You Have a Point

1

Plotting, Comparing, and Ordering Rational Numbers

Lesson Overview

In this lesson, students investigate place value by using a human number line to plot decimal values. They plot given decimals on a number line and identify other decimals that lie between them. Students create a rule to compare decimals and apply their rule in context. They use a number line to compare decimals and fractions.

Grade 6
Number and Operations
(2) The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

    (C) locate, compare, and order integers and rational numbers using a number line.

    (D) order a set of rational numbers arising from mathematical and real-world contexts.

ELPS

1.A, 1.C, 1.D, 1.F, 2.C, 2.D, 2.G, 2.H, 2. I, 3.A, 3.B, 3.C, 3.D, 3.E, 3.J, 4.A, 4.B, 4.C, 4.D, 4.F, 4.K, 5.E, 5.G

Essential Ideas

- A decimal is a number written in a system based on multiples of 10 and is another way to represent parts of a whole.
- You can plot any decimal value on a number line by determining between which two known values it lies.
- There is always a value between any two points on a number line.
- When comparing two decimal values, rewrite them so that they have the same number of decimal places.
- When comparing a fraction and a decimal, consider their placements on a number line.

Lesson Structure and Pacing: 1 Day

Engage

Getting Started: Representations and Misrepresentations

Students analyze different representations of money values. They determine which ones are correct and state why the others are incorrect.

Develop

Activity 1.1: Using a Number Line to Compare Decimals

Students plot decimal values on a number line and write decimals that fall between two given decimal values. They write and apply a rule to compare two decimals, and compare a decimal and a fraction by plotting both value on a number line.

Demonstrate

Talk the Talk: Be Fast on Your Feet

Students compare data in a context that requires ordering decimal values.

Facilitation Notes

In this activity, students analyze different representations of money values. They determine which ones are correct and state why the others are incorrect.

Ask a student to read the introduction aloud and discuss as a class. Have students work individually to complete Questions 1 and 2. Discuss responses as a class.

Questions to ask
- Is 0.99¢ closer to a penny or a dollar? Explain your thinking.
- What value do you think should be written on the sign?
- Why does it make sense to use a decimal point with a dollar sign, but not with a cent symbol?
- How could you express the value of one dollar using the cent symbol?

Summary

The digits after a decimal point represent a value less than one, or a part of a whole.

Activity 1.1
Using a Number Line to Compare Decimals

DEVELOP

Facilitation Notes

In this activity, students plot decimal values on a number line and write decimals that fall between two given decimal values. They write and apply a rule to compare two decimals. Students compare a decimal and a fraction by plotting both values on a number line.

Note

Before class, use masking tape to create a number line on the floor with three equally spaced tick marks at 0, 1, and 2. Ensure that the tick marks are spaced far enough apart for five students to stand between them. Next, write each of these values on an index card: 1.5, 0.5, 0.6, 0.7, and 0.55.

Ask a student to read the introduction aloud, and discuss as a class. To facilitate Question 1, distribute the index cards to five students.

Using the suggested order of values, one-by-one, have students stand at the appropriate place on the number line. After the class identifies the value that a student represents, have them show their index card, and then move on to the next student.

Questions to ask
- How did you use the labeled tick marks to determine the value of the decimal?
- How did you use the location of the other students to determine the value of the decimal?

Have students work with a partner or in groups to complete Questions 2 through 4. Discuss responses as a class.

Differentiation strategy
To scaffold support, have students label each tick mark on the number line, 0.1 to 0.9. If it is helpful to locate the decimals written in the hundredths place, also include 0.10 to 0.90.

As students work, look for
The realization that including additional zeros after a decimal number does not affect its value. For example, $0.2 = 0.20$.

Questions to ask
- What is the scale on the number line? How did you figure that out?
- How did you know to place that decimal between those two tick marks?
- How did you know which tick mark to place your point closest to?
- Why is 0.25 placed between 0.2 and 0.3? How could you rewrite those decimals to help make sense of that placement?

Have students work with a partner or in groups to complete Questions 5 and 6. Discuss responses as a class.

Questions to ask
- How did you figure out that the first tick mark represented 0.05?
- How many decimals written in the hundredths are between 0.3 and 0.4?
- Explain your process to determine decimals between 0.45 and 0.46?
- How many decimal values lie between 0.45 and 0.46?

Have students work with a partner or in groups to complete Questions 7 through 9. Discuss responses as a class.

Questions to ask

- How does your rule address decimals that have different amounts of digits after the decimal point?
- What is another way to state the rule?
- What do you think Remlee got the first question correct but made errors in the remaining questions?
- What information does Remlee need to know to correct her mistakes?
- How could you show Remlee that 0.4 is greater than 0.35?
- Can you create an example that shows Sarah a case when her rule doesn't work?

Misconception

Students might compare the digits of the numbers without considering the decimal point and place value. Question 9 serves to identify and clarify that misunderstanding.

Have students work with a partner or in groups to complete Question 10. Discuss responses as a class.

Questions to ask

- How did you know where to place the fraction $\frac{1}{4}$ on the number line since it didn't coincide with a tick mark?
- How could you relate these values to money to check your work? Explain your reasoning.

Summary

You can plot any decimal value on a number line by determining between which two known values it lies. When comparing two decimal values, rewrite them so that they have the same number of decimal places. When comparing a fraction and a decimal, consider their placements on a number line.

Talk the Talk: Be Fast on Your Feet

Facilitation Notes

In this activity, students compare data in a context that requires ordering decimal values.

Ask a student to read the introduction and situation aloud, and discuss as a class. Have students complete Questions 1 and 2 with a partner or in groups. Discuss responses as a class.

As students work, look for
- Recognition that a faster time has a lower value.

Questions to ask
- Why isn't Danielle the winner, since she has the highest value?
- Why isn't Ronnie the winner, since 3 is less than 16?
- Which two runners had the closest finish times?

Summary

Comparing decimal values may be a strategy to solve problems in context.

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Plotting, Comparing, and Ordering Rational Numbers

WARM UP

Write each decimal in expanded form.

1. 240.12
2. 5.06

LEARNING GOALS

- Plot decimals on a number line.
- Compare and order decimal values.
- Compare fractions and decimals using a number line.

You know how to represent a number in more than one way by decomposing it. How can you compare numbers represented in different ways?

Getting Started

Representations and Misrepresentations

Recall that you can write decimals to represent fractions with a denominator of 10 or a power of 10 (such as 100, 1000, 10,000, and so on). You can use decimals to write amounts of money.

1. Steve saw this advertisement outside a convenience store. He went in and handed the cashier a penny to pay for his bottle of pop. The cashier told him that it wasn't enough money. Who's correct? Explain your reasoning.

Botella de soda de 16 oz

0.99¢

2. Consider the representations shown for the cost of each item. Circle the correct representations. If a representation is not correct, state why not.

   a. Item B costs one dollar and fifty cents.
   - $1\frac{1}{2}$ dollars
   - $1\frac{1}{2}$ cents
   - $1.50
   - 1.50¢

   b. Item C costs one dollar.
   - $1
   - 100 cents
   - $1.00
   - $1.00¢

Answers

1. See number line below.

2. See number line below.

3. 2.92 is the greatest value. 0.25 is the least value.

4. When I look at values plotted on a number line, the number to the right is always the greatest.

ACTIVITY
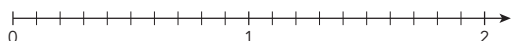**1.1**

Using a Number Line to Compare Decimals

Decimals are valuable when you need more precision for measurements between whole numbers.

The decimal point in a number separates the whole part of the number from the fractional part. The digits following the decimal point represent a value less than 1.

Let's use a number line to represent decimals.

Your teacher will assign students to participate in the activity. Be sure to record what happens on the number line.

Remember…

You can write a rational number in the form $\frac{a}{b}$ where b is not equal to 0. If you can write a decimal as a fraction, then it is a rational number.

1. **Plot and label the point where each student stands on the number line.**

2. **Plot a point on the number line to represent each decimal.**
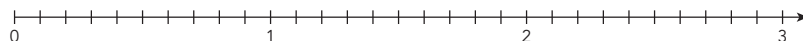
    a. 0.25   b. 1.38   c. 0.5   d. 2.3

    e. 0.56   f. 2.92   g. 1.75   h. 1.1

3. **Which number has the greatest value? The least value?**
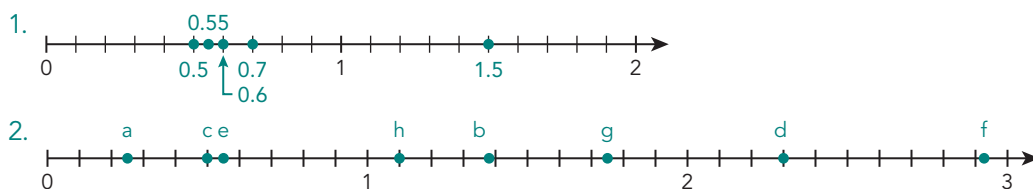
4. **How can you use a number line to compare numbers?**

1.

2.

Answers

5a. See number line below.

5b. Sample answer.
The points I chose are 0.32, 0.34, 0.36, 0.37. See number line below.

6. Sample answer.
0.451, 0.452, 0.453, 0.454

7. Sample answer.
Compare the digits in the place value of each digit from left to right until the place value of one decimal is greater than the other.

8. Sample answer.
Question 1 is correct, but Questions 2, 3, and 4 are incorrect. Remlee is ignoring place value when she is comparing the decimals. I would use hundredths grids or place value charts to show Remlee how to correctly compare the decimals.

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5. **Analyze the number line.**
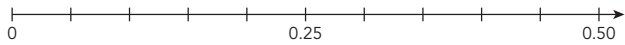
a. **Label each tick mark on the number line with the decimal value it represents. Then plot points to represent 0.3 and 0.4.**

b. **Plot and label four points that represent decimals between 0.3 and 0.4.**

6. **Write four decimals between 0.45 and 0.46.**

You are babysitting your neighbor Remlee, who is in the fourth grade. Remlee is doing her homework and asks you whether her work is correct.

	Encierra en un círculo el mayor decimal de cada par.	
1.	0.32	(0.45)
2.	(0.35)	0.4
3.	0.6	(0.09)
2.	(0.999)	1.00

7. **Write a rule that states how to determine when a decimal is greater than another decimal.**

8. **Explain to Remlee whether or not her homework is correct, and instruct her on how to correct any incorrect answers.**

5.
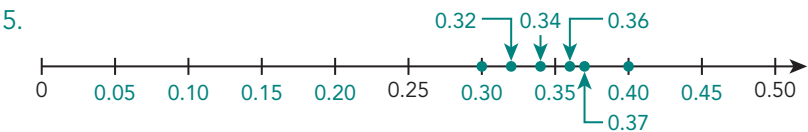
9. Explain to Sarah why she is incorrect.

> Sarah 👎
>
> I can tell how large each decimal is by looking at its last digit. If the last digit of one decimal is greater than the last digit of a second decimal, then the first decimal is greater.
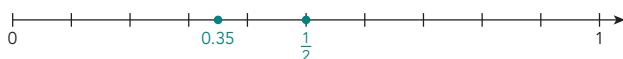
You can compare fractions and decimals using a number line.

WORKED EXAMPLE

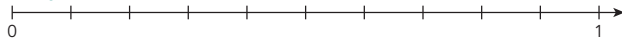Consider $\frac{1}{2}$ and 0.35. Which value is greater?
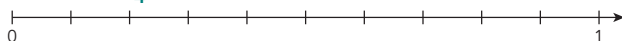
Plot each value on a number line.

Because $\frac{1}{2}$ is to the right of 0.35 on the number line, $\frac{1}{2}$ is greater than 0.35, or $0.35 < \frac{1}{2}$.

10. Plot each pair of values on a number line. Then, use >, <, or = to compare each pair of numbers.
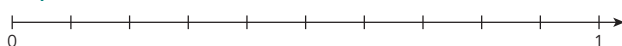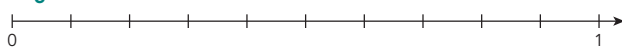
a. $\frac{9}{10}$ _____ 0.71

b. 0.15 _____ $\frac{1}{4}$

c. $\frac{3}{4}$ _____ 0.67

d. $\frac{1}{5}$ _____ 0.2

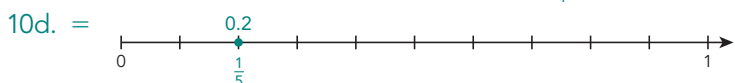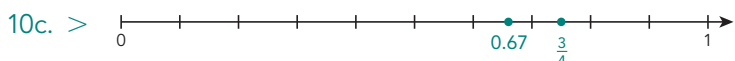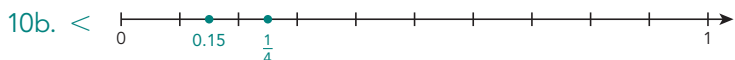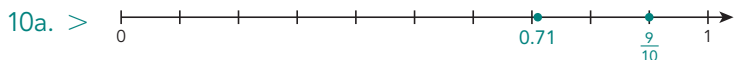9. Sarah needs to consider all the numbers to the right of the decimal point to understand what part of the whole those numbers represent.

10a–d. See number lines below.

10a. $>$

10b. $<$

10c. $>$

10d. $=$

1. Regina is correct. Vonetta has the fastest time because 25.16 seconds is the least decimal in the list. If Yvonne adds a 0 to the hundredths place of Ronnie's time, she can see that 30 hundredths is a greater decimal than 16 hundredths.

2. Vonetta
   Nia
   Ronnie
   Felicia
   Danielle

NOTES

TALK the TALK

Be Fast on Your Feet

You can compare decimals to solve real-world problems.

Yvonne and Regina are judges at the sixth-grade track meet. They recorded these results for the 200-meter dash. The runners' names and their times are shown.

Corredor	Tiempo (segundos)
Felicia	26.98
Nia	25.23
Vonetta	25.16
Ronnie	25.3
Danielle	27.78

1. Yvonne claims Ronnie is first because 25.3 is the fastest time. Regina insists Vonetta is the winner because 25.16 is the fastest time. Who's correct? Explain your reasoning.

2. Identify which runner won each medal or ribbon.

   Gold Medal/First Place _____

   Silver Medal/Second Place _____

   Bronze Medal/Third Place _____

   Ribbon/Fourth Place _____

   Ribbon/Fifth Place _____