

## Lesson 12: Divide to Compute Equivalent Fractions

### Lesson Objective

- Students will generate equivalent fractions by dividing the numerator and denominator by the same number.

### Instructional Materials

Material	Quantity	Description
Fraction Strips from Lesson 1: Area Models for Fractions	1 set per student	
How Am I Doing? graph	1 per student	
Colored pencils	1 per student	
Display Masters	1 each	<ul style="list-style-type: none"> <li>Preview: Key Ideas: Divide to Compute Equivalent Fractions</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{2}{4}</math> A</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{2}{4}</math> B</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{2}{4}</math> C</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{12}{16}</math></li> <li>Demonstrate: Blank Multiplication Table (optional)</li> <li>Demonstrate: Completed Multiplication Table (optional)</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{16}{10}</math> A</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{16}{10}</math> B</li> <li>Demonstrate: Equivalent Fraction to <math>\frac{16}{10}</math> C</li> </ul>
Handouts	1 per student	<ul style="list-style-type: none"> <li>Cumulative Review</li> <li>Practice 1</li> <li>Practice 2</li> <li>Blank Multiplication Table (optional)</li> <li>Completed Multiplication Table (optional)</li> <li>Independent Practice</li> </ul>
Answer Keys	1 each	<ul style="list-style-type: none"> <li>Cumulative Review</li> <li>Practice 1</li> <li>Practice 2</li> <li>Independent Practice</li> </ul>

## Cumulative Review



### TEACHER NOTE

This lesson is similar to Lesson 10: Multiply by 1 to Compute Equivalent Fractions. It is important that students understand the process of generating equivalent fractions with multiplication before continuing to division.

Have students answer the questions on the Cumulative Review handout. Go over the answers. Correct misconceptions. Have students use a colored pencil to make corrections as needed. Collect student papers to determine who needs additional instruction. 

## Preview

This lesson will build on students' conceptual knowledge of generating equivalent fractions using multiplication. Students will generate equivalent fractions using division. Students will use the mathematical ideas taught in this lesson when they write and identify fractions in their simplest form.

Display and introduce through a brief explanation the key ideas for this lesson:

- Multiplying by 1 (applying the identity property of multiplication or its inverse) requires that the same operation be performed on the numerator and the denominator.
- A tool to find equivalent fractions is the multiplication table.

Use the Key Ideas: Divide to Compute Equivalent Fractions



display master as needed.

## Engage Prior/Informal Knowledge

To open the lesson, present questions to activate students' background knowledge and preskills related to the content to be taught in this lesson. Refer to the timed multiplication test in Lesson 10 and ask students questions such as:

- What happens when you multiply a number by 1? (You get the same number. For example,  $3 \times 1 = 3$ ) A fraction by 1? You get the same number. See the example below.

$$\frac{1}{3} \times 1 = \frac{1}{3}$$

- Is  $\frac{3}{8}$  equivalent to  $\frac{6}{16}$ ? (yes) How do you know?

$$\frac{3}{8} \times \frac{2}{2} = \frac{6}{16}$$

Have students verbalize their reasoning and thought process.

If students cannot correctly answer these questions, stop and explicitly teach the material.

## Demonstrate

1. Calculate the original fraction in which the numerator and denominator have been multiplied by the same value to generate an equivalent fraction. 

 Display  $\frac{\dots}{\dots} \times \frac{2}{2} = \frac{2}{4}$ .

Use the Equivalent Fraction to  $\frac{2}{4}$  A  display master as needed.

**Say:** *I need to find the original fraction. I am going to use what I learned in the previous lesson to solve this problem.*



### TEACHER NOTE

Provide several examples to demonstrate how to use division to generate equivalent fractions.



### TEACHER NOTE

Students may benefit from writing the fraction used as 1 in a different color to draw attention to the 1.

Draw attention to the blank denominator.

**Say:** *What number times 2 equals 4? 2 times 2 equals 4.  
The missing denominator is 2.*

Display 2 below the fraction bar. Use the Equivalent Fraction to  $\frac{2}{4}$  B  display master as needed.

Draw attention to the missing numerator.

**Say:** *What number times 2 equals 2? 1 times 2 equals 2.  
The missing numerator is 1.*

Display 1 above the fraction bar. Use the Equivalent Fraction to  $\frac{2}{4}$  C  display master as needed.

**Say:** *The original fraction is  $\frac{1}{2}$ .  $\frac{1}{2}$  and  $\frac{2}{4}$  have the same value. They are equivalent fractions.*

**Say:** *I can also solve this problem a different way. I can work backward.*

Draw attention to the missing denominator.

**Say:** *What is 4 divided by 2? 4 divided by 2 equals 2.  
2 is the missing denominator. Repeat this for the numerator. What is 2 divided by 2? 2 divided by 2 equals 1. 1 is the missing numerator.*



**TEACHER NOTE**

Students may benefit from writing the number you are dividing by in a different color.

Emphasize that multiplication and division are inverse operations.

Repeat with additional examples as needed.

2. Generate an equivalent fraction by dividing the numerator

and denominator by the same number. 

Display  $\frac{12 \div 2}{16 \div 2} = \frac{6}{8}$ . Use the Equivalent Fraction to  $\frac{12}{16}$   display master as needed.

Draw attention to dividing both the numerator and denominator by the same number, 2.

**Say:** *I am dividing the numerator and denominator by the same number. I am dividing them both by 2.  $\frac{12}{16}$  and  $\frac{6}{8}$  have the same value. They are equivalent fractions.*

Repeat with additional examples as needed.

When using a single fraction to generate many different equivalent fractions, it may be helpful to relate to the multiplication table. Use the Blank Multiplication Table  display master or Completed Multiplication Table  display master as needed.



3. Calculate the number the numerator and denominator are divided by to generate an equivalent fraction.

Display  $\frac{16 \div ?}{10 \div ?} = \frac{8}{5}$ . Use the Equivalent Fraction  $\frac{16}{10}$  A  display master as needed.

Think aloud as you ask and answer the following question.

**Say:** *What number do I divide both the numerator and denominator by to make the equation true?*

**Say:** *First, I am going to find the number that I would divide 10 by to get 5.*



#### TEACHER NOTE

It may be helpful to write the number by which the numerator and denominator are divided in a different color to help students identify the pattern and devise a rule.

Display 2 under the fraction bar, next to the division sign.  
 Use the Equivalent Fraction to  $\frac{16}{10}$  B  display master as needed.

**Say:** *To find an equivalent fraction, multiply or divide the numerator and the denominator by the same number. I will write the same number above the fraction bar.*

Display 2 above the fraction bar, next to the division sign.  
 Use the Equivalent Fraction to  $\frac{16}{10}$  C  display master as needed.

**Say:** *I changed the fraction  $\frac{16}{10}$  into an equivalent fraction with the numerator 8 and the denominator 5.* 

Repeat with additional examples, such as:

- Change  $\frac{14}{28}$  into an equivalent fraction with a denominator of 4.

5. Have students create and solve their own examples for the types of problems shown in steps 1–4. Be prepared to have examples for students who are not ready to create their own examples.

Select a few students to share their examples and explain their reasoning and thought process. 



**TEACHER NOTE**

If students struggle, it may be helpful to relate to the multiplication table when students are using values that would be shown in a table. Use the Blank Multiplication Table display master or the Completed Multiplication Table display master as needed.



**TEACHER NOTE**

Students who struggle may benefit from using the strips they shaded and folded in previous lessons.

To use the strips:

**Say:** *When I divide the numerator and denominator by the same number, I change the size of the parts. The fractional amount does not change.*

Think aloud as you write examples for all strips that you folded. For example, show the strip with  $\frac{1}{2}$  shaded.

Display  $\frac{4 \text{ shaded} \div 2 = 2 \text{ shaded}}{8 \text{ total} \div 2 = 4 \text{ total}}$

**Say:** I am dividing the numerator and denominator by 2.  $\frac{4}{8}$  and  $\frac{2}{4}$  have the same value.

Show students the fraction strip and draw attention to how 2 parts were combined.

Display  $\frac{4 \div 2}{8 \div 2} = \frac{2}{4}$

Repeat, using other fractions.

6. Restate the rule for creating equivalent fractions to incorporate division.

**Say:** To find an equivalent fraction, multiply or divide both the numerator and denominator by the same number.

Remind students that the numerator and the denominator of a fraction must always be a whole number. Therefore, both the numerator and denominator must always be divided evenly by the chosen divisor (i.e., no remainders).

## Practice

For each practice activity, provide detailed feedback to students, highlighting what was done correctly and what needs improvement. Provide opportunities for students to correct their errors. Collect student work to review and monitor student progress.



**WATCH FOR** Some students use additive instead of multiplicative reasoning to identify or generate equivalent fractions. For example, given  $\frac{12}{16}$ , these students subtract 8 from both the numerator and denominator to get  $\frac{4}{8}$ , rather than dividing both the numerator and denominator by 2 to get  $\frac{6}{8}$ . To correct this error, teach students to contrast the effects of adding and multiplying. Relate addition/multiplication to subtraction/division. Teach students that adding changes the number of parts and that dividing changes the size of the parts. Use manipulatives as appropriate.

**Activity 1:** Help students complete the activity on the Practice 1 handout. Select a few students to verbalize their reasoning and each step in the process. Listen for the development of any misconceptions within the reasoning.

**Activity 2:** Have students work in pairs or small groups to complete the activity on the Practice 2 handout. Have



**WATCH FOR**

Some students perform an operation only on the numerator. For example:  $[\frac{2}{6} \div 2 = \frac{1}{6}]$ . Teach students that performing an operation only on the numerator changes the fraction's value. Use manipulatives as necessary.



**TEACHER NOTE**

For students who need practice, a multiplication table may help them create equivalent fractions. Students first find the column that contains the numerator and denominator of the given fraction. Then, they color those 2 rows on the multiplication table to see several equivalent fractions. Use the Blank Multiplication Table handout or Completed Multiplication Table handout as needed.

students verbalize their reasoning for each step in the process to their partners. Listen for development of misconceptions within the reasoning.

Example:

To create an equivalent fraction for  $\frac{6}{8}$ , highlight the row that contains 6 and 8 in the same column to see several equivalent fractions.

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

## Independent Practice

1. Have students work independently to complete the activity on the Independent Practice handout.
2. Go over the answers (students self-check and correct, using a colored pencil).
3. Have students record the number correct in the box and complete their How Am I Doing? graph.

4. Collect the papers to review and monitor student progress.

## Closure

Review the key ideas. Have students provide examples from the lesson. Ask questions such as:

- How would you explain to someone else how to create equivalent fractions by using division?
- How would you draw an area model to show what happens when you divide to create an equivalent fraction?

Clear up any misconceptions. Students who do not divide both the numerator and denominator by the same number or use additive instead of multiplicative reasoning need additional instruction.