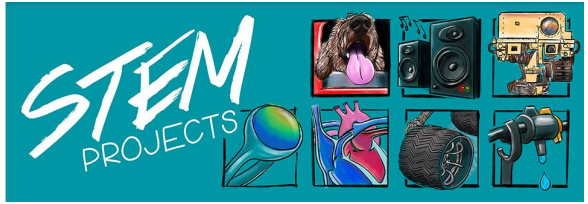

Do you hear what I hear? Make sound and music come alive with coding in a STEM project!

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Why STEM and Coding in the Classroom?

1. **Collaboration in the Classroom**

   Teamwork and Communication

2. **Creativity**

   Introduce Innovation with Real-World Problems

3. **Critical Thinking**

   Connect Science and Math

Ten Minutes of Code

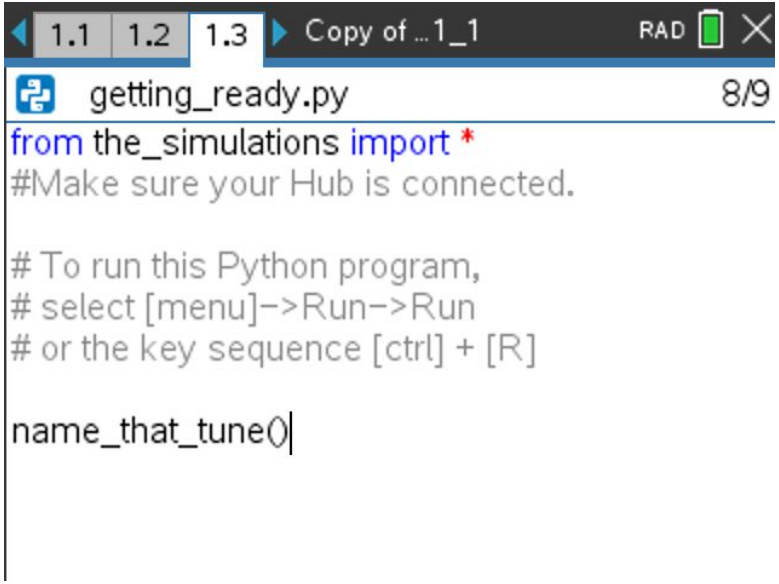
Python Programming »

TI-Basic Programming »

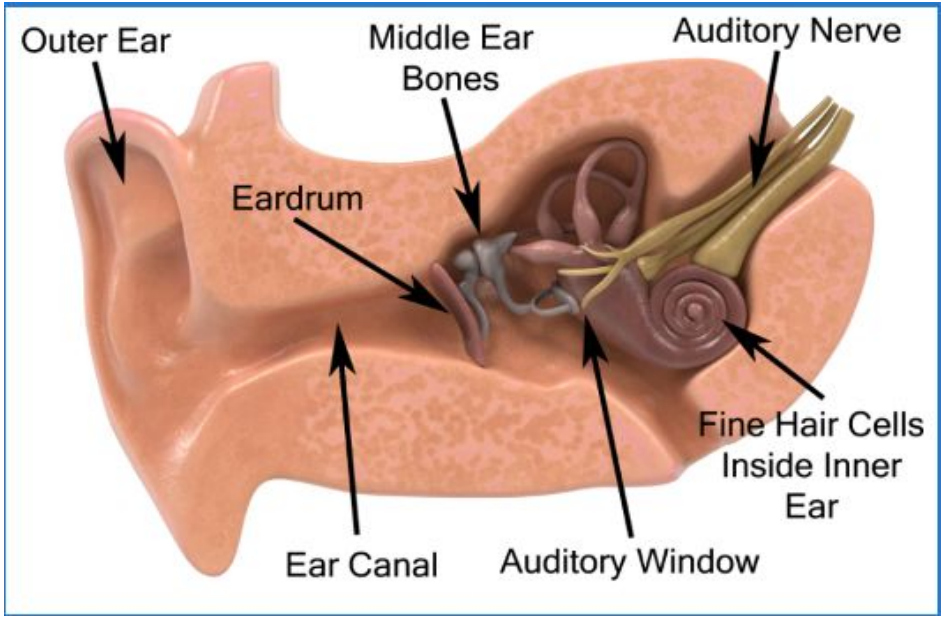
- » Entry-level
- » Menu-based
- » Python (TI- Nspire CX II) or TI-Basic (TI-84 CE/TI-Nspire CX)
- » STEM integration with TI-Innovator Hub
- » Spark interest in Robotics with TI-Rover

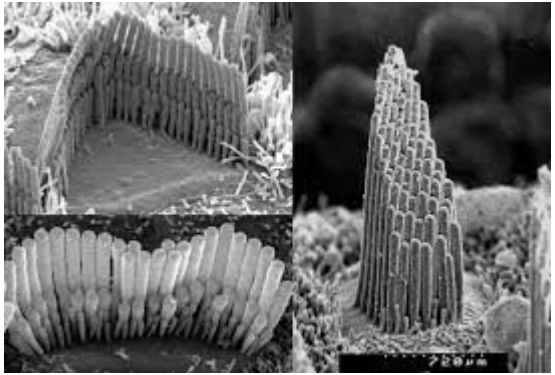
Engage: Name that tune!!!

We will play a tune. Type in the chat what you think the name of the tune is!

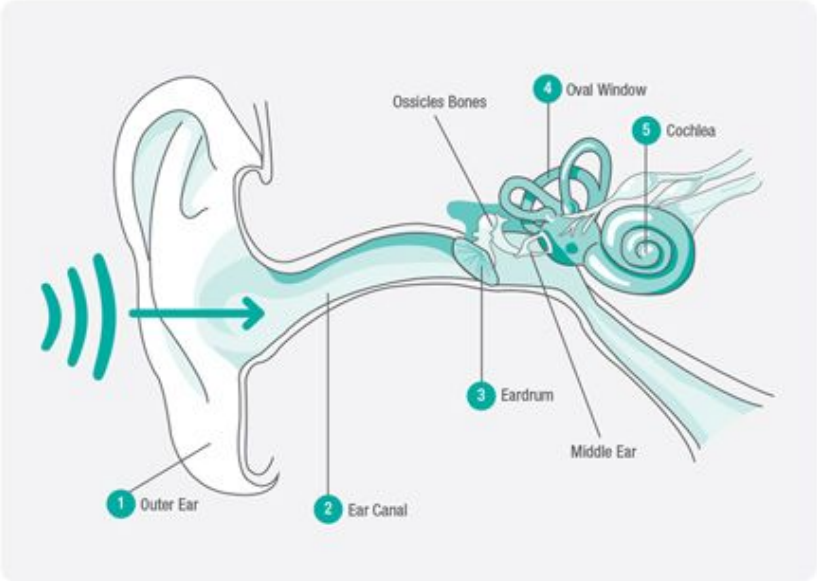


Explore: Science Behind Hearing





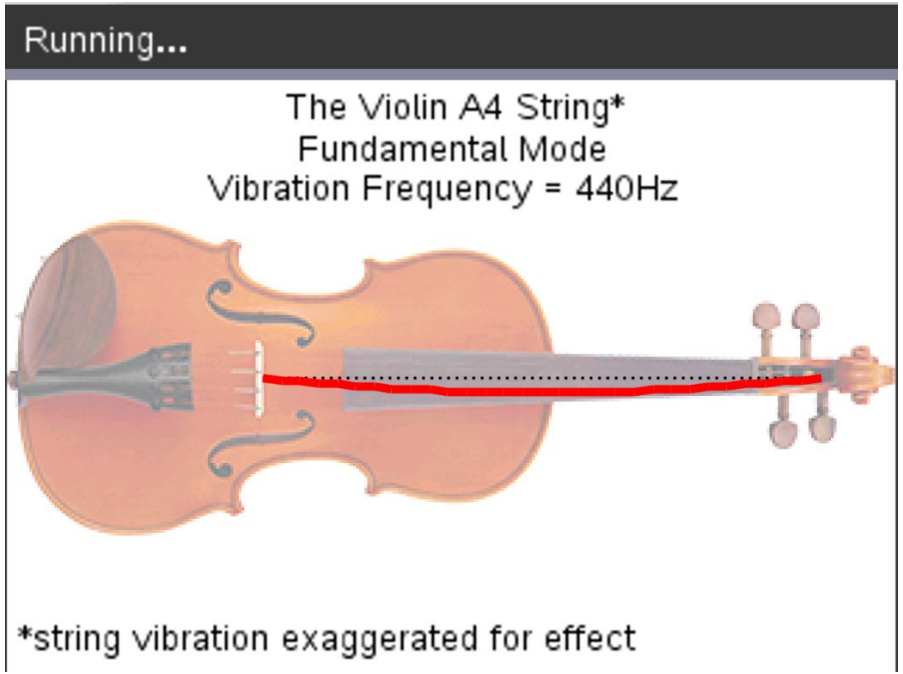
Explore: Science Behind Hearing



How hearing works

1. The outer ear catches sound waves and directs them into the ear canal.
2. The sound waves are amplified by the canal's funnel-like shape.
3. When the waves hit the eardrum they create vibrations, which in turn move the tiny ossicles bones (commonly referred to as the hammer, anvil, and stirrup).
4. The ossicles convey the vibrations through the middle ear to the "oval window," the membrane between the middle and inner ear.
5. The spiral-shaped inner ear is called the cochlea. It's lined with thousands of microscopic hair cells that convert sound energy into electrical signals. These signals travel on nerve pathways to the brain where they are finally interpreted.

Explore: Violin Activity

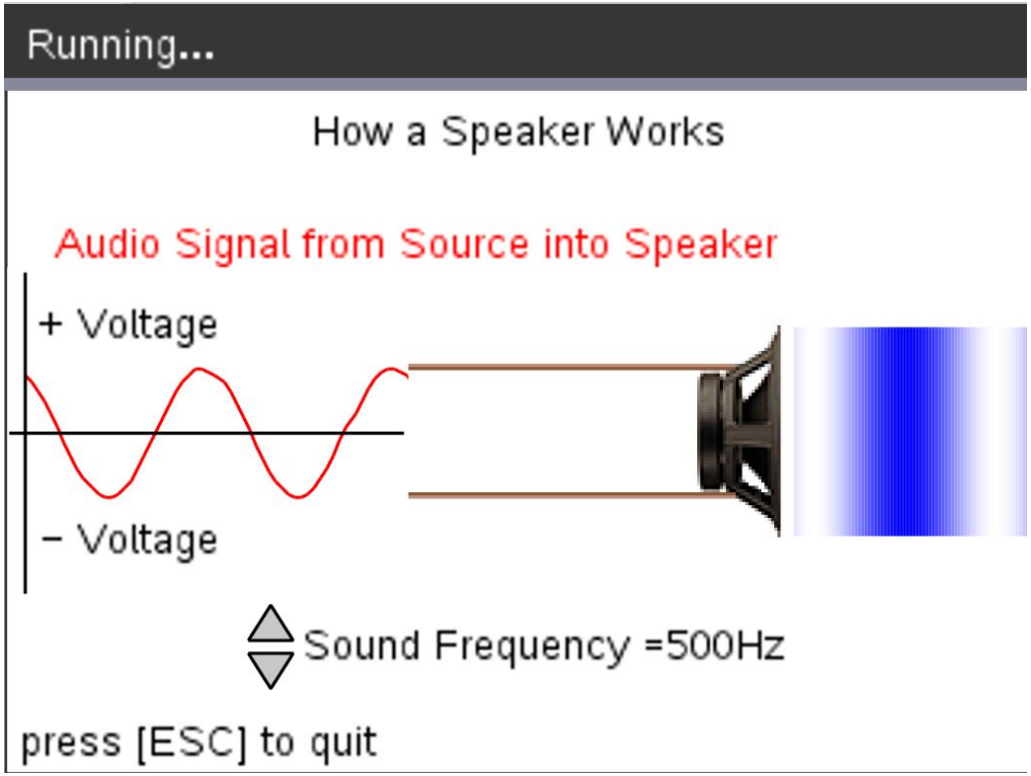


sound.tone(frequency, time)

Coding for this activity:

Command	Example	Behavior
from module_name import *	`from ti_hub import *`	Imports all the functions in the ti_hub module for use in the program. The ti_hub module includes all the necessary additions needed for the Music project.
sound.tone(frequency,time)	`sound.tone(440,1)`	Plays a tone through the TI-Innovator Hub speaker. In the example, plays the frequency 440 hertz (Hz) for 1 second.
sleep(seconds)	`sleep(1.5)`	Pauses program for 1.5 seconds.
sound.note("note",time)	`sound.tone("C4",.6)`	Plays a note through the TI-Innovator Hub speaker. In the example, plays the note C4 (middle C, C in the 4th octave) for .6 seconds. The note is entered as a text string with capital letters for the note name.
# text comment	`#Make sure your Hub is connected`	# at the beginning of a line denotes a comment. Comments are a "best practice" by programmers to annotate their code. Comment statements are ignored when the program is run. In the TI-Nspire CXII Python editor, [ctrl]+[T] toggles the statement of the current cursor location from a comment to a statement that will be run.

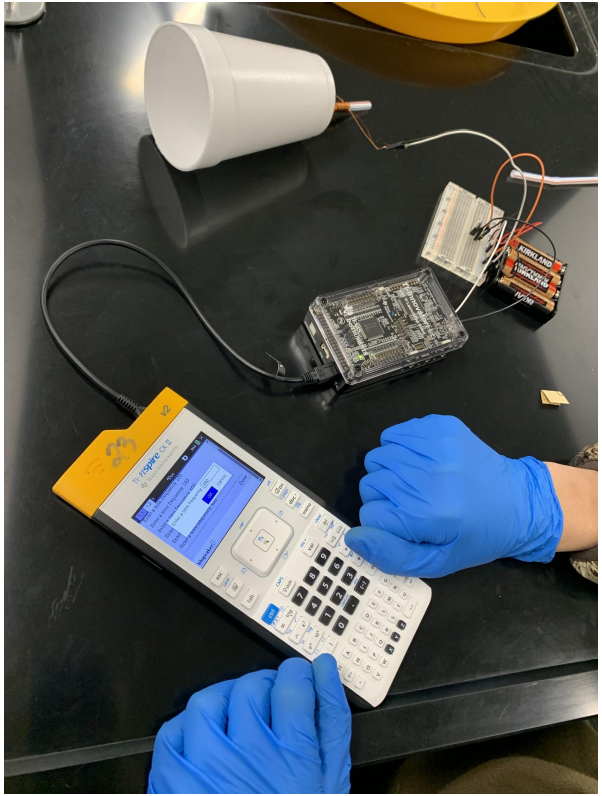
Explore More: Challenge 1
How Do Speakers Work



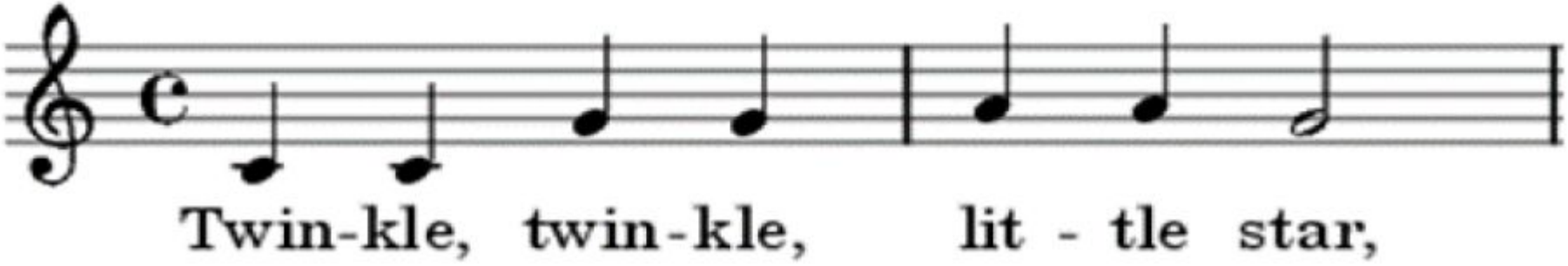
A speaker changes an electrical voltage signal into an air pressure wave.

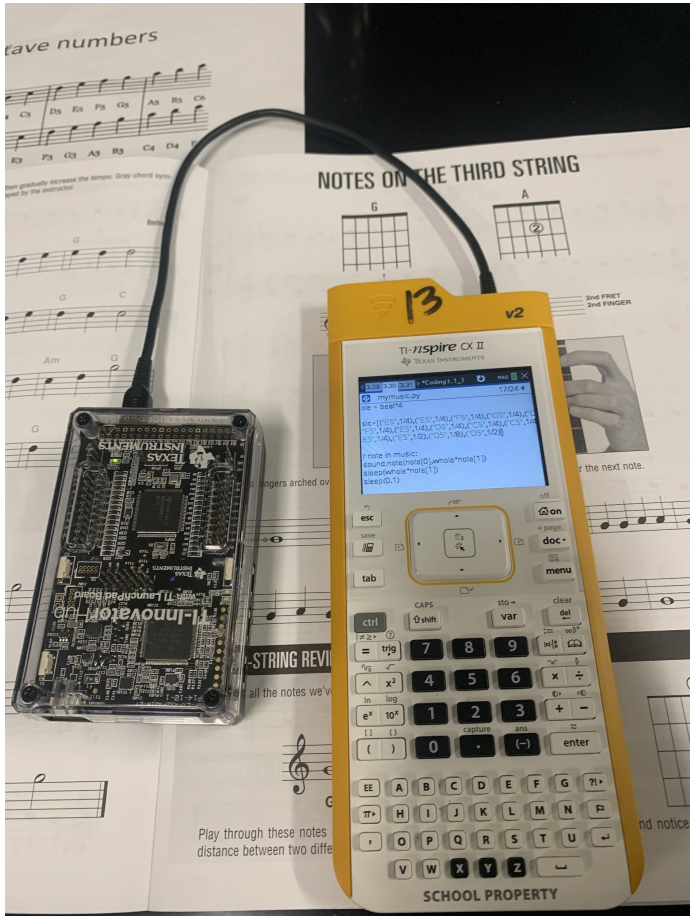
Extend: Using external breadboards - Path to STEM Projects

We made a speaker with magnetic wire, a nail, and the styrofoam cup!



Evaluate: Twinkle, Twinkle





Coding with sheet music!

Printed Handout

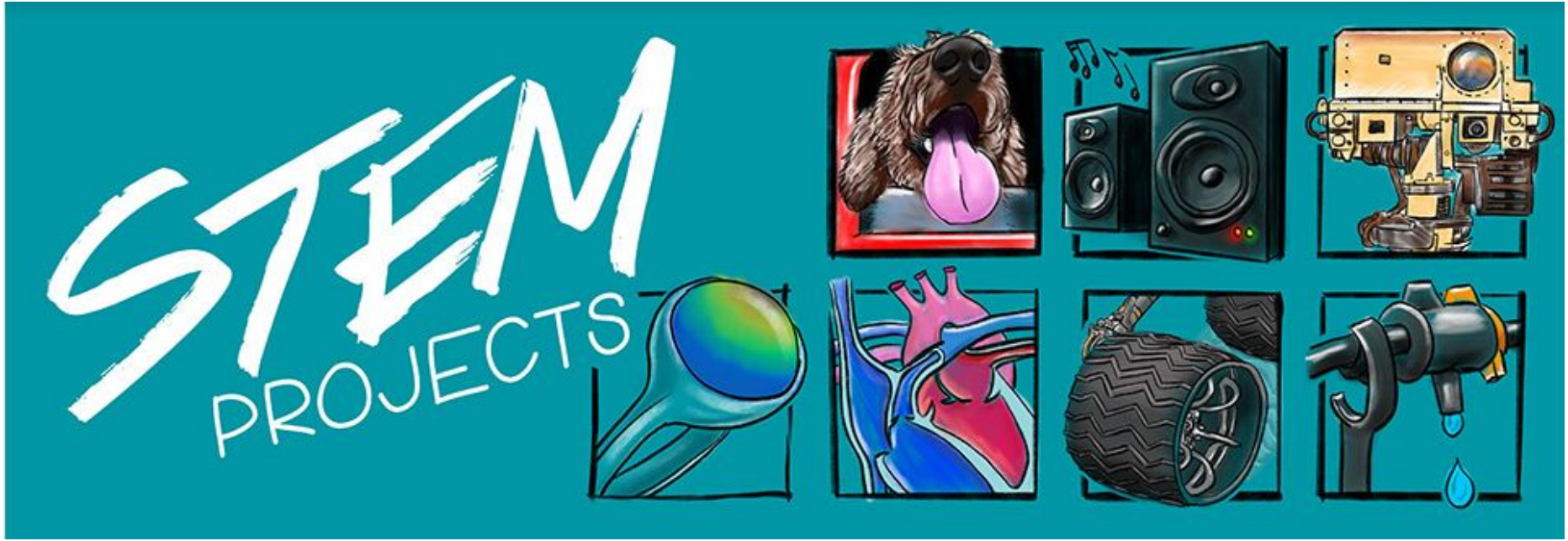
Octave	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B
0	16	17	18	19	21	22	23	25	26	28	29	31
1	33	35	37	39	41	44	46	49	52	55	58	62
2	65	69	73	78	82	87	93	98	104	110	117	124
3	131	139	147	156	165	175	185	196	208	220	233	247
4	262	277	294	311	330	349	370	392	415	440	466	494
5	523	554	587	622	659	699	740	784	831	880	932	988
6	1047	1109	1175	1245	1319	1397	1480	1568	1661	1760	1865	1976
7	2093	2217	2349	2489	2637	2794	2960	3136	3322	3520	3729	3951
8	4186	4435	4699	4978	5274	5588	5920	6272	6645	7040	7459	7902

262 = Middle C

Highly recommend staying in the 4-5th octave, a few notes into the 3rd or 6th is OK too.

Adapted from: Brown, Hass, Poramski - PD Day T3IC 2020

STEM Projects- How to borrow supplies



TI Support for hosting a TI-Innovator STEM camp/club/project

- TI provides curriculum materials that can be used as the basis for detailed planning of the activities
- TI will provide training through webinars, emails and teleconferences to instructors.
  - TI can provide a loan of an individual set of equipment for instructors to prepare with.
- TI can provide recommendations for educators who have the necessary background with graphing calculators to be camp instructors.
- TI can provide information on sources for equipment.
- TI can provide support for publicizing your camp with media outlets.

Need assistance with technology and equipment? Educational Technology Consultants are the ones to contact!!!

Thank you

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