

A Fresh Look at Improper Fractions



Isabelle Hoag M. ED.
Director of Education
UnCommon-Core.com

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Pages which are likely to be printed do not have a number.

Within each section pages are arranged so that the example/answer key is first, the Teacher Tips pages are next. All the printable pages are at the end.

Hello Teachers,

Rational numbers are challenging for students to understand. For one thing, there is a never-ending supply of equivalent fractions that share a place on the number line ~ including improper fractions that reduce to mixed numbers.

A Fresh Look at Improper Fractions invites students to use familiar skills and concepts in order to make sense of whole numbers written in fractional form and mixed numbers.

These activities ask your students to write down what they know about fractions. When they explain their ideas either in speech or writing, students consolidate their understanding and give you insights into their progress toward learning goals.

Of course, not every activity is suitable for all students. Feel free to adapt these activities to fit your needs, your students, and your specific educational setting. Then join our group and share your ideas with other [UnCommon Core Teachers](#) on Facebook!

If you have questions or comments about these activities, please email me at Isabelle@UnCommon-Core.com.

Thank you,

Isabelle

Isabelle Hoag M. ED.
Director of Education
UnCommon-Core.com



A Fresh Look at Improper Fractions

Beginning with modeling whole numbers in fractional form, **A Fresh Look at Improper Fractions** guides students toward a complete understanding of improper fractions and mixed numbers.

These activities link the improper fraction with its place on the number line and also an area model. Seeing these three representations together allows students to conceptualize the whole number and the fractional portions of each improper fraction before they are asked to reduce it to a mixed number.

Making sense of rational numbers is a difficult task that is an essential part of every students' education.

Whole Numbers in Fractional Form

Whole numbers can be written as improper fractions, division problems, or as the quotient when the numerator is divided by the denominator. They can be shown as a place on the number line, pieces of a whole, or - later on - as parts of a set.

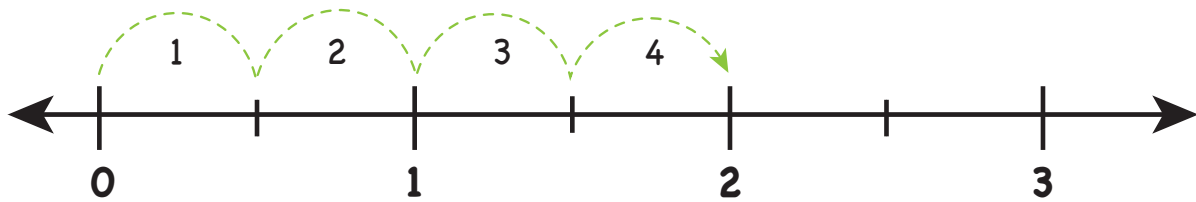
In order to become adept at switching between improper fractions and mixed numbers, students need to see numerical relationships between the numerator and denominator. In the case of whole numbers in fractional form, the numerator will be a multiple of the denominator.

In order to develop these ideas, students need lots of mindful practice connecting improper fractions with their representations on the number line and in area models.

Improper Fractions in Halves

name: **Example**

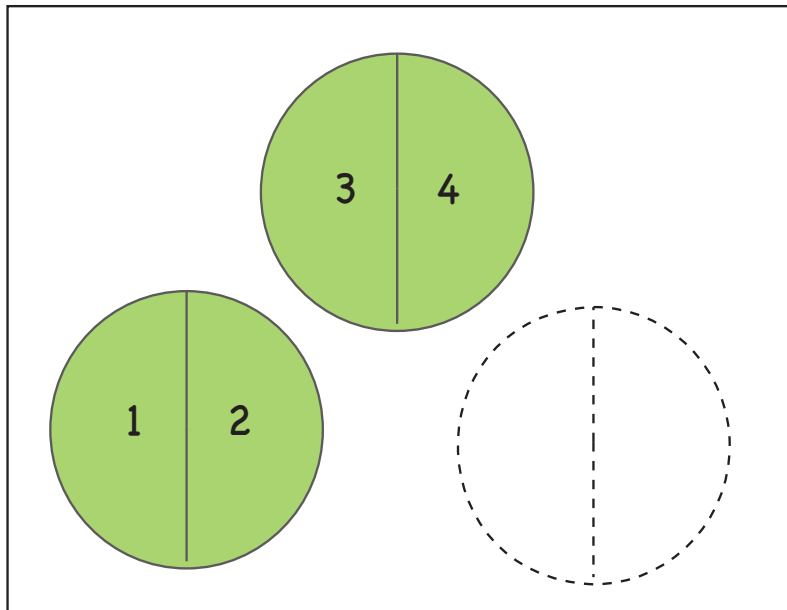
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of halves

Denominator: number of halves
needed to make one

$$\frac{4}{2}$$



Describe the rational number shown above.

Four-halves is an improper fraction because the numerator is larger than the denominator. Since 2 one-half pieces make a whole thing, four $\frac{1}{2}$ pieces can make two whole things.

Four-halves is an example of a whole number written in fractional form.

The 4 in the numerator shows the number of unit fractions described. There are four hops on the number line - each hop is one-half of the length from zero to one.

There are 4 one-half pieces - two in each circle.

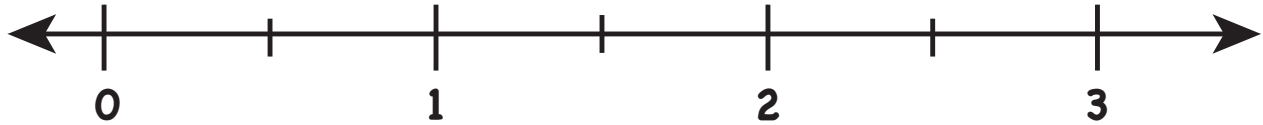
The denominator is two. That shows how many unit fractions are needed to make one whole thing. This is why there are two hops between each whole number on the number line. This is why each circle is made up of two equal pieces.

Improper Fractions in Halves

name: _____

Make the number line, fraction, and image show the same improper fraction.

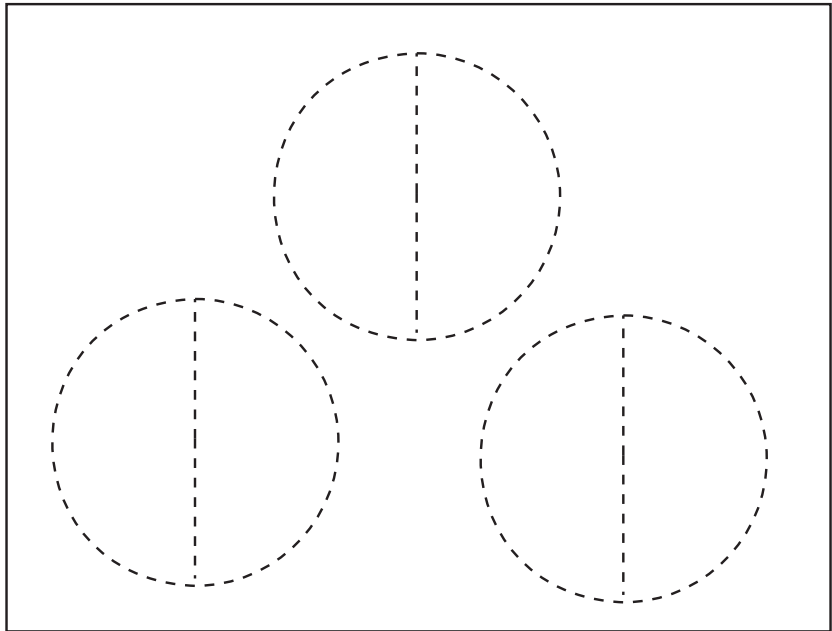
Make haste, slowly. Do not rush through these activities. Make sure your students completely understand each step of the way.



Numerator: number of halves

Denominator: number of halves
needed to make one

A rectangular box containing a horizontal line, intended for students to write a fraction.



Describe the rational number shown above.

Start by having your students show that two-halves is equal to one. They should already be familiar with fractions equivalent to one, so this is a good way to begin. You might decide to have them show fractions equivalent to one, two, and three on each of the forms: halves, thirds, and fourths.

This is not only a good introduction to how to complete these pages correctly, but it gives every student a clear understanding of how to represent whole numbers as fractions. This skill will help them later when they need to calculate the whole number portion of a mixed number.

Arrange the fractions in order of size in a display or a booklet for future reference. Make sure your students understand that the numerator divided by the denominator equals the whole number shown by the fraction.

Representing More Improper Fractions

Once students are experts at connecting the improper fraction with its representations on the number line and the area model, you can introduce improper fractions that are not equivalent to whole numbers.

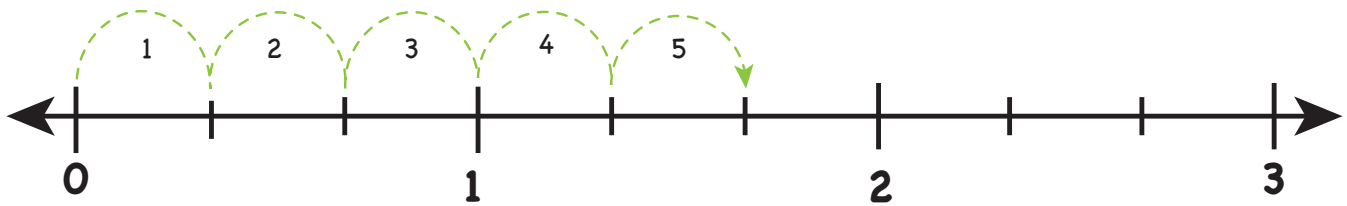
Give students plenty of time to identify the whole number portion and the proper fraction portion of each improper fraction. Let them explain where each part comes from. Have them show the whole numbers found inside each improper fraction on the number line and the area model.

Keep the tasks concrete: directly related to finding whole numbers on the number line or the area model at this stage. By modeling improper fractions below three, your students will be able to see how whole numbers are ‘subtracted out’ of the improper fraction.

Improper Fractions in Thirds

name: **Example**

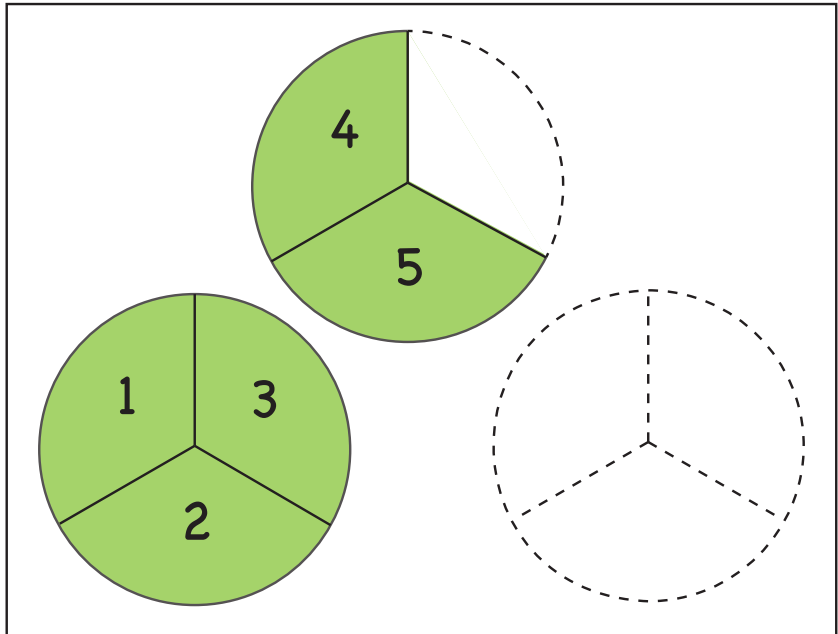
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of thirds

Denominator: number of thirds needed to make one

$$\frac{5}{3}$$



Describe the rational number shown above.

The rational number shown above is five-thirds.

The numerator is 5. This means there are 5 hops on the number line and 5 one-third pieces shaded in on the circles. Five is the number of unit fractions being described by this number. Each of the five pieces is the size of a one-third unit fraction.

The denominator is 3. This means that each whole thing is divided into three equal parts which gives the name of thirds. Since three pieces make one whole thing, and there are 5 pieces, five-thirds is greater than one.

Three-thirds can be subtracted from the fraction and written as one. Then, there are 2 one-third pieces remaining. So another name for five-thirds is one and two-thirds.

Improper Fractions in Thirds

name: **Teacher Tips**

Make the number line, fraction, and image show the same improper fraction.

Give your students plenty of practice showing improper fractions in different ways.

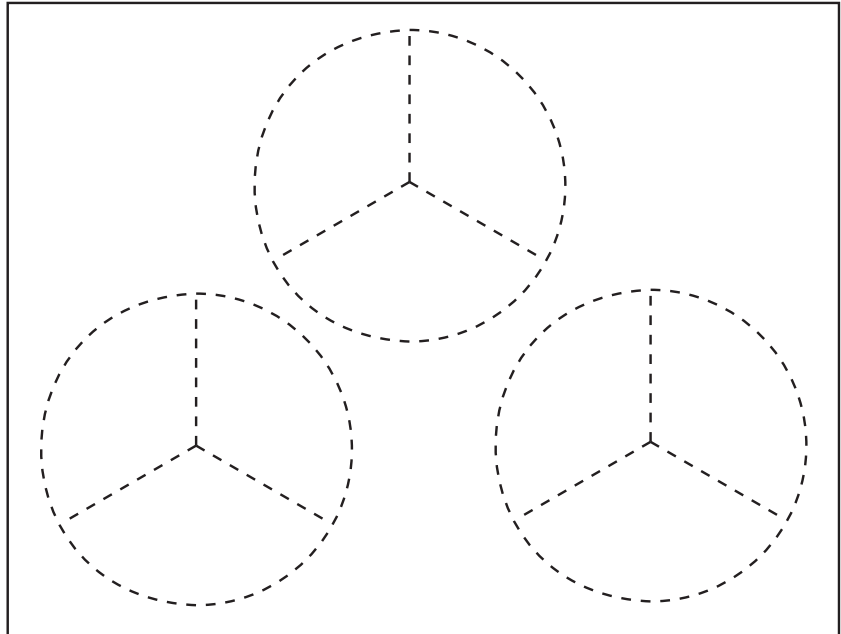


Numerator: number of thirds

Denominator: number of thirds needed to make one

Ask your students to connect the numerator with the total number of hops and shaded unit fractions on the circles.

Help your students see that the denominator is equal to the number of equal pieces in each circle and the number of hops between zero and one.



Describe the rational number shown above.

Start by completing the number line, circles or fraction so your students know which improper fraction they are working on. Make sure that they are able to get the right answer no matter which of the three you fill out. This helps students develop a flexible understanding of fractions.

Eventually, let your students decide which improper fractions to model. Once they have completed a few of these pages, have them arrange them in order from least to greatest.

Writing about improper fractions is going to help students solidify the skills and concepts they are learning. At first they may simply copy your text inserting different numbers to make it apply to their work. Later, they will be able to write their own sentences.

Gradually Increase the Level of Difficulty

Let your students take over the job of setting up the number line and the shapes. This extra work will require them to think about the numerator and denominator in new ways.

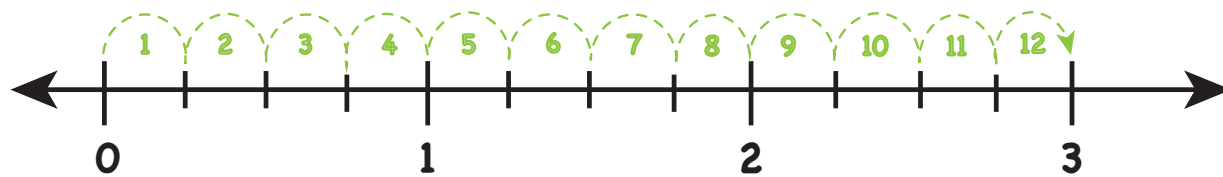
Encourage them to identify the whole number and remaining fraction. You may introduce the term mixed number at this point.

Let them work with larger improper fractions, and with small improper fractions that have larger denominators.

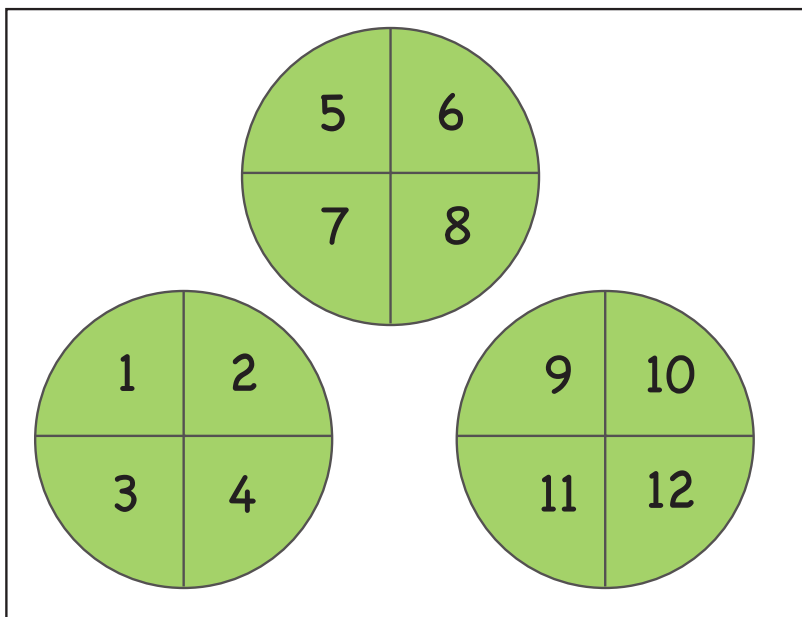
Show a Fraction

name: **Example**

Make the number line, fraction, and image show the same rational number.



$$\frac{12}{4}$$



Describe the rational number shown above.

The rational number shown above is twelve-fourths.

The numerator is 12. This means there are 12 hops on the number line and 12 one-fourth pieces shaded in on the circles. Twelve is the number of unit fractions being described by this number. Each of the twelve pieces is the size of a one-fourth unit fraction.

The denominator is 4. This means that each whole thing is divided into four equal parts which gives the name of fourths or quarters. This is why the 4th, 8th, and 12th hop lands on a whole number, because 4, 8, and 12 are multiples of four.

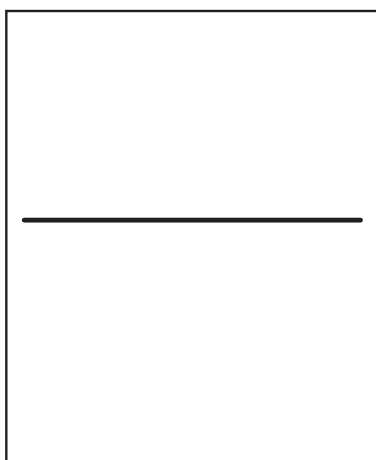
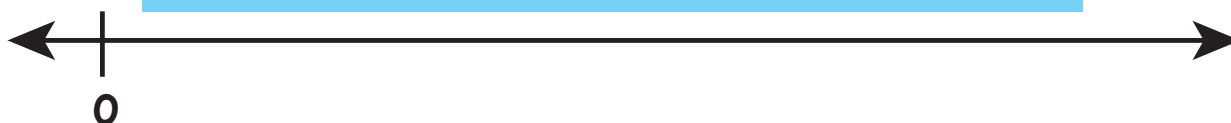
Four quarters can be subtracted from the fraction thrice and written as three. There are zero one-fourth pieces remaining. So, another name for twelve-fourths is three.

Show a Fraction

name: **Teacher Tips**

Make the number line, fraction, and image show the same rational number.

Take off the 'training wheels' gradually. Let your students do more of the work as they demonstrate competence.



Challenge your students to show a variety of fractions at this point. Now that they are familiar with every type of fraction from unit fractions, through proper fractions and whole numbers in fractional form, and now improper fractions, have them create a collection of pages showing an example of each type of fraction.

Describe the rational number shown above.

Writing about their math work is an important part of the learning process. Writing about math helps students remember, organize, and retrieve information.

Reading your students' writing about math helps you see their progress, identify misunderstandings or remaining questions they may have.

Once your students are adept at completing these pages, you could decide to use them as a part of your assessment. Let students roll dice to come up with numbers for the numerator and denominator. Or give everyone the same denominator and they can roll the dice to generate the numerator.

These pages could also be used as homework.

Various Representations of Mixed Numbers

With all the practice they have had modeling whole numbers in fractional form, modeling small improper fractions, and slowly increasing the level of difficulty, your students won't bat an eyelash when you swap the familiar handout for one with a place for the mixed number.

Begin by filling out the improper fraction or the hops on the number line to show your students which number they are modeling. Go back to using smaller numbers at first.

Continue to have students subtract out the whole numbers as part of the process. As the improper fractions get larger, the process of counting how many *times* the denominator has been subtracted from the numerator will become tiresome.

Hopefully, someone will complain about too much *repeated subtraction*. When they do, feel free to commiserate with them, "Gosh, you certainly are *subtracting the same number over and over* again.

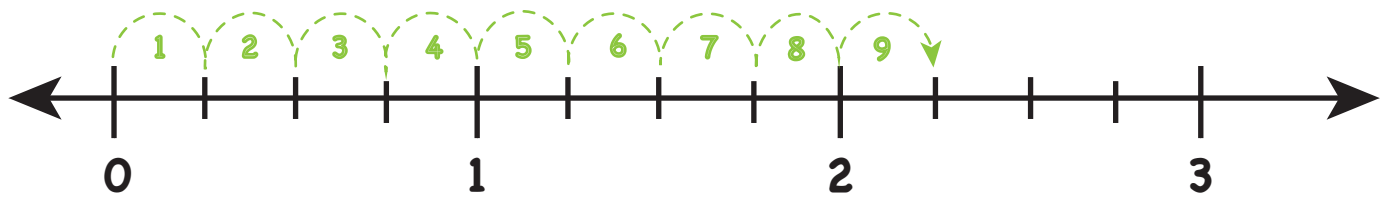
Gee, if only there were some other way to calculate *the number of times one number was subtracted from another.*"

If no one complains about having to keep track of all the whole numbers they are subtracting out - give them 110 over 7 as an improper fraction. At that point, someone should suggest dividing the numerator by the denominator to which you reply, "yeah sure, see if it works."

Show a Mixed Number

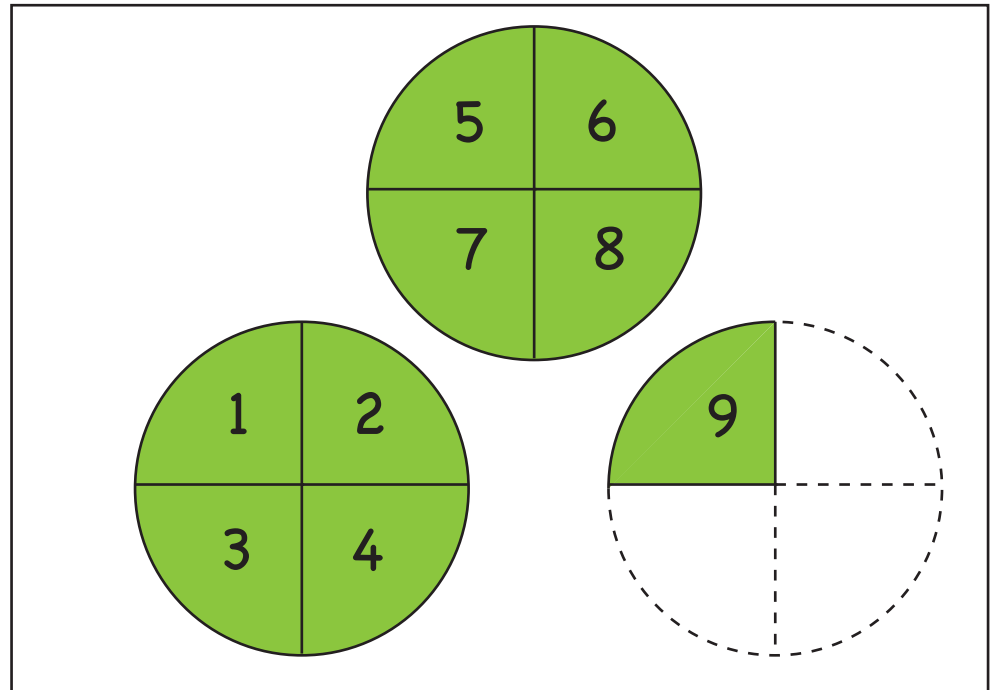
name: **Example**

Make the number line, fraction, and image show the same mixed number.



$$\frac{9}{4}$$

$$2 \frac{1}{4}$$



Describe the number shown above.

The number shown above is two and a quarter. That means there are two whole numbers and a quarter of the next number. The improper fraction is nine-fourths.

Four-fourths makes a whole number or a whole circle. Two groups of four-fourths can be subtracted from the numerator to make two whole numbers or two whole circles. 8 one-fourth pieces make two whole numbers or two circles. Eight is also the multiple of four which is closest to 9 without going over.

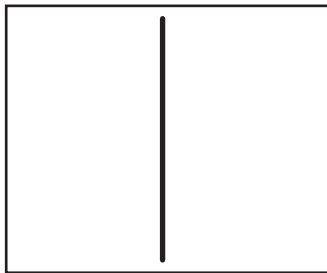
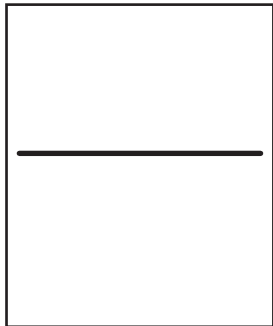
The 9th one-fourth piece is left over. Since there is one unit fraction remaining, it becomes the proper fraction in the mixed number.

Mixed numbers have two parts: a whole number and a proper fraction. The whole number is $8 \div 4 = 2$ and the proper fraction is one-fourth.

Show a Mixed Number

name: **Teacher Tips**

Make the number line, fraction, and image show the same mixed number.



As your students get better and better at modeling mixed numbers, encourage them to use shapes other than circles or even model mixed numbers in sets.

Keep asking students to explain the connections between the numbers, the hops on the number line and the images.

Have your students show fractions with larger and larger denominators.

Describe the number shown above.

One way to vary the assignment is to require students to write about different topics. Depending on which learning goal you would like to assess, you might have them include the unit fraction for each number, explain where each part of the mixed number came from, or explain why the fractional portion of a mixed number has to be a proper fraction.

You might even ask them to come up with a step by step process for reducing an improper fraction to a mixed number.

Continue to have the students sort and resort the pages of their work. Organizing the numbers by various criteria helps students make sense of fractions and mixed numbers. Make sure they know how to compare mixed numbers.

Printable Worksheets

The worksheets are arranged in order of complexity. Those with the most support are at the beginning and those with the least support are closer to the end.

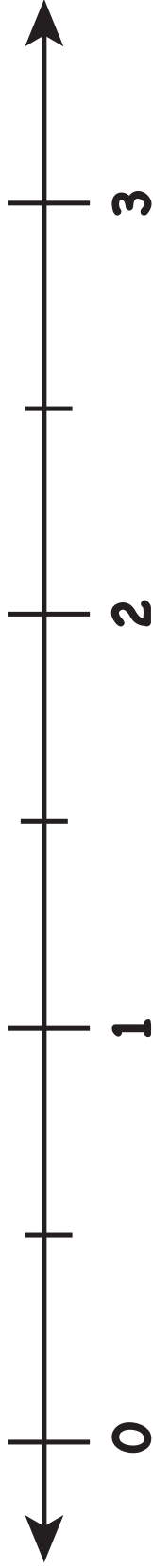
Use these materials in whatever way makes sense for you and your students. You might print some in large format to use as a class poster or as part of a demonstration. You could print four on a page and have your students complete each of them with the same numerator and different denominators ~ or the same denominator and different numerators.

If you know another teacher who might benefit from using these activities, please encourage them to download their own copy from UnCommon-Core.com.

Improper Fractions in Halves

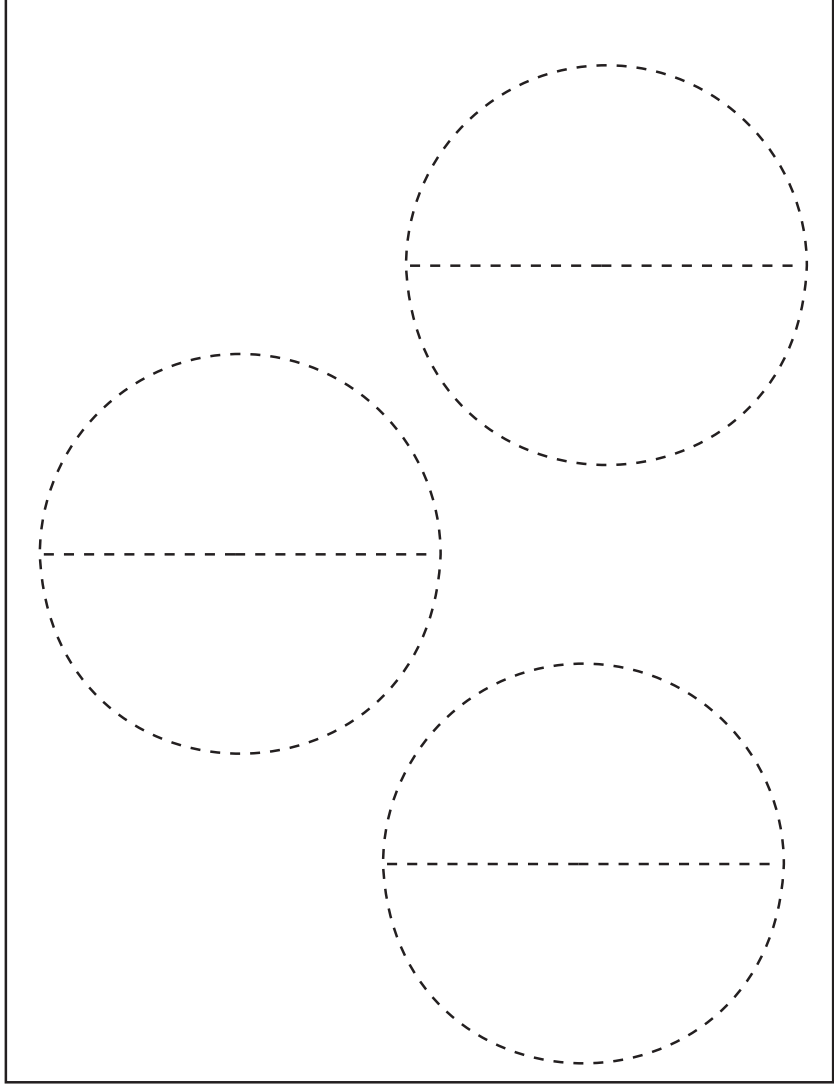
name: _____

Make the number line, fraction, and image show the same improper fraction.



Numerator: number of halves

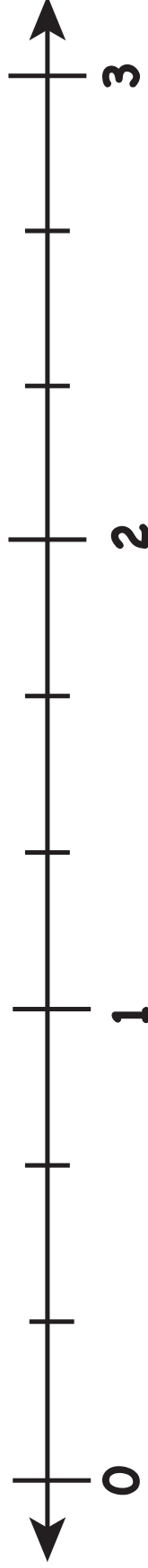
Denominator: number of halves
needed to make one



Improper Fractions in Thirds

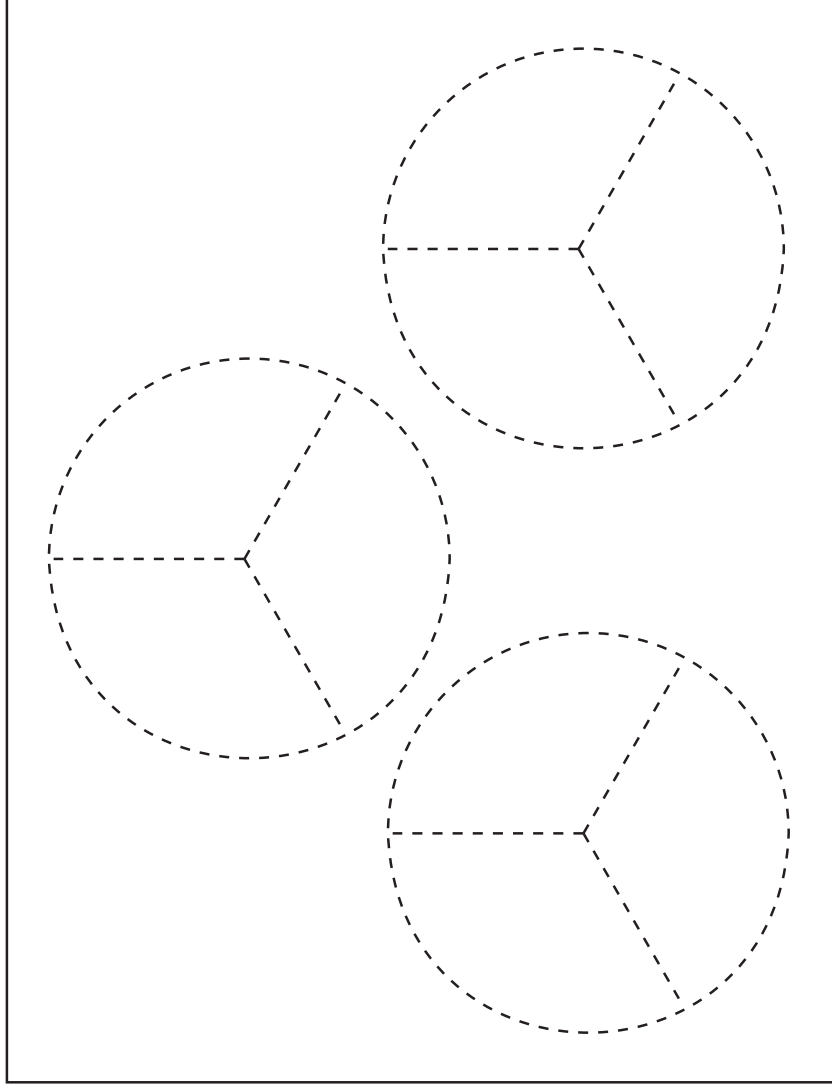
name: _____

Make the number line, fraction, and image show the same improper fraction.



Numerator: number of thirds
Denominator: number of thirds
needed to make one

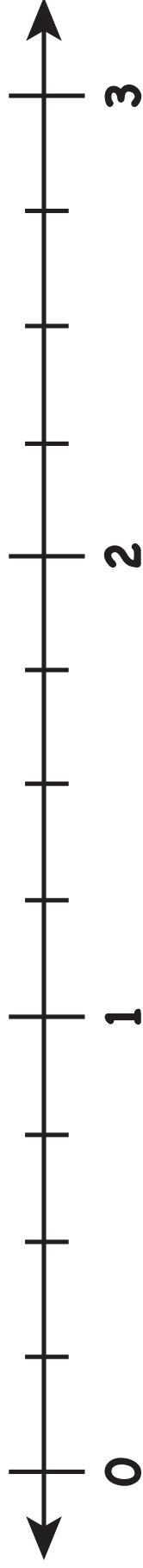
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Improper Fractions in Fourths

name: _____

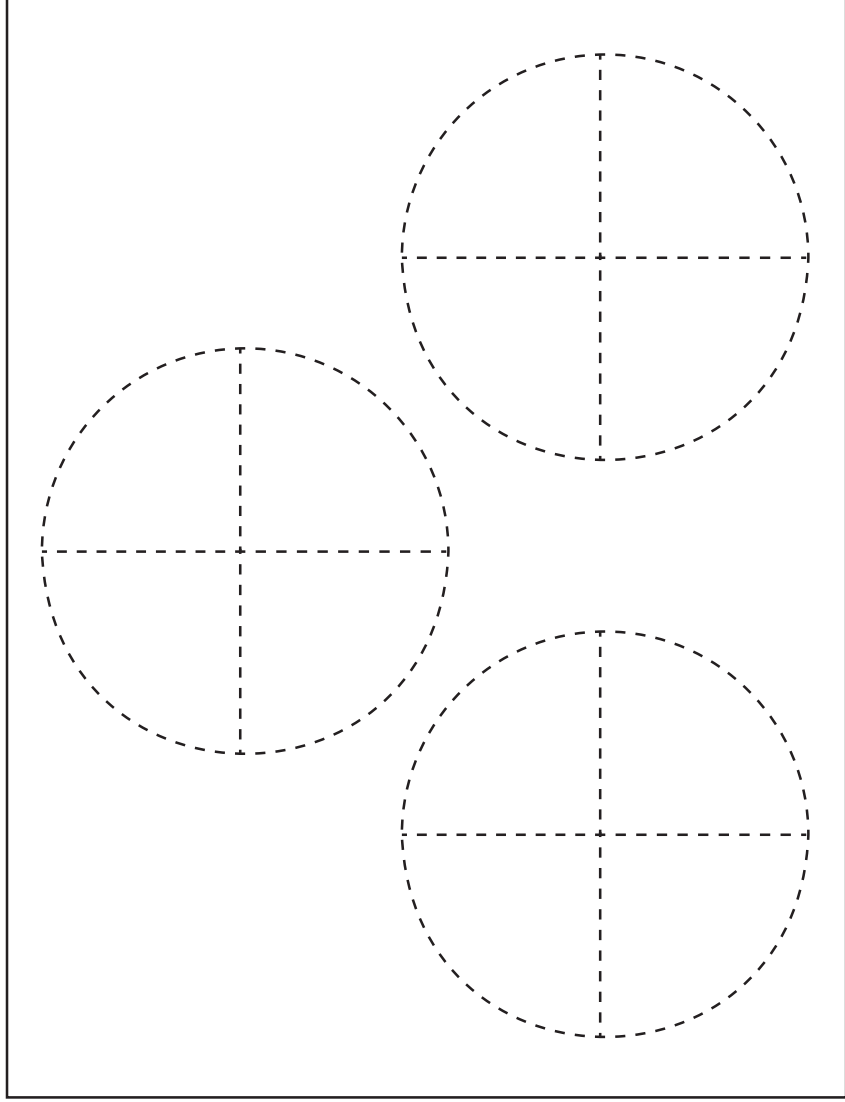
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of fourths

Denominator: number of

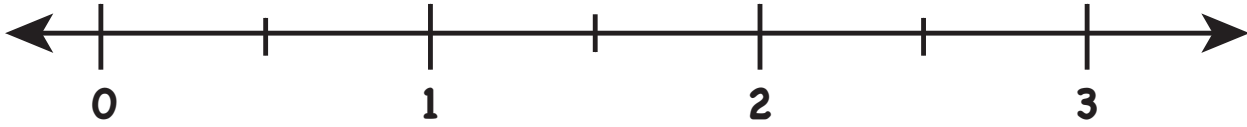
fourths needed to make one



Improper Fractions in Halves

name: _____

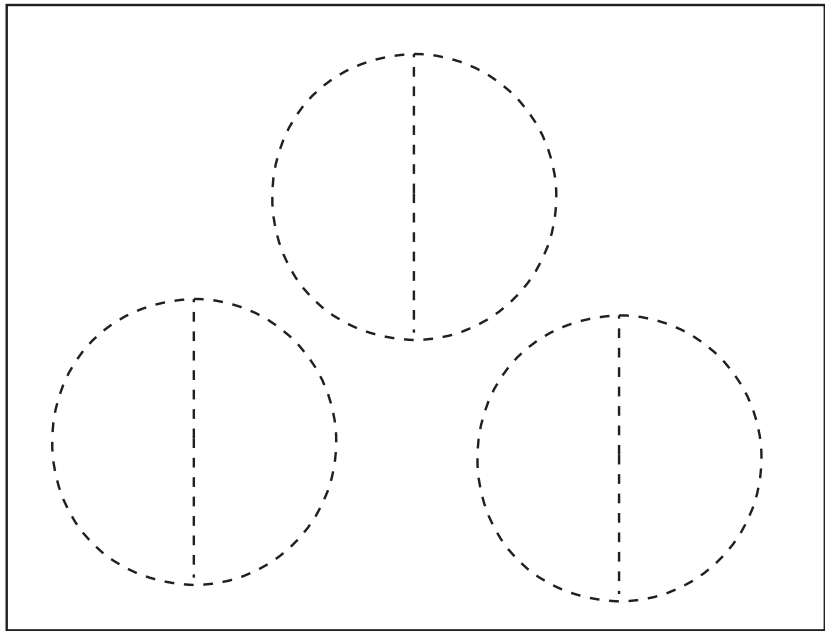
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of halves

Denominator: number of halves
needed to make one

A rectangular box with a horizontal line drawn across its middle, intended for writing a fraction.

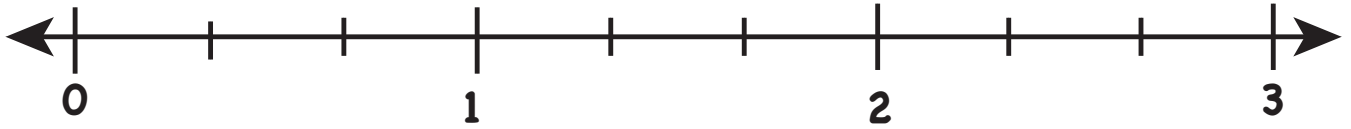


Describe the rational number shown above.

Improper Fractions in Thirds

name: _____

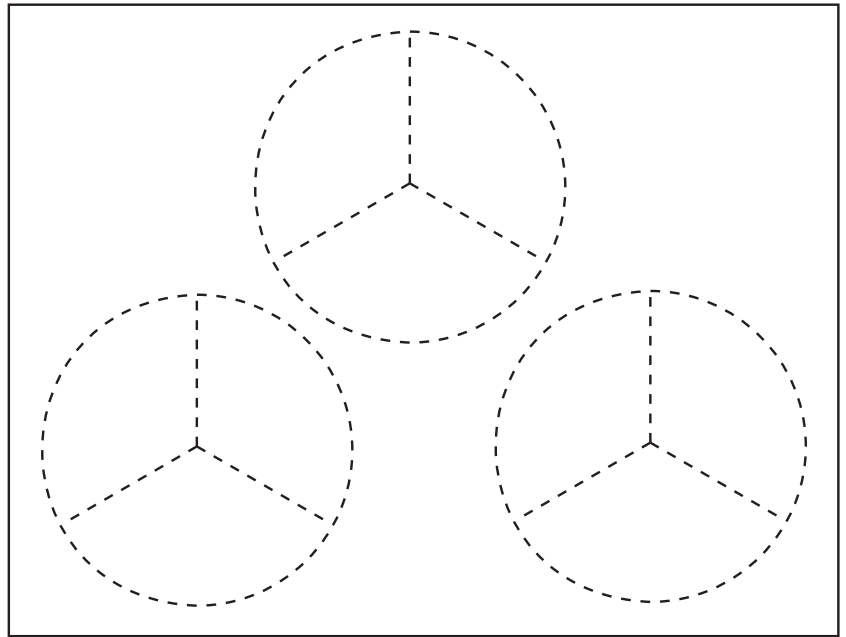
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of thirds

Denominator: number of thirds
needed to make one

A rectangular box containing a horizontal line, intended for students to write a fraction.

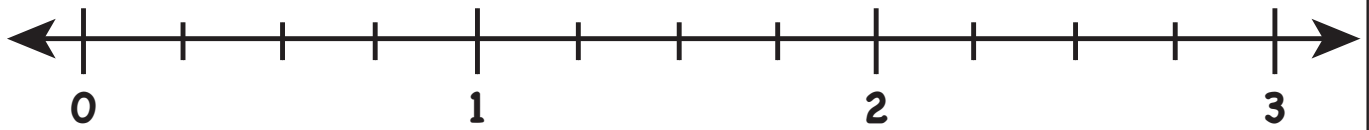


Describe the rational number shown above.

Improper Fractions in Fourths

name: _____

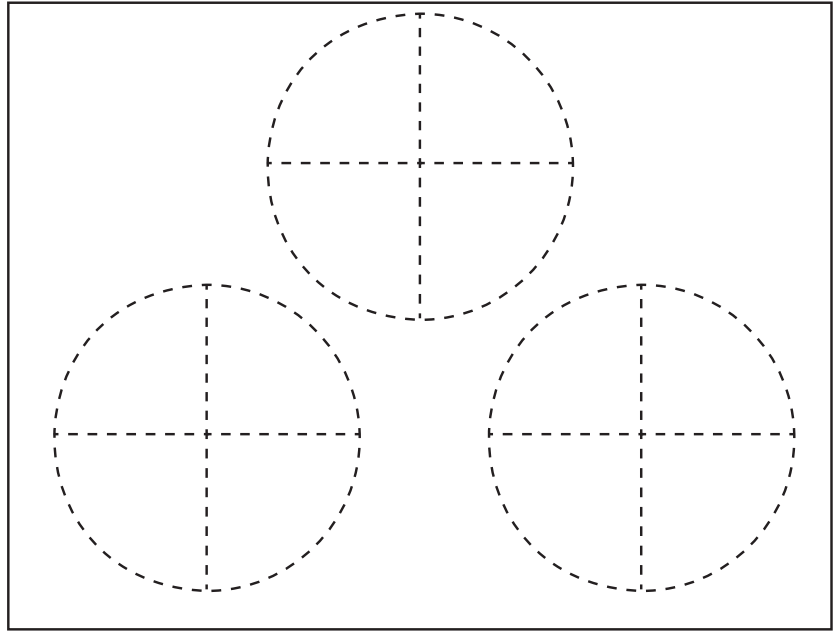
Make the number line, fraction, and image show the same improper fraction.



Numerator: number of fourths

Denominator: number of fourths needed to make one

<hr/>

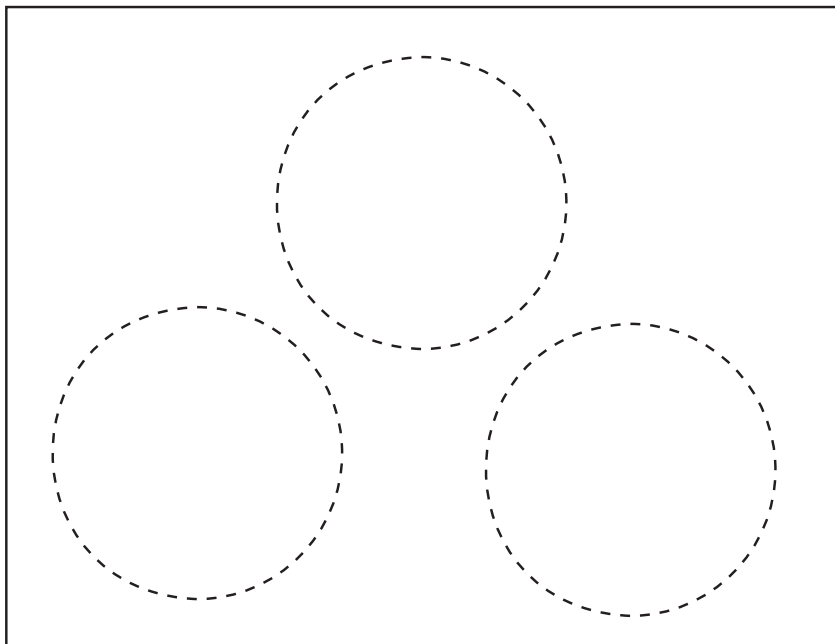
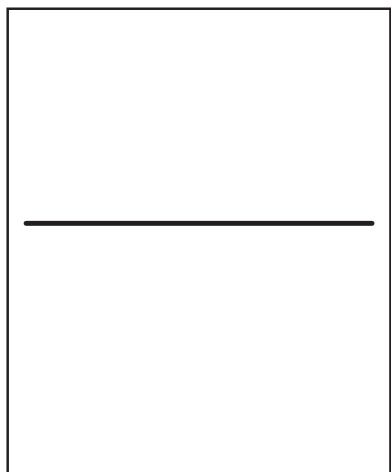


Describe the rational number shown above.

Show a Fraction

name: _____

Make the number line, fraction, and image show the same rational number.

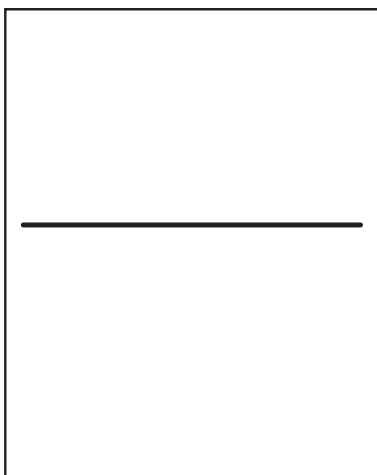


Describe the rational number shown above.

Show a Fraction

name: _____

Make the number line, fraction, and image show the same rational number.

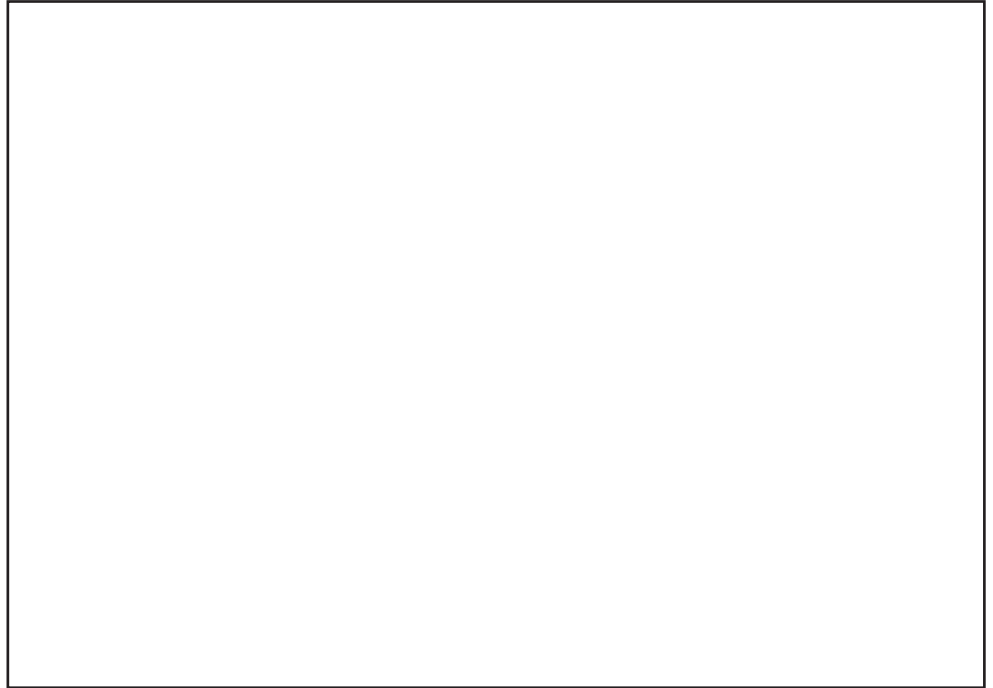
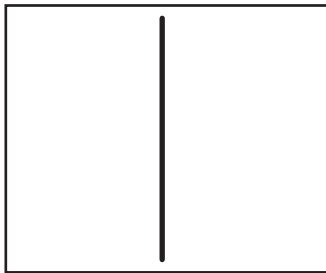
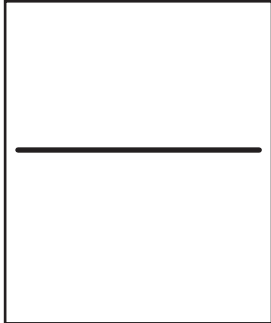


Describe the rational number shown above.

Show a Mixed Number

name: _____

Make the number line, fraction, and image show the same mixed number.



Describe the number shown above.

Resources

Kids

[Convert to Mixed Numbers](#)

[NRICH Maths](#)

Teachers

[Fractions: Building a Strong Foundation Based on Conceptual Understanding](#)

[Identifying Fractions on a Number Line](#)

[Obstacles Faced by Students in Making Sense of Fractions](#)

[Primary Teachers' Preferred Fraction Model](#)

[What's the Deal with Fractions?](#)

[UnCommon-Core.com](#) helps teachers explore effective instructional methods and strategies to use in class.

Academic standards organizations define the learning goals that teachers use in class.

[UnCommon-Core.com](#) is not affiliated with any academic standard initiative.

A Fresh Look at Improper Fractions

Students who can compare equivalent fractions are ready for

A Fresh Look at Improper Fractions

These activities walk students from fractions equivalent to one, through whole numbers written in fractional form, and improper fractions, all the way to making sense of mixed numbers.

