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Integrated learning solutions

COUNTING WITH CUPS Grade Band: 4-5 Content Focus: Music & Math



LEARNING DESCRIPTION

Help students recognize and cultivate creative and critical thinking using various activities that connect math and music! Consider valuable curriculum connections that assist in the development of problem solving skills through fun and engaging learning experiences.

LEARNING TARGETS

Essential Questions	"I Can" Statements
How can connecting math and music aid students in their problem solving abilities and cultivate creative and critical thinking?	<p>I can identify, speak, and move to a steady beat.</p> <p>I can demonstrate understanding of mathematical concepts, such as fractions and multiplication, etc., through music.</p> <p>I can compose and notate music.</p>



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	<p>I can explain how I used math to create my musical composition.</p> <p>I can compare fractions with the same and different denominators.</p>
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GEORGIA STANDARDS

Curriculum Standards	Arts Standards
<p>Grade 4: 4.NR.4.2 Compare two fractions with the same numerator or the same denominator by reasoning about their size and recognize that comparisons are valid only when the two fractions refer to the same whole. 4.NR.4.3 Compare two fractions with different numerators and/or different denominators by flexibly using a variety of tools and strategies and recognize that comparisons are valid only when the two fractions refer to the same whole.</p> <p>Grade 5: 5.NR.3.1 Explain the meaning of a fraction as division of the numerator by the denominator ($a / b = a \div b$). Solve problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. 5.NR.3.2 Compare and order up to three fractions with different numerators and/or different denominators by flexibly using a variety of tools and strategies.</p>	<p>Grade 4: ESGM4.CR.1 Improvise melodies, variations, and accompaniments. ESGM4.CR.2 Compose and arrange music within specified guidelines. ESGM4.PR.2 Perform a varied repertoire of music on instruments, alone and with others. ESGM4.RE.1 Listen to, analyze, and describe music. ESGM4.RE.2 Evaluate music and music performances. ESGM4.CN.1 Connect music to the other fine arts and disciplines outside the arts.</p> <p>Grade 5: ESGM5.CR.1 Improvise melodies, variations, and accompaniments. ESGM5.CR.2 Compose and arrange music within specified guidelines. ESGM5.PR.2 Perform a varied repertoire of music on instruments, alone and with others. ESGM5.RE.1 Listen to, analyze, and describe music. ESGM5.RE.2 Evaluate music and music performances. ESGM5.CN.1 Connect music to the other fine arts and disciplines outside the arts.</p>

SOUTH CAROLINA STANDARDS

Curriculum Standards	Arts Standards
<p>Grade 4: 4.NSF.2 Compare two given fractions (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100) by creating common denominators or numerators, or by comparing to a benchmark</p>	<p>Anchor Standard 1: I can arrange and compose music.</p> <p>Anchor Standard 2: I can improvise music.</p>



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fraction such as $1/2$ and represent the comparison using the symbols $>$, $=$, or $<$.
 4.ATO.1 Interpret a multiplication equation as a comparison (e.g. interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.) Represent verbal statements of multiplicative comparisons as multiplication equations.
 4.ATO.5 Generate a number or shape pattern that follows a given rule and determine a term that appears later in the sequence.

Grade 5:

5.NSF.3 Understand the relationship between fractions and division of whole numbers by interpreting a fraction as the numerator divided by the denominator (i.e., $a/b = a \div b$).

Anchor Standard 4: I can play instruments alone and with others.

Anchor Standard 6: I can analyze music.

Anchor Standard 7: I can evaluate music.

Anchor Standard 9: I can relate music to other arts disciplines, other subjects, and career paths.

KEY VOCABULARY

Content Vocabulary	Arts Vocabulary
<ul style="list-style-type: none"> • <u>Division</u> - Splitting a quantity into equal parts or groups • <u>Multiplication</u> - Combining equal groups to find the total number of items • <u>Fractions</u> - A mathematical expression that represents the division of one quantity by another 	<ul style="list-style-type: none"> • <u>Body percussion</u> - Sounds produced by striking or scraping parts of the body; typically includes snapping, clapping, patting, and stamping • <u>Steady beat</u> - An unchanging continuous pulse • <u>Timbre</u> - The unique quality of a sound; also known as tone color or tone quality • <u>Dynamics</u> - Volume of sound (loudness, quietness) • <u>Found sound</u> - Sounds produced by non-traditional sound sources in the environment (e.g., scraping a ruler along a binder spine, tapping a pencil on a desk) • <u>Phrase</u> - A musical sentence • <u>Retrograde</u> - A musical line which is the reverse of a previously or simultaneously stated line



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- Rondo - A form of composition in which the first section recurs throughout the piece, alternating with different sections (e.g., A-B-A-B-A or A-B-A-C-A, etc.). This form is found especially in compositions of the Baroque and Classical eras.
- Tempo - The speed of the beat

MATERIALS

- Variety of unpitched percussion instruments (can be “found sound”, such as, scraping a ruler along a binder spine, tapping a pencil on a desk)
- Plastic cups in various colors and sizes
- Rhythm sticks or dowel rods
- Sound source (e.g., computer and speaker)
- Musical recordings
- Large pads and markers
- Paper and writing utensils (pencils, markers, crayons, etc.)
- Note cards with mathematical equations

INSTRUCTIONAL DESIGN

Opening/Activating Strategy

Classroom Tips - You may find it helpful to discuss proper use of, and care for, instruments prior to use. Discuss “resting” position, meaning no sound at all from instruments. Also discuss moving through “space” without touching anything else around. Pretend you are in a bubble and cannot touch anything or anyone in your surroundings.

- Turn on music with a steady beat that is easy for students to follow (or, simply play a steady beat without accompanying music).
- Students stand in the space (no formation).
- Leader claps (or plays) the beat while students walk to the pulse.
- Leader plays four beats (while students move); then students stop and clap four beats (same tempo as leader).
- Continue the game, moving around the room freely.
- Have students stop in front of someone and clap their partner’s hands for the second set of four claps.
- Thus, the sequence becomes:
 - Move to leader’s beat (set 1 = 4 beats)
 - Stop and clap beat alone (set 2 = 4 beats)
 - Move to the leader's beat (set 3 = 4 beats)
 - Stop and clap your partner's hands (set 4 = 4 beats).
- Have students move to a new partner each time.



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- Extend the sequence by adding additional movements and/or body percussion for subsequent sets of four beats (e.g., move to leader's beat; clap beat alone; move to leader's beat; clap partner's hands; move to leader's beat; pat beat; etc.).

Work Session

Wake-up and Warm-up

- Tell students that they will continue the activator, but now, they will turn it into a mathematical equation!
 - Example: $4+4+4+4=16$ or $4 \times 4=16$
- Experiment with different tempos and different numbers of beats (i.e., slower tempo, use body percussion or instruments to show $3+3+3+3=12$ or $3 \times 4=12$).
- Introduce a variety of rhythm instruments if available (rhythm sticks, drum, wood block, triangle, tambourine). Otherwise, use objects around the classroom, such as scraping a ruler along a binder spine, tapping a pencil on a desk.
- Take time to discuss the various shapes of each instrument (compare and contrast both shapes and sounds—timbre).
- Use students to demonstrate to group various equations that can be solved.
- Teacher will have two students play $6+6=12$.
- Arrange students in pairs and pass out equations. Then have students “play” equations and have partners solve the equations.
 - For example if a notecard shows $4+4=8$, one student would play 4 beats with one instrument or body percussion (such as clapping) and the other student would have to solve by saying “you demonstrated $4+4=8$ ”. Next, have students express the equation in terms of fractions. For example, $\frac{1}{2}$ of the composition was clapping and $\frac{1}{2}$ was stomping.
 - Then switch roles.
 - Then challenge the students to just play the answer (for example, 8). The other student must find a way to “play” 8, such as $2+2+2+2$. Then, have students express the composition in terms of fractions.

Question and Answer

- The format of this strategy will have the question being asked on the first eight beats and the answer on the second eight beats); reverse. Display visuals of numbers.

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	-

 - Have students speak numbers in a given tempo.
 - Have students clap once on each number while speaking; repeat, eliminating speech.
- Divide the class into two groups.
- Have students clap twice on one number of their choice; extend to clapping twice on two numbers.
 - Discuss how if we clap twice on one beat (or one number) it represents two half beats. Show the fraction $\frac{1}{2}$.
- Under each of the numbers, draw “stick notation” to show quarter notes and eighth notes. Quarter note = 1 and the eighth note = $\frac{1}{2}$.
- Now, incorporate questions and answers. Leader provides a question via clapping the first eight beats; students use part of the question in their answer in the second eight beats (e.g., “use the first part of my question as the first part of your answer”).
 - Extend to other body percussion, found sound, and/or unpitched percussion.



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- Try the strategy using pairs instead of two groups. Divide students into pairs, with one person providing the question and another, the answer; reverse.
- Incorporate movement; add to a recording if desired (for example, “Hora Agadati” or “Jai Ho”).
 - Have students walk eight beats and then “answer” using body percussion for the next eight beats.
- Tell students that a phrase in music is a musical sentence. Ask mathematical questions such as, if each phrase is eight beats and we have four phrases, how many total beats? If the first eight beats are made by clapping, what fraction of the composition is clapping?
- Have students work in pairs to create a “composition” using rhythm instruments that contains between two and six phrases (each phrase must be between six and twelve beats).
- Have them label the phrases with capital letters and then show equations for “how they play” each phrase (as demonstrated in the previous activity).
- Have students compare compositions in terms of fractions. The total number of beats in the composition will be the denominator.

Composing with Cups

- Display different colored cups and have students reach consensus about desired sound for each (e.g., blue – quarter note, yellow – eighth notes, clear – quarter rest).
- Introduce silently, having students use creative and critical thinking to figure out the values (number of sounds for each cup) independently first.
- Teacher should lead this activity in silence, changing cups (number of sounds) and even length of phrase prior to any discussion.
- Pause and discuss what students observed about the values of each cup.
- Next, have individual students create rhythmic patterns for others to perform using the different colored cups.
- Have students “conduct” their patterns by leading other students in performing them.
- Variations:
 - Experiment with performing multiple patterns at the same time (having two groups perform simultaneously), reading in retrograde (reverse order), adding dynamics (loud/soft), etc.
 - Add to a recording as desired (such as Sousa’s “Stars and Stripes Together”).
 - Have two groups face each other. Have a student compose a pattern behind another group and the group facing him/her perform the rhythm.
 - The group with their back to the composer will write the rhythm using traditional or “stick” notation.
- Finally, have students work in small groups to create their own composition with cups. Students should notate their composition and be able to explain the mathematical concepts embedded in their composition, such as fractions.

Closing/Reflection

- Students will perform their compositions for the group. Discuss appropriate audience participation prior to performances.
- Ask the audience to help identify mathematical connections.
- Have students compare different compositions in terms of fractions. For example, students can compare the fraction of claps in one composition to the fraction of claps in another composition even if the total number of beats in the composition is different (different denominators).



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ASSESSMENTS

Formative

Teachers will assess students' understanding of the content throughout the lesson by observing students' participation in the activator, ability to "play mathematical equations", ability to move and speak to a steady beat, and collaboration with groups to compose and notate a musical composition.

Summative

CHECKLIST

- Students can identify, speak, and move to a steady beat.
- Students can demonstrate understanding of mathematical concepts, such as multiplication, division and fractions, through music.
- Students can compose and notate music.
- Students can explain how they used math to create their musical compositions.
- Students can compare fractions with different and same denominators.

DIFFERENTIATION

Acceleration:

- Have students listen to examples of songs and identify mathematical concepts in the song construction.
- Challenge students to add dynamics to and/or change the tempo of their performances and discuss how these changes alter the music.

Remediation:

- Reduce the length of the composition students create at the end of the lesson.
- Limit the focus of the lesson to one mathematical concept (such as fractions being an expression of division) that students will build upon throughout the three strategies.

ADDITIONAL RESOURCES

NA

**This integrated lesson provides differentiated ideas and activities for educators that are aligned to a sampling of standards. Standards referenced at the time of publishing may differ based on each state's adoption of new standards.*

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