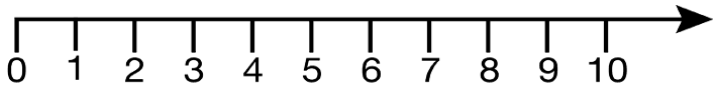
Comparing and Plotting Rational Numbers on a Number Line

Student Probe

Plot $4\frac{3}{5}$ on the number line.



Lesson Description

In this lesson students will plot rational numbers on a number line. This lesson is limited to positive rational numbers.

Rationale

Plotting rational numbers on a number line is an expansion of earlier ideas about whole numbers and their positions on a number line. Because students tend to think of fractions as part of a set or part of a whole, they view fractions as objects rather than numbers. This leads to difficulty placing fractions on a number line. Once students realize that fractions can be written as terminating or repeating decimals, their locations on a number line become much easier. A companion idea is the density of the rational numbers: between any two rational numbers there exists an infinite number of other rational numbers. These concepts are instrumental in helping students build and deepen their understanding of the real numbers.

Preparation

Prepare copies of Number Lines for each student.

At a Glance

What: Comparing and locating rational numbers and their position on a number line.
Common Core Standard: CC.6.NS.6c. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. (c) Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
Mathematical Practices:
Make sense of problems and persevere in solving them
Who: Students who cannot locate fractions on a number line.
Grade Level: 6
Prerequisite Vocabulary: fraction, numerator, denominator, number line
Prerequisite Skills: Plot whole numbers on a number line, converting between fractions and decimals
Delivery Format: Individual
Lesson Length: 15-30 minutes
Materials, Resources, Technology: calculator (optional)
Student Worksheets: Number Lines (.pdf)

Lesson

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
1. Where would you place $\frac{1}{2}$ on the number line? Explain how you know where it goes.	Between 0 and 1. I know that the distance from 0 to 1 must be divided into 2 equal lengths. That is where the mark for $\frac{1}{2}$ will be.	Model location of $\frac{1}{2}$ for the student and guide them to see $\frac{1}{2}$ as equidistant between two numbers. (See Teacher Note 5.)
2. Plot $2\frac{3}{4}$ on the number line. Explain how you know where it goes.	I will divide the distance between 2 and 3 into 4 equal lengths and place the point at the third one. Alternative: I know that $2\frac{3}{4}$ is equivalent to 2.75, so it is between 2 and 3, but closer to the 3.	What whole numbers is $2\frac{3}{4}$ between? Divide the distance into 4 equal lengths. Each length is $\frac{1}{4}$ of the distance between 2 and 3. How many $\frac{1}{4}$ segments do we need to count? Where is $\frac{3}{4}$ of the distance between 2 and 3?
3. Plot $3\frac{2}{5}$ on the number line. Explain how you know where it goes.	It is between 3 and 4. I will divide the distance into 5 equal lengths and count 2 of them. Alternative: $3\frac{2}{5}=3.4$, so it is a little less than 3.5.	What whole numbers is $3\frac{2}{5}$ between? Divide the distance into 5 equal lengths. Each length is $\frac{1}{5}$ of the distance between 3 and 4. How many $\frac{1}{5}$ segments do we need to count?

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
4. Which is larger: $4\frac{3}{8}$ or $4\frac{2}{5}$? Show me on your number line and explain how you know.	They are both between 4 and 5, but they are both less than $4\frac{1}{2}$. If I divide the distance into 8 equal lengths and count 3 of them, I am at $4\frac{3}{8}$. If I divide the distance into 5 equal lengths and count two of them, I am at $4\frac{2}{5}$. So $4\frac{2}{5}$ is larger. Alternative: I know that $4\frac{3}{8}=4.375$ and $4\frac{2}{5}=4.4$. So $4\frac{2}{5}$ is larger.	Prompt students to divide the segment between 4 and 5 into equal distances for 8 and 5, respectively.
5. Repeat with additional rational numbers as needed.		

Teacher Notes

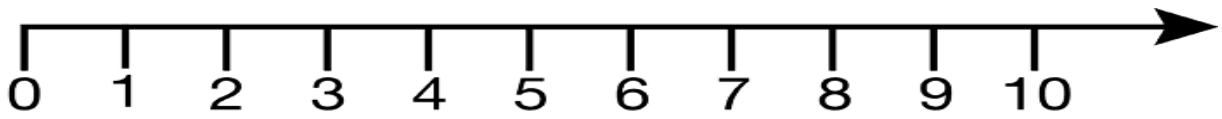
1. Most children begin learning fractions as parts of a whole object and can identify something as half or a quarter. They will usually be able to halve an object or find half of a group of objects, yet many will not have any idea of where to put a fraction on a number line.
2. While it may seem simplistic to ask a student to place $\frac{1}{2}$ on a number line, it serves as an assessment to determine whether or not students understand the concept of placement on a number line.
3. Students frequently use the terms "middle", "halfway" or "between" to denote one-half the distance. Be precise in your use of the terminology.
4. Students who struggle with the placement of rational numbers on a number line may benefit from converting them to decimal form. Refer to Decimal Expansion of Rational Numbers.
5. If students choose to convert rational numbers to decimal form, allow them to use a calculator initially.
6. Cut a paper strip that is the length of one unit on the number line. Fold it into 2 equal lengths and mark the distance on the number line. This can be repeated with other fractions and mixed numbers. The number line unit may be to be enlarged to make this feasible.

Variations

1. Extend the number line to the left of the zero and introduce negative rational numbers for placement.
2. Create a ruler marked with subdivisions marked into the appropriate fractional parts to "measure" the number. (Example: To locate $3\frac{2}{5}$, create a ruler that has each unit subdivided into fifths.)

Formative Assessment

Place the following numbers on the Number Line: $3\frac{1}{4}, 2\frac{1}{2}, 0, \frac{2}{3}, 5\frac{1}{6}, 3\frac{3}{5}$



References

Russell Gersten, P. (n.d.). *RTI and Mathematics IES Practice Guide - Response to Intervention in Mathematics*. Retrieved 2 25, 2011, from rti4sucess.

"Help with Fractions: Getting A Perspective." *Solar Power Facts: A Brighter, Cleaner Future*. Retrieved 9 5, 2011, from green-planet-solar-energy.

Number Lines