

Lesson Plan: Fractions in Disguise

Grades and Contents:

4th grade Math, Visual Art, Computer Science

Topic

Using Fractions to Develop Patterns in Art

Enduring Understanding

- A fraction expressed in tenths can be written as an equivalent fraction expressed in hundredths.
- A number that can be written as a decimal or as an equivalent fractions and have the same value.
- Approach problem solving and pattern development with a cyclical process.
- All patterns start out simple.
- Visual models help us compare and contrast the size and equivalent parts of a whole.

Primary Standards/Indicators

Math:

4.NSF.6 Write a fraction with a denominator of 10 or 100 using decimal notation, and read and write a decimal number as a fraction.

4.NSF.7 Compare and order decimal numbers to hundredths, and justify using concrete and visual models.

Secondary Standards/Indicators

Visual Art:

VA4-2.3 Use visual structures and functions of art to create artworks that communicate ideas. (Pattern)

Computer Science:

Standard 1: Recognize that many daily tasks can be described as step-by-step instructions (i.e., algorithms).

4.AP.1.1 Use step-by-step instructions to perform tasks (i.e., sequential execution).

Standard 2: Use an ordered list of steps (i.e., sequential execution) and simple control structures

4.AP.2.1 Use a combination of picture models to reorder a sequence of steps.

4.AP.2.2 Recognize that the same steps can be ordered in different ways to perform the same task (i.e., simple control structures).

Standard 3: Explore how tasks can be decomposed into simple tasks and simple tasks can be composed to form complex tasks. The student will:

4.AP.3.1 Compose simple tasks (e.g., eating breakfast; brushing your teeth; walking to the bus stop) into a complex task (e.g., getting ready for school).

4.AP.3.2 Decompose a complex task (e.g., getting ready for school) into simple tasks (e.g., eating breakfast; brushing your teeth; walking to the bus stop).



Academic Language

Vocabulary

- Denominator
- Numerator
- Equivalent
- Hundredths
- Pattern
- Repetition
- Algorithm
- Decomposition

Objective and Language Function

- Design a work of art by repeating a pattern that uses non equivalent and equivalent fractions with denominators of 100.
- Decompose (break down) verbally and in writing the algorithm (steps it takes) to create a pattern.
- Put in order the decimal amounts for colors and amount of beads used in the pattern.

Assessment Plan

- Pre-Assessment-
 - Students will complete an anticipation guide that covers questions on fractions being converted to decimals, patterns in regards to principles of art, and algorithms. These will be agree or disagree questions that will provide insight into current levels of understanding. This will not count as a grade.
- Post-Assessment-
 - Students will refer back to the anticipation guide. They will complete the “after” portion at this time to see how their answers have changed.
- Criteria for Mastery-
 - Student is able to successfully identify at least 3 fractions based on the colors used in the pattern art with the denominator being 100.
 - Student is able to convert all three of the fractions into decimals.
 - Student is able to correctly put the decimals in order (smallest-largest).
 - Student is able to create an artwork that showcases the principle of pattern using the elements of color, line, or shape.
 - Student is able to sequentially decompose the steps required to complete the task (algorithm) of pattern development for their design orally or in writing.

Materials

- Magnet backs
- Key chain hooks
- Iron
- Perler Beads
- Peg Boards that hold at least 100 beads
- Parchment/Ironing Paper



- Anticipation Guide
- *Fractions in Disguise* read aloud book

Teacher Preparation

This lesson focuses on the big ideas of fractions converting to decimals and pattern development as it relates to art, computer science, and math. The computer science indicators addressed in this lesson have the students working with two major components of computational thinking: recognizing and creating patterns and the process of decomposition by breaking down the complex task (algorithm) for creating a pattern into smaller action steps. All students should be able to create their own artwork and make it a keychain or a magnet.

To keep students on task, it is helpful to stress that during Makerspace time, they are the experts and need to help each other if they get stuck. The discussion guide is a helpful tool to ensure important concepts are covered. There are suggestions for pre- and post-assessments as a way to measure student learning as well as criteria for mastery.

Meat of Lesson

- **Hook:**

1. Math is everywhere and Patterns are everywhere you just have to train your brain to see it! Ask students what makes something a pattern. *Repetition.*
 - a. Students should Think-Pair-Share to come up with and discuss their ideas.
 - b. The instructor can list answers on the board, organizing them into different types of patterns or math concepts that are patterns.
2. Students complete the pre-reading portion of the anticipation guide.
3. Next, read aloud: *Fractions in Disguise*
 - a. Read text.
 - b. Discuss book. (*See discussion guide*)
4. **Introduction:** GCF was able to spot fractions and use his reducer to find their simplified for or equivalent fractions. We are going to work with fractions today as well, but by looking for fractions in patterns. We are going to design a piece of Perler Bead art that you will turn into a keychain or a magnet. Your design must have a pattern to it. The type of pattern will be made of equivalent and nonequivalent fractions. You will get 100 beads and must use at LEAST 3 colors. After you create your pattern, you will decompose the task (algorithm) by writing out the steps you took to develop your pattern.

- **Brainstorm**

- At the bottom of your anticipation guide there is a box where you can plan out the type of pattern that you will create with your art work and plan your pattern fractions.
- Ask students, if you have 100 beads total, what is your denominator always going to be? (100).
- How might your numerator change? (Depends on how many colors and how many beads of each color you use).



- Give about 5-10 minutes for students to plan out their patterns and prepare their fractions.
- Call students back together to explain the concept of decomposition of an problem. Show some examples of abstract pattern art. Ask students, “How did this artists create this pattern?”

If we wanted to recreate this or do a similar pattern it would be easier if we knew the steps they took. To do this, they would need to decompose or break down their big task.

Write the phrase “Simplify a fraction” on a piece of chart paper or the board. Tell students, “This is an algorithm. In order to to complete the task of “simplifying a fraction” a person must follow a series of steps. Can anyone tell me the steps for one way of simplifying a fraction? Write the steps out one by one. Once they are done with the steps, tell the students we just “broke down” the algorithm for “simplifying a fraction” this is called “Decomposition.”

- Tell students that once they have created their design using the beads they will then need to decompose their pattern task so that others can easily replicate the pattern.

- **Prototype**

- Students will gather beads and begin developing their pattern.
- They need to decide whether they want to create a keychain out of their work or a magnet.
- Once they finish their design, students should place pieces of masking tape over their design so that their beads don’t get damage or shift while the students are waiting for their pattern to be fused (ironed down).

- **Share**

- Break students into two groups. Have one group form an “inner circle” and one group form an “outer circle”. Students should then turn to face each other.
- Have them show their work and then explain the fractions in their final artwork (if fused) or show the planning pattern from the anticipation guide.
- After 1 minute for each person (inner person then outer person) the inner circle stands still and the outer circle rotates clockwise.
- Students could then speak to their new partner about how they decomposed the steps to create their pattern.
- Repeat as time allows.

- **Synthesize**

- Bring students back together for a final discussion. During this conversation, students will share more about the process of pattern development and decomposition. *See discussion guide for questions.*
- Finally, have students reflect on the “after” portion of the anticipation guide.

Supports for Student Learning

Accommodations



- **ELs**- Provide sentence starters for the writing of the algorithm and the decomposition process when breaking down the steps it took for the pattern development.
- **Grade Level adaptations**- This task could be adjusted to only work on most commonly used equivalent fractions as opposed to using both equivalent and non equivalent when developing the pattern.
- **Advanced students**- May want to also give monetary value to their bead amounts and/or showcase in % amounts.
- **Additional supports**- As needed.

Discussion Guides

- Hook-
What types of ways can things be in a pattern?
Are there any patterns in this room?
How do patterns connect with fractions and or decimals?
- Synthesis-
 - How did the colors in the pattern of your art work relate to the fractions and then the decimals?
 - Did anyone notice a pattern when converting the fractions to decimals?
 - Did anyone find the decomposition of the algorithm portion difficult?
 - What made today's maker lesson fun?
 - What made it challenging?

More to Explore (Resources)

- Decomposition for the process of pattern development: <https://www.art-is-fun.com/how-to-make-a-pattern/>
- Examples of Ellsworth Kelly artwork: <https://www.theartstory.org/artist-kelly-ellsworth.htm>

