Study Guide

6th Grade Decimals Practice
05/24/2016

**Order of Operations with Decimals - A**Performing operations with decimals is similar to performing operations with whole numbers.

Operations inside parentheses are performed first.

**Example 1:** (7.2 + 3.4) + (2.31 + 5.352) = ?

 (1) 7.2 + 3.4 = 10.6 and 2.31 + 5.352 = 7.662
 (2) 10.6 + 7.662 = ?
 (3) 10.6 + 7.662 = 18.262

Step 1: Perform all operations within parentheses. Add 7.2 + 3.4 = 10.6. And add 2.31 + 5.352 = 7.662.
Step 2: Rewrite the equation with the new numbers in place of the parentheses.
Step 3: Add 10.6 and 7.662.

The answer is 18.262

**Example 2:** (13.295 - 1.62) - (3.5625 + 5.92) = ?

 (1) 13.295 - 1.62 = 11.675 and 3.5625 + 5.92 = 9.4825
 (2) 11.675 - 9.4825 = ?
 (3) 11.675 - 9.4825 = 2.1925

Step 1: Perform operations within parentheses. Subtract 13.295 - 1.62 = 11.675. And add 3.5625 + 5.92 = 9.4825.
Step 2: Rewrite the equation with the new numbers in place of the parentheses.
Step 3: Subtract 9.4825 from 11.675.

The answer is 2.1925.

**Compare Decimals - C**Comparing decimal numbers involves determining which decimal in a set is either the least or the greatest. Real world problems, also called word or story problems, present decimal problems in text format. Students are required to read passages and determine the questions being asked. They should then identify the elements needed to solve the problem, decide on the correct method to solve each problem, and find a solution.

Story problems are often difficult for students to master. It may be beneficial to confirm that the student is comfortable with his or her ability to compare decimals outside of a story problem context. To review this concept with the student, use the example below. Remember, when comparing numbers, line the decimal points up and compare the corresponding columns beginning with the highest place value.

**Comparing Decimals Without a Context:**

**Example 1**:
Put the decimals below in order from least to greatest:
 2.4091, 2.904, 2.09, 2.049

**Solution:**

Step 1: Write the decimals in vertical form, lining up the decimal points.

 
Step 2: Look at the numbers from left to right, stopping when any of the numbers are different. The two is the same in all of the numbers. In the tenths place (to the right of the decimal point), there is 4, 9, 0, and 0.
Step 3: The greatest number is 9, so 2.904 is the greatest number in the set. The next highest is the 4, so 2.4091 is next.
Step 4: Look at the two numbers with a 0 in the tenths place. In the hundredths place, one number has a 9 and the other number has a 4. Therefore, 2.09 is the third greatest, and 2.049 is the least. The numbers in order from least to greatest are: 2.049, 2.09, 2.4091, and 2.904.

**Answer**: 2.049, 2.09, 2.4091, 2.904.

A common mistake that students make is to assume that the numbers after the decimal place follow the rules of counting numbers (1, 2, 3, etc.). Specifically, students assume that the more digits there are in the number, the greater the number is. For example, students know that 215 is greater than 23 because 215 has more digits than 23. However, with decimals, 0.215 is less than 0.23, even though 0.215 contains more digits.

**Comparing Decimals in a Real World Context**:

When the student appears to have mastered the skill of comparing decimals, increase the difficulty of the problem by putting the decimals in a real world context. It may be beneficial to create problems that relate to his or her daily activities, such as sports or measurements. Then, help the student determine the correct process to find the solution.

**Example 2:**
Kendall is trying to reduce his weight class for wrestling. He wants to determine what time of day he should be weighed so that he will weigh the least. He weighed himself throughout the day and his results are in the table below.

 
At what time did Kendall weigh the least?

**Solution:**
Step 1: Line up all of the decimal points and move from left to right. The numbers are all identical until the hundredths place. That is, the 70.3 part of the number is common to all of the numbers.
Step 2: Look at the hundredths place. There are three numbers with a 0 and one number with a 1 in the hundredths place. Therefore, the 70.31 is the greatest number, and it is eliminated because the question is asking for the smallest weight.
Step 3: Look at the thousandths place since all of the other numbers have a 0 in the hundredths place. The thousandths place contains a 6, a 7, and an 8 for the remaining numbers. Regardless of the number that follows it, 6 is the smallest number of the three that are remaining, so 70.3068 kg is the least Kendall weighed during the day.

**Answer:** Kendall weighed the least at 11:30 A.M.

**Example 3:**
Naomi's baseball team has won more games than it has lost for four years in a row. Her team has had almost the same record every year as shown in the table below.

 
In what year was the team's record the highest?

**Solution:**
Step 1: Line up all of the decimal points and move from left to right. The numbers are all identical until the hundredths place. That is, the 0.6 part of the number is common to all of the numbers.
Step 2: Look at the numbers in the hundredths place. There are two numbers with a 3, one with a 2, and one with a 4 in the hundredths place. Therefore, the highest number is 0.64 and the year it occurred was 2000.

**Answer:** The team's record was the highest in 2000.

NOTE: When working with real world problems that involve speed, the lowest decimal number is equal to the fastest speed.

An activity relating to this skill would be to choose a certain stock from the newspaper or on the Internet (try a search for "stock quotes" and look for one that carries the decimal places out to the hundredths place) and monitor the stock once a day for one week. Determine which day the stock was worth the most and which day it was worth the least. A similar activity would be to have the student track his or her favorite professional sport team's record throughout the season or from year to year.

**Order Decimals: Story Problem**Ordering decimal numbers involves determining which decimals in a set are greater or smaller than the other decimals in the set and ordering them from least to greatest or greatest to least. Real world problems, also called word or story problems, present decimal problems in text format. Story problems require students to read passages and determine the questions being asked. They should then identify the elements needed to solve each problem, decide on the correct method to solve the problem, and find a solution.

Story problems are often difficult for students to master. It may be beneficial to confirm that the student is comfortable with ordering decimals outside of a real world context. Remember, when comparing numbers, line the decimal points up and compare the corresponding columns beginning with the highest place value.

**Ordering Decimals Without a Context:**

**Example 1:**
Put the decimals below in order from least to greatest:
 2.4091, 2.904, 2.09, 2.049

**Solution:**

Step 1: Write the decimals in vertical form, lining up the decimal points.

 
Step 2: Look at the numbers from left to right, stopping when any of the numbers are different. The two is the same in all of the numbers. In the tenths place (to the right of the decimal point), there is 4, 9, 0, and 0.
Step 3: The greatest number is 9, so 2.904 is the greatest number in the set. The next highest is the 4, so 2.4091 is next.
Step 4: Look at the two numbers with a 0 in the tenths place. In the hundredths place, one number has a 9 and the other number has a 4. Therefore, 2.09 is the third greatest, and 2.049 is the least. The numbers in order from least to greatest are: 2.049, 2.09, 2.4091, and 2.904.

**Answer**: 2.049, 2.09, 2.4091, 2.904.

A common mistake students make is to assume that the numbers after the decimal place follow the rules of counting numbers (1, 2, 3, etc.). Specifically, students assume that the more digits there are in the number, the greater the number is. For example, students know that 215 is greater than 23 because 215 has more digits than 23. However, with decimals, 0.215 is less than 0.23, even though 0.215 contains more digits.

**Ordering Decimals in a Real World Context:**

When the student appears to have mastered the skill of comparing decimals, increase the difficulty of the problem by putting the decimals in a real world context. It may be beneficial to create problems that relate to his or her daily activities, such as sports or measurements. Then, help the student determine the correct process to find the solution.

**Example 2:**
Paul is trying to determine which breakfast cereal costs the least per ounce. By his calculations, he determines that Crispy O's cost $0.2073 per ounce, Rice Puffs cost $0.273 per ounce, Sugar Beads cost $0.0273 per ounce, and Frosty Orbs cost $0.07723 per ounce. Order the cereals from most expensive to least expensive.

**Solution:**
Step 1: Write the decimals in vertical form, lining up the decimal points.

 
Step 2: Look at the numbers from left to right, stopping when any of the numbers are different. The numbers are all the same until the tenths place. In the tenths place, we have two numbers with a 2 and two with a 0.
Step 3: Look at the two numbers with the 2 in the tenths place because these are the two largest numbers. In the hundredths place for these two numbers, one has a 0 and the other has a 7. Therefore, 0.273 is the greatest, followed by 0.2073.
Step 4: Look at the two numbers with a 0 in the tenths place. In the hundredths place, one has a 2 and the other a 7. Therefore, the third largest number is 0.07723 and the smallest is 0.0273. The numbers in order from most expensive to least expensive are: 0.273, 0.2073, 0.07723, 0.0273.

Answer: Rice Puffs, Crispy O's, Frosty Orbs, Sugar Beads

NOTE: Although the student is used to seeing dollar amounts written to the hundredths place, when dealing with unit rates (per ounce, per pound, per unit, etc.) decimal values are often extended further.

**Example 3:**
The manager at Fizz Cola tests the machine once each hour to make sure it is performing as it should. He has measured the amount of cola the two-liter bottles contained and found the following results.

 8:00 A.M. - the machine filled the container with 2.0023 liters of cola
 9:00 A.M. - the machine filled the container with 2.0203 liters of cola
 10:00 A.M. - the machine filled the container with 1.9708 liters of cola
 11:00 A.M. - the machine filled the container with 1.981 liters of cola
 12:00 P.M. -the machine filled the container with 2.023 liters of cola

Put the times in order so that the time when the bottle was filled with the most cola comes first and the time the bottle was filled with the least cola comes last.

**Solution:**
Step 1: Write the decimals in vertical form, lining up the decimal points.

 
Step 2: Look at the numbers from left to right, stopping when any of the numbers are different. Begin by comparing the numbers that have a 2 in the ones place because they are greater than those that have a 1 in the ones place.
Step 3: For the three numbers that have a 2 in the ones place, compare the tenths place. All three numbers have a 0 in the tenths place, so look at the hundredths place. The numbers 2.0203 and 2.023 have a 2 in the hundredths place, so they are greater than 2.0023. Since 2.023 has a 3 in the thousandths place, it is greater than 2.0203 which has a 0 in the thousandths place. The order of the greatest numbers is: 2.023, 2.0203, 2.0023.
Step 4: Now compare 1.9708 and 1.981. The two numbers are the same until the hundredths place. Since 1.981 has an 8 in the hundredths place, it is greater than 1.9708 which has a 7 in the hundredths place. This means that the order of the amounts is: 2.023, 2.0203, 2.0023, 1.981, 1.9708.

**Answer**: 12:00 P.M. , 9:00 A.M. , 8:00 A.M. , 11:00 A.M. , 10:00 A.M.

NOTE: When working with real world problems that involve speed, the lowest decimal number is equal to the fastest speed.

An activity relating to this skill would be to choose a certain stock from the newspaper or on the Internet (try a search for "stock quotes" and look for one that carries the decimal places out to the hundredths place) and monitor the stock once a day for one week. Order the stock prices from least to greatest or greatest to least. A similar activity would be to have the student track his or her favorite professional sport team's record throughout the season or from year to year.

**Add Decimals: Story Problems - C**Story problems, also called word problems, relate addition of decimal numbers to actual situations. Operational symbols, such as the addition (+) symbol, are replaced with text. Word problems in this skill also deal with money.

Story problems are often very difficult for students to master. It may be beneficial for you to create problems that students can easily relate to, and help the student determine the correct formulas.

**Example:** Fred ran 8.971 miles on Saturday and 5.363 miles on Sunday. How many miles did Fred run in all?

 
Step 1: Identify the equation and remember to line up the decimal points.
Step 2: Add the numbers in the thousandths position (1 + 3 = 4). Write the 4 in the thousandths position below the line.
Step 3: Add the numbers in the hundredths position (7 + 6 = 13). Write the 3 in the hundredths position below the line. Carry the 1 to the next column (tenths).
Step 4: Add the numbers in the tenths column, including the number carried over from the previous column (9 + 3 + 1 = 13). Write the 3 in the tenths position (below the line). Carry the 1 to the next column (ones). Bring the decimal point down.
Step 5: Add the numbers in the ones position, including the number carried over from the previous column (8 + 5 + 1 = 14). Write the 14 to the left of the decimal point (below the line).

Answer: Fred ran 14.334 miles.

**Subtract Decimals: Ten Thousandths**Subtracting decimal numbers with more than one decimal position (columns of numbers) is very similar to subtracting whole numbers. Subtracting decimal numbers requires the ability to regroup (carry, borrow, or rename) when the number being subtracted is greater than the other number.

**Example 1**: Solve 7.3639 - 0.4312 = ?


Step 1: Rewrite the problem vertically. Always line up the decimal points.
Step 2: Begin by subtracting the ten thousandths column (9 - 2 = 7). Put the 7 in the ten thousandths column.Step 3: Subtract the thousandths column (3 - 1 = 2). Put the 2 in the thousandths column.
Step 4: Subtract the hundredths column (6 - 3 = 3). Put the 3 in the hundredths column.
Step 5: Subtract the tenths column. Regrouping must occur because you cannot subtract 4 from 3. Borrow 1 from the ones column, changing the 7 to a 6. Give the one to the tenths column, creating 13. Subtract the tenths column (13 - 4 = 9). Put the 9 in the tenths column. Bring down the decimal point.
Step 6: Subtract the ones column (6 - 0 = 6). Put the 6 in the ones column.
Answer: 7.3639 - 0.4312 = 6.9327

**Order of Operations with Decimals - B**Performing operations with decimals is similar to performing operations with whole numbers.

Operations inside parentheses are performed first.

**Example 1:** (2.3 x 5.4) ÷ (1.3 x 1.1) = ?

 (1) 2.3 x 5.4 = 12.42 and 1.3 x 1.1 = 1.43
 (2) 12.42 ÷ 1.43 = ?
 (3) 12.42 ÷ 1.43 = 8.685314685

Step 1: Perform all operations in parentheses. Multiply 2.3 x 5.4. And multiply 1.3 x 1.1.
Step 2: Rewrite the equation with the new numbers in place of the parentheses.
Step 3: Divide 12.42 by 1.43.

The answer is 8.685314685.

**Example 2:** 34.25 ÷ (1.23 x 2.12) = ?

 (1) 1.23 x 2.12 = 2.6076
 (2) 34.25 ÷ 2.6076 = ?
 (3) 34.25 ÷ 2.6076 = 13.13468323

Step 1: Perform all operations in parentheses. Multiply 1.23 x 2.12.
Step 2: Rewrite the equation with the new number in place of the parentheses.
Step 3: Divide 34.25 by 2.6076.

The answer is 8.685314685.