

Title: Fractions....Roll 'em, Roll 'em, Roll 'em!

Brief Overview:

The teacher will discuss with the students how a "whole" can be divided into fractional parts. The students will design fractional strips to equal a "whole". Using a number cube, students will roll the number cube until their "whole" strip is covered.

Link to Standards:

- **Problem Solving** Students will demonstrate their ability to solve mathematical problems through the use of color-coded fractions strips.
- **Communication** Students will demonstrate their ability to communicate mathematically by expressing fraction symbols and fraction word names.
- **Reasoning** Students will demonstrate their ability to reason analytically from data gathered as a result of the game.
- **Connections** Students will demonstrate their ability to connect fractional parts to probability.
- **Number Relationships** Students will demonstrate their ability to generalize a relationship between fraction parts to a "whole". Students will use number cubes to show percentage of fractions rolled.
- **Estimation & Computation** Students will demonstrate their ability to estimate and add fractional parts.
- **Statistics** Students will tally the number of rolls to cover a "whole" bar and as a result, construct a frequency table and graphs (circle and bar).
- **Probability** Students will learn the meaning of probability by determining the outcomes of the roll of their number cube.
- **Patterns & Relationships** Students will recognize fraction patterns and will generalize a relationship from the fractional parts. Students will use rainbow cubes to show their frequency of fractional parts rolled.

Grade/Level:

Grades 3-6

Duration/Length:

This lesson will take 3 to 5 class sessions.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Predicting
- Determining percentages
- Averaging
- Constructing and labeling bar and circle graph
- Tallying
- Expressing fraction symbols and word names.

Objectives:

Students will:

- Construct fractional strips and write fraction word names and symbols.
- Create a "whole" strip from fractional parts.
- Collect and organize data on frequency table, averaging table, bar & circle graphs.
- Analyze the relationship of fractional parts in journal writing.
- Sketch a drawing of their fractional strip as they place parts on the "whole" strip.
- Work in cooperative pairs to play the game.
- Work independently to organize and analyze the data collected.

Materials/Resources/Printed Materials:

- Strips of 3" x 18" construction paper in 5 colors.
- Student Resource 1-4 (frequency table, bar graph, averaging table, and circle graph)
- Pen/Pencils/Markers
- Labeled Number Cubes (one for each group) with $\frac{1}{16}$ & $\frac{1}{8}$ written twice on each side and $\frac{1}{4}$ and $\frac{1}{2}$ written once on each side of cube
- Scissors (optional)
- Colored Rainbow Cubes
- Transparent Rainbow Cubes
- Transparencies
- Envelopes to hold fraction pieces

Development/Procedures:

Day 1:

- Divide students into pairs.
- Hand out color construction paper strips.
- Decide as a class what fraction symbol will be represented by each color.
- Fold strips of construction paper to represent $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ (the 5th color is one "whole").
- Cut/tear folded strips in fractional parts.
- Write the fraction name on one side of the strip and the fraction symbol on the other side.
- Discuss and explore how the fraction pieces can make a "whole."
- Mix the fraction up to see how many "whole" strips can be created.
- Draw sketches in journals modeling how many different pieces of fraction parts make a "whole."

- Write in journal the algorithms that make up a "whole" using the fraction pieces.
Ex. $1/4 + 1/4 + 1/4 + 1/4 = 1$ whole

$$\boxed{1/4} + \boxed{1/4} + \boxed{1/4} + \boxed{1/4} =$$

$$\boxed{1 \text{ whole}}$$

Day 2:

- Take out color fraction strips.
- Review the various fraction parts that make up a "whole."
- Distribute the number cube to each group.
- Discuss with the students how the fraction strips, along with the number cube, will be used to play a game.
- Distribute Student Worksheet #1-2 on Frequency and Averaging.
- Discuss the rules of the game with students (rules are found on Student Resource 1).
- Explain to students how to record the number of times a fraction is rolled.
- Repeat the game two more times.
- Find the average from the total number of times rolled for each fraction.

Day 3:

- Discuss how many rolls it takes to make a "whole" from Frequency Chart.
- Have student consider and write answers to the following questions in their journals:
 1. Which outcomes are more likely?
 2. What happened in a game that took a greater amount of rolls?
 3. Why would it take longer to roll a $1/4$ or $1/2$?
 4. Explain if this game is fair or not? How would you change it?
- Discuss the meaning of probability and how it relates to the number of times a certain fraction will appear on the cube.

Day 4:

- Review and display some models of bar graphs.
- Distribute Student Resource #3
- Have students label and title their bar graph.
- Transfer averages from Student Resource #2 to the bar graph.
- Students should color in bar graph.
- Have students write on the lines provided what the data on their graph represents.

Day 5:

- Review and display models of circle graphs.
- Provide guided practice with examples of percentage data using rainbow cubes.
- Have students use their circle graphs to arrange the cubes to represent the example percentages given.
- Allow the students to independently construct their circle graphs based on the information from their averaging data sheet.
- Write on the Student Resource #4 explaining what the data on your graph represents.

Performance Assessment:

- Use the cut fraction strips to assess students' comprehension.
- Students can be evaluated based upon the following:
 1. Review journal entries for recognition, recall, and modeling of fractions.
 2. Cooperative participation and performance in pairs. Individual participation, accountability, and on-task behavior should be checked daily.
 3. Understanding of probability/frequency chart.

Extension/Follow Up:

- Add fraction pieces to your first set that show $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{12}$.
- Add another number cube with $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{12}$, and $\frac{1}{16}$ written on each side.
- Use two "whole" strips and try to cover each or one and one-half "wholes".

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Fractions...Roll 'em Frequency Table

To Win the game, a player must get their "whole" strip covered with the fraction pieces. **Directions:** Place a tally mark in the appropriate box for each fraction rolled. If the fraction you rolled is already covered and not needed, place that tally in the "Extra" box. Put a tally mark in the "Extras" table for the fraction you do not need.

Roll	$1/2$	$1/4$	$1/8$	$1/16$
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Total				

Extras

$1/2$	$1/4$	$1/8$	$1/16$

Fractions...Roll 'em Averages



Directions: Write the total number for each fraction rolled from your first try. Repeat the steps and play the game two more times. Record your data on the chart below. Average your total for each fraction. You will use this data later to create graphs.

	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$
Game 1				
Game 2				
Game 3				
Total				

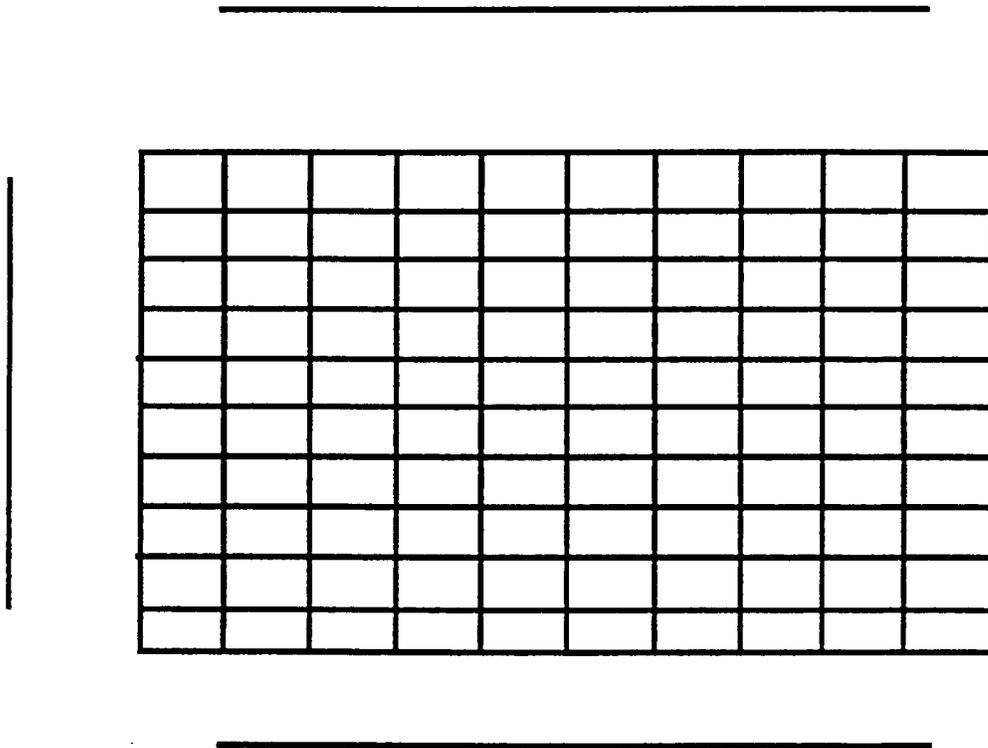
Average				
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Think about the number of rolls it took to make a hole. Compare what happened in each of the games. Explain your answer below.

Fraction Roll 'em Bar Graph



Directions: Place the total average of the three games for each fraction on the bar graph below. Remember to title and label your graph.



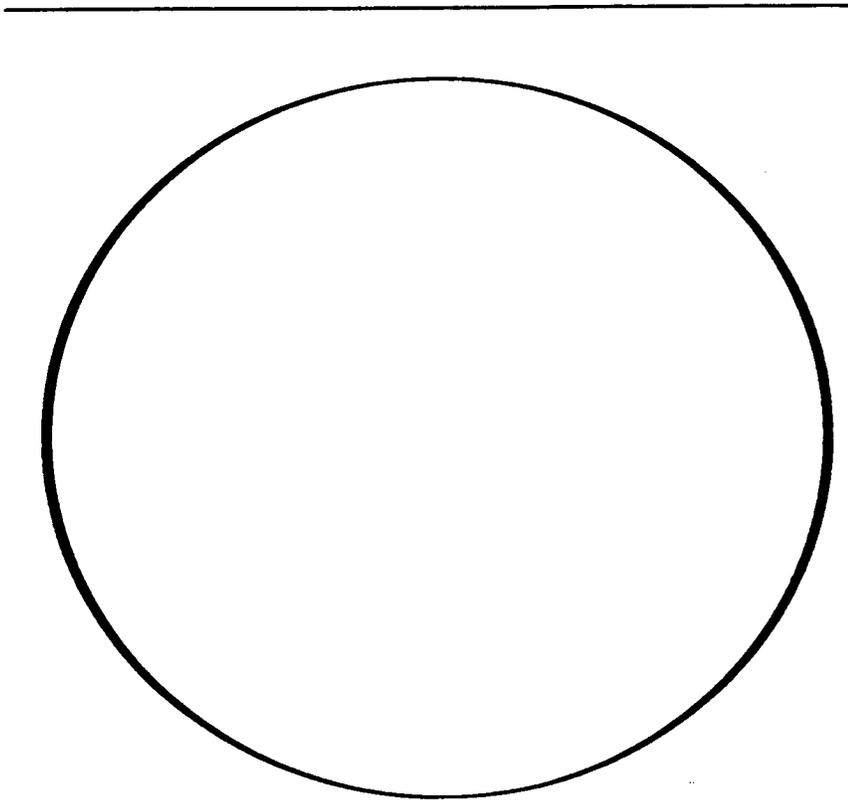
On the lines provided below, explain what the data on your bar graph represents.

Name _____

Date _____

Fraction...Roll 'em Circle Graph

- 1) Select **RAINBOW CUBE** colors for each of your fraction averages.
- 2) Select the **amount** of **RAINBOW CUBES** you need.
- 3) **Arrange the cubes evenly** around the circle (keep the same colors together).
- 4) **Draw a line** from the center to where the colors change.
- 5) **Label each part** of the circle graph with the category and number of data.



Explain what each percentage represents. What did you notice about the data.
