



## Music = Math!



March is Music in Our Schools Month, but we don't have to limit music to just one month or to music class. Most concepts in music make *noteworthy* connections to math!

### Rhythm and arithmetic

You have sung many songs without realizing you are counting beats with a certain pattern. For example, clap along while you sing "Rock-a-Bye Baby." Notice how the syllables of the lullaby naturally suggest counts of 1-2-3 as you sing it, even though some syllables get more than one beat.

### Fractions in music

We say "Rock-a-Bye Baby" is in "three-quarter time" because each **measure**, marked off by vertical lines in the sheet music, contains the equivalent of three quarter notes. (The **time signature** visually resembles the fraction 3/4.) Other songs have different rhythmic patterns. For example, a popular song in "four-four time" (where each measure gets the equivalent of four quarter notes) is "Twinkle, Twinkle Little Star."



Notes can be **whole** notes, or **half**, **quarter**, **eighth**, **16th**, **32nd** or **64th** notes. In 4/4 time, a whole note gets four beats.

Using fraction math, you can see that  $1/2 + 1/4 + 1/8 + 1/8 = 1$ , just as four quarter notes would also add up to 1. Can you think of other fractions that would add up to 1?

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### Harmony and fractions

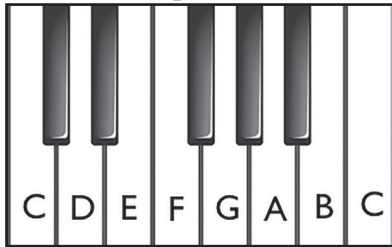
Borrow a guitar from a teacher or friend. The length of a guitar string affects the pitch of the note the string makes.

Choose one of the strings and pluck it, then play that same string while holding it down against the fretboard so that only half of the string's length is free to vibrate. You notice not only the mathematical relationship that shortened strings have a higher pitch, but the two notes also sound the same, yet different.

Harmony involves fractions. The string lengths are in a 2-to-1 ratio, and the shorter length vibrates twice as much as the longer length. This produces the sound of an octave.

What other words does **octave** remind you of? Octagon? Octopus? If you write out the major scale (do, re, mi, fa, so, la, ti, do), the "low do" and "high do" span eight notes. (Play the white piano keys from C to the next highest C, for example.)

The low C and the high C are the same note, but different octaves.



### Mini Quote:

"Music is the pleasure that the human soul experiences from counting without being aware that it is counting."

—German mathematician  
Gottfried Wilhelm  
von Leibniz

### Graphing music

We can see that sheet music notation is really just a graph. Written music graphs two variables: the length of time (duration) of each note, and the pitch (frequency) of that note.



### Math songs

Not only is there math in music, but you can also bring music to math by singing (or writing!) songs about math.

The National Museum of Mathematics has held contests for math teachers and students to write math songs. Try taking a song you know and changing the words or adding onto it to illustrate whatever math concepts you are now learning in school.

### Resources



#### On the Web:

- [bit.ly/1nE0pbm](http://bit.ly/1nE0pbm)
- [bit.ly/1RYFEUO](http://bit.ly/1RYFEUO)
- [momath.org](http://momath.org)

#### At the library:

- "Music Math: Exploring Different Interpretations of Fractions" by Kathleen Collins

## Try 'n' Find

Words that remind us of music and math are hidden in this puzzle. Some words are hidden backward or diagonally, and some letters are used twice. See if you can find:



BEAT, CONCEPTS,  
FRACTION, GRAPH,  
HALF, HARMONY,  
MAJOR, MATHEMATICS,  
MEASURE, MUSIC,  
NOTE, OCTAVE,  
PATTERN, QUARTER,  
RHYTHM, SCALE,  
SONG, TIME, VARIABLE,  
WHOLE.

C	Q	U	A	R	T	E	R	C	I	S	U	M	W	N
J	O	V	K	M	W	B	T	I	M	E	V	L	F	O
N	G	N	A	Y	A	H	E	V	A	T	C	O	Z	I
R	H	G	C	R	N	J	O	R	H	O	C	S	R	T
E	A	R	T	E	I	O	O	L	U	N	Q	C	H	C
T	L	A	G	A	P	A	M	R	E	S	M	A	Y	A
T	F	P	N	X	E	T	B	R	V	J	A	L	T	R
A	K	H	O	R	D	B	S	L	A	H	Y	E	H	F
P	D	S	S	C	I	T	A	M	E	H	T	A	M	P

## Cook's Corner

### Easy Cheesy Corn Dish

#### You'll need:

- 4 slices pre-cooked bacon
- 1 (15.25-ounce) can of sweet whole-kernel corn, drained
- 1/2 cup reduced-fat cheddar cheese
- 1/2 cup mozzarella cheese

- 1/4 cup low-fat milk
- 1/4 teaspoon salt
- 1/4 teaspoon ground sage
- 1/4 teaspoon pepper



#### What to do:

1. Heat pre-cooked bacon according to directions. Crumble into small pieces.
2. Combine all ingredients in a small baking dish. Place uncovered in a cold oven. Set for 400 degrees and bake for 12 minutes.
3. Remove dish from oven; stir ingredients thoroughly.
4. Place back in 400-degree oven and bake 10 more minutes until bubbly. Cheese and milk will form a sauce in the casserole. Serves 4.

\* You'll need an adult's help with this recipe.

## 7 Little Words for Kids

Use the letters in the boxes to make a word with the same meaning as the clue. The numbers in parentheses represent the number of letters in the solution. Each letter combination can be used only once, but all letter combinations will be necessary to complete the puzzle.

1. what a cat chases (4) \_\_\_\_\_
2. you eat them with spaghetti (9) \_\_\_\_\_
3. the day after today (8) \_\_\_\_\_
4. grass around the house (4) \_\_\_\_\_
5. what you type on (8) \_\_\_\_\_
6. having little money (4) \_\_\_\_\_
7. bread you eat with pasta (6) \_\_\_\_\_

BA	KEYB	MEAT	ROW
PO	LIC	LLS	OARD
MOR	CE	TO	WN
OR	MI	LA	GAR

Answers: mice, meatballs, tomorrow, lawn, keyboard, poor, garlic.



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### Mini Jokes



**Dane:** How do you do math and music at the same time?

**Vi:** With algo-rhythms!

**Dane:** And what do you call someone who does that?

**Vi:** A mathemusician!

### Eco Note



Of all the energy that an incandescent lightbulb uses, how much do you think is turned into light? Only one-tenth! The rest is turned into heat instead. That's why a lightbulb gets so hot.

adapted with permission from "The New 50 Simple Things Kids Can Do to Save the Earth" by The Earthworks Group, Andrews McMeel Publishing (andrewsmcmeel.com)

### Thank You



The Mini Page thanks Dr. Larry Lesser, professor of mathematics education at the University of Texas at El Paso, for help with this issue.

### Teachers:

For standards-based activities to accompany this feature, visit:

[bbs.amuniversal.com/teaching\\_guides.html](http://bbs.amuniversal.com/teaching_guides.html)

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