Fraction Mobile

3 Sessions – 90 minutes each

Essential Question: How can fractions and colors be understood as parts and wholes?

Lesson Goal: Students correlate fraction families with color families by mixing tertiary colors and cutting paper circles and rectangles into fractional parts. They create a mobile that demonstrates how fractional parts combine to make a whole.

Essential Objectives:
Students will be able to:

- create halves, thirds, and fourths.
- blend secondary colors with oil pastels.
- assemble a 3-D mobile using fractional parts.

Common Core State Standards for Mathematics

Geometry: Reason With Shapes and their Attributes

2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Visual Art Content Standards

ARTISTIC PERCEPTION 1.2: Perceive and discuss differences in mood created by warm and cool colors.

CREATIVE EXPRESSION 2.2: Demonstrate beginning skill in the use of art media, such as oil pastels.

HISTORICAL AND CULTURAL CONTEXT 3.1: Explain how artists use their work to share experiences or communicate ideas.

AESTHETIC VALUING 4.2: Compare different responses to the same work of art.

Materials

- 11 x 18 drawing paper
- Oil Pastels
- Cake rounds
- Deli Lids
- Scissors
- Twisty wire
- Ebony pencils
- Hole punchers
- Acrylic paint

Key Vocabulary

Visual Art: mobile; primary, secondary
Math: wholes; parts; half;
fourth; third

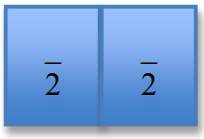
PRE-LESSON MATH SESSION

Math Background

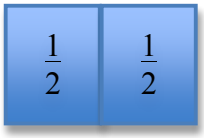
The CA Common Core standards shift the focus of fractional concepts to the geometry domain. Students in second grade (actually K-2) are learning that fractional parts represent equal pieces of a whole, solidifying the conceptual understanding of fractions.

- **Focus Question**: What is a fraction?

- Facilitate a class discussion where students talk about what fractions are. Some questions that might get your class talking: Are fractions numbers? Why do we need fractions? When do we use them in our lives? Chart all the responses. This will help you remember the misconceptions/misinformation students have concerning fractions.
- Explain that fractions are numbers that represent a part of a whole.
- Draw a rectangle that represents a cake. Say that you want to share that cake with a friend at my house. How many pieces would you need? You would need two pieces. Divide the cake unevenly. A child may protest, saying that the cake is not divided equally. Divide the cake into two equal parts. Explain that in math, fractional parts are the same size.
- Give each child a piece of paper. Have the students hold the paper (portrait). Ask: How many sections or pieces does the paper have? Then, fold the paper in half. Open the paper asking, "How many sections or pieces does the paper have now?" Point to each section or piece and count.
- Ask the students to get out their art journals. Point to one section. Ask: How much of the paper is this? Draw a picture of the paper on the overhead, dividing it into halves. Say: There are two sections. Write the number 2 in the denominator in each section. The denominator tells us how many equal parts the fraction has.



- Now point to one of the sections. Ask: How much of the cake is this piece? Label the drawing. The top part of the fraction is called the numerator. The numerator shows how many parts of the whole we are working with in the fraction. Point to the other section. Ask: How much of the cake is this piece? Label the drawing. So ½ + ½ = Two halves or 1 whole.



- I was going to share my cake with one friend, but then two more came over to my house!

Hold up the folded paper. Model how to fold it in half again. How many pieces do you think I will have now?

- Open up the paper to reveal 4 equal pieces or parts. Remind students: When we had two equal pieces we had a two in our denominator. Since we now have four equal pieces, what number should be in the denominator? Have students draw and label the whole divided into ¼ sections.
  - **Closing discussion:** What do we know now about fractions? Are fractions numbers? What are the parts of fractions? How do we know what to put into the denominator?

Session 1 – Make Color Wheel

ACCESS PRIOR KNOWLEDGE: (15 min)

- How do mathematicians and artists work in the same way?
- What do you know about paint? What do you think paint is made of?
- What do you know about different kinds of colors?

WARM-UP ACTIVITY (60 min)

Demonstrate how to properly use a brush, how much paint to put on the brush, how to make the paint more or less saturated, and how to wash the brush with each color change.

Procedure/Steps

1. Ask students to divide their cake round in half, and then in fourths (note that one fourth is the same as one quarter; ask how many fourths are in one half). Ask students to divide each fourth into three equal parts.
2. Have students write numbers 1-6 in each space.
3. On the cake round, have students begin the color wheel by filling in the primary colors (red, yellow, and blue in spaces 1, 3, and 5)
4. Explain that when two primary colors are mixed together, they make a secondary color. E.g. Red (1) + Blue (1) = Violet (2).
5. Students fill in the secondary colors onto the color wheel.
    a. Orange in space 2, Green in space 4, Purple in space 6

*** Extension: If students are familiar with color theory, they can make a 12-segment color wheel using tertiary colors.

1. Explain that primary colors mixed with secondary colors make tertiary colors. (e.g. Red (1) + Violet (2) = 3)
    a. Students mix a red-orange and paint on color wheel.
    b. Students mix a yellow-orange and fill in on color wheel.
    c. Wash out brush.
    d. Mix a red-violet and paint on color wheel.
    e. Mix a blue-violet and paint on color wheel.
    f. Wash out brush.
    g. Mix a yellow-green and paint on color wheel.
    h. Mix a blue-green and paint on color wheel.

CLOSURE (15 min)

- What did you learn about color?
- What were some of the challenges in mixing colors?
- Which colors came out differently than what you expected?

Session 2 – Make fractional parts with circles and rectangles

ACCESS PRIOR KNOWLEDGE (10 min)

- What do you know about fractions?
- What fractions do you notice on the color wheel?

ART MAKING ACTIVITY (50 min)

Primary Colors with Circles

- Give each student a piece of either red, yellow, or blue construction paper or poster board.
- Trace the deli lids to create three circles on the poster board.
- Cut out all three circles and distribute so each student has one red, one blue, and one yellow circle.
- Fold first circle in half and cut.
    - Ask students how many halves make a whole.
    - Write ½ on the back of each half.
- Create thirds by drawing a Y on second circle, keeping in mind that fractions are equal parts. Demonstrate that the pieces should be as close to equal as possible, perhaps modeling what the Y drawing should look like with their body.
    - Cut out all thirds.
    - Ask students how many thirds make a whole.
    - Write 1/3 on the back of each piece.
- Fold third circle in half, and then in fourths.
    - Cut out all fourths.
    - Ask students how many fourths make a whole.
    - Write ¼ on the back of each piece.

Secondary Colors with Rectangles

Ask the students to mix secondary colors using their primary oil pastels.

- Give each student a piece of card stock.
- Divide cardstock into three rectangles.
- Cut out all three rectangles.
- Repeating the same process as above, divide one rectangle into halves, one rectangle into thirds, and one rectangle into fourths.

Extension: Connect fractions and the color wheel to a clock, which is also divided into 12.

CLOSURE (15 min)

- What did you learn about blending oil pastels to create secondary colors?
- How are fractions in a circle the same from fractions in a rectangle?
- Put your fractional pieces in order from greatest to least.
    - Students should see: ½, $^1/_3$, ¼. Have students notice that the fractional parts decrease in size as the denominator gets greater.

Session 3 – Show art, compose mobile, and reflect

ACCESS PRIOR KNOWLEDGE (5 min)

- What do you know about sculpture?
- What is a mobile?

ART OBSERVATION (15 min)

Show students Alexander Calder image and ask the following questions comparing student responses:

- What do you see?
- What shapes can you identify?
- What parts of a whole do you see? Make sure students understand that these parts are not fractions because they are not cut into equal pieces.
- What do you notice about how the artist uses color?
- What do you notice about how the shapes are arranged?
- What was the first step the artist took when creating this work?
- What ideas or experiences is the artist Alexander Calder trying to communicate?
- What part of this sculpture gives you an idea for making your own work?

Tell students about the life and work of Alexander Calder.

ART ACTIVITY (40 min)

Demonstrate how to assemble a mobile.

1. Thread one color of twisty wire through all of the fractional pieces with the same denominator.
2. Students should have 6 total strands of twisty wire (each a different color).
3. Poke twisty wire through color wheel cake round and hang.

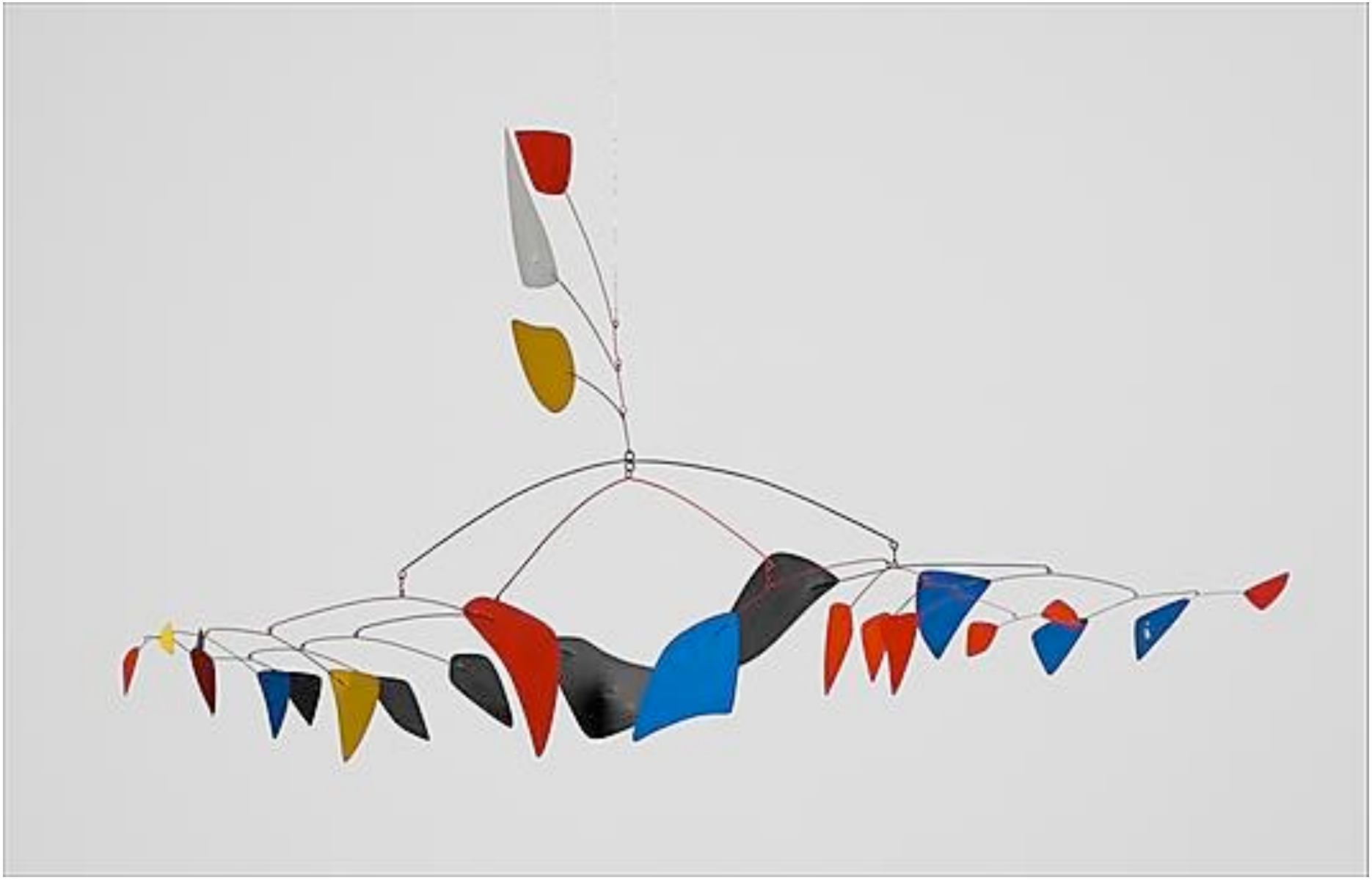
CLOSURE (30 min)

- What do you see?
- What parts of a whole do you see?
- What do you notice about how (this student) placed their fractional parts?
- What experiences do you think this artist wanted to share?
- What ideas is this artist trying to communicate?

POST-LESSON MATH FOCUS QUESTIONS

- **Draw a picture of three different examples of a shape that is divided into equal fractional** parts. Label the picture.
- Have students explain their drawings to each other, pointing out the equal parts of each fraction.

Red Gongs, Alexander Calder, 1950
Painted aluminum, brass, steel rod, and wire
60 x 144 in. (152.4 x 365.8 cm)



Four Directions, Alexander Calder, 1956
Hanging mobile: painted aluminum and iron wire
41 x 80 x 84in. (104.1 x 203.2 x 213.4cm)

Alexander Calder

This mobile demonstrates for students how a series of small colorful pieces can be hung and balanced.

Alexander Calder was born in 1898, the second child of artist parents—his father was a sculptor and his mother a painter. Because his father, Alexander Stirling Calder, received public commissions, the family traversed the country throughout Calder's childhood. Calder was encouraged to create, and from the age of eight he always had his own workshop wherever the family lived. For Christmas in 1909, Calder presented his parents with two of his first sculptures, a tiny dog and duck cut from a brass sheet and bent into formation. The duck is kinetic—it rocks back and forth when tapped.

Despite his talents, Calder did not originally set out to become an artist. He instead enrolled at the Stevens Institute of Technology after high school and graduated in 1919 with an engineering degree. Calder worked for several years after graduation at various jobs, including as a hydraulics engineer and automotive engineer, timekeeper in a logging camp, and fireman in a ship's boiler room.

Calder committed to becoming an artist shortly thereafter, and in 1923 he moved to New York and enrolled at the Art Students League. He also took a job illustrating for the National Police Gazette, which sent him to the Ringling Brothers and Barnum & Bailey Circus to sketch circus scenes for two weeks in 1925. The circus became a lifelong interest of Calder's, and after moving to Paris in 1926, he created his Cirque Calder, a complex and unique body of art. Every piece was small enough to be packed into a large trunk, enabling the artist to carry it with him and hold performances anywhere.

Calder found he enjoyed working with wire for his circus: he soon began to sculpt from this material portraits of his friends and public figures of the day. In the fall of 1931, a significant turning point in Calder's artistic career occurred when he created his first truly kinetic sculpture and gave form to an entirely new type of art. The first of these objects moved by systems of cranks and motors, and were dubbed "mobiles" by Marcel Duchamp—in French mobile refers to both "motion" and "motive." Calder soon abandoned the mechanical aspects of these works when he realized he could fashion mobiles that would undulate on their own with the air's currents. Jean Arp, in order to differentiate Calder's non-kinetic works from his kinetic works, named Calder's stationary objects "stabiles."

Fraction Mobile Rubric

	1 Does not meet Expectations	**2** Approaching Expectations	**3** Meets Expectations	4 Exceeds Expectations	**Total Score**
A. Artwork shows an understanding of fractions.	Fractional pieces are not attached to strands in any systematic way.	Most strands of wire have all fractional parts to equal one whole.	Each strand of wire has all fractional parts to equal one whole.	Each strand equals one whole and some use different fractional parts to create a whole.	
B. Artwork demonstrates an understanding of secondary colors.	Only one shape is blended.	Two shapes are blended.	Three shapes of blended.	All three shapes are fully blended.	
C. Artwork demonstrates students' ability to create a mobile.	Fractional pieces are not attached to wire and/or wire is not attached to base. Mobile is not balanced.	Some fractional pieces are attached to wire. Mobile is not balanced.	All fractional pieces are attached to wire and wire is secured to base. Mobile is balanced.	All pieces are fully attached and wire is formed to create volume. Mobile is balanced.	