

# Solve Problems Involving Operations with Rational Numbers

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**Strand:** Computation and Estimation

**Topic:** Solve practical problems involving operations with rational numbers.

**Primary SOL:** 7.2 The student will solve practical problems involving operations with rational numbers.

**Related SOL:** 7.3

## Materials

- What is a Rational Number? graphic organizer (attached)
- Problem Situations graphic organizer (attached)
- Practical Problems Using Rational Numbers activity sheet (attached)
- Practical Problems Using Rational Numbers – QR Codes activity sheet (attached)
- Devices with a QR reader (optional)
- Practical Problem Recording Sheet (attached)
- Exit Ticket (attached)

## Vocabulary

*improper fraction, integer, mixed number* (earlier grades)  
*rational number* (7.2)

## Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Lead a class discussion about the characteristics of a rational number. Ask each student to go to the board and write a rational number. Different types of numbers should be provided. Explain that the goal is to complete practical word problems using these types of numbers. Following this event, ask students to take notes under the What is a Rational Number? graphic organizer.
2. Ask the students to refer to the Problem Situations graphic organizer. Lead a whole group discussion in which students pose a practical situation that would match the situations described under each operation. The use of key words is not an effective strategy for students to use when problem solving, so asking students to recognize various situations when these operations may be needed to solve a problem is preferred. As students work on problems, have them add to this list as appropriate.
3. Teachers will provide students with the opportunity to use problem-solving strategies to apply computational skills involving positive and negative rational numbers expressed as integers, fractions, and decimals, along with the use of percents within practical situations.
4. Complete the following teacher-led examples and ask the students to follow along:

## Mathematics Instructional Plan – Grade 7

- Today's high temperature in Chicago was 12°F and the low temperature was 15.1°F lower than this. Yesterday's low temperature was 3°F. What was the difference between the two low temperatures?
  - An industrial factory makes  $4\frac{3}{5}$  yards of chain every minute. The cost of each yard of chain is \$6.59. What is the total cost for all chain produced in 10 minutes?
5. Place students in groups of three or four. Give each student a Practical Problem Recording Sheet to show their work as they complete the QR code activity. If technology is not available, the teacher can provide each group with a copy of the practical problems.
  6. Ask students to independently complete the Exit Ticket and submit it before leaving. The data collected from this activity can be used to plan for upcoming lessons.

### Assessment

- **Questions**
  - Where do you see rational numbers in real life?
  - Are there multiple ways to solve a single problem?
  - How do you know that you have provided a reasonable answer?
  - What role does estimation play in solving practical word problems?
  - What are some key words and phrases that represent a specific operation?
- **Journal/writing prompts (include a minimum of two)**
  - Describe ways that rational numbers are present in real life.
  - Write a paragraph to explain how to solve one of the problems (refer to Nos. 1–6).
  - Will rational numbers be present in the career that you hope to pursue after high school? If so, explain where the rational numbers will appear.
- **Other Assessments**
  - Use the exit ticket as an assessment.
  - Observe the strategies that students use to complete the station activities.
  - Ask the students to explain how they solved a specific problem.
  - Write a practical problem that includes rational numbers and at least two steps to solve.

### Extensions and Connections (for all students)

- Compare rational numbers with irrational numbers.
- List three different ways rational numbers are present within the Science curriculum.
- Provide a magazine or newspaper to each group and have them find rational numbers present within the article.
- Create a real-world problem that contains at least three rational numbers and a minimum of two operations.
- Create a Venn diagram that compares rational and irrational numbers.

### Strategies for Differentiation

## *Mathematics Instructional Plan – Grade 7*

- Ask students to draw a visual representation of the word problem.
- Provide individual whiteboards and dry-erase markers to students so that they can show the mathematical process needed to arrive at the correct answer.
- Provide students with a calculator to use throughout the lesson.
- Have students work with a partner to complete the Which Operation Should I Use? activity.

### **How to Use QR codes in the Classroom**

1. Before the lesson, locate tablets or devices with a QR reader app on the desktop. There are many free brands of the QR app reader.
2. Students with a device can download the app at home and bring the device to class on the day of the assignment (optional).
3. The following three steps are needed in order to view the mathematics problem on the device:
  - Open the QR reader on the device.
  - Hold your device over a QR Code so that it's clearly visible within your smartphone's screen.
  - Some devices will automatically capture the code. If needed, press the button to snap a picture.
4. The mathematics problem will appear on the device once it is correctly scanned.

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

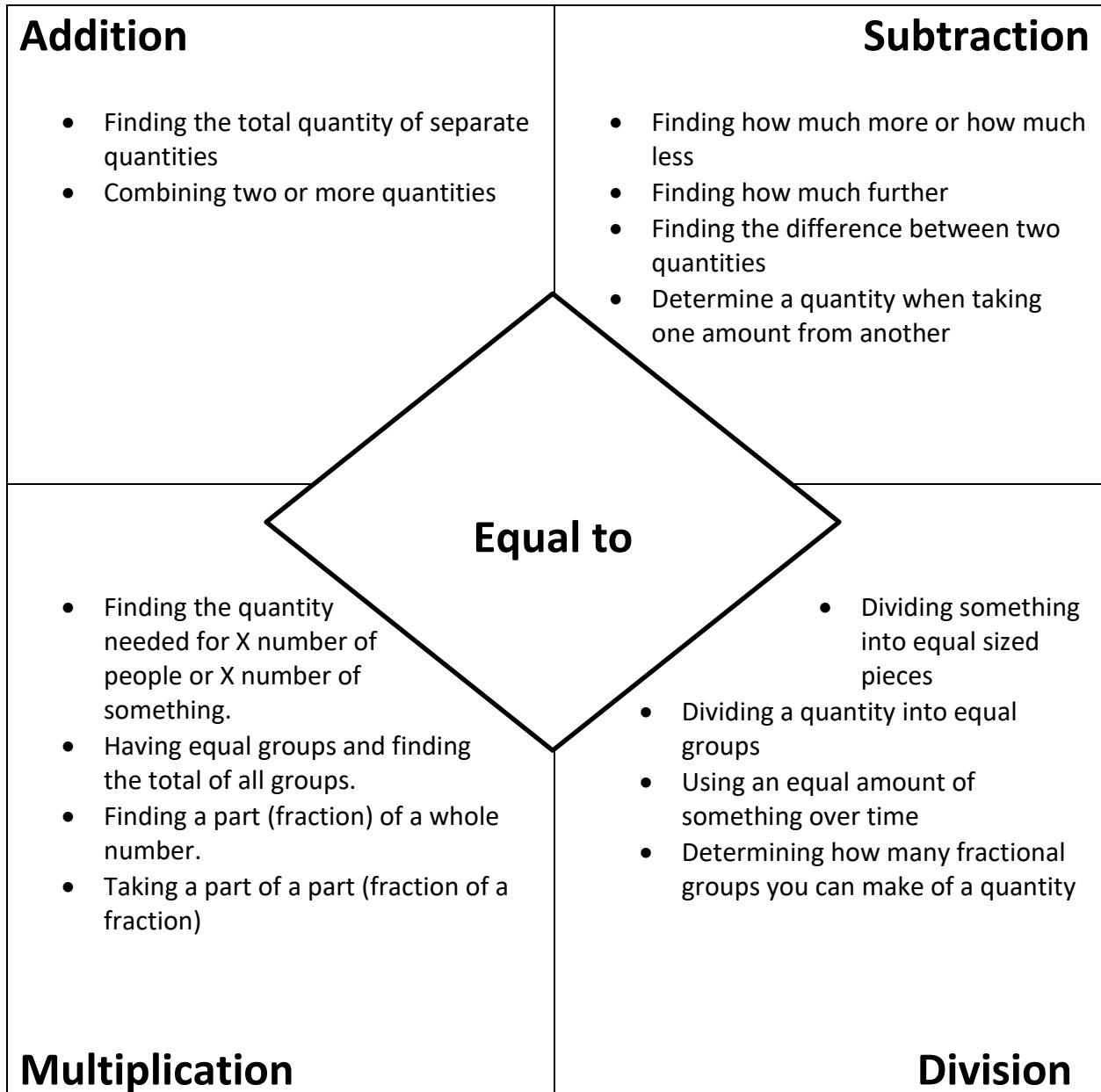
## What is a Rational Number?

Fill in the following boxes with characteristics and examples of Rational Numbers.

<b>Characteristics</b>	<b>Examples</b>

## Problem Situations

There are different types of problem situations that can occur when trying to apply mathematics to solve practical problems. The following chart helps students to understand that there are various situations in which operations are used to solve a problem. Have students use this chart as they tackle problems. Encourage students to add their own problem situations to the chart.



## Practical Problems Using Rational Numbers

1. Alicia had \$-11 in her checking account. She did a few chores and made \$44.50. She decided to pay for her and a friend to go to the movies, and each ticket cost \$6.25. How much money does she have left in her checking account?
2. There are 30 students in Mrs. Woodward's class, and  $\frac{1}{5}$  of the class has their own cellphone. Of this group of students,  $\frac{1}{2}$  of them are allowed to use social media. How many of the students have a cellphone and can use social media?
3. Joe bought a box of laundry detergent that contains 195 scoops. Each load of laundry uses  $2\frac{1}{2}$  scoops. How many loads of laundry can he do with this one box? The box of detergent was \$19.99. How much is he paying for each load that he washes?
4. Edward started his hike at an elevation of 115 feet below sea level. Throughout the hike he ascended 3,200 feet and then descended 676 feet. How much did his elevation change?
5. Mr. and Mrs. Jones wanted to plan a fun day with their two children. An adult ticket to the local amusement park is \$20. A child's ticket is 40 percent less than the adult ticket. What is the total amount for a family of four to enter the park?
6. Josh rents a kayak at a nearby state park. He pays a flat rate of \$12.99 plus \$3.75 for each hour that he spends in the water. How much did Josh spend if he was on the river for  $4\frac{1}{2}$  hours?

## Practical Problems Using Rational Numbers – QR Codes

1.



2.



3.



4.



5.



6.



## Practical Problems Using Rational Numbers

(Actual Problems – for use if QR Code Reader Not Available)

<p>1.</p> <p>Alicia had - \$11.00 in her checking account. She did a few chores and made \$44.50. She decided to pay for her and a friend to go to the movies and each ticket costs \$6.25. How much money does she have left in her account?</p>	<p>2.</p> <p>There are 30 students in Mrs. Woodward’s class and <math>\frac{1}{5}</math> of the class has their own cell phone. Of this group of students, <math>\frac{1}{2}</math> of them are allowed to use social media. How many of the students have a cell phone and can use social media?</p>
<p>3.</p> <p>Joe bought a box of laundry detergent that contains 195 scoops. Each load of laundry uses <math>2\frac{1}{2}</math> scoops. How many loads of laundry can Joe do with this one box? The box of detergent cost \$19.99. How much is he paying for each load of laundry that he washes?</p>	<p>4.</p> <p>Edward started his hike at an elevation of 115 feet below sea level. Throughout the hike, he ascended 3,200 feet and then descended 676 feet. How much did his elevation change?</p>
<p>5.</p> <p>Mr. and Mrs. Jones wanted to plan a fun day with their two children. An adult ticket to the local amusement park is \$20.00. A child’s ticket is 40% less than the adult ticket. What is the total amount for a family of four to enter the park?</p>	<p>6.</p> <p>Josh rents a kayak at a nearby state park. He pays a flat rate of \$12.99 plus \$3.75 for each hour that he spends in the water. How much did Josh spend if he was on the river for <math>4\frac{1}{2}</math> hours?</p>



## Practical Problem Recording Sheet

*Solve and show your work for each practical problem.*

<p>1.</p>         <p>Answer <input type="text"/></p>	<p>2.</p>         <p>Answer <input type="text"/></p>
<p>3.</p>         <p>Answer <input type="text"/></p>	<p>4.</p>         <p>Answer <input type="text"/></p>
<p>5.</p>         <p>Answer <input type="text"/></p>	<p>6.</p>         <p>Answer <input type="text"/></p>

## Exit Ticket

Solve the following practical problems. Show your work.

1. Mark owes his sister \$15. He earned \$20 for mowing the grass. He gave  $\frac{1}{5}$  of his earnings to a local charity and then paid his sister. Does Mark have enough to repay his sister the full amount? Why or why not?
  
2. The seventh-graders at the middle school are going on a field trip to the aquarium. They will spend  $4\frac{1}{4}$  hours at the aquarium. The students will need to visit five exhibits while they are there. If the time is evenly distributed, how many minutes will the students spend at each exhibit?
  
3. Mary's mom gave her \$100 to go shopping. She bought a shirt for \$22.65 and a skirt for \$33.31. She had a coupon for 10 percent off her total purchase. How much change did she receive from the cashier?