Weekly Focus: Fractions
Weekly Skill: Write equivalent, reduce, convert improper to mixed numbers

LESSON 3 Fractions Sense

Lesson Summary: In the warm-up, students will solve a word problem that reviews decimal division. In Activity 1, they will review vocabulary related to fractions and decimals. In Activity 2, they will work with a partner to reduce fractions and also to find equivalent fractions. In Activity 3, they will put some reduced fractions on a number line. In Activity 4, students will learn/review more vocabulary. Activity 5 calls for students to convert improper fractions to mixed numbers. There is an exit ticket and an extra word problem at the end. Estimated time for the lesson is two hours.

Materials Needed for Lesson 3:

- Worksheet Lesson 3 and Answers (attached)
- Website for visual fractions. This site offers lots of practice for working with fractions. Take a few minutes to become familiar with it and to tell the students about it so they can practice at home:
  http://www.visualfractions.com

Objectives: Students will be able to:

- Write equivalent fractions and simplify (reduce) fractions
- Put fractions on a number line
- Convert mixed numbers to improper fractions and vice-versa

Note to teacher: It is not necessary for students to complete the worksheet. You may assign some as homework.

ACES Skills Addressed: N, CT, LS
CCRS Mathematical Practices Addressed: Model with Mathematics, Reason Abstractly and Quantitatively, Construct viable arguments and critique the reasoning of others
Levels of Knowing Math Addressed: Intuitive, Pictorial, abstract, communication, application

Notes:
You can add more examples if you feel students need them before they work. Any ideas that concretely relates to their lives make good examples.

For more practice as a class, feel free to choose some of the easier problems from the worksheets to do together. The "easier" problems are not necessarily at the beginning of each worksheet. Also, you may decide to have students complete only part of the worksheets in class and assign the rest as homework or extra practice.

The GED Math test is 115 minutes long and includes approximately 46 questions. The questions have a focus on quantitative problem solving (45%) and algebraic problem solving (55%).

Students must be able to understand math concepts and apply them to new situations, use logical reasoning to explain their answers, evaluate and further the reasoning of others, represent real world

problems algebraically and visually, and manipulate and solve algebraic expressions.

This computer-based test includes questions that may be multiple-choice, fill-in-the-blank, choose from a drop-down menu, or drag-and-drop the response from one place to another.

The purpose of the GED test is to provide students with the skills necessary to either further their education or be ready for the demands of today's careers.

Lesson 3 Warm-up: Solve the decimal problem	**Time: 10 Minutes**

Write on the board: You want to buy the least expensive cereal of two brands. A box of Brand A costs $3.50 for 14 oz. and Brand B costs $4.68 for 18 oz.

Basic Questions:
What is the cost per oz. for each brand? Which is less expensive? (A because it is $0.25/oz, B is $0.26/oz)

Extension Questions:
If your kids eat 1.5 boxes of Brand A per week, how many boxes would you need to buy in one year? (1.5 boxes x 52 weeks = 78 boxes)
How much would this cost you? (78 boxes x $3.50 each = $273.00)

Lesson 3 Activity 1: Vocabulary	**Time: 5-10 Minutes**

This activity can be projected on the board and done as a whole class. Have students volunteer to write answers. Also note that one extra choice is given that will not be used to make the activity a little more challenging.

Answers and examples:
1F, 2H (denominator is down), 3E (ex. 1/3 = 0.33 with 3 repeating), 4B (ex. 8 is GCF of 16 and 24), 5C (ex. 2 is LCF of 16 and 24), 6A (ex. 2x6 is equivalent to 12, 1/2 is equivalent to 2/4), 7G. Solicit more examples from students.

1. The numerator is ___.	A. The same in value
2. The denominator is ___.	B. The largest number that can divide evenly into 2 or more numbers
3. A repeating decimal is ____.	C. The smallest number that can divide evenly into 2 or more numbers
4. A greatest common factor is ___.	D. The largest digit in the fraction
5. A least common factor is ___.	E. Number(s) after a decimal point that keep repeating
6. Equivalent numbers are ___.	F. The top number of a fraction
7. Simplifying fractions means the same as ___.	G. Reducing fractions
	H. The bottom number in a fraction

Activity 2: Equivalent Fractions and Simplifying	**Time: 25-30 Minutes**

1) Write 1/2 and 2/4 on the board. Ask students whether they are equivalent or not and why. Then show how these two fractions are equivalent:
   - Visually: Drawing a circle and dividing it in half and color in one side to represent half. Then draw another circle next to it and cut it into four pieces.
   - Money: How much is half of a dollar? Two quarters of a dollar? (both are $0.50)
   - Time: How much is one half of an hour? Two quarters of an hour? (both are 30 minutes)
2) Now that we have seen examples of why the fractions are equivalent, let's review how we do it with computation. How do we change 1/2 to 2/4? We multiply both the numerator and the denominator by the same number (2) and that way the fraction doesn't change in value.

$$\frac{1x2}{2x2} = \frac{2}{4}$$

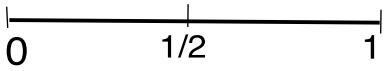
3) How do we simplify (reduce) fractions? By dividing both the numerator and the denominator by the same number. We can take 3/9 and divide both the numerator and denominator by 3 to get 1/3.
4) **Pair Activity:** Assign students to work with a partner. Give each pair of students two fractions and they are to reduce the first fraction and to find an equivalent of their choice for the second fraction. Do the example together first. Also encourage them to draw the fractions in either a circle or a number line (bar) format. Circulate to help.

Assign to Students to do in Pairs	Fraction to Reduce	Write one or more equivalents
example	49/56 *(answer is 7/8)*	3/5 *(answer can be 6/10, 9/15, 12/20 etc.)*
Pair 1	4/6 *(2/3)*	4/7 *(8/14, 12/21 etc.)*
Pair 2	4/16 *(1/4)*	3/8 *(6/16, 9/24 etc.)*
Pair 3	15/21 *(5/7)*	2/9 *(4/18, 6/27 etc.)*
Pair 4	7/14 *(1/2)*	4/5 *(8/10, 12/15, etc.)*
Pair 5	25/30 *(5/6)*	5/7 *(10/14,15/21, etc.)*
Pair 6	90/100 *(9/10)*	3/4 *(6/8, 9/12 etc.)*
Pair 7	56/64 *(7/8)*	2/3 *(4/6, 6/9 etc.)*
Pair 8	16/20 *(4/5)*	1/9 *(2/18, 3/27 etc.)*
Pair 9	21/27 *(7/9)*	3/7 *(6/14, 9/21, etc.)*
Pair 10	11/55 *(1/5)*	1/2 *(2/4, 5/10, etc.)*

Have students volunteer to come to the board and explain their examples. Ask students how they reduced their fractions. Did they keep dividing until they got to the smallest number possible (as in 4/16 above, you can divide the 4 and the 16 by 2 to get 2/8 and do it again to get ¼ or did they divide by the greatest common factor of 4 right away to get ¼? Say that both methods work, but dividing by the greatest common factor gets you the answer more quickly.

Activity 3: Put Fractions on Number Line	**Time: 15 Minutes**

Draw a line on the board with the number 0 on the far left and the number 1 on the far right. Point to the middle and ask what fraction belongs there *(1/2)*. Write it in.

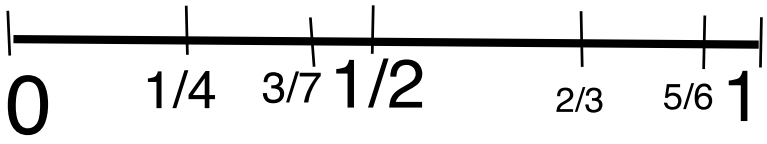


Choose the first five reduced fractions from previous activity (2/3, 1/4, 3/7, 1/2 is done already, and 5/6). Ask volunteer students to put in the approximately correct place on the number line you drew. Ask the students to think:

- Is it more or less than one half?
- What if it's close and you don't know? What can you do? (Solicit ideas from the students.)
  - You can write equivalent fractions with the same denominator. For example with 2/3 and 3/7, you can change both to have a denominator of 21 to get 14/21 and 9/21. Then you can tell which is greater.
  - You can also change the fractions to decimals. How? Divide the numerator by the denominator. Ex. 2÷ 3 = 0.67. You could do this with all fractions.
  - You can also draw a picture.

Extensions (if you finish early or want to assign for homework): Have the students convert all the fractions to decimals to see how these are in order on the number line too. They can also put the other fractions from the previous activity on the number line too.

The places the fractions go on the number line should be about like this:



Also share the website www.visualfractions.com with the students for individual practice.

Activity 4: More Fractions Vocabulary	**Time: 10 Minutes**

Write the following on the board: Match the vocabulary with the correct example:

Fraction Vocabulary	Example
1) Proper Fraction 2) Improper fraction 3) Mixed number 4) Whole number	a) 45 b) $\frac{9}{5}$ c) $\frac{2}{3}$ d) $7\frac{4}{5}$

(*Answers are 1c, 2b, 3d, 4a)*

Ask the students:

- what makes a fraction proper? (numerator smaller than denominator)
- what makes a fraction improper? (numerator greater than denominator)
- what makes a number mixed? (a whole number with a fraction)

Solicit more examples of each type from the students.

Activity 5: Change Improper Fractions to Mixed Numbers and Vice-Versa	**Time: 30 Minutes**

1) Example A: How do you change the improper fraction 9/4 to a mixed number? You can mentally count how many times 4 goes into 9 and determine what is left over to get $2\frac{1}{4}$. You can also do the division of 9÷4 with a remainder of 1. You can draw circles or rectangles and divide each one into 4 parts to show how they are equivalent.

Example B: How do you do the opposite of changing $2\frac{1}{4}$ to $\frac{9}{4}$? You multiply 4 x2 and add 1.

Example C: How do you do change $3\frac{1}{5}$ to an improper fraction? You multiply 5 x3 and add 1 to get $\frac{16}{5}$. You can also visually how they are equivalent.

2) Do Worksheet 6.1 (attached). Do a few problems together first, then students can work alone or with a partner. Circulate to help. Take the last five minutes to have students volunteer to do a few of the more challenging problems on the board. Assign the rest for homework.

Exit Ticket	Time: 5-7 Minutes

Write on the board:

Grandma made 3 pies for the family reunion. Each pie is already cut into 8 slices and there are enough slices for each person. There should be half a pie left after everyone gets one slice.

- How many people are at the reunion? *(20 people. Two pies x 8 slices each = 16 slices plus half a pie at 4 slices = 20 total.)*
- Write a mixed number *(2 ½)* and an improper fraction *($\frac{5}{2}$ or $\frac{20}{8}$)* that shows how many slices of pie will be eaten if each person eats one.

Extra Problem	Time: 10 Minutes

Write on the board: You work for a large company with 1200 employees. One day the manager announces that 1 out of 6 employees will be laid off.

Basic Questions:

How many employees will be laid off? *(200 employees)* How many will keep their jobs? *(1000 employees)*. Challenge the students to solve this with an equivalent fraction.

Extension Question:

The employees who remain will get a 25% cut in pay. If you make $40,000 annually, what will your new salary be? *($30,000)*

Ask the students how they got their answers. Did they simply divide 1200 by 6? Did anyone set up an equivalent fraction? If not, ask them how that could be done.

$$\frac{1}{6} = \frac{\quad}{1200}$$

Do the same for the extension question. Did they just divide 40,000 by 4 and then subtract that? Can it be done with equivalent fractions? Did anyone take 25% off? Did anyone multiply 40,000 by .75?

$$\frac{25}{100} = \frac{\quad}{40{,}000}$$

Let the students know that this way of solving problems uses ratios of equivalent fractions and they will get to practice more in another lesson in a few weeks.

Lesson 3 Worksheet

Converting Improper Fractions to Mixed Numbers

1) $\frac{53}{10} =$ ____ 2) $\frac{13}{2} =$ ____ 3) $\frac{22}{6} =$ ____

4) $\frac{20}{3} =$ ____ 5) $\frac{23}{4} =$ ____ 6) $\frac{47}{6} =$ ____

7) $\frac{37}{9} =$ ____ 8) $\frac{17}{3} =$ ____ 9) $\frac{41}{9} =$ ____

10) $\frac{23}{10} =$ ____ 11) $\frac{39}{10} =$ ____ 12) $\frac{35}{8} =$ ____

13) $\frac{29}{4} =$ ____ 14) $\frac{29}{5} =$ ____ 15) $\frac{57}{9} =$ ____

Converting Mixed Numbers to Improper Fractions

1) $2\frac{1}{7} =$ ____ 2) $4\frac{3}{5} =$ ____ 3) $6\frac{2}{3} =$ ____

4) $7\frac{1}{8} =$ ____ 5) $2\frac{1}{2} =$ ____ 6) $9\frac{1}{2} =$ ____

7) $9\frac{7}{8} =$ ____ 8) $6\frac{1}{2} =$ ____ 9) $6\frac{6}{7} =$ ____

10) $6\frac{5}{6} =$ ____ 11) $6\frac{1}{7} =$ ____ 12) $4\frac{1}{2} =$ ____

13) $2\frac{3}{4} =$ ____ 14) $5\frac{4}{5} =$ ____ 15) $5\frac{1}{4} =$ ____

Lesson 3 Worksheet Answers

Converting Improper Fractions to Mixed Numbers

1) $\frac{53}{10} = 5\frac{3}{10}$ 2) $\frac{13}{2} = 6\frac{1}{2}$ 3) $\frac{22}{6} = 3\frac{2}{3}$

4) $\frac{20}{3} = 6\frac{2}{3}$ 5) $\frac{23}{4} = 5\frac{3}{4}$ 6) $\frac{47}{6} = 7\frac{5}{6}$

7) $\frac{37}{9} = 4\frac{1}{9}$ 8) $\frac{17}{3} = 5\frac{2}{3}$ 9) $\frac{41}{9} = 4\frac{5}{9}$

10) $\frac{23}{10} = 2\frac{3}{10}$ 11) $\frac{39}{10} = 3\frac{9}{10}$ 12) $\frac{35}{8} = 4\frac{3}{8}$

13) $\frac{29}{4} = 7\frac{1}{4}$ 14) $\frac{29}{5} = 5\frac{4}{5}$ 15) $\frac{57}{9} = 6\frac{1}{3}$

Converting Mixed Numbers to Improper Fractions

1) $2\frac{1}{7} = \frac{15}{7}$ 2) $4\frac{3}{5} = \frac{23}{5}$ 3) $6\frac{2}{3} = \frac{20}{3}$

4) $7\frac{1}{8} = \frac{57}{8}$ 5) $2\frac{1}{2} = \frac{5}{2}$ 6) $9\frac{1}{2} = \frac{19}{2}$

7) $9\frac{7}{8} = \frac{79}{8}$ 8) $6\frac{1}{2} = \frac{13}{2}$ 9) $6\frac{6}{7} = \frac{48}{7}$

10) $6\frac{5}{6} = \frac{41}{6}$ 11) $6\frac{1}{7} = \frac{43}{7}$ 12) $4\frac{1}{2} = \frac{9}{2}$

13) $2\frac{3}{4} = \frac{11}{4}$ 14) $5\frac{4}{5} = \frac{29}{5}$ 15) $5\frac{1}{4} = \frac{21}{4}$