

# Music Factory

Have you imagined yourself  
being a music star?



## WARNING:

CHOKING HAZARD - Children under 8 years can choke or suffocate on uninflated or broken balloons. Adult supervision required. Keep uninflated balloons from children. Discard broken balloons at once.



## Dear Parents and Guardians:

Through play, children develop different cognitive skills. Scientific studies show that when we are having fun or making discoveries during an experiment, a neurotransmitter called Dopamine is released.

Dopamine is known to be responsible for feelings like motivation, reward and learning and that's why experiences are related to positive feelings. So, if learning is a positive experience, it will stimulate the brain to develop various skills.

Therefore, Science4you aims to develop educational toys that combine fun with education by fostering curiosity and experimentation.

Find out below which skills can be developed with the help of this educational toy!

### Educational toy that boosts your brainpower:



The educational feature is one of the key strengths of our toys. We aim to provide toys which enable children's development of physical, emotional and social skills.

Find out more about Science4you toys at:

[www.playmonster.com](http://www.playmonster.com)

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**Play Monster**



We wanna hear how much fun you had! Get in touch at:

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For more fun, visit [playmonster.com](http://playmonster.com)

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## SAFETY RULES

- Read these instructions before use, follow them and keep them for reference.
- Keep young children and animals away from the activity area.
- Clean all equipment after use.
- Make sure that all containers and/or non-redosable packaging are fully closed and properly stored after use.
- Ensure that all empty containers and/or non-redosable packaging are disposed of properly.
- Wash hands after carrying out activities.
- Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
- Do not eat or drink in the activity area.

## GENERAL FIRST AID INFORMATION

- **In case of eye contact:** wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
- **If swallowed:** wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- **In case of inhalation:** remove person to fresh air.
- **In case of skin contact and burns:** wash affected area with plenty of water for at least 10 minutes.
- In case of doubt, seek medical advice immediately. Take the reagent and its container with you.
- In case of injury always seek medical advice immediately.

## ADVICE FOR SUPERVISING ADULTS

- Read and follow these instructions, the safety rules and the first aid information, and keep them for reference.
- This activity set is for use only by children over 6 years.
- Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which activities are suitable and safe for them. The instructions should enable supervisors to assess any activity to establish its suitability for a particular child.
- The supervising adult should discuss the warnings and safety information with the child or children before commencing the activities.
- The area surrounding the activity should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.

In case of poisoning by any of the components used in the experiments of this toy, contact your local poison control center or the nearest hospital. Please consult the following link for more information: <https://www.poison.org/>

**In case of emergency dial:**  
**9-1-1 or Poison Control: 1-800-222-1222**



## LIST OF SUBSTANCES SUPPLIED

Sand

Gravel

Recommendations for substances and mixtures: Do not ingest. Avoid contact with the eyes and mouth. Use only according to the instructions. Store in tightly closed containers. Keep in a cool, dry place. Protect from moisture, direct sunlight and heat sources.

## DISPOSAL OF SUBSTANCES

Do not dispose of substances and / or mixtures together with household or other waste. Please recycle packaging materials where local recycling programs exist.







## KIT CONTENTS



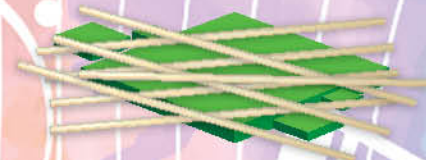
Card with graphic elements



Straws



Bells



Wooden sticks



Bottle caps



Craft wires



Maracas pieces



Wooden stirrers

Paint your stirrers for more colorful flair!



Sand



Rubber bands



Gravel



Beads



Balloons



Petri dish



Musical trays



Large measuring cups



Spoon



Yarn





## 1. The world of music



The brain is responsible for controlling your body!  
And your body has 5 senses!



The **brain** receives stimuli through your senses, allowing you to understand everything that goes around you.



We are **neurons**, very large cells that compose the brain! We are the cells that connect the brain to the other organs, allowing for the correct functioning of your body, as well as its response to external stimuli.





## 1.1 But anyway, how does sound propagate?

Sound is a moving wave, an oscillation of pressure transmitted through a solid, liquid or gas.

Thus, the sound is caused by the **vibration** of the air molecules and this is then picked up by our **ear**.

SOURCE



Sound Production

MEANS OF PROPAGATION

Sound Propagation

RECEIVER

Sound Reception

We can say that the sound has 3 fundamental characteristics:

- It's a mechanical wave
- It does not propagate in a vacuum
- It is a longitudinal wave

### DID YOU KNOW...

The only totally silent place is space? On our planet there are always sounds around us. These, however, may or may not be detected by our ears!

There are lots of animals, like **cicadas**, capable of producing very loud sounds, while others can only be heard by each other. They can use the vocal cords or parts of their body.

The sound waves penetrate into the outer ear

Hammer, Anvil, Stirrup

In the snail, the nerve cells originate electrical signals

Cochlea or snail

Electrical signals are transmitted to the brain

Outer ear

The tympanum vibrates

Middle ear

In turn, the **blue whale** is one of the noisiest aquatic animals of our planet! And the fact that it lives in water, which is a means of sound propagation, also helps!

On land, the animal capable of producing the loudest sounds is the **Howler Monkey**! Its snoring is impressive and can be heard from two miles away!





## 1.2 What is music?

Music is the art of coordinating and transmitting sounds in a harmonious way, with voices, musical instruments, or both together!

Deep down, music is the combination of sounds and pauses (silences) that are made in an organized way!

### Harmony

Is the result of the combination of the notes that serve as a base. These can only be provided by an instrument or by the combination of several voices or instruments joined together.

### Melody

It's the part of the music that can be sung.

We can make music by singing, clapping, whistling...

### Rhythm

Marks the time of a song, helping us to accompany the rest of the group.



## 2. Activities

Scientist, do you know how sound propagates?

### ACTIVITY 1

#### Propagation of sound

#### What you will need:

Extra items you will need:

- 2 Paper or plastic cups • String • Sharp pencil

**Always ask an adult for help!**

#### Steps:

1. Ask for the help of an adult and make a hole on the base of each cup, with the help of a sharp pencil.

The sound of the voice makes the cup vibrate, which makes the string also vibrate.

2. Pass the string through the holes at the bottom of the cups and tie a knot on each end.

4. Take turns, talking inside the cup — while one talks, the other holds the opening of the cup to their ear.

3. Now, hold one of the cups and give the other to another person. Move away from each other, until the string is stretched tightly.

The ears receive sound vibrations then send this information to our brain, and we can understand the message!





Thus, we begin to perceive that sound propagates through waves!

## ACTIVITY 2

### Water xylophone

#### What you will need:

##### Extra items you will need:

- 8 Glass cups of the same size • Measuring cup • Metal spoon
- Water • Food colorings (optional) • Dropper (optional)

#### Steps:

1. With the measuring cup, put 25 milliliters (ml) of water in the first cup. This is the control measure to make all the notes.

2. Now, add water to the rest of the glasses following the indicated measures on the table shown on the side.

Rank	Note	Quantity of water (ml)
1	Ti (B)	25
2	La (A)	50
3	Sol (G)	75
4	Fa (F)	100
5	Mi (E)	125
6	Re (D)	150
7	Do (C)	175

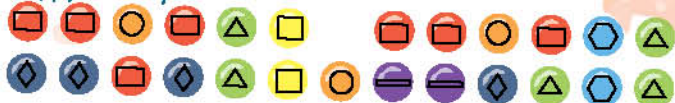
It is the different amounts of water that will create different sounds!



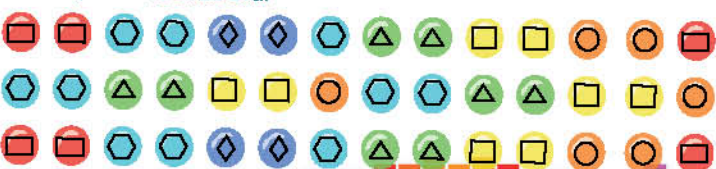
3. If you want an even more fun water xylophone, use the dropper and add food coloring to the water in each glass. Don't forget to wash the dropper every time you change colors.

4. Now, use a metal spoon and touch each cup. You are now ready to play different types of music and sounds!

#### Happy Birthday



#### Twinkle, Twinkle Little Star



Do you know these songs?

How about playing them with your water Xylophone?

#### Musical explanation

When you touch the glasses with the spoon, the air inside vibrates creating a sound!

The tone of a note depends on the vibration velocity of a sound wave — **the frequency**.

The larger the air speaker, the slower it will vibrate, emitting **bass sounds!**

In this activity you've created a musical scale in Do (C)!

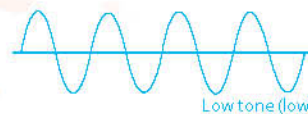
+ low-pitched



+ high-pitched

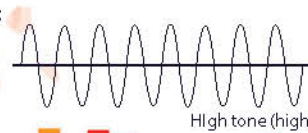
Sounds are characterized by their volumes and can be **low-** or **high-pitched!**

Sound waves that vibrate slowly create low tones



Low tone (low)

Sound waves that vibrate fast, create high-pitched tones



High tone (high)

Can you make a connection between a wave and a type of sound? This exercise represents the characteristic of the sound of boys and girls.



Low tone (low)



High tone (High)



High tone (High)

High tone (High)

High tone (High)

In general, girls have more high pitched voices and boys lower.



## But after all, what are the musical notes?

Each musical note originates from a certain number of vibrations per second — its **frequency** (which is read in Hertz [Hz]).

Let's build different types of musical instruments and learn their sounds!

Each musical instrument makes the air around vibrate in a specific way, producing different **timbres**!

**Timbre (or tone)** is the characteristic sound of each instrument or voice!

## The tips of T-rex:

Did you know that music is a language that calms and brings humans together?

It's fantastic that art allows you not only to express, but also how to influence, emotions!

## DID YOU KNOW...

It was Guido de Arezzo (10th century), a French monk, who organized the musical note system that is used even today!



## String Instruments

### ACTIVITY 3 Guitar

#### What you will need:

Material included in the kit:

- 3 Rubber bands
- 2 Wooden sticks

• Musical tray

Extra items you will need:

- Scissors
- Adhesive tape

Always ask an adult for help!

#### Steps:

1. Ask an adult for help to cut out the musical tray like you see in the picture.



2. Fold the musical tray in half, and tape the sides of it.



3. Now pass the 3 rubber bands around the folded musical tray, as shown.



4. Put the wooden sticks under the rubber bands, on each side of the cut-out circle.



5. Strum the rubber bands to play your guitar!



What sound do you hear, Scientist?





## ACTIVITY 4

### Mini banjo

#### What you will need:

Material included in the kit:



• 2 Rubber bands



• Petri dish



• Wooden stirrer



• Card with graphic elements

Extra items you will need:

• Scissors • Adhesive tape • White glue

**Always ask an adult for help!**

#### Steps:

1. With the help of an adult, use scissors to cut out one of the smallest circles of the card with graphic elements.



2. Then, also cut out one of the stirrer shapes from the card with graphic elements.



3. Now glue the circle inside the petri dish and the stirrer shape on the large wooden stirrer.



4. Put the rubber bands around the Petri dish, trying to stretch them to the maximum. You may need to wind them several times.



5. Finally, with the tape, attach the wooden stirrer to the Petri dish, in the same direction as the rubber bands, leaving it with the opening facing out.



Can you play your mini banjo?



Stringed instruments work, as the name indicates, through the **vibration of their strings!**

The first stringed instrument we know of is the **musical bow**, whose origin is between 35 to 15 BC.

Musical bow or berimbau.

On **stringed instruments**, the height of the sounds emitted depends on the length, thickness and tension of the strings.

• The **shorter the length** of the strings, the **higher** the pitch of the sound.

Short strings

High-pitched sounds

Long strings

Low-pitched sounds

• The **thinner** the strings, the **higher** the pitch of the sound.

Thin strings

High-pitched sounds

Thick strings

Low-pitched sounds

• The **more you stretch** a string, the **higher** the pitch of the sound.

Stretched strings

High-pitched sounds

Loose strings

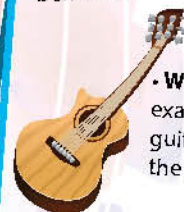
Low-pitched sounds

There are 3 types of string instruments:

• **Without neck**, for example the harp and the berimbau.



• **With neck**, for example, the guitar, the violin, the banjo, etc.



• **Played with a bow**, like the violin and the double bass.





## Percussion

### instruments

Tambourine

Bell stick

Triangle

Hand bell

Wrist bell

Castanets

Claves

Egg shakers

Maracas

Finger castanets

Are you ready to enter the world of percussion instruments?

Percussion instruments make sounds through impact, scraping or agitation.

### DID YOU KNOW...

Percussion instruments are some of the oldest on record! In early archaeological records, we see several representations of people dancing around a drum!

## ACTIVITY 5

### Drum

What you will need:  
Material included in the kit:

• 2 Large measuring cups

• Ballons

• Spoon

Extra items you will need:  
• Scissors • X-acto knife

Always ask an adult for help!

### Steps:

1. With the help of an adult, use an X-acto knife to cut the base off of the large measuring cup. Cut another cup so it's shorter than the first.

4. Use the spoon to play your drums! Can you hear two different sounds?

2. Cut the end off the balloons, so that you can use one end, as shown.

3. Stretch the balloon over the opening of each cup, as you see here.

Drums are rhythmic instruments!



## ACTIVITY 6

### Hand drum

#### What you will need:

Material included in the kit:



• Yarn



• Straw



• 2 Beads



• Card with graphic elements

Extra items you will need:

• Scissors • Ruler • Adhesive tape • White glue

**Always ask an adult for help!**

#### Steps:

1. Cut out the two largest circles of the card with graphic elements. Use scissors and ask an adult for help.

3. With tape, attach one of the cut-out circles to the straw. Then use the tape to attach the yarn as you see in the image.

4. Now, use glue to attach the other circle.

5. Press one circle to the other and let the glue dry.

6. Tie one bead to each end of the yarn.

7. Are you ready to play? Just hold the straw between your hands and rub them, as if you were cold!

**Helps you stay in shape**  
Playing percussion is like doing physical exercise.

**Increases school performance**  
Music and math, among others, are very related!

**Increases creativity**  
Every time we play percussion, we have to use our imagination to make it sound great!

**Do you know the advantages of playing percussion instruments?**

**Increases the power of the brain**  
because you need a lot of hand and foot coordination.

**Increases happiness and reduces stress**  
because endorphins are released — the happiness hormone!

**The tips of T-rex**

## ACTIVITY 7

### Castanets

#### What you will need:

Material included in the kit:



• Cardboard strip  
(like the flap from this package)



• 2 Bottle caps



• Card with graphic elements

Extra items you will need:

• Scissors • Ruler • White glue • Paper

**Always ask an adult for help!**

#### Steps:

1. Cut out one of the graphic elements for the castanets from the included sheet.

3. Glue it to the cardboard strip. Wait until it dries.

5. Tape the paper squares inside the bottle caps.

2. Trace the design that you chose onto the cardboard flap from this package. Ask an adult for help to cut out the shape.

4. Now, you need to fold some of the paper to make 2 pieces the same size (height) as the inside of the bottle cap. Use tape to secure the end of the paper.

6. Finally, glue the bottle caps, top side out, to the strip that you prepared in step 3. To play, all you have to do is fold them in half and click the bottle caps together to make a catchy rhythm!

Castanets are a percussion instrument that have existed since the Phoenicians' time (3,000 years ago!).

They are an instrument used to set the rhythm that accompanies a dance.

**DID YOU KNOW...**  
The two castanets usually emit two different sounds? These are the female castanet and the male castanet.



## ACTIVITY 8

### Tambourine



• Musical tray

**What you will need:**  
Material included in the kit:

• 2 Craft wires



• 6 Bells

Extra items you will need:

• Scissors • Paper hole punch

**Always ask an adult for help!**

#### Steps:

**1.** For this instrument, use the musical tray. Start by removing the two flaps to make it smooth. Then, fold it in half at the middle like the image shows.



**2.** Cut out the semi-circle illustration along the lines as indicated.



**3.** Use the paper punch and punch the 6 holes marked along the curved area that you cut.



**4.** Again with the scissors and the help of an adult, cut each craft wire in 3 pieces.



**5.** Finally, thread a piece of craft wire through each hole and attach a bell to the end of each wire. Twist the ends of the wire to secure each bell.



**Your tambourine is ready!**



The term **tambourine** means "drumhead." Some have a stretched membrane on one or both ends like a drum. However, some tambourines don't have that.

## ACTIVITY 9

### Bell stick

• Wooden stick

**What you will need:**  
Material included in the kit:

• Craft wire



• 4 Bells

#### Steps:

**1.** Carefully, wrap the craft wire around the wooden stick. Thread on bells as you curl around the stick to space them out, as you can see in the picture.



This is a very simple instrument, but provides an incredible rhythmic effect!

It was in England between the years 1696 and 1724 that the first instruments of this kind were created.



Both the **tambourine** and the **rattle** are manual percussion instruments. This instrument can be used for all kinds of musical genres, from folk music, classic, gospel, pop and even rock!

#### DID YOU KNOW...

There's a reptile that has a rattle in its tail? It's the rattlesnake and this rattle serves to protect you from danger!





## ACTIVITY 10

### Maracas

**What you will need:**  
Material included in the kit:

• Maracas pieces

• Spoon

• Sand/gravel

Extra items you will need:  
• Adhesive tape

#### Steps:

1. Add 2 spoons of sand in one of the maracas pieces.

2. Place the other container on top of the first one and tape them together, as shown here.

3. Now you just shake your maraca with a lot of rhythm.

Scientist, what if you tried this with gravel? Would the sound be different?

Maracas are agitation percussion instruments. We usually use two, one in each hand.

They are typically instruments of Latin dances which, as the name indicates, have their origins in Latin America.

#### SUPER MUSIC:

Make maracas with different materials: Use paper or plastic cups and try rice, pasta, beads... Or whatever you think is best! Can you get different sounds using different materials?

## ACTIVITY 11

### Rainstick

**What you will need:**  
Material included in the kit:

• Wooden sticks

• 2 Rubber bands

• Spoon

• Sand/gravel

Extra items you will need:  
• Cardboard tube • Needle • White glue • Washable paints  
• Scissors • Markers • Adhesive tape • Other graphic elements

**Always ask an adult for help!**

#### Steps:

1. Use paints, markers and other graphic elements to add colors and decorations to the cardboard tube. This will be your rainstick!

3. Break the wooden sticks into pieces a little shorter than the diameter of the tube and slide them through each hole you made.

5. When ready, start by gluing one end to the tube, by the flaps. Use the rubber bands to secure the flaps on the ends.

2. With the help of an adult, use the needle to make holes along the cardboard tube.

4. With the cardboard, prepare the ends of the tube, so that they can close. To do this, draw two circles that are the same diameter as the tube and make a few little flaps, as shown here. Decorate any way you like.

6. Now put sand and gravel inside the tube and close the other end of the tube.

How about the sound of your rainstick?

Now you can use your rainstick!

Scientist, you can replace the gravel and sand with beans, rice, pasta or other small objects that might make good, or different, sounds.

The rainstick is built with a tube that has small pins passing from one side to the other in its interior. Then, small seeds, sand or other solid materials are placed inside. By moving the instrument, it makes the sound that reminds us of rain.

It is believed that the rainstick has its origin from the Mapuche; indigenous people from the south-center of Chile and southwest of Argentina.



## Wind instruments

These instruments got their name because the sound is originated by the emission of air inside a tube!

Blow comes from the Latin *sufflare*, formed by *sub*, "under," and *flare*, "move the air, blow" — that's what the artist uses when playing these types of instruments.



### ACTIVITY 12 Straw flute

**What you will need:**  
Material included in the kit:

• 7 Straws

• 2 Wooden stirrers

Extra items you will need:

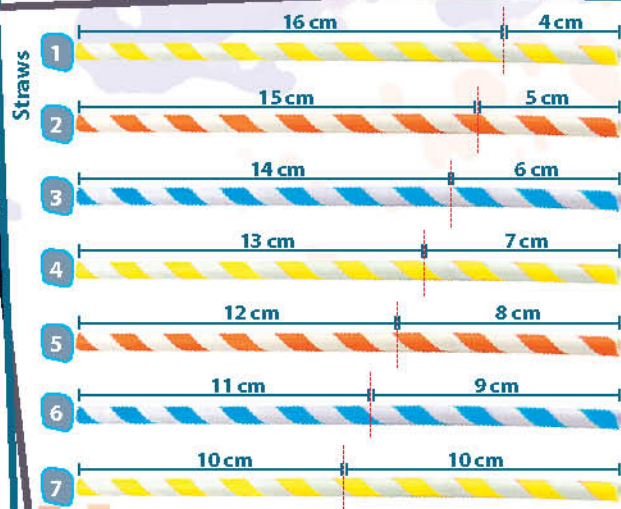
• Double-sided tape or white glue • Ruler • Pencil • Scissors

**Always ask an adult for help!**

#### Steps:

1. With a ruler, start measuring the straws by marking them, with a pencil, with the measures that you see in the diagram below.

2. Then with the help of an adult, cut them with scissors at the marks. **Each straw corresponds to a musical note!**



**Note:** You'll end up with two 10 cm straws. Save one for the next activity.

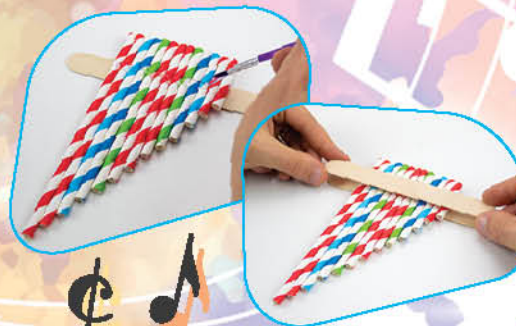
3. Put glue (or double-sided tape) on the center of one of the stirrers.



4. Stick the straws from the longest to the shortest along the stirrer. Make sure the tops stay lined up as you attach them.



5. Glue or tape another large stirrer over the straws.



6. Finally, you can glue one of the stirrer-shaped graphic elements to decorate your flute.



**Your straw flute is ready! Blow through the straws! Does it make a sound?**

Peruvian playing a pan flute.



This type of flute is also known as **pan flute** because of the association with the Greek god Pan.

#### SUPER MUSIC:

If you want, you can decorate your musical instruments by adding paint, stickers, or anything you like! Use your creativity to create even more original instruments.



## ACTIVITY 13

### Harmonica

#### What you will need:

##### Material included in the kit:

• Card with graphic elements

• 2 Rubber bands

• 2 Wooden stirrers

• 2 Pieces of straw (left over from activity 12) or toothpicks

##### Extra items you will need:

• Scissors • Sheet of paper • Double-sided tape or white glue

**Always ask an adult for help!**

#### Steps

1. Choose one of the graphic elements in the shape of a large stirrer and have an adult help you cut it out with the scissors.

3. Now cut a strip of paper also in the shape of a large stirrer, then position the two pieces of straw as shown here.

5. To finish, secure the two stirrers with a rubber band at each end.

2. Glue it on top of a large wooden stirrer. Let it dry.

4. Press the second stirrer on top of the two straws.

*It's ready! Blow through your harmonica and squeeze it in different places. Can you make different sounds?*

The word harmonic was first used by Benjamin Franklin, referring to a set of lenses. Later the name was applied to the musical instrument, called "organ of the mouth," in English



Did you know that the harmonica is also known as the mouth pipe?



#### TREBLE CLEF

To know more about sound...

Sound waves take time to move around, so sometimes you will see something first and then hear the sound!



Does a sound reach your ears as soon as it's produced? The answer is **no!**







## TREBLE CLEF

And where does sound move faster?



SOLID

HIGHER PROPAGATION SPEED



LIQUID

LOWER PROPAGATION SPEED



GAS

## SUPER MUSIC:

In a thunderstorm, count the seconds between the lightning flash and the thunder, and then divide this time by 3. This will tell you how far away the thunderstorm is (in kilometers)!



ex:

$$\frac{5 \text{ sec.}}{3} = 1.6 \text{ km}$$

## ACTIVITY 14

### The speed of sound

What you will need:

Material included in the kit:



• Balloon

Extra items you will need:

• Flour • Spoon • Pin • Funnel



Always ask an adult for help!

It is best to perform this activity outdoors!

Steps:

1. Stretch the balloon's opening and add 3 spoonfuls of flour using a funnel. You may need help.
2. Ask an adult to hold the balloon a far distance away from you.
3. Now, with the pin, the adult must pop the balloon.

**ATTENTION:** when you finish the activity, throw away all used food.

## DID YOU KNOW...

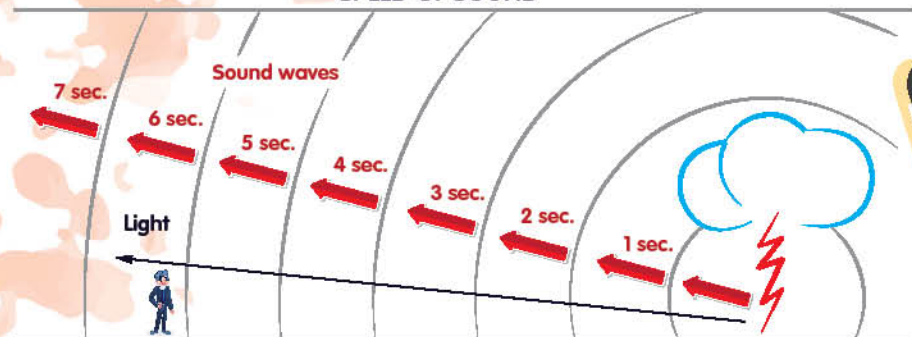
The speed of sound is much slower than the speed of light! The rays of light move about a million times faster than the sound waves — first you see, then you hear!



## WHAT HAPPENED?

You should see the cloud of flour falling from the balloon before you hear the sound of the balloon bursting!

## SPEED OF SOUND







## TREBLE CLEF

How do you use a musical scale, anyway? Here's how to read a musical score...

The treble clef is one of the best known musical symbols. This symbol indicates the position of the note sol on the musical score.

**Treble clef**

High-pitched

Do-4  
Do Central

Do (C) Re (D) Mi (E) Fa (F) Sol (G) La (A) Ti (B) Do (C) Re (D) Mi (E) Fa (F) Sol (G)...

Do (C) Re (D) Mi (E) Fa (F) Sol (G) La (A) Ti (B) Do (C) Re (D) Mi (E) Fa (F) Sol (G)...

**Treble bass**

Low-pitched

In a music score you can still find other symbols. Look at some examples in the table:

NUMBER	FIGURE	NAME	TIME
1		WHOLE NOTE	4
2		HALF NOTE	2
4		QUARTER NOTE	1
8		EIGHTH NOTE	$\frac{1}{2}$
16		SIXTEENTH NOTE	$\frac{1}{4}$
32		THIRTY-SECOND-NOTE	$\frac{1}{8}$
64		SIXTY-FOURTH-NOTE	$\frac{1}{16}$

These symbols represent the time that the note needs to be "held/sustained," the longer the time, the longer the note.



## Happy Birthday to you

Recorder

do do re do fa mi do do re do sol

Recorder

fa do do do la fa mi re si si la fa sol fa

Example of the musical score of the song "Happy Birthday." If you have a flute, try playing this song!



## DID YOU KNOW...

Pythagoras played a big part in the definition of the scale of musical notes? A legend has it that he was guided by the gods in the discovery of the relationship between music and math.

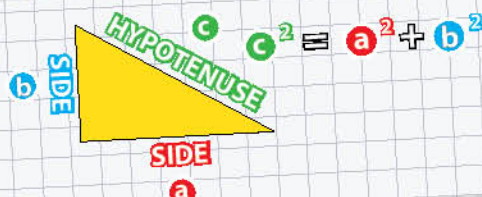


It was through the relationship between the length of a rope stretched and the sound produced — just like the strings on a guitar or the banjo!

Pythagoras realized as soon as the sound was produced it always depended on its length.

Pythagoras was a Greek mathematician and philosopher, well known for the **Pythagorean Theorem**.

Now that you know more about music and you even know how to make your own instruments, form your own band, compose your songs with beautiful poems and turn into a amazing modern-day musician!





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