

Order on Line



Institute Notes

Concept: Explore relationships between fractions, decimal fractions, and percents on the number line. Explore ordering of rational numbers.

TEKS Focus: **6.1A**—The student is expected to compare and order non-negative rational numbers.

7.1A—The student is expected to compare and order integers and positive rational numbers.

8.1A—The student is expected to compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals.

Overview: Participants will create a number line that includes fractions, decimal fractions, and percents. Participants will answer the question “How do I know where this fraction belongs in relation to other fractions on the number line?” The activity is an adaptation from an activity in *Number Sense Now* -available from NCTM.

Materials: Long laminated strip (approximately 12 inches wide and 12 feet long) or a long strip of masking tape, Cards with fractions, Cards with decimal fractions, Double sided tape or tacky stick, Sticky notes (optional)

Procedure:

1. Before doing this lesson, make a strip of paper 12 inches wide by 12 feet long. Do not put any marks on the line. Laminate the strip. As an added feature, put a Velcro strip on the laminated strip. Then when you copy and laminate your cards, put Velcro on each side of the cards. By doing this, if there are equivalent numbers, the cards can go on top of each other. This could also be done with Post-It spray or glue.
2. Also before the lesson, prepare the cards with fractions and percents. You can make the cards on card stock and laminate or use Post-It notes.

Also
Grade 6
1B
Grade 7
1B

Math Notes:
An alternative set up is to divide the participants in half. Give each group a number line and different starting fractions to place on the number line. When both groups have finished placing their fractions, compare the resulting number lines. Note that fractions should be in the same order on each line.

Order on Line

Possible cards are included after the institute notes.

Change the fractions and decimals used to vary the difficulty. You may also wish to include negative numbers.

2. Attach long strip to the wall. The length should run horizontally.
3. Ask a participant to place $-\frac{1}{2}$ on the number line anywhere he or she chooses. Leave the decision to him or her. Next give someone the fraction $\frac{3}{4}$ to place on the number line relative to the first fraction.
4. Now have participants look back at the denominator they explored "What's the Point?" and place those fractions on the number line. (Note: You can have these cards already made up or use sticky notes.) Fractions should not be simplified. (That is, $\frac{3}{6}$ should not be rewritten as $\frac{1}{2}$.)
5. After everyone has agreed that all the fractions are placed correctly relative to each other, give participants random fractions to place on the number line. Examples include $\frac{9}{19}$, $\frac{20}{21}$, $\frac{7}{27}$, $\frac{6}{23}$, etc. The motivation for this part of the activity is for participants to develop a strategy for placing a number like $\frac{9}{19}$. ($\frac{9}{18}$ is one half. If the numerator remains constant and the denominator increases, the fraction decreases; therefore, $\frac{9}{19}$ is less than one half.)
6. Leaving the fractions on the number line, now have participants add decimal fractions. Be sure to include fractions such as 0.1 and 0.10.
7. Place a smaller blank number line (or piece of masking tape) on the wall. Place a few fractions (perhaps some of the benchmarks) on the number

Math Notes:

One of the ideas that is very important here is that between any two fractions, no matter how close they are, we can always find another fraction. This leads to the idea of density of the number line.

Having fractions and decimal fractions on the same number line helps make the connection between the two. Discuss how the decimals help order fractions and the benefits of knowing the decimal fraction of benchmark fractions.

Order on Line

line. Ask, "How would this model change if the distance from 0 to 1 doubled? Halved?" See the math notes for more information.

Extensions: Extend the number line to include more negative rational numbers and mixed numbers.

Assessment: Give students two different denominators for fractions. For each denominator, students should determine all possible proper fractions. For example, if one of the denominators is 7, then the fractions would be

$\frac{1}{7}, \frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7},$ and $\frac{6}{7}$. Have them place the fractions on a number line, then change the fractions to decimals to verify that the two sets of fractions have been placed proportionally. Name a decimal between 3.4 and 3.68.

Name a fraction between $\frac{1}{8}$ and $\frac{2}{5}$. Name a fraction

between $\frac{1}{4}$ and $\frac{1}{2}$ that has a denominator of 10.

Notes:

0	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{2}{4}$
$\frac{3}{4}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{4}{5}$
1	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{1}{7}$
$\frac{2}{7}$	$\frac{6}{7}$	$\frac{1}{3}$	$\frac{3}{8}$
$\frac{7}{8}$	$\frac{1}{9}$	$\frac{4}{9}$	$\frac{1}{10}$

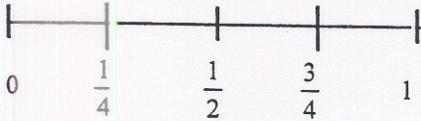
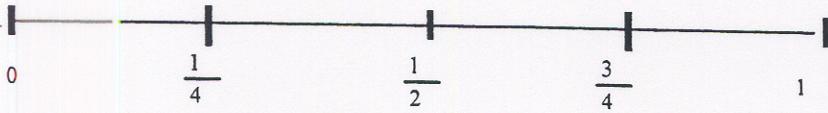
$\frac{3}{10}$	$\frac{1}{11}$	$\frac{6}{11}$	$\frac{10}{11}$
$\frac{1}{12}$	$\frac{5}{12}$	$\frac{11}{12}$	$\frac{3}{13}$
$\frac{2}{15}$	$\frac{2}{17}$	$\frac{6}{17}$	$\frac{8}{15}$
$\frac{5}{16}$	$\frac{15}{16}$	$\frac{1}{8}$	$\frac{7}{18}$
$\frac{4}{19}$	0.17	0.2	0.30

0.3	0.32	0.4	0.40
0.50	0.5	0.59	0.6
0.1	0.0	0.10	0.7
0.8	0.9	1.0	1.1
1.1	0.05	0.01	0.20

0.20	0.60	0.70	0.80
0.90	1.00	1.10	0.08
0.46	0.67	0.75	0.83
0.92	1.05	1.17	

Order on Line

Math Notes:



On the number line above, if the distance from 0 to 1 is doubled, the distance from 0 to each fraction doubles, as on the second number line. If the distance from 0 to 1 is halved, the distance from 0 to each fraction is halved, as on the third number line.

Reason and Communicate:

- What is a number to the right of $\frac{1}{2}$? Can you name another number

closer to $\frac{1}{2}$? Another one closer?

Answers may vary, but eventually you want participants to realize that you

can get closer and closer to $\frac{1}{2}$ (from either side) and always find another number closer.

- What is a number next to 0.12?
- What is a number between 0.12 and 0.13?
- How will the number line change if zero remains fixed and we move one (1)?
- How do you know where to put the 0.7 (or any number)?