



Lesson 9: Sums and Differences of Decimals

Student Outcomes

- Students relate decimals to mixed numbers and round addends, minuends, and subtrahends to whole numbers in order to predict reasonable answers.
- Students use their knowledge of adding and subtracting multi-digit numbers to find the sums and differences of decimals.
- Students understand the importance of place value and solve problems in real-world contexts.

Lesson Notes

Students gained knowledge of rounding decimals in Grade 5. Students have also acquired knowledge of all operations with fractions and decimals to the hundredths place in previous grades.

Classwork

Discussion (5 minutes)

It is important for students to understand the connection between adding and subtracting mixed numbers and adding and subtracting decimals.

- Can you describe circumstances when it would be easier to add and subtract mixed numbers by converting them to decimals first?
 - *When fractions have large denominators, it would be difficult to find common denominators in order to add or subtract.*
 - *When a problem is solved by regrouping, it may be easier to borrow from decimals than fractions.*
- How can estimation be used to help solve addition and subtraction problems with rational numbers?
 - *Using estimation can help predict reasonable answers. It is a way to check to see if an answer is reasonable or not.*

Example 1 (8 minutes)

Use this example to show students how rounding addends, minuends, and subtrahends can help predict reasonable answers. Also, have students practice using correct vocabulary (addends, sum, minuends, subtrahends, and difference) when talking about different parts of the expressions.

Example 1

$$25\frac{3}{10} + 376\frac{77}{100}$$

MP.6

- Convert the mixed numbers into decimals.
 - $25.3 + 376.77$
- Round the addends to the nearest whole number. Then, find the estimated sum.
 - $25 + 377 = 402$
- Line up the addends appropriately using place value, and add.
 - $$\begin{array}{r} 25.3 \\ + 376.77 \\ \hline 402.07 \end{array}$$

MP.2

Show students that the sum is close to the estimation. Also show how the place value is important by completing the problem without lining up the place values. If this mistake is made, the actual sum is not close to the estimated sum.

Example 2 (8 minutes)

This example will be used to show that changing mixed numbers into decimals may be the best choice to solve a problem.

Divide the class in half. Have students solve the same problem, with one half of the class solving the problem using fractions and the other half of the class solving using decimals. Encourage students to estimate their answers before completing the problem.

Example 2

$$426\frac{1}{5} - 275\frac{1}{2}$$

Each group should get the same value as their answer; however, the fraction group will have $150\frac{7}{10}$, and the decimal group will have 150.7.

It is important for students to see that these numbers have the same value. Students solving the problem using fractions will most likely take longer to solve the problem and make more mistakes. Point out to students that the answers represent the same value, but using decimals made the problem easier to solve.

MP.2

When discussing the problem, use the correct vocabulary. $426\frac{1}{5}$ is the minuend, $275\frac{1}{2}$ is the subtrahend, and $150\frac{7}{10}$ is the difference.

Exercises 1–5 (14 minutes)

MP.2
&
MP.6

Students may work in pairs or individually to complete the following problems. Encourage students to write an expression and then round the addends, minuends, and subtrahends to the nearest whole number in order to predict a reasonable answer. Also, remind students that it is not always easier to change fractions to decimals before finding the sum or difference. Discuss the use of the approximation symbol when rounding decimals that repeat.

Exercises 1–5

Calculate each sum or difference.

1. Samantha and her friends are going on a road trip that is $245\frac{7}{50}$ miles long. They have already driven $128\frac{53}{100}$. How much farther do they have to drive?

Expression: $245\frac{7}{50} - 128\frac{53}{100}$

Estimated answer: $245 - 129 = 116$

Actual answer: $245.14 - 128.53 = 116.61$

2. Ben needs to replace two sides of his fence. One side is $367\frac{9}{100}$ meters long, and the other is $329\frac{3}{10}$ meters long. How much fence does Ben need to buy?

Expression: $367\frac{9}{100} + 329\frac{3}{10}$

Estimated answer: $367 + 329 = 696$

Actual answer: $367.09 + 329.3 = 696.39$

3. Mike wants to paint his new office with two different colors. If he needs $4\frac{4}{5}$ gallons of red paint and $3\frac{1}{10}$ gallons of brown paint, how much paint does he need in total?

This problem is an example of where it may not be easiest to convert mixed numbers into decimals. Either method would result in a correct answer, but discuss with students why it may just be easier to find the sum by keeping the addends as mixed numbers.

Expression: $4\frac{4}{5} + 3\frac{1}{10}$

Estimated answer: $5 + 3 = 8$

Actual answer: $4\frac{8}{10} + 3\frac{1}{10} = 7\frac{9}{10}$

4. After Arianna completed some work, she figured she still had $78\frac{21}{100}$ pictures to paint. If she completed another $34\frac{23}{25}$ pictures, how many pictures does Arianna still have to paint?

Expression: $78\frac{21}{100} - 34\frac{23}{25}$

Estimated answer: $78 - 35 = 43$

Actual answer: $78.21 - 34.92 = 43.29$

Use a calculator to convert the fractions into decimals before calculating the sum or difference.

5. Rahzel wants to determine how much gasoline he and his wife use in a month. He calculated that he used $78\frac{1}{3}$ gallons of gas last month. Rahzel's wife used $41\frac{3}{8}$ gallons of gas last month. How much total gas did Rahzel and his wife use last month? Round your answer to the nearest hundredth.

Expression: $78\frac{1}{3} + 41\frac{3}{8}$

Estimated answer: $78 + 41 = 119$

Actual answer: $78.333 + 41.375 \approx 119.71$

Closing (5 minutes)

- Have students share their answers and processes for each of the exercise problems.
- Discuss which exercises would be easiest if the addends, minuends, or subtrahends were converted to decimals.
 - *Exercises 1, 2, and 4 would be easiest if the terms were converted to decimals before finding the sum or difference.*
 - *The only way to calculate the exact sum for Exercise 5 would be to leave it as a fraction. However, it would be easiest to solve by converting the mixed numbers to decimals.*

Exit Ticket (5 minutes)

Name _____

Date _____

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Exit Ticket

Solve each problem. Show that the placement of the decimal is correct through either estimation or fraction calculation.

1. $382\frac{3}{10} - 191\frac{87}{100}$

2. $594\frac{7}{25} + 89\frac{37}{100}$

Exit Ticket Sample Solutions

Solve each problem. Show that the placement of the decimal is correct through either estimation or fraction calculation.

1. $382\frac{3}{10} - 191\frac{87}{100}$

Estimation: $382 - 192 = 190$

$382.3 - 191.87 = 190.43$

2. $594\frac{7}{25} + 89\frac{37}{100}$

Estimation: $594 + 89 = 683$

$594.28 + 89.37 = 683.85$

Problem Set Sample Solutions

1. Find each sum or difference.

a. $381\frac{1}{10} - 214\frac{43}{100}$

$381.1 - 214.43 = 166.67$

b. $32\frac{3}{4} - 12\frac{1}{2}$

$32\frac{3}{4} - 12\frac{2}{4} = 20\frac{1}{4}$ or 20.25

c. $517\frac{37}{50} + 312\frac{3}{100}$

$517.74 + 312.03 = 829.77$

d. $632\frac{16}{25} + 32\frac{3}{10}$

$632.64 + 32.3 = 664.94$

e. $421\frac{3}{50} - 212\frac{9}{10}$

$421.06 - 212.9 = 208.16$

2. Use a calculator to find each sum or difference. Round your answer to the nearest hundredth.

a. $422\frac{3}{7} - 367\frac{5}{9}$

$422.428571 - 367.555556 \approx 54.87$

b. $23\frac{1}{5} + 45\frac{7}{8}$

$23.2 + 45.875 \approx 69.08$