

Topic: Math and Latin Music

NCTM Standards: Problem Solving, Connections, Communication, Representation

Goals: Students will connect mathematics to the Latin culture through music. They will review basic mathematical skills such as addition, subtraction, and division in the context of studying notes and rhythms in music. They will also look at the amount of combinations of notes can make up a standard measure of four beats in music.

Introduction: Latin music is an important art form that was developed in Latin American countries, primarily Cuba. This type of music was derived from African religious ceremonies. It is known today for its use in dance music. The strongest characteristic that sets Latin music apart from other music is its rhythm. Various rhythms are played at one time, then other rhythms come in and create an exuberant sound. Most Latin music is created using a rhythmic pattern known as the clave, which involves a 3-2 (occasionally a 2-3) rhythmic pattern. An important characteristic in Latin Music is the “call and response”. This involves two main “voices” that call and answer one another within the music. This is done through improvisation between a lead vocalist and instruments.

Activities:

- 1) At the beginning of class, have websites for students to explore to learn more about Latin Music. If no access to computers is available, use your own computer and guide them through websites using a projector. Students will choose one interesting fact they learned about Latin Music to share with the class, and write down others' facts during the discussion.
- 2) Have several pieces of Latin music for students to listen to. Have them pick out the rhythm. Can they find the rhythm in those songs? Do they know where the beats fall? Have students listen to you as you give them a beat with drum sticks, or use a metronome found at <http://www.metronomeonline.com/>. Have students count out several rhythms with you.
- 3) Show students examples of sheet music found at <http://www.8notes.com/>. Give students a chart that explains the notes on the page. Have students complete a rhythms worksheet. Have students experiment and write several measures of music in groups.
- 4) Have students choose one of the measures they created and write that measure on the whiteboard or overhead projector. Also within the four beat measure write down the portion of the measure the note covers. Have the students in each group clap the beats of that measure for the rest of the class.

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- 5) Have students group the types of measures together. For example, list all of the measures that begin with a quarter note, then those that begin with eighth notes, etc. Have a student or the teacher to organize all of the combinations on the board.
- 6) Discuss any evident patterns in the measures. Have students note how many different ways a measure can be completed if it began with a certain note, such as a quarter note or eighth note.
- 7) After coming up with all of the possibilities, have students look at an easier problem. Suppose they only looked at two ways to notate a beat and looked at all the combinations in which they could occur in a 4 beat measure. Let's call note A a quarter note and note B two eighth notes. All of the possible combinations are:

AAAA	ABAA	BBBB	BABB
AAAB	ABAB	BBBA	BABA
AABA	ABBA	BBAB	BAAB
AABB	ABBB	BBAA	BAAA

Essentially, there are two types of notes that have to fill up four beats. The number of combinations is $2 \times 2 \times 2 \times 2 = 16$, or $2^4 = 16$

- 8) Now that we have found this pattern, have students test out several other possibilities in class to see if this formula will work for several cases. If so, come up with a specific formula to use in all situations of music.

Assessment

Have students get into groups of two or three. Groups will each be assigned a combination of notes and beats in a measure, and have to figure out the number of combinations with those particular values of notes. All students will record groups' findings with this assignment. A mini project that can be completed over two or three days can also involve using groups of two or three. Groups will create 10 measures of music, all with different rhythms. Groups will create a rhythms worksheet (along with an answer key for the teacher) for the rest of the class using these measures of music they create. Also, each group will play all of the music they create. They may clap the rhythm, sing the rhythm, sing and dance to the rhythm, display their rhythm on a computer, etc. Students will be allowed to show their creativity with creating music.

Resources

TeacherVision. (2000-2006). *Jazz and math: Improvisation permutations*. Retrieved 2006, September 4th, from <http://www.teachervision.fen.com/musical-notation/lesson-plan/4862.html>.

List of ways to notate one beat worksheet:

<http://www.pbs.org/jazz/classroom/printerfriendlyonebeat.html>





































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Fraction of a note Chart:

<http://www.pbs.org/jazz/classroom/printerfriendlyfractionsworksheet.html>

Metronome: <http://www.metronomeonline.com/>

Samples of Sheet Music: <http://www.8notes.com/>


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Rhythms Worksheet

Fill in the missing blanks with fractions or notes or rests. You may use your Fractions of a Note Chart or List of Notations for One Beat Worksheet if you are having trouble. At the bottom of the page for number 5, create your own order of notes that have the values of adding up to one.

1) 

_____ 1/16 _____

2) 

_____ 1/4 _____

3) 




1/4 1/16 _____ 1/8 1/2

4) 

List Of Ways To Notate One Beat












			
			
			
			
			
			
			

*There is one more way to notate one beat. Can you figure it out?

 = quarter rest  = eighth rest  = sixteenth rest

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Solutions to Rhythms Worksheet:

- 1) $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$,  or  , $\frac{1}{16}$
- 2) $\frac{1}{4}$,  or  , $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{4}$
- 3)  or  ,  or  , $\frac{1}{16}$,  +  , 
- 4) $\frac{1}{16}$, $\frac{1}{4}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{16}$

Assessment Rubric: Mini Project

	5	4	3	2	1
10 measures of music	All 10 measures are correct	There are a couple of counting errors within the measures	Students made four or five mistakes within the measures	There are more than 10 mistakes within the 10 measures	Only one or two of the measures are correct
Rhythms Worksheet	Worksheet is neat, has enough space to answer the questions, answer key turned in	Worksheet has a few errors with notation, but neat and organized	Worksheet has errors with notation and fractions, does not have enough space to answer questions	Worksheet has errors with notation and fractions with no space to answer questions, unclear what group members want students to answer	No answer key was turned in, worksheet shows no evidence that group members understand the concepts of notes and their values
Clapping the Rhythm	Group members all participate; all count the rhythms correctly	Group members all participate, few errors were made when counting rhythms	Group members all participate, errors with counting rhythms in more than 7 measures	Not all group members participate; rhythms counted correctly	Not all group members participate; errors were made when counting rhythms
Creativity (up to 5 points extra credit)	Students came up with a new way to display their knowledge of the notes and rhythms		Students were very creative with displaying their knowledge of the notes and rhythms from suggestions given to them in class		Students used a little creativity with the assignment