Math + Arts | Musical Fractions

In this lesson, students will explore fractions through rhythmic sequences.

Lesson Summary

There are three options for this lesson, depending on class needs and time available:

1. Frame, Focus, and Reflection (view and discuss): students will watch segments from *CyberChase* that introduce or reinforce fraction concepts.

2. Short hands-on activity: students will play a game with fractions.

3. Project: students will explore fractions through rhythmic sequences.

Time Allotment

1. Frame, Focus, and Reflection (view and discuss): 1 1/2 class periods

2. Short hands-on activity: 1/2 class period

3. Project: 1-2 class periods

Learning Objectives

Math

I can identify fractions as parts of a whole.

I can identify fractional parts on a number line.

Arts and Humanities

I can understand the terms steady beat, tempo, and rhythm.

I can create an original rhythmic sequence.

Prep for Teachers

"What Is Music?" clip from the *Music Arts Toolkit* video, "Doorways to Music: Music Basics"

(The entire clip is very informative and worthwhile. For this lesson, pay close attention to the discussion of pitch, from 0:21 to 1:22, tempo, from 3:02 to 4:12, and rhythm, from 4:12 to 5:03.)

Supplies

Paper

Pencil

Ccomputer with internet access

"Measuring Music" graphic

"I Have, Who Has" game

Media Resources

Cyberchase: Solving the Sphinx's Fraction Problem

KET: What Is Music?

KET: Rabbit in a Log

Cyberchase: Grubby's Wacky Worms

Cyberchase: The Puzzle of the Amulet of Amagansett

Cyberchase Game: Equivalent Fractions

Playing Fraction Pies

Introductory Activity

Students should have a basic understanding of fractional parts of a whole.

Learning Activities

Frame, Focus, and Reflection

Use the "Solving the Sphinx's Fraction Problem" segment from *CyberChase* to introduce the lesson.

Frame: Fractions are special numbers. When are they useful? You've probably noticed how a fraction consists of a number on top, the numerator, and a number on the bottom, the denominator. What does each of these numbers mean? Can you give examples of some fractions that you know?

Focus: As you watch this segment, notice Digit's fraction clue. What does the denominator tell us? What does the numerator tell us? Why does he only take one candy from the box?

Follow Up: How did Digit know to take only one candy from the box? What fraction of the box of candy was left after Digit took one candy? How can you tell the difference between the numerator and denominator in a fraction?

If you wish, you can use the *CyberChase* segments "Grubby's Wacky Worms" and "The Puzzle of the Amulet of Amagansett."

Short Activity

Tell students they will now be playing a game using fractions. Draw and shade in the following for the fraction 11/16.

Ask students what the denominator should be (16)

What should the numerator be? (11)

What is our fraction? (11/16)

Give one of the "I Have, Who Has" cards to each student (mixed up).

The teacher should go first.

Call out what the fraction is on your card and ask who has the next fraction.

The student with that fraction will then come up and stand beside the previous person.

Continue until every student has had a turn.

Project

Introduction

Have music playing as students enter the classroom. It can be any music.

Tell students that they are going to work with music and fractions. First we need to understand what we mean by the "steady beat" of a song and what we mean by rhythm and tempo.

Explain that what confuses many students—and adults, too—is that in the common vernacular, what is often referred to as the "beat" of a song is actually a basic rhythm pattern played in time with the beat rather than the actual beat itself. In music education, the beat is the underlying pulse of the music that establishes the tempo, which can be steady or changing.

Steady beats can be fast or slow. The speed of the beat in music is the element known as tempo. Introduce this concept to students by having them place their hands over their hearts and count the beats when they are at rest. Then have them jump up and down or do another vigorous exercise and repeat the activity. They will notice a change in the tempo of their heartbeat.

Show the "What Is Music" video segment for tempo and rhythm.

Explain that you are going to listen to a song written by Bill Monroe, a Kentucky musician who helped to develop the style of music known as Bluegrass.

Show the *Music Arts Toolkit* segment "Rabbit in a Log" and lead students in clapping the steady beat. The steady beat stays the same throughout the song. Play the song again, and, this time, lead them in clapping with the words. This is the rhythm pattern and it changes from the verse to the chorus. Play it a third time and have half of the class tap their feet to the steady beat while the other half claps to the rhythm. Play it a fourth time, reversing roles. Finally, play it and challenge students to keep the steady beat with their feet while clapping the rhythm.

Rhythm Fractions (one class session)

Tell students, "We're going to work with fractions in rhythm. The most common rhythmic structure in the music we're used to hearing is called 4-4 time. It's also called common time because it's...the most common! When a piece of music is in 4-4 time, it means there are four beats, or pulses, in each measure. A measure is a small section of a piece of music, just like an inch is a small section of a ruler or yardstick. Music is divided into measures, and measures are divided into beats."

Show the "Measuring Music" graphic and point out the measures, the time signature, the beats, and the parts of the ruler.

Say, "Notice that, in the piece of music pictured on the 'Measuring Music' page, the first measure has four quarter notes in it. Each quarter note fills 1/4 of the time in the measure. Remember that 'one quarter' is another way to express '1/4' and 'one-fourth.'"

Say, "Do you see the half note in the second measure? A half note fills up two beats, or half of the time in the measure. Remember that 'one-half' is another way to express '1/2.'"

Go over the instructions in the "Playing Fraction Pies" interactive activity page. You should feel free to skip the eighth and sixteenth notes, as well as the dotted notes if you feel your students (or you!) aren't ready for them. The objective is to help the students understand the relationship between rhythm and fractions, not to become experts in rhythmic notation.

Following the instructions on the page, allow the students to create original rhythmic sequences. If you want to help them get started as a group, you could ask them to use the first two measures of the "Twinkle, Twinkle, Little Star" rhythmic sequence written out for them on the "Measuring Music" graphic as a practice run (quarter, quarter, quarter, quarter / quarter, quarter, half).

Allow the students to share their original rhythmic sequences with the class. Ask each "composer" to explain their fraction sequence to the listeners.

Formative Assessment

What are the indicators of student progress toward or achievement of each learning target?

Math Assessment Problems

Observation

Differentiated levels of questioning

Use the interactive fractions game from *Cyberchase: Equivalent Fractions*.

Arts and Humanities

Rhythm Fractions: teacher observation—Did students successfully create a rhythmic pattern?

Exit slip: explain the difference between the beat and the rhythm of a song.

Exit slip: what is meant by tempo?

Program Review

Where does this fit in? How should you document it?

This activity contributes to your school's overall efforts in art programming in several areas, depending on whether you implement just the Frame, Focus, and Reflection portion or you implement the entire project.

Document with lesson plan and recordings of sample rhythmic sequences.

Curriculum and Instruction: Aligned and Rigorous Curriculum

a) To what extent does the school ensure that the arts curriculum encompasses creating, performing, and responding and is fully aligned with the Kentucky Core Academic Standards?

b) To what extent does the school ensure that the arts curriculum provides for the development of arts literacy in all four arts discipline and also utilizes the Common Core Standards for English/Language Arts?

c) To what extent does the school ensure that the school's curriculum provides opportunities for integration as natural cross-curricular connections are made between the arts and other content areas?

d) To what extent does the school ensure that the arts curriculum includes the study of representative and exemplary works of dance, music, theater and visual arts from a variety of artists, cultural traditions, and historical periods?

Curriculum and Instruction: Instructional Strategies

a) To what extent do teachers systematically incorporate all three components of arts study: creating, performing, and responding, into the arts?

b) To what extent do teachers provide models of exemplary artistic performances and products to enhance students' understanding of an arts discipline and to develop their performance/production skills?

c) To what extent do arts teachers provide for the development of artistic theory, skills, and techniques through the development of student performances or products that are relevant and developmentally appropriate for students?

Curriculum and Instruction: Student Performance

To what extent are students actively engaged in creating, performing, and responding to the arts?

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