

MATH lesson: Compute using all four operations with fractions and decimals.

Main Curriculum Tie:  
Mathematics Grade 7

[Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. 2.](#)

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

Materials:

- Team Boards, marker and eraser or rag, or Smart Pal for each team
- Color Tiles, Fraction Towers or Fraction Strips
- [0-9 number tiles](#) for each student
- Foldable for each student
- Transparencies of shopping ads
- Game Boards: [Skill Board](#), [Maze Game](#)
- Ti-73 calculators
- Worksheets: "[Estimating Fractions and Decimals by Rounding](#)", "[Investigating Operations With Fractions](#)", "[Decimal Operations With Color Tiles](#)".

Attachments

- [Number\\_Chart.pdf](#)
- [Maze\\_Game\\_Board.pdf](#)
- [Investigating\\_Operations\\_with\\_Fractions.pdf](#)
- [Estimating\\_Fractions\\_and\\_Decimals.pdf](#)
- [Decimal\\_Operations.pdf](#)
- [foldable.pdf](#)
- [skillboard.pdf](#)

Background For Teachers:

Enduring Understanding (Big Ideas):  
Operations with fraction

Essential Questions:

- What operation is needed to find the answer?
- What different symbols are used to indicate different operations?
- How can I predict whether the answer to a problem using fractions or decimals will be an increase or a decrease of the original value?
- How can I use estimation to determine reasonableness?

Skill Focus:

Compute, estimate to determine reasonableness

Vocabulary Focus:

Product, quotient, sum, difference, estimate, reasonable, increase, decrease.

Ways to Gain/Maintain Attention (Primacy):

Cooperative discussion, games, manipulatives, technology, Foldable notes.

Instructional Procedures:

Note: Throughout the lesson, have students read and say all rational numbers in this lesson identifying the place value, for example saying, “three tenths”, rather than merely saying “point 3”.

Starter: Review

1. Sketch a model to represent  $\frac{1}{2} \times \frac{1}{4}$
2. Write one situation or place in our world where you would use:
  - A. a fraction
  - B. a mixed number
  - C. a decimal
3. Write the prime factorization for 45

Lesson segment 1: How do I use estimation to determine reasonableness?

In past lessons we have compared rational numbers and located numbers on a number line. This comparing will help in being able to round a fraction or a decimal in order to determine

reasonableness. Rounding a fraction or decimal to the nearest whole number or half is close enough to estimate for determining reasonableness.

The worksheet, "[Estimating Fractions and Decimals by Rounding](#)", will provide the basis for class discussion.

Students have been studying estimation in previous years. You may want to review and practice rounding and estimating decimals by having them make the [three-flap Foldable](#) (attached), playing The Price Is Right, and [Skillboard for Compatible Numbers](#).

#### The "Price Is Right" Estimation Relay

Objective: Students will use appropriate methods for estimating reasonableness in decimal computations.

Materials: Several shopping ads copied onto transparencies, dry erase marker for each team, a place on the board for each team to write a problem and answer)

Procedure: Explain the rules of the relay to the students as follows:

1. A shopping ad will be shown on the transparency.
2. The teacher will ask a question such as, "How many of \_\_\_\_ could you get for \$100?", or "Which three items could you purchase with a \$20 dollar bill?", or "How much for each?" (if the ad says 2 for \_\_ or 3 for \_\_\_\_).
3. Students will work with their team to answer the question. Each student will write two problems for the question, one writing the items and the actual costs from the ad and the other, beside it on the paper, writing the rounded values. Only the rounded values will be used for the estimation.
4. After giving the students time to discuss with their teams and to write the problems on their own papers, the teacher will select on person at random (using Numbered Heads) to the team's space on the board where they will write the estimated values and the estimated answer to the question the teacher had asked.
5. The teacher will watch for the first four people at the board that finish. The class will look at their problem on the board. If it is correctly done, that team gets a point.

Division of decimals is often a challenge for student to estimate. The following game can give them some practice in finding compatible numbers.

#### Skillboard Game For Estimating Quotients Using Compatible Numbers (adapted from Marci Cook)

Objective: Students will use compatible numbers to estimate when dividing decimals.

Materials: A skillboard and two sets of 0-9 digit markers (different color for each partner).

Problems written on an overhead transparency. (all attached)

Procedure: Give each pair of students a skillboard and two sets of 0-9 markers (different color for each partner).

The answers for these estimated problems will be 0-9. There are two forms of each correct answer on each skillboard, though they may be written as expressions rather than the actual quotient. For example, if the best estimated quotient is 3, the students will find two expressions on their board that are equivalent to three such as  $3 \times 1$  and  $6/2$ , or  $12/4$  and  $9-6$ . Explain this to the students.

Write "compatible numbers, and quotient" on the board. Review estimating quotients using compatible numbers by modeling and referring to the vocabulary:

- A.  $467.3 / 89.12$  (45 can be divided nicely by 9, so 45 and 9 are compatible numbers. Round to 450 and 90. Then, do mental division. The estimated quotient would be approximately 5).
- B.  $638.8 / 82.23$  (64 can be divided by 8 nicely, so 64 and 8 are compatible numbers. Round to 640 and 80. Then, do mental division. The estimated quotient will be approximately 8.)

Show a problem on the transparency as listed below. Have partners discuss together how to use compatible numbers to estimate. Each partner tries to find one expression that is equivalent to the best estimated quotient on the skillboard and places that digit marker on the expression. Then, show the second problem on the overhead and repeat until you have shown all nine problems.

All the digits 0-9 will be used except one. At the end of the game, those pairs who have the correct digit marker left off the board win.

Assignment: Remind students to write an example for each of the methods of estimating discussed in segment 2 on their Foldable, and finish of any part of the Decimals With Color Tiles or Estimating Decimals and Fractions worksheet that needs to be finished. Assign any additional appropriate text practice.

Lesson Segment 3: What operation is needed to find the answer? What different symbols are used to indicate different operations? How can I predict whether the answer to a problem using fractions or decimals will be an increase or a decrease of the original value? How can I use estimation to determine reasonableness?

Write the following questions on a transparency:

- A. What operation will you use to find the answer? Why do you think so?
- B. What information do you need to find the answer?
- C. Will the answer be  $<$ ,  $>$ , or  $=$  either of the other numbers? How can you tell?
- D. What is a good estimate for the answer? How did you decide this?

Student teams may work together to sketch a model, write math symbols, and answer the questions on the transparency as you write the words below. Rotating roles help build accountability in the activity: a leader (keep folks on task), a gatekeeper (makes sure all ideas

are treated with respect), an encourager (invites each person to contribute), and a scribe(writes on a team board or Smart Pal so class can see team ideas). Have teams rotate roles, so each person take the role at least once.

Write each of the following As they look for a way to show each of the following (except for the whole) discuss the answers to the questions on the transparency. Help the students build the models. Then, have them sketch the model and represent the problem mathematically and write out words for the operation involved. Have them check their answers with a calculator after they have used the manipulative and sketched.

After teams have been given time to model, sketch, write the problem and set up math symbols, teacher selects a person from a team to show the class what the team did on the team board or Smart Pal. Class discussion about different approaches or responses and justification for their thinking should follow each problem below.

1. eight equal parts of one whole
2. a third and a half
3. a half decreased by a third
4. three halves
5. half of a half
6. two fifths less than three

Work with students to complete the "[Investigating Operations With Fractions](#)" paper.

Using a Color Tile or other counter to represent the value of a decimal, help students visualize operations with decimals. Remind them that multiplication means repeated addition and division means repeated subtraction or how many of in the total.

Discuss and work with students on "[Decimal Operations With Color Tiles](#)" (attached)

Lesson segment 4: Practice predicting and estimating.

Using calculators, the attached Maze game is played by two. Each player places a marker on Start on the Game Board. Using 100 as the start number, a turn involved each player choosing one segment as a route to an intersection point as they move toward End. The indicated operation must always be performed on their last answer. They may not move backward or return to an intersection they used previously. When both players have reached End, the player with the least final number wins. All work must be recorded on assignment.