Lesson Title: Intro to Adding/Subtracting Rational Numbers Course: Common Core 7
Date: _____ Teacher(s): _____ Start/end times: _____

Lesson Objective(s): *What mathematical skill(s) and understanding(s) will be developed?*

7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers.

Lesson Launch Notes: *Exactly how will you use the first five minutes of the lesson?*

Review with students the various vocabulary associated with the operations of addition, subtraction, multiplication and division by having them complete a sorting activity. Place large signs of the 4 operations as well as an equal sign on the board. Give each student an index card with a vocabulary word on it and have the students place their cards under the symbol it stands for on the board. Review the results as a class and make any corrections needed.
(A list of words is included with this lesson.)

Lesson Closure Notes: *Exactly what summary activity, questions, and discussion will close the lesson and provide a foreshadowing of tomorrow? List the questions.*

Based on the activities completed in class, the students will compose their own stories using the required number of operations. They will also make an answer key for their stories. Follow up questions should include:

- What was most challenging about writing your own story?
- What was the easiest?
- How did you overcome the challenges/what resources did you use?

Lesson Tasks, Problems, and Activities (attach resource sheets): *What specific activities, investigations, problems, questions, or tasks will students be working on during the lesson?*

1. Begin the lesson by asking students how they use rational numbers in real life (ie. temperature, recipes, money, etc.) and then introduce the activity by telling them they are going to read a story and translate it into a mathematical problem in order to see how a high school student earned extra spending money for his summer vacation. (Note: This lesson will focus primarily with operations with rational numbers expressed as decimals.)
2. Present students with the following story. Students can be paired up or put in small groups for the activity. (Note: The tables provided after each week in the story are optional scaffolds.):

Joe wanted to make some extra money for his summer vacation so he decided he was going to sell iced tea after sports practice at his school each weekday to earn some money. He went to the grocery store and bought 30 containers of iced tea and 5 packages of medium sized plastic cups. He divided up the iced tea and cups so that he would use the same amount of iced tea and cups each day and decided to charge $1.05 per cup. After the first day, he sees that his profit for the day is negative but he decides to keep trying for the rest of the week in the hopes that he will turn a profit. He uses the same number of gallons of iced tea and the same number of packages of cups each of the five weekdays. However, after five days of selling iced tea he has the same negative profit each day. (use the information below to determine Joe's sales each day and his total for the week)

1 container of iced tea - $3.79
1 package of medium plastic cups - $2.55
cups sold each day – 24

Week 1 Profit each day:

Monday	Tuesday	Wednesday	Thursday	Friday

Profit for Week 1: _____

After looking over his sales for the week, Joe decides he needs to come up with a different sales approach in order to make more money. So, he decides to offer different sizes of iced tea for different prices. He finds a variety pack of cups at the store that contains small, medium and large cups that costs the same as the cups he bought the previous week so he buys 5 packages of those cups and the same 30 containers of iced tea as he did the week prior. He decides he will continue to charge $1.05 per medium cup and will price the small cups at $.75 per cup and the large cups at $1.55 per cup. He hopes this new strategy will take him from losing money last week to gaining money this week. Use the information below to determine if Joe started making a profit in Week 2 and then find his total profit for the two weeks.

1 container of iced tea - $3.79
1 variety package of plastic cups - $2.55
Cups sold each day: 14 large, 10 medium, 6 small

Week 2 Profit each day:

Monday	Tuesday	Wednesday	Thursday	Friday

Profit for Week 2: _____

Overall profit for Weeks 1 and 2: _____

3. Read through the story together and explain that the students need to use the information in the story to determine how much money Joe made each week and then his overall profit for the two weeks. Give students 10-15 minutes to complete this activity. Give students the option to create a visual to show how they arrived at their answers and what strategies they used (this may require adding on additional time to this section of the lesson.)
4. Once completed, have students/groups share out their answers and strategies used. Review the correct answers and link the vocabulary used to their corresponding operations (i.e. per-multiply, total-add, divided-divide, etc.)
5. As a class, discuss other situations in which rational numbers are used in everyday life (i.e. debits and credits, changes in temperature, above and below sea level, etc.). Next, tell students they are going to write their own stories with rational numbers with the following requirements:
    - Stories must contain both positive and negative rational numbers.
    - Stories must utilize all 4 operations (addition, subtraction, multiplication and division).
    - Stories must be turned in with an answer key on a separate sheet of paper.
6. Allow students 20-25 minutes to work on this task and then collect papers. If time permits, have groups switch papers and solve each other's stories. If time is short, collect all stories and use them as a warm up activity/extension activity for the next class. The stories and answer keys will serve as a formative assessment for the lesson.
7. Wrap up the lesson by discussing the following questions:
    - What was most challenging about writing your own story?
    - What was the easiest?
    - How did you overcome the challenges/what resources did you use?

Solutions:
Week 1: Cost for materials: $126.45
Profit: M -101.25, T -76.05, W -50.85, R -25.65, F -0.45 (He does not break even)
Week 2: Cost for materials: $126.45
Profit: M -89.75, T -53.05, W -16.35, R 20.35, F 57.05 (By the end of the week he has a profit of $57.05)
By end of Week 1 and 2, he has made a profit of $56.60.

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Evidence of Success: *What exactly do I expect students to be able to do by the end of the lesson, and how will I measure student mastery? That is, deliberate consideration of what performances will convince you (and any outside observer) that your students have developed a deepened (and conceptual) understanding.*

The students will be able to solve real-world and mathematical problems involving the four operations with rational numbers. They will also be able to translate those operations into words/stories.

Student-created stories and answer keys will serve as formative assessment for this lesson. Assigned homework will provide the students the opportunity to further practice and extend this skill and also allow the teacher to check for understanding.

Notes and Nuances: *Vocabulary, connections, common mistakes, typical misconceptions, etc.*

Key Vocabulary: rational numbers, *see attached list of operation vocabulary to be used in Lesson Launch*

Connections: Students will need to connect their prior understanding of integers, rational numbers and absolute value from 6.NS.5, 6.NS.6 and 6.NS.7.

Common Mistakes/Misconceptions: Students often confuse which operation is being referred to when given the solution names sum, difference, product and quotient. They also tend to use numbers in the incorrect order when given a subtraction problem using *less than*. Additionally, students often mistake *more than* and *less than* as referring to the inequality symbols rather than addition and subtraction and vice versa when presented with *is more than* or *is less than*.

Common computation mistakes occur when students attempt to apply the sign rules for multiplying and dividing numbers to adding and subtracting. For example, if they are subtracting two negative numbers they subtract the numbers and make the answer positive. Another common mistake occurs when adding numbers with positive and negative values as students often combine the two numbers and use the sign of the larger number in their answer rather than realize they are actually moving up or down the number line depending on the signs of the numbers. Similarly, when subtracting numbers with positive and negative values, students often subtract the two numbers and use the sign of the larger number in their answer rather than realize they are actually moving up or down the number line depending on the signs of the numbers. They also become very confused when subtracting a negative and often add the numbers and make the answer negative or subtract the numbers and make the answer negative.

Resources: *What materials or resources are essential for students to successfully complete the lesson tasks or activities?*

operation signs and vocabulary cards
story
calculator (optional)
large paper (optional for presentation)
markers (optional for presentation)

Homework: *Exactly what follow-up homework tasks, problems, and/or exercises will be assigned upon the completion of the lesson?*

As homework, have students add to the original story by writing a scenario for Week 3. The scenario must use rational numbers and at least 3 of the 4 basic operations and include an answer key. (Note: This homework assignment can be used as a warm-up and/or short classwork assignment in the next class whereby students exchange papers and complete each other's scenarios.)

Lesson Reflections: *What questions, connected to the lesson objectives and evidence of success, will you use to reflect on the effectiveness of this lesson?*

Were students able to correctly apply the rules for adding, subtracting, multiplying and dividing rational numbers?
Were students able to correctly recognize when to use each operation?
Were students able to apply the rules to various problem solving situations and scenarios?

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Were students able to transfer the rules to create problems and scenarios of their own using appropriate vocabulary? Do I need to differentiate or re-teach the lesson to meet the needs of the various student groups represented in my class?