Magnetic Fraction Number Line

by Kit Norris

Magnetic Fraction Number Line

This set of magnets will help students to develop a deep understanding of fractions as numbers and explore equivalence, ordering, and operations with fractions. The Magnetic Fraction Number Line is designed for either small-group activities or front-of-the-class demonstration.

Each of the three number lines consists of two pieces that together make a number line 32” long. One line is marked in eighths, and another is marked in tenths; each can display fractions to 2. The blank number line is for use with all fraction strips and ranges. The magnetic fraction strips are not marked with their values, making it possible to represent the values in a number of ways. Labels are included for use in certain activities.

IMPORTANT: These strips are intentionally not labeled. We want students to reason about the size of each strip as compared to the whole. Try not to identify the strips by their colors. Students should always refer to the fraction by name rather than color.

Reference values for magnets:

SAMPLE LESSONS

These lessons demonstrate possibilities for increasing understanding of fractions as students connect the area model (fraction strips) with the number line model. Students need practice problems associated with each lesson so they can build their proficiency. We suggest that teachers begin with below grade-level lessons, since students have not worked with the fraction strips before. The sample lessons provided with this product are included to get you started. They are not intended to be comprehensive but rather to demonstrate the power of the strips.

Grade 3

Lesson 1: Naming Fractions

Common Core State Standard

3.NF.A.2: Understand a fraction as a number on the number line; represent fractions on a number line diagram.

CCSS Mathematical Practice Standards

2. Reason abstractly and quantitatively.

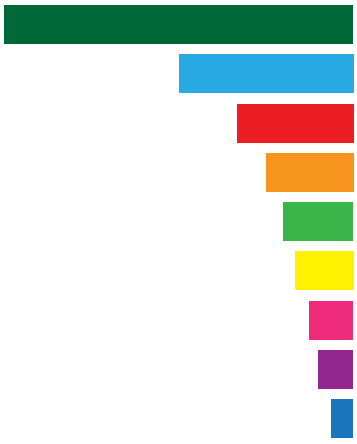
Students reason quantitatively as they locate fractions on the number line and as they connect the number of groups of a unit fraction with the value of the numerator.

7. Look for and make use of structure.

Students use structure as they locate groups of unit fractions on a number line.

Instructions:

1. Show the magnetic fraction strips organized from whole to smallest unit.



2. Select a fraction strip and show it to the students.
3. Ask, "What size is this strip? How do you know?"
4. Look for students to say that the size of the strip is one-half because 2 strips this size are the same size as the whole.
5. Repeat these questions for 1/4, 1/3, 1/8, 1/6, and so on.
6. Then ask "how many strips the size of 1/15 would we need in order to be the same as a whole?"
7. Now, place the magnetic number line indicating eighths so that all students can easily see it.
8. Ask, "What do you notice about this number line?"
9. Look for students to see the arrows and think that the line continues in both directions. (Students should realize that they need to know the scale and that they need to compare the number line to the unit whole.)
10. Ask, "What do we need now on this number line?"
11. Look for students to say that they need 0 and 1 to show the unit whole.
12. Ask, "Where would 1/2 be located on this number line?" Provide an opportunity for students to discuss their thoughts with a partner.
13. Ask a volunteer to predict where the 1/2 strip would end on this number line when the left side of the strip is aligned with zero. Then, have the student place the strip on the number line. Have students work in pairs to determine ways that they could prove this strip represents 1/2.
14. Look for students to say that two strips the size of 1/2 make the whole. So, one strip represents 1/2.
15. Remove the 1/2 strip and ask students to locate 1/4 on this number line. Ask for a volunteer to place the strip and the label. Again ask students to discuss with their partner how they can verify that this is 1/4.
16. Look for students to say that four strips the size of 1/4 make the whole. So, one strip represents 1/4.
17. Conduct a check-in to see whether or not students feel confident in locating these fractions on a number line.
18. If necessary, continue the same process with eighths.
19. Change the number line to tenths, and repeat the same questions for halves and fifths.

Closure:

Ask students to complete this third grader's statement: Emily said, "Fractions are like numbers because . . ."

Lesson 2: Representing Groups of Unit Fractions

Common Core State Standard

3.NF.A.2: Understand a fraction as a number on the number line; represent fractions on a number line diagram.

CCSS Mathematical Practice Standards

2. Reason abstractly and quantitatively.

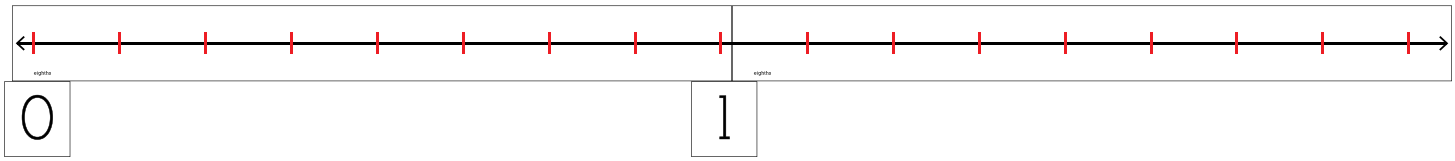
Students reason quantitatively as they locate fractions on the number line and as they connect the number of groups of a unit fraction with the value of the numerator.

7. Look for and make use of structure.

Students use structure as they locate groups of unit fractions on a number line.

Instructions

1. Show the students the eighths number line.
2. Ask the students to show 5 groups of 1/8 on the number line. Ask, "What fraction is indicated?" (5/8)



3. Ask students to show 3 groups of 1/8 on the number line. Ask, "What fraction is indicated at this location?" (3/8)
4. Ask: "Where will 7/8 be located on this number line? How do you know?"
5. Look for students to realize that 7/8 is the same as 7 groups of 1/8.
6. Repeat questions with as many examples as needed.
7. Look for students who want to count the hash marks that indicate the size of the unit on the number line rather than the spaces. By placing repeated strips of unit fractions on the number line, students should come to realize that a fraction represents a distance from zero on the number line—just as whole numbers do.
8. Now, show the open number line.
9. Ask, "Suppose we want to represent 1/4 on this number line. What do we need to do?"
10. Look for students to want to determine the whole. After they give that response, label the open number line and then ask, "Now, how can we determine where 1/4 will be located?"
11. Look for students to say that we can take half of the whole and then take half of that. Students might also suggest that we need to divide the whole into four parts.
12. Review vocabulary: *numerator, denominator, unit fraction.*

Closure:

Ask students to share their understandings as a result of locating fractions on a number line. Encourage them to use the appropriate vocabulary.

Then ask them to consider 4 groups of 1/2. Where is it located on the number line?

Grade 4

Lesson 1: The Power of 1!

Common Core State Standard

4.NF.A.1: Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

CCSS Mathematical Practice Standards

3. Construct viable arguments and critique the reasoning of others.

Students work with partners to justify and explain their thinking.

7. Look for and make use of structure.

Students understand that multiplying a number by 1 results in the original number and use that understanding to determine why fractions are equivalent.

8. Look for and express regularity in repeated reasoning.

Students use repeated reasoning as they investigate equivalent fractions and why they are equivalent.

Instructions:

1. Ask students the following:
   - How many halves make one whole?
   - How many fourths make one whole?
   - How might we write two halves as a fraction? (2/2)
   - How might we write four fourths as a fraction? (4/4)
   - Are these fractions (2/2 and 4/4) the same size? Turn to your partner and share your thinking.
2. Look for students to say that the two fractions are the same size, since they are based on the same whole unit. Some students may suggest that 2 ÷ 2 is the same as one whole because any number divided by itself is one whole.
3. Show the eighths number line and then place 3/8 on it.
4. Ask, "What do you suppose will be the result if we double the numerator and double the denominator of 3/8? Turn to your partner and discuss."
5. Ask a student to show the result of 6/16 using the strips. Student places these strips on the number line.
6. Ask, "What happened when we doubled the numerator and denominator of 3/8?"
7. Look for students to say that 3/8 and 6/16 are equivalent or that they are the same distance from zero on the number line.
8. Ask, "Has 3/8 become larger? Why or why not?"
9. Look for students to say that the two fractions are equivalent since they are the same distance from zero on the number line. Students should also think about the fact that 3/8 has been multiplied by 2/2, which is equivalent to one whole. A value multiplied by 1 does not change.
10. Students may need more examples before answering the above questions. Show the tenths number line and place the 0 and 1 labels on it.
11. Have students consider 1/2. Ask:
    - What happens if we multiply the numerator and denominator by 5?
    - What happens if we multiply both the numerator and denominator by 10?"
    - Is 1/2 becoming larger? Why or why not?

Closure:

Ask, "How many ways can we represent one whole?"

Look for students to say 2/2, 40/40, 1000/1000, and so on. Someone might say, "Any number divided by itself!"

Ask, "So what is A/A?"

Lesson 2: Just like Whole Numbers

Common Core State Standard

4.NF.B.3: Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

CCSS Mathematical Practice Standards

1. Make sense of problems and persevere in solving them.

Students are making sense of the word problems presented.

2. Reason abstractly and quantitatively.

Students reason quantitatively as they represent mixed numbers.

7. Look for and make use of structure.

Students look for and make use of structure as they add and subtract fractions.

Instructions:

1. Ask the students, "How can we represent 6/8 using the fraction strips? Think about some different ways that we could represent this quantity using eighths."
2. Look for students to say 6 groups of 1/8, or 1/8 + 1/8 + 1/8 + 1/8 + 1/8 + 1/8, or 4/8 + 2/8, or 3/8 + 3/8.
3. Say, "Fractions are just like whole numbers. We can represent 32 as 30 + 2. We can compose and decompose fractions just like we do when working with whole numbers."
4. Show 7/10 on the tenths number line.
5. Ask, "How many ways can you find to represent 7/10?"
6. Look for students to suggest 1/10 + 6/10, 3/10 + 4/10, 7 groups of 1/10, or 2/10 + 2/10 + 2/10 + 1/10.
7. Place the fraction strip representing one whole on the board.
8. Ask, "How might we represent 1 and 1/4 using the number line?" Ask a volunteer to show 1/4 and place it next to the strip representing one whole.
9. Ask, "How many fourths might we need to represent 1 1/4, as shown here?" If necessary, show the number line representing eighths. Students can count the spaces to see that 1 1/4 is equivalent to 5/4. Also, ask students to determine the number of fourths in one whole. Then ask how many fourths we have in all.
10. Ask, "How many fifths are equivalent to 1 3/5?" Ask students to give their answer and then demonstrate their thinking using the tenths number line.
11. Ask, "How many fourths are the same as 2 3/4?
12. Show one whole.
13. Ask, "Suppose we have 1/4 of a pumpkin pie and 1/2 of an apple pie. How much pie can we serve for dessert?" Have students share their thoughts with a partner.
14. Place the 1/4 and 1/2 fraction strips on the number line. Collect answers from students and ask them to verify their thinking.
15. Look for students to simply read the number line and decide that the sum of 1/4 and 1/2 is 3/4. If this is the case, ask students to prove that the sum is equivalent to 3/4 by placing 3 groups of 1/4 on the number line. Students should also state that 1/2 is the same as 2/4, so 2/4 + 1/4 is 3/4.

Closure:

Ask students to reflect on what they did in this lesson. Ask, "What do you now know about working with fractions?" Write down three statements.

Extend students' thinking by offering the following problem: Peter purchased 2 pizzas. His sister, Kit, was hungry and she ate 3/4 of one pizza. How much pizza was left for Peter?

Grade 5

Lesson: Just like Whole Numbers, AGAIN!

Common Core State Standards

5.NF.A.1: Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.A.2: Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

CCSS Mathematical Practice Standards

1. **Make sense of problems and persevere in solving them.**

Students make sense of word problems and use the demonstration fractions strips to help guide their thinking.

2. **Reason abstractly and quantitatively.**

Students reason quantitatively as they recognize the need to find common denominators.

4. **Model with mathematics.**

Students use the fraction strips and number lines to model addition and subtraction problems.

Teaching Tip:

Review Grade 3, Lesson 2, on equivalent fractions using the fraction strips and number line. Consider presenting these ideas to your Grade 5 students before this lesson, since understanding fraction equivalence is a foundational skill.

Instructions:

1. Present the following word problem to your class:

> Jaymes has 1/4 of a meter of rope and his brother has 5/8 of a meter of rope. They need 1 meter of rope to make a leash for their puppy. Will they have enough rope?

2. Provide students with independent think time and then ask them to share their thinking with a partner.
3. Ask the students, "Which strip can we use to represent 1/4? How can we represent 5/8?"
4. Position these strips to form one length.
5. Ask, "Is there enough rope to make one whole meter?"
6. Students may want to add the numerators and then add the denominators, giving them 6/12. Show students 5/8 on the eighths number line. Ask students to determine where 6/12 might be located on this number line. Students can reason that 6/12 is the same as 1/2. That means that 5/8 is greater than 6/12. So 6/12 cannot be the answer to this problem.
7. Ask students who have solved this problem to explain their thinking using the strips. Have the students place the 1/4 and 5/8 strips on the eighths number line.
8. Ask, "How many eighths are represented on this number line? Is it easy to see that 1/4 is the same as 2/8 on this number line?"
9. Ask a student to write the number sentence that represents this question. (2/8 + 5/8 = 7/8)
10. Look for students to explain that the boys do not have enough rope because 7/8 is less than one whole.

Closure:

Provide students with the following problem and ask them to work independently on a sheet of paper. Collect the students' work and use it to determine the next steps in their learning.

> Maizey has 2 pieces of ribbon. The first piece is 11/2 feet long and the second piece is 2 3/8 feet long. How much ribbon does she have all together?

Check out these other great fraction resources!

Magnetic Equivalent Fractions

These 56 large magnets will help students develop an understanding of the relationship between fractions. They may be used as labels on a number line, for simple games, and for seeing equivalence through multiple representations. Teaching notes include suggested activities, games, and reference to the CCSS. Magnets are 3 x 3 inches. Grades 2–5.

didax.com/211035

Common Core Collaborative Cards – Fractions

Set contains 120 cards, 40 cards per grade level, that can be assigned on or off-grade level as necessary. The set also includes four additional cards are for a teacher to create his/her own custom problems. Durable, two-color cards measure 4" x 6". Teacher's guide provides complete instructions including suggestions for problem-solving lessons for the collaborative groups. Grades 3–5.

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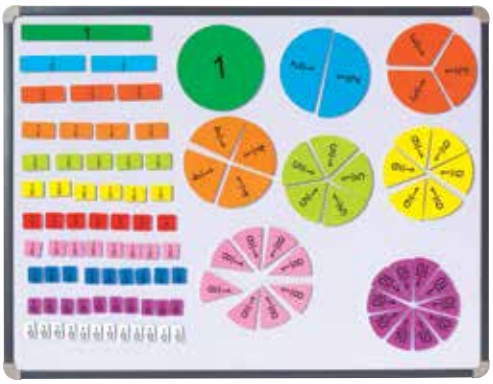

Magnetic Fraction, Decimal, and Percent Tiles

106 pieces, thick foam. Full circle is 5" in diameter. Full rectangular piece is 8" long. Magnetic board not included. Sold separately. Grades 2–5.

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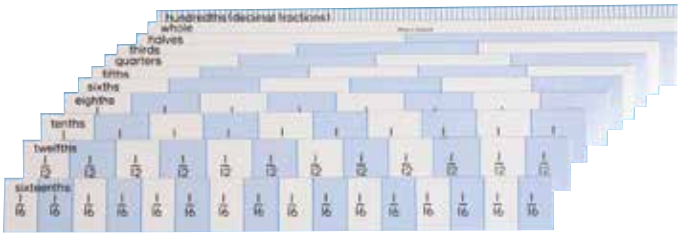

Comparative Fraction Strips

Eleven 1" x 10" laminated strips showing wholes, halves, quarters, eighths, sixteenths, thirds, sixths, twelfths, fifths, tenths, and decimals. Grades 3–5.

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