## Representing Rational Numbers

Summary
Use multiple representations for real-world situations involving fractions decimals and percents. Recognize equivalent forms for fractions, decimals and percents.

Main Core Tie
Mathematics Grade 4
Strand: NUMBER AND OPERATIONS - FRACTIONS (4.NF) Standard 4.NF. 4

## Additional Core Ties

Mathematics Grade 4
Strand: NUMBER AND OPERATIONS - FRACTIONS (4.NF) Standard 4.NF. 5
Mathematics Grade 4
Strand: NUMBER AND OPERATIONS - FRACTIONS (4.NF) Standard 4.NF. 6
Time Frame
3 class periods of 60 minutes each

## Life Skills

Thinking \& Reasoning, Communication, Employability

## Materials

Worksheets

- Layered Foldable (pdf)
for each student
- How Do We Represent Fractions (pdf)
- How Folding an Inch (pdf)
- Meter Sticks, Base-ten Blocks and Money (pdf)
- How Much Is A Ten-thousandth? (pdf)
- Representing Equivalent Rational Numbers (pdf)
- Fraction, Decimals and Percents With Candy (pdf)
- Bingo Game Board (pdf)


## Manipulatives:

counters
rulers
Color Tiles
Fraction Towers
paper plates
Geoboards and bands
Fraction Circles
Linker Cubes
meter sticks
base-10 blocks
money packets for each group (include penny, nickel, dime, quarter, dollar in each packet)
Tools

## Background for Teachers

## Enduring Understanding (Big Ideas)

Rational numbers can be represented in multiple ways.

## Essential Questions

Where do we see fractions, decimals, and percentages being used in our world?
How can physical models represent fractions, decimals and percents?
How do we represent fractions, decimals, and percents using words and symbols?

## Skill Focus

Identifying and representing and identifying fractional, decimal, and percentage amounts Vocabulary Focus
:
fraction
decimal
percent
equivalent
names of manipulatives in the lesson

## Intended Learning Outcomes

Develop positive attitudes toward mathematics, including the confidence, creativity, enjoyment, and perseverance that come from achievement.
Become proficient problem-solvers by posing appropriate questions, selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches.
Think logically, using inductive reasoning to formulate reasonable conjectures and using deductive reasoning for justification, formally or informally.
Cooperatively and independently explore mathematics, using inquiry and technological skills. Make connections between mathematical ideas, between mathematics and other disciplines, and to life.
Communicate mathematics through writing, modeling, and visualizing, using precise mathematical language and symbolic notation.

Instructional Procedures

## Warm-Up

.
Each of the following situations can be represented by a rational number in the form of a) a fraction, b) a decimal or c) a percent. Predict which form fraction, decimal or percent you would be most likely to see for the situation described. Have students predict, then discuss.

On a food label you can find the fat calories compared to the total calories. (percent)
You are using a meter stick to measure length. (decimal)
A recipe tells you how much sugar to add. (fraction)
A sales ad tells you everything in the store is on sale. (percent)
Some data shows a baseball player's batting average. (decimal)
A sales receipt shows the amount money you paid. (decimal)
You are talking about how much time you spent doing homework. (fraction)

## Launch: Where do we see fractions, decimals, and percentages used in the world?

Contest. Who can make the longest list for where we might see fractions, decimals and percents being used in our world? Students divide a paper into three columns labeling one column "Fractions", another "Decimals", and the third, "Percents". In small groups, students brainstorm situations and places where they might see each form and record ideas for three minutes.
Students then mix around the room until teacher says, "Freeze." Student partners with the person closest to them sharing and adding to their lists.
Do mix and freeze 3 times to enlarge list. Return to small group and share any new ideas. Have the team that had the longest lists read their list to the class. Then ask a student from each group to tell two or three situations that haven't been mentioned. Students record their finalized lists under the first flap of their Layered Foldable.

## Explore Part 1: How do we represent fractions?

We can model fractions by counting and grouping part out of whole. Teacher reviews idea of part out of whole and models representing a fraction using counters, such as group $1 / 2$ of 12 counters, of 16 counters.
Students complete \#1 on "How Do We Represent Fractions" worksheet. Have students sketch either $1 \mathrm{a}, 1 \mathrm{~b}$, or 1c from their worksheet as an example under the "Pictures" flap of their Foldable, write the appropriate words for that model under "Words", and write the appropriate symbols under the Symbols flap.
We can model fractions using length. Work with students to complete the "Folding an Inch" activity.

## Folding An Inch

Ask students if they have seen the movie, "Honey I Shrunk the Kids" where a scientist accidentally shrinks his children. Tell them they have been shrunk so small that an inch actually looks very large to them. Give them an 11" template for an inch (see Folding Inch pdf file in the Materials section). Looking at this inch that has been magnified as this one has, we can discover the fractions of the inch. Have students fold the paper in half, count the sections and label $0 / 2,1 / 2$ and $2 / 2$ in appropriate places leaving room below their labels to write five other fractions. Have them refold the halves, then fold in half again, count the sections and label $0 / 4,1 / 4,2 / 4,3 / 4$, and $4 / 4$ in the appropriate places. Have them fold making eighths and label. Then fold again to get the sixteen sections and label. As the equivalent fractions are listed below each other, the columns of symbols look very much like the marks on an inch.
Next, tell students they have been restored to their own size. Give the students a ruler and ask them to compare the marks on an inch. Have students complete \#2-3 on the "How Do We Represent Fractions" worksheet. Have students select one drawing from \#3 to represent with pictures, words, and symbols on the foldable.
We can model fractions using an area model. The teacher demonstrates using color tiles to represent an area such as a $2 \times 5$ rectangle with $2 / 5$ red and $3 / 5$ blue. Students work with partners to complete \# 4-8 on the worksheet, "How Do We Represent Fractions".
After completing \# 4-8, they switch partners to help each other find errors or edit. They return to their partner and compare for accuracy. Teacher circulates during this fixing time to assess and suggest corrections. Students then choose two of their models to record on their foldable (picture, words, symbols).

## Explore Part 2: How do we represent decimals and percents?

Meter Sticks, Base-ten Blocks and Money: Have students compare their meter stick, base-10 blocks and money and prepare posters. Have a gallery walk to see the different posters. Students should take notes on their gallery walk. These notes then help them in the large group discussion.
After the large group discussion, students should write their own individual commentary. Teachers, invite input as to what would make a quality commentary, (e.g. knowledge, presentation, pictures, numbers, connections, real life examples). Use the rubrics to assess the student commentaries. Work
with students to complete the "Meter Sticks, Money, and Base-ten Blocks" investigation worksheet. (See pdf in Materials section.)
To help students visualize decimals, work together to do the "How Much Is A Ten-Thousandth?" activity, having students cut, sketch, and record symbols on their paper.
As a class discuss and work to complete the "Representing Equivalent Rational Numbers" worksheet. Apply: Students complete the "Fractions, Decimals, and Percents With Candy" worksheet.
Have students complete the "Bingo Game Board". (See Bingo attachment in the Materials section.) Play Bingo with the class.
Summarize: After completing these decimal and percent activities, have students complete the decimal and percent flaps of their foldable by sketching pictures, writing words, and showing correct symbols. They may use examples from the activity worksheets or make up their own. The foldable can be kept in a math journal to refer to on quizzes and assignments.
Have students show and explain their foldables to their group or team.

## Extensions

Work with virtual manipulatives in visualizing fractions and decimals and in addition and subtraction of rational numbers.

## Assessment Plan

## Performance tasks

Observation
Game board
Authors

Camille Baker<br>Linda Bolin

