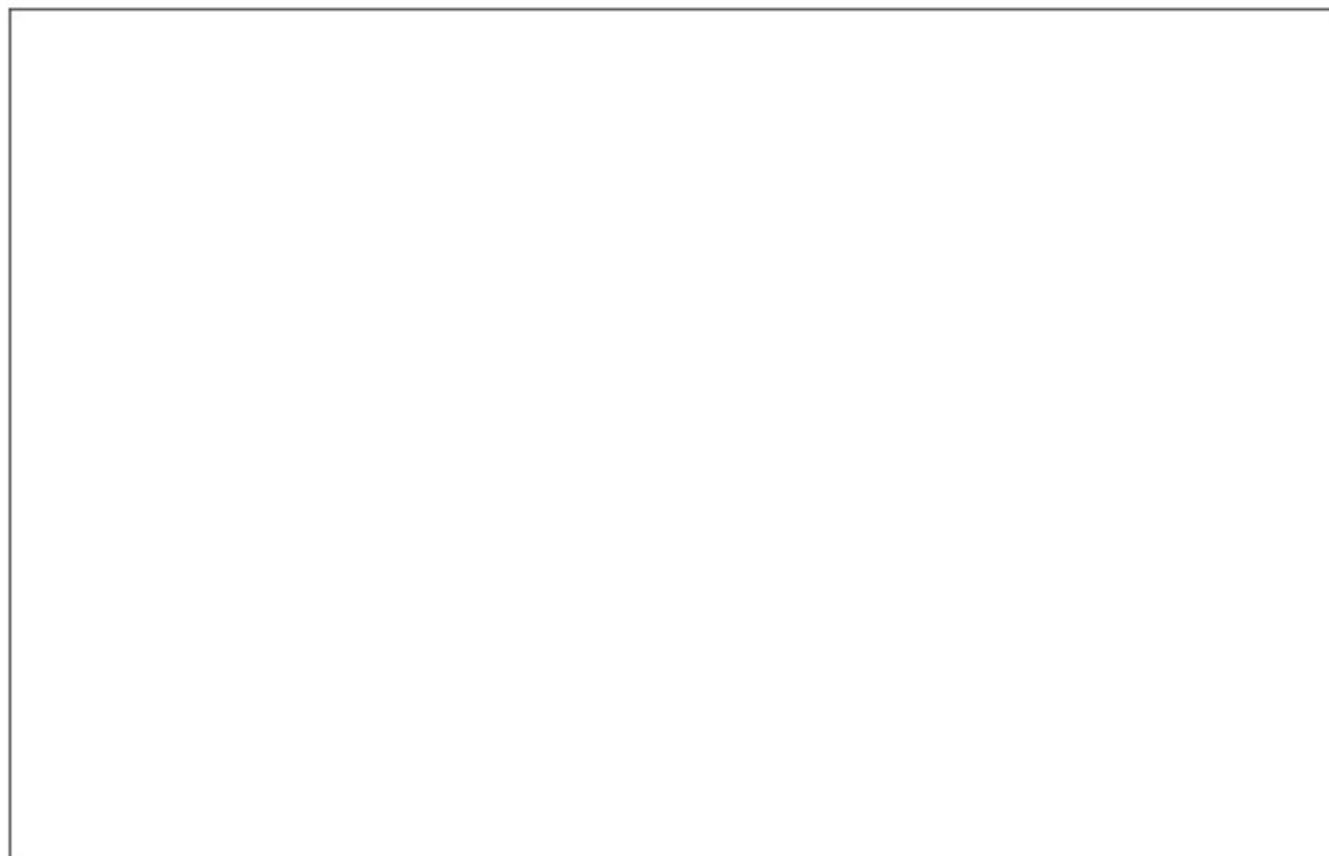
End of Mystery Assessment

1. Why can't sound vibrations travel in outer space?

2. Jayden and his little brother are on a boat trip looking for dolphins. Jayden's little brother keeps banging his hand on the side of the boat. Jayden says to his little brother, "Shhh! Be quiet, I don't want you to scare the dolphins away!" Jayden's little brother says, "Don't be ridiculous, the dolphins can't hear us through the water!"


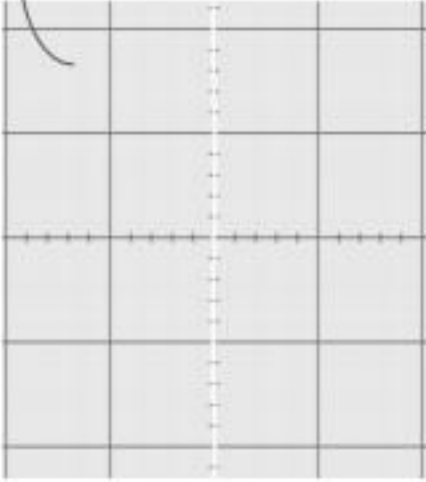

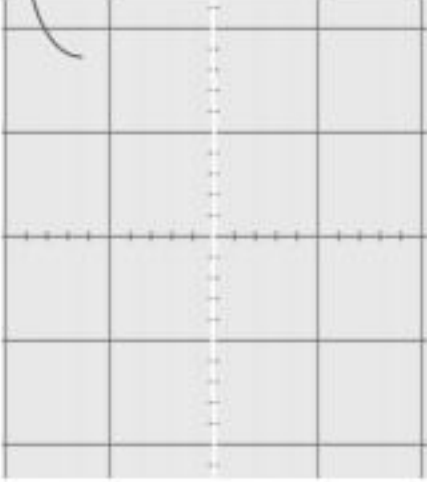
How could Jayden convince his little brother that sound can be heard through water?

3. You've seen that it's possible for sound to break a car's windshield. Why do you think this happens? Show your ideas by drawing a picture below, and using words:



Sound vibrations

Name: _____

PITCH	VIBRATION	HOW THE SOUND WAVE LOOKS	WAVELENGTH
<div>High pitch</div> <div></div> <div>Imagine the sound of a <i>flute</i></div>	<div>The vibration is:</div> <div>_____</div>	<div>High-pitched sound waves look:</div> <div></div> <div>spread out</div> <div>squished together</div>	<div>The wavelength is:</div> <div>short</div> <div>long</div>
<div>Low pitch</div> <div></div> <div>Imagine the sound of a <i>tuba</i></div>	<div>The vibration is:</div> <div>_____</div>	<div>Low-pitched sound waves look:</div> <div></div> <div>spread out</div> <div>squished together</div>	<div>The wavelength is:</div> <div>short</div> <div>long</div>

Be the Vibration!

Name: _____

1

Step 1 Make sure you have all your supplies. Your experiment set-up should look like this:

Tie the rope at one end, or have someone hold it still.

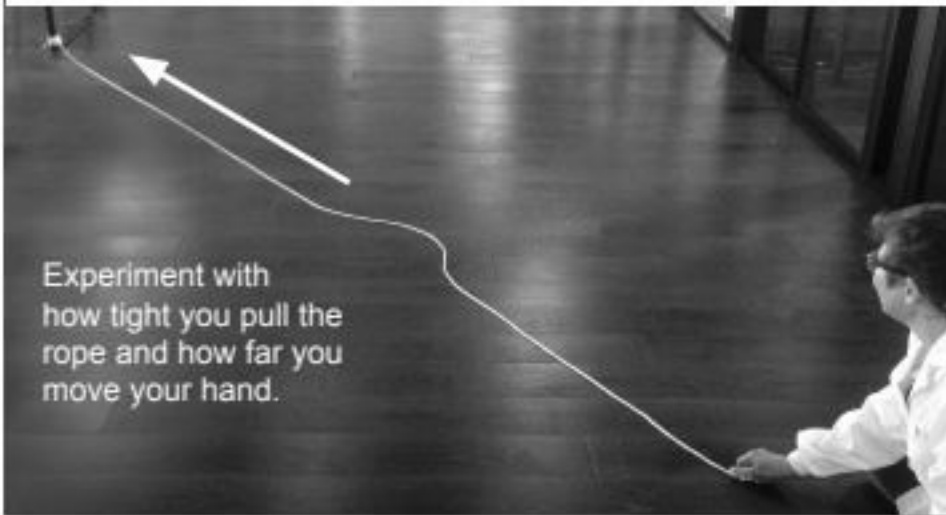
Be sure you're on a smooth, hard floor.



2

Step 2 Make a vibration by jerking your hand to the side and back. Try to make a wave that travels to the end of the rope.

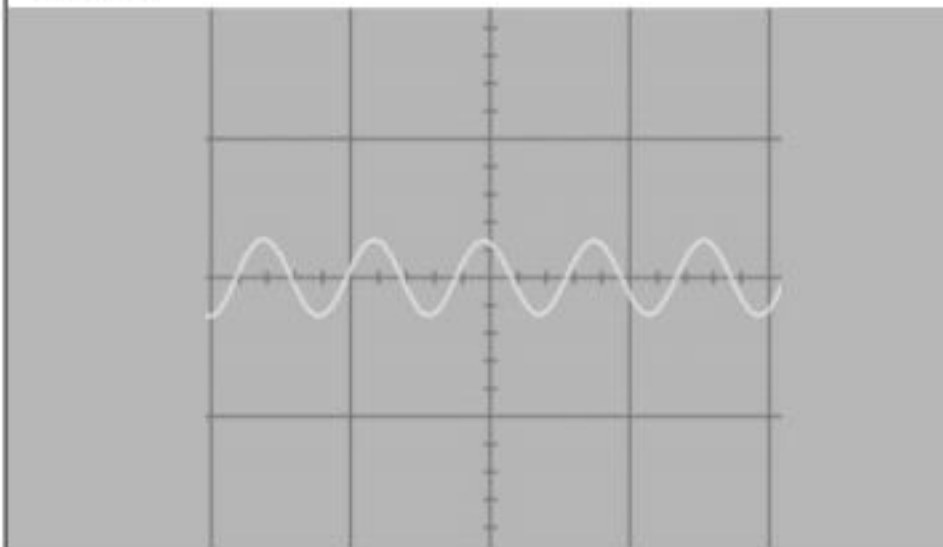
Experiment with how tight you pull the rope and how far you move your hand.



3

Step 3

Challenge! Make waves that look like this oscilloscope picture of a **high**-pitched sound:

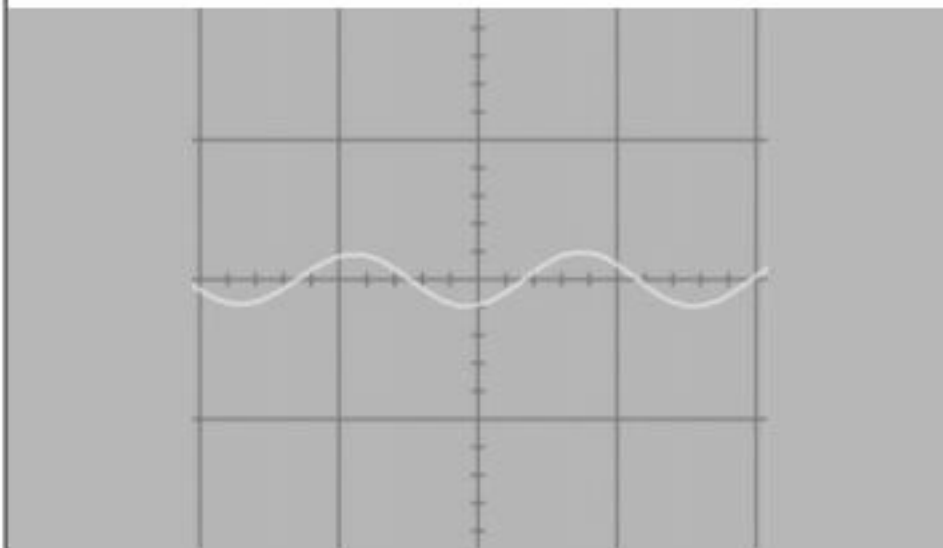


How do you have to vibrate your hand to make waves that are squished together like this?

4

Step 4

Challenge! Make waves that look like this oscilloscope picture of a **low**-pitched sound:



How do you have to vibrate your hand to make waves that are spread out like this?

Waves of Sound

Mystery 3: Why are some sounds high and some sounds low?

Name: _____

Date: _____

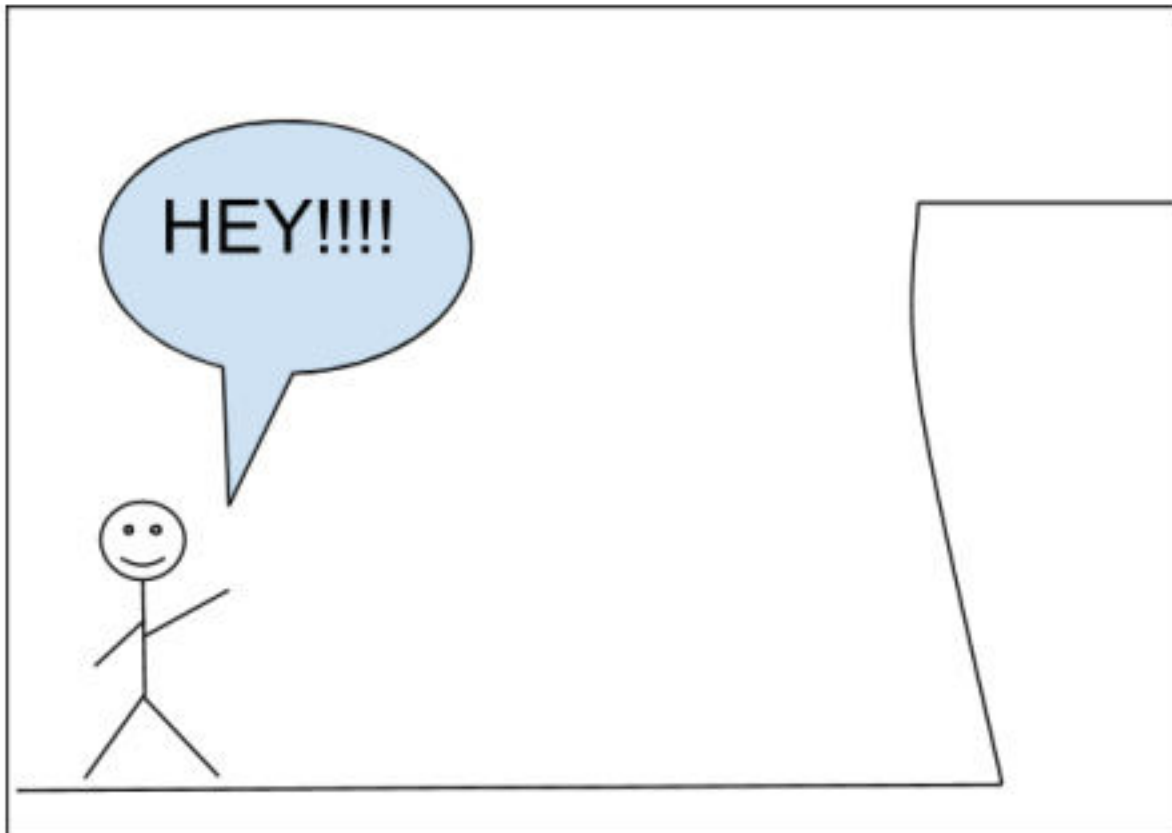
End of Mystery Assessment

1. What does sound have in common with ripples in a pond?

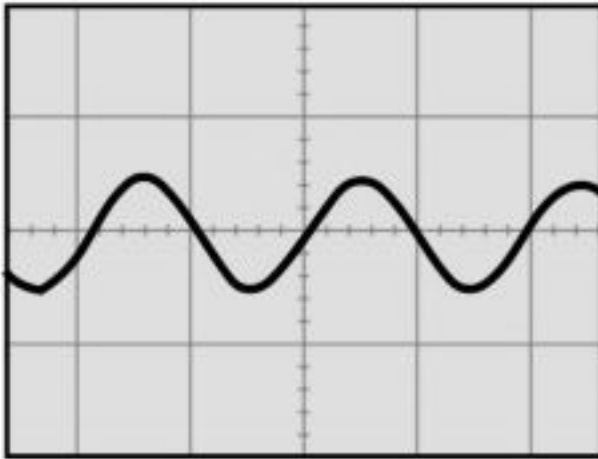
2. If a vibration goes back and forth rapidly (fast), what kind of sound waves does it make in the air: short waves or long waves?

3. The person in the drawing is at the bottom of the Grand Canyon. They yell, "HEY!!!!" and then hear their echo a couple of seconds later.

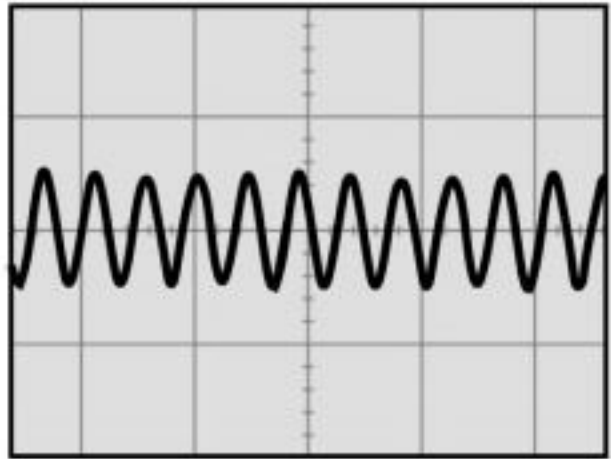
Given what you know about sound, what do you think is happening when a person hears their echo? Show your ideas by drawing on the picture below, and using words:



4. The pictures below show two different sounds, seen through an oscilloscope. One of them is the sound of a flute (a high-pitched sound), and the other is the sound of a tuba (a low-pitched sound). Which is the tuba? Which is the flute? How do you know?



Sound A



Sound B

My Sound Wave Watcher

Part 1: You've been invited to make an exhibit for the International Museum of Interesting Sounds. The museum wants to fill a room with devices that make sound waves visible.

1. **Brainstorm** Write or draw at least 3 ideas for a Sound Wave Watcher in the boxes.

For each idea, include a sound source (something that makes sound) and a sound detector (something that shows the vibrations of sound waves).

Idea #2

Idea #1

Idea #3

Waves of Sound

Final Project

Name: _____

- 2. Design & Test** Choose your best idea (or two ideas) and build your device. Test your device with your partner by asking them to use and explain your device.

- What is the sound source for your device?**
- How does your device make sound waves visible?**

- 3. Reflect & Improve** Think about what you can improve on your device. You can use our ideas or come up with your own.

Things I can improve on my device	Ways to improve

Suggested improvements to try:

- ☐ Use a sound that has a higher or lower pitch.
- ☐ Turn up the volume—make a louder sound.
- ☐ Find a sound detector that vibrates more easily.
- ☐ Add a sound box (like the body of a guitar). *Sound waves bounce around inside the box, adding up to a bigger vibration.*

Waves of Sound

Final Project

Name: _____

Part 2: You'll need to tell museum visitors how to use your device and how it works. You can write and draw to explain your device. Your sign must include:

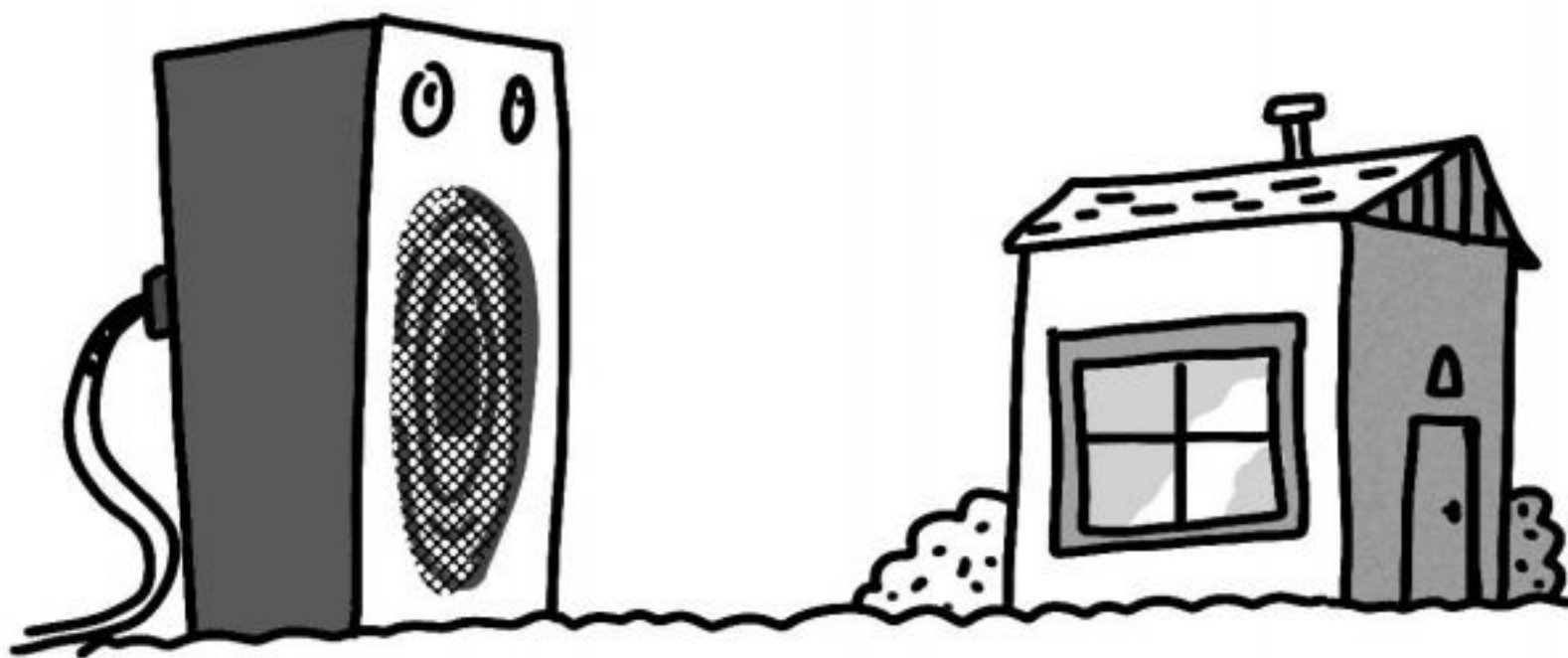
- ☐ How to use the device
- ☐ What sound works best
- ☐ How to see the sound waves
- ☐ How the sound travels from the sound source to the Sound Wave Watcher

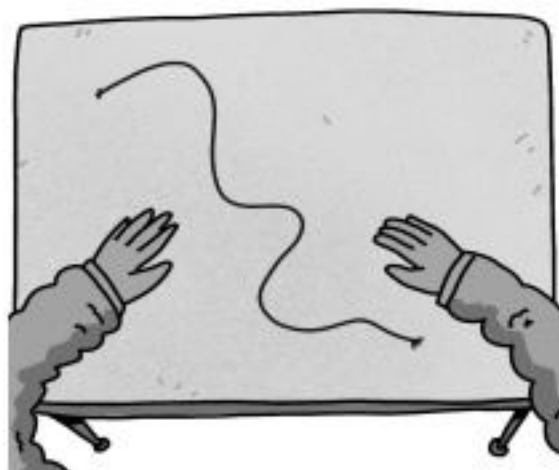
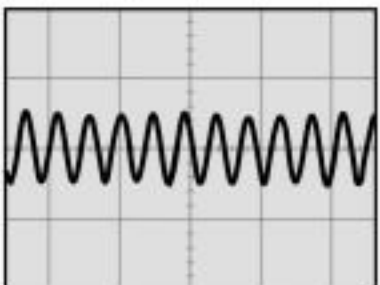
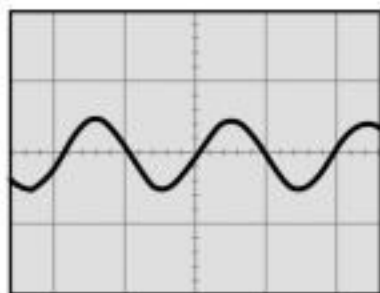
A large rectangular area for drawing and writing, framed by a grey border. The top half is blank for drawing, and the bottom half contains ten horizontal lines for writing.

Unit Assessment

1. Isaiah has built a giant speaker so that he can play music really loudly. He has set the speaker right outside his neighbor's house. Draw arrows and add words to the image below to show a model of what will happen to the glass window of the house when Isaiah starts playing music using the large speaker.

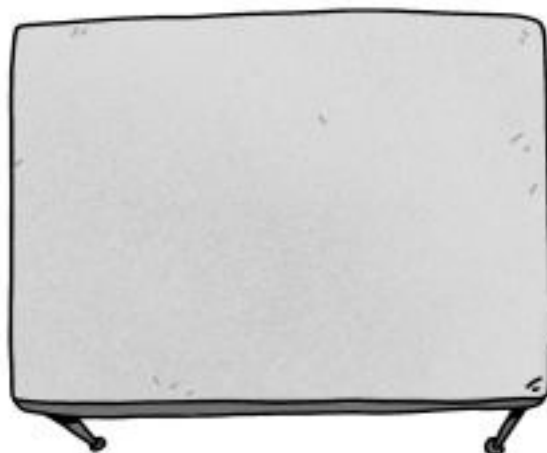
Hint: You can add "air blobs" to your model if that helps.





You recently learned about the wavelengths of sound waves. You've learned that different sounds have different wavelengths. For example, a tuba makes a low sound that has a long wavelength, but a flute makes a high sound that has a short wavelength. Pretend your teacher has given you a long piece of string and asked you to use it to model what sound waves look like. You can lay the string on your desk and bend it to make different wave shapes.

2. Imagine your teacher plays the high-pitched sound of a bird singing. Draw what the string on your desk should look like when you use it to create a model for the sound waves of the bird song.



3. Imagine your teacher plays the low-pitched sound of a whale singing. Draw what the string on your desk should look like when you use it to create a model for the sound waves of the whale song.



4. Leketa is a secret agent. She needs to send secret messages to her partner, Daniel. Leketa uses the sound waves from the beat of a drum to send her messages. Leketa and Daniel create a secret code using a pattern of drum beats to communicate with one another. Here's their secret code:

BAM-BAM-BAM

means "Danger!"

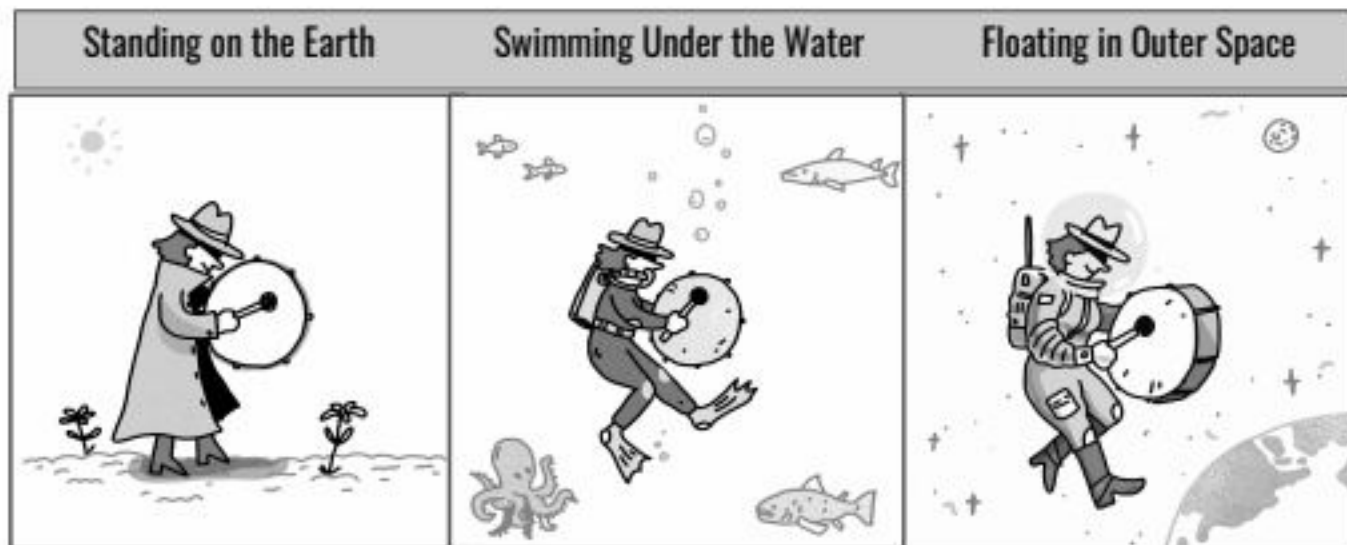
BAM-BAM

means "Mission Accomplished!"

BAM

means "Send Help!"

Leketa bangs on her drum from three different locations: standing on the Earth, swimming under the water, and floating in outer space.



In which of the following places would using a drum work to send her secret messages?

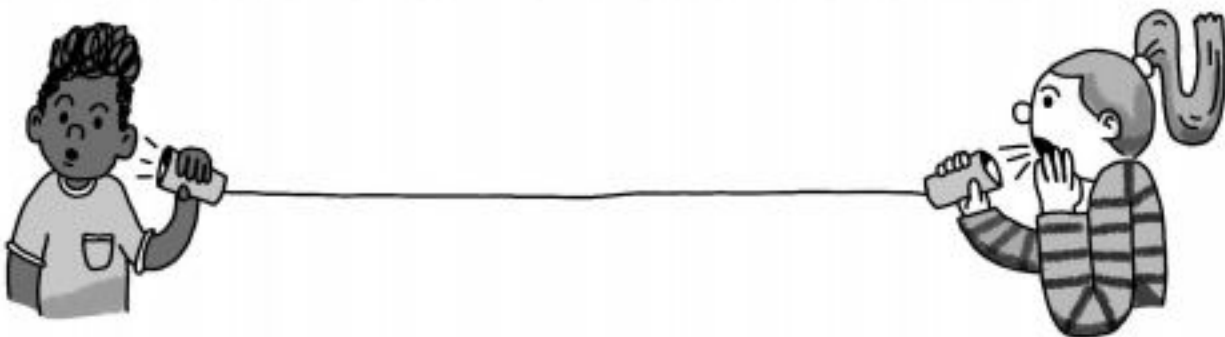
- The drum will work on Earth, under the water, and in outer space.
- The drum will work on Earth and under the water. The drum will not work in outer space.
- The drum will work on Earth and in outer space. The drum will not work under the water.
- The drum will work under the water and in outer space. The drum will not work on Earth.

5. Why did you choose your answer to Question 4? Explain in terms of sound waves.

6. Mateo and Ava made a paper cup telephone that they use to communicate with one another. But there is a problem: The string is too long, so there is a lot of distance between the two paper cups. Mateo can hear sounds when Ava speaks, but he cannot hear the exact words. Mateo thinks that they can solve the problem if they develop a code **using a pattern of sounds**. Generate at least two different ideas that Ava and Mateo could use to communicate with a sound pattern when they use the cups and string. Be sure to explain how each solution would work.

Solution 1:

Solution 2:



7. Mateo and Ava want to compare the solutions that you came up with to see which one will work better. Using the two solutions that you generated above, how could Ava and Mateo test these solutions to compare them and see which one works the best? Choose the best answer.

- a. Ava sends a message using Solution 1 that instructs Mateo to sit down. Mateo hears the sound pattern and sits down. This is evidence that Solution 1 is better than Solution 2.
- b. Ava sends a message using Solution 2 that instructs Mateo to stand on one foot. Mateo hears the sound pattern and stands on one foot. This is evidence that Solution 2 is better than Solution 1.
- c. Ava sends a message using Solution 1 that instructs Mateo to sit down. Mateo hears the sound and sits down. Ava then sends a message using Solution 2 that instructs Mateo to stand on one foot. Mateo doesn't stand on one foot. This is evidence that Solution 1 is better than Solution 2.
- d. Ava sends a message using Solution 1 that instructs Mateo to sit down. Mateo hears the sound and sits down. Ava then sends a message using Solution 2 that instructs Mateo to stand on one foot. Mateo doesn't stand on one foot. This is evidence that Solution 2 is better than Solution 1.