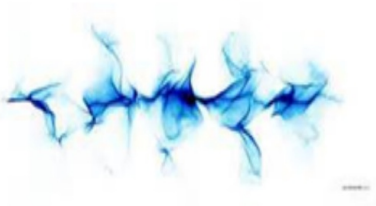
Sound Reading Sheet



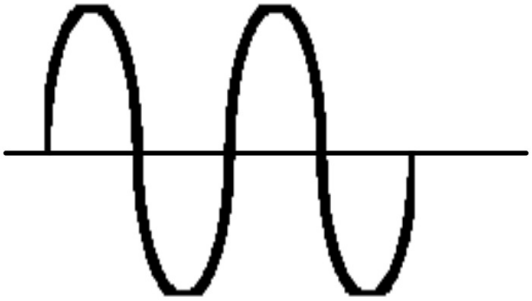
✓ **3-5.5** Recall that vibrating objects produce sound and that **vibrations** can be transferred from one material to another.

Sound is a type of energy made by vibrations. When any object vibrates, it causes movement in the air particles. These particles bump into the particles close to them, which makes them vibrate too causing them to bump into more air particles. This movement, called **sound waves**, keeps going until they run out of energy. If your ear is within range of the vibrations, you hear the sound.

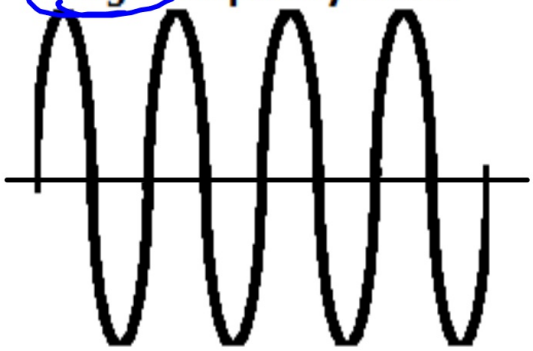
Picture a stone thrown into a still body of water. The rings of waves expand indefinitely. The same is true with sound. Irregular repeating sound waves create noise, while regular repeating waves produce musical notes.

When the vibrations are fast, you hear a high note. When the vibrations are slow, it creates a low note. The sound waves in the diagram show the different frequencies for high and low notes.

Low frequency notes



High frequency notes



So what is sound?

Sound vibrations are back and forth movements that occur very quickly. Vibrations can be transferred from one material to another causing that material to vibrate. Have you ever been in a car and turned the radio up really loud? What happens? What do you notice? Often times you can feel the car or your seat vibrating. The vibrations are moving through your seat and all of the solid parts of your car. If the music is REALLY loud you can almost hear your voice vibrate too because of the sound vibrations in the air. If you have ever been swimming in a pool, it is fun to yell at your brother or sister underwater. It is hard to understand exactly what they are saying, but you can still hear it.

These sound vibrations can travel through solids, liquids, and gases, but they cannot travel through empty space where there are no particles of matter to vibrate. Imagine you are an astronaut. If it were possible to float in space without a helmet on and you tried to tell something to another astronaut, he/she would not hear you even if you tried to shout at the top of your lungs. There is no air in space so there is nothing that will vibrate.

Sound moves better through some materials than others. Try this with a friend. Tie a metal spoon to a string. Hit the metal spoon so that it vibrates. The sound can be heard through the string held to your ear better than through the air only.

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~ Experiment #1:

Does sound travel BEST through a solid, liquid, or gas?

1. **PREDICTION:** What I THINK...

   I think sound travels best through _____.

2. **EXPERIMENT:** What I DID...

STATE of MATTER	VOLUME (none, loud, soft)
solid (wooden block)	LOUD
liquid (water)	Loud/soft
gas (bag of air)	soft

3. **CONCLUSION:** What I LEARNED...

   Sound travels best through SOLID objects.

- What are sound vibrations? _____
  Sound Vibrations are back and forth movements that occur very quickly.
  _____

- What happens when vibrations are transferred from on material to another?
  The second material begins to vibrate as well, producing sound.
  _____

- Vibrations of materials causing sound can travel through solids, liquids, and gases, but they CANNOT travel through empty space where there are no particles of matter to vibrate.

Sound Reading Sheet

- 3.5.6 Compare pitch and volume of different sounds.

What is pitch?

~ Experiment #2:

What is PITCH?

1. **PREDICTION:** What I THINK...

   I think pitch is

   _____.

2. **EXPERIMENT:** What I DID...

SIZE of NAIL	PITCH Predicted (high or low)	PITCH produced (high or low)
large		Low
medium		higher
small		highest

3. **CONCLUSION:** What I LEARNED...

   Pitch *is how* HIGH *or* LOW *a sound is*

Music is made up of many sounds. The **pitch** of a sound is how high or how low the sound is. In music, we call these notes. Each note is different because it has a different sound. A bird chirping in the spring has a high pitch. Can you name any other examples of a **high pitch**?

scream	sueaky mouse	soprano	whistle
bird's song	woman's voice	meow of a cat	opera

A man's voice or booming thunder has a low pitch. Can you name any other examples of a **low pitch**?

man's voice	thunder	growl	tuba
large drum	bass	rumble of a truck	bullfrog

Changing the length of the vibrating object can change pitch. A long string or wire will have a lower pitch than a short string or wire. Let's do a quick experiment.

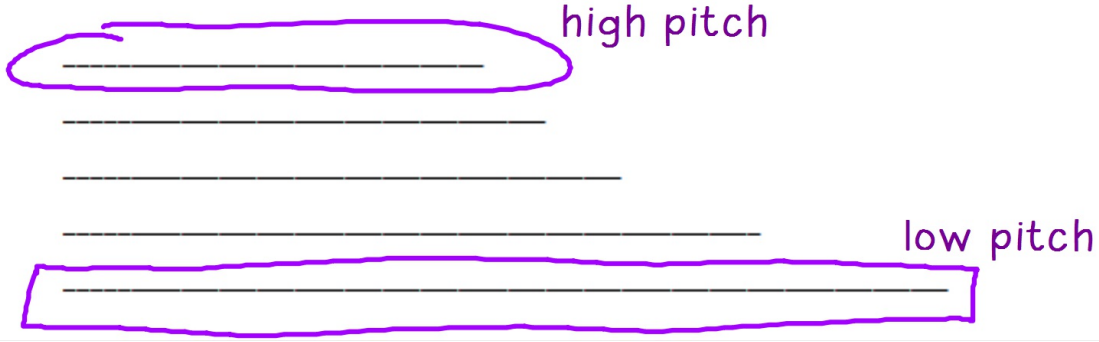
- **What is PITCH?** how high or low a sound is

  Example: A.) **high pitch** - a woman's voice, a chirping bird

  B.) **low pitch** - thunder, rumble of a truck

- **What is one way to change the pitch of an object?** change the length of the object

- ***Circle*** **the string with the** ***highest pitch.***
- ***Draw a box*** **around the string with the** ***lowest pitch.***



What is volume?

Experiment #3:

What is VOLUME?

1. **PREDICTION:** What I THINK...

   I think volume is

   _____.

2. **EXPERIMENT:** What I DID... **"Adding a Bridge"**

   Draw your pegboard strings with the attached bridge.

   1. What difference did you OBSERVE when you added the bridge?

   _____

   _____

   2. What else could you do to an object to increase its volume?

   _____

   _____

3. **CONCLUSION:** What I LEARNED...

   _____ *is how* _____ *or* _____ *a sound is*

Volume is the loudness or softness of a sound. Many times, when people hear a song they like on the radio, they turn the volume up. When this happens, the song gets really loud and makes it hard to hear anything else. What happens when the phone rings or someone tries to talk? You turn the volume down so that the music is quiet and you can hear the person speak.

Many babies have a hard time falling asleep at night. Parents will sometimes put a sound machine in the room to help soothe the baby. These sounds are constant and never change. This means that sound never stops and always has the same pitch. Even though the pitch may not change, the volume can be turned up or down depending on how loud the baby likes the noise. An example might be the sound from a person yelling and the sound from a person whispering. The pitch may be the same but the person yelling makes a louder sound (has more volume) than the sound from a person whispering (has less volume).

We discussed energy and force in our last unit. It takes a force to make a sound. Did you know it takes more force to produce loud sounds than it does to produce soft sounds? Try it sometime. You could wrap a rubber band around an empty box. If you pluck it hard, the sound is loud. If you pluck it softly, the sound is soft.

- What is VOLUME? how loud or soft a sound is

Example: A.) loud volume - scream/yell OR rock concert

B.) soft volume - whisper OR breath

- It takes (more / less) force to produce loud sounds than soft sounds.

strong force = LOUD sound

weak force = soft sound

Sound Reading Sheet

✓ **3-5.7** Recognize ways to change the volume of sounds.

How can the volume of a sound be changed?

Some sounds are loud and some can barely be heard. We can change the volume of a sound using force. Think about this for a minute. Have you ever screamed and yelled at a game? By the end of the game your throat hurts and you may even lose your voice. This is because you used a lot of force in your throat to push out that yell.

The opposite of that would be a whisper. Now I know you can make your whisper really loud if you want to, but then it really isn't a whisper anymore. If you are truly whispering, you will not feel any vibration in your throat. Give it a try. You could whisper for hours and it would not bother your throat the way yelling does because you are using very little force.

So what does this tell us? If the vibrations are made stronger or weaker by striking or plucking objects harder or softer, the volume will get louder or softer. This sounds confusing so let's take a minute to understand it better. If the force is decreased (lowered, soft), the volume becomes softer. If the force is increased (hard), the volume becomes louder. Tapping a desk lightly produces a soft sound while hitting a desk hard produces a loud sound.

- Vibrations are made stronger by plucking harder and therefore the volume will be louder.
- Vibrations are made weaker by plucking lighter and therefore the volume will be softer.
- If the force is decreased (made smaller or weaker); the volume becomes softer.
- If the force is increased (made bigger or stronger); the volume becomes louder.

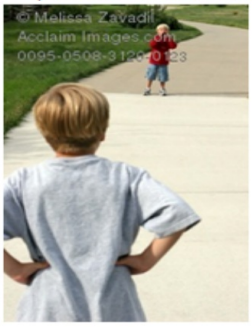
Example: A.) loud sound - _____

B.) soft sound - _____

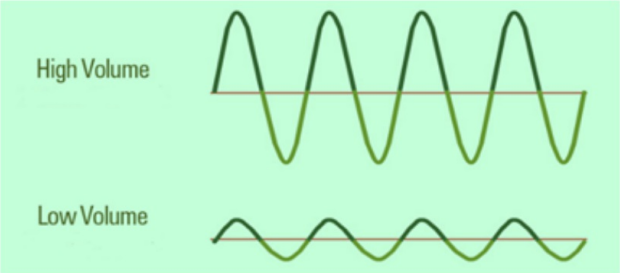
How does distance affect volume?

We know there are loud sounds and soft sounds everywhere. Did you know that the closer a sound is to you, the louder it is? We know that a whisper is a soft volume, but think about this for a minute. If you are standing next to your best friend and he/she whispers in your ear, even though a whisper is soft it might sound loud in your ear. This is because the distance from your friends whisper is right next to your ear and the sound waves (vibrations) do not have far to travel. If your friend whispers to you from across the room, you may not even hear them at all. This is because the volume of the sound is already soft and there is too great a distance for those sound waves (vibrations) to travel.

On the other hand, think about that same best friend yelling at you. A yell is a loud sound (loud volume). If that person is standing right next to your ear and they yell at you, it will sound extremely loud in your ear. So loud that it actually hurts and could damage your ears. This is because the distance is very small and the loud sound will not need to travel far. If that friend moves to the other side of the room and yells to you, the volume of a yell is already loud and will likely still be loud to you from this reasonable distance. Now let's move that friend even farther away. Let's say you are both standing at the ends of a very long hall. Again, a yell is a loud sound, but when your friend yells to you the sound may be very soft or low. This is because there is a greater distance from the start of the sound waves (your friend's yell) and where you are standing (your ear).



All of this tells us that if the source of the vibrations is *farther away*, the volume of the sound is softer. The closer the source of the vibrations is, the louder the volume of the sound will be. Radios, TVs, and disc players have loudness, or volume, controls. The volume can be turned up to make the sound louder or turned down to make the sound softer.



- Distance can affect how _____loud_____ or _____soft_____ a sound is.
- If the source of the vibrations (sound) is _____closer_____, the volume of the sound is _____louder_____.
- If the source of the vibrations (sound) is _____farter away_____, the _____softer_____ the volume of the sound will be.

✓ **3.5.8** *Explain how the vibration of an object affects pitch.*

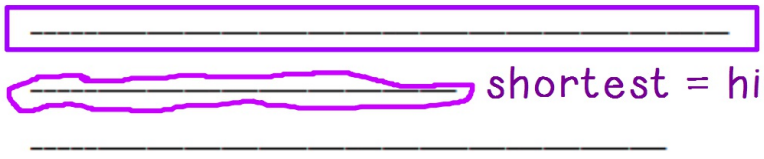
How can you change the pitch of a sound?

The vibrations of an object affect the pitch of the sound. The pitch depends on how fast an object is vibrating. There are a few ways to change pitch. We are going to learn about a few of them below.

1. Length affects the pitch of a sound

The **length** of an object can change the vibration and cause the pitch to change. Shorter materials vibrate faster than longer ones. The faster a string, wire, or air in a tube vibrates, the higher the pitch of the sound. For example, when you shorten the length of a guitar string it makes a higher pitched sound.

- The length of an object can change the pitch of an object
- shorter materials = faster vibrations HIGHER
- longer materials = slower vibrations lower
- *Circle* the string with the *highest pitch*. *Draw a box* around the string with the *lowest pitch*



~ Experiment #4: Does the thickness of an object affect its pitch?

1. **PREDICTION:** What I THINK...

   I think thickness will change / will NOT change the pitch of an object.

2. **EXPERIMENT:** What I DID...

STEP 1. Pluck the thick rubber band on the cup. What is its pitch? LOW

STEP 2. Add a thin rubber band to your cup. Pluck the thin rubber band.

What is its pitch? HIGH

3. **CONCLUSION:** What I LEARNED...

A thin rubber band has a high *pitch.*
A thick rubber band has a low *pitch.*

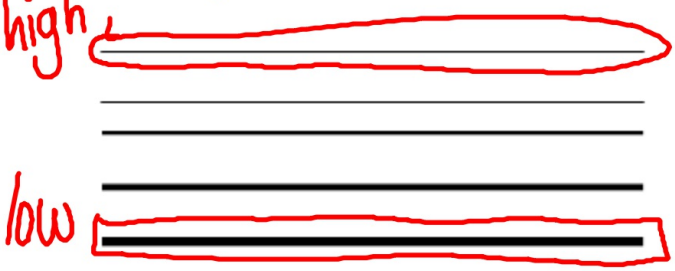
Thickness affects the pitch of a sound

The **thickness** of an object can change the pitch of a sound. Thinner strings or wires vibrate faster than thicker ones. Thinner vibrating materials have a higher pitch than thicker ones when they are vibrated. For example, when a thick rubber band and a thin rubber band are plucked, the thinner one produces a higher pitched sound.

- Thickness changes the pitch of a sound
- thinner strings or wires = vibrate faster = higher pitch
- thicker strings or wires = vibrate slower = lower pitch
- *Circle* the string with the *highest pitch*. *Draw a box* around the string with the *lowest pitch*

high

low



~ Experiment #5: Does tightening a rubber band change its pitch?

1. **PREDICTION:** What I THINK...

   I think tightening the rubber band will change / will NOT change the pitch.

2. **EXPERIMENT:** What I DID...

STEP 1. Place a rubber band around your cup. Make the band as loose as possible. Does it make a high or low pitch? Low

STEP 2. Tighten the rubber band around the cup. Does it make a high or low pitch? High

3. **CONCLUSION:** What I LEARNED...

Tightening the rubber band made the pitch High.

Loosening the rubber band made the pitch Low.

2. Tightness affects the pitch of a sound

The tightness of the stretch of the string or wire can change the pitch—the tighter the stretch of the String, the higher the pitch of the sound. For example, guitars and pianos have screws that can tighten the wire. Tightening the wire to tune the instrument can change the pitch. Tighter wires vibrate faster, making the pitch higher.

- Tightness is the stretch of the string or wire.
- tighter stretch = vibrate faster = higher pitch
- looser stretch = vibrate slower = lower pitch
- What tightens string on a guitar? a peg/screw at the top
- How can a piano's keys be tightened? a screw under the lid
- Tightening or loosening wires changes pitch.

Let's tie it all together

- What three things can change or (effect) PITCH?
  a.) tightness b.) thickness c.) length
- Volume is changed by force (strength of vibrations).
- Distance effects volume.
- Sound travels best through SOLID.