

# CHAPTER 5 OPERATIONS ON FRACTIONAL EXPRESSIONS

## Section 5.1

### TERMINOLOGY

5.1

For each of the following terms, provide 1) a definition in your own words, 2) the formal definition (as provided by your text or instructor), and 3) an example of the term using a drawing or problem. A sample filled-out form is available in the Introduction.

#### Common Factor

Your definition	
Formal definition	
Example	

#### Reciprocal

Your definition	
Formal definition	
Example	

### READING AND SELF-DISCOVERY QUESTIONS

5.1

1. In the context of mathematics, what operation does the word *of* indicate? (For example, "one half of one tenth.")

**It indicates multiplication.**

2. Describe the steps used to multiply fractions.

**a. Reduce fractions by eliminating common factors; b. Multiply the numerators; c. Multiply the denominators.**

3. One of the steps in dividing fractions requires you to invert the second fraction. What does the phrase *invert the fraction* mean?

**If we multiply the dividing fractions by 1 (which is presented as the reciprocal of the denominator divided by itself), the denominator of the dividing fractions multiplies out to equal 1. Only the numerator is being multiplied by the reciprocal of the denominator, which is what we mean by inverting the fraction.**

4. How would you explain the process of dividing fractions to another student?

**Dividing a fraction is converting a division problem into a multiplication problem, which we already know how to solve (multiply the numerator by the reciprocal of the denominator).**

5. Does the process of dividing fractions change if there are variables present in the numerator and/or denominator? Explain your answer.

**The process is the same, but the simplification process as well as the reduction of common factors must stay consistent to the rules.**

## CRITICAL THINKING QUESTIONS

5.1

1. Why is it considered a good idea to simplify fractions before multiplying them?

**It reduces the complexity of the multiplication and therefore reduces the chance of errors.**

2. How do you use common factors when multiplying fractions?

**To reduce common factors in the numerators and denominators into "ones".**

3. Does the rule of signs differ when multiplying fractions (as compared to multiplying integers)? Explain your answer.

**The rule of signs stays consistent in multiplication in all contexts. The negative value (whether in the numerator or denominator) has the same impact.**

4. Does every number have a reciprocal? Explain your answer.

**Zero does not, but every other number  $n$  can be represent as  $1/n$ . Thus when you multiply  $n \times 1/n$  you obtain 1. This works with negative numbers such as -2. Therefore, every number except for zero, has a reciprocal.**

## DEMONSTRATE YOUR UNDERSTANDING

5.1

1. Some of the ingredients of an apple crisp, which serves 12, include:  $2\frac{2}{3}$  cups flour  
 $\frac{1}{2}$  tsp. cinnamon  
 $4\frac{1}{2}$  cups apples  
 3 cups sugar

How much of each ingredient would you need to serve 4?

Ingredients	flour	cinnamon	apples	sugar
Serves 12	$2\frac{2}{3}$ cups	$\frac{1}{2}$ tsp.	$4\frac{1}{2}$ cups	3 cups
Serves 4	$\frac{8}{9}$ cups	$\frac{1}{6}$ tsp.	$1\frac{1}{2}$ cups	1 cups

2. a) What is the answer to the following:  $30 \div 5 \cdot 2 =$  12
- b) Add parentheses to the expression " $30 \div 5 \cdot 2$ " in the following equations to make the given solutions correct:

i)  $(30 \div 5) \cdot 2 = 12$

ii)  $30 \div (5 \cdot 2) = 3$

## IDENTIFY AND CORRECT THE ERRORS

5.1

In the second column, identify the error(s) you find in the following worked solution and describe the error made. Solve the problem correctly in the third column.

Problem	Describe Error	Correct Process
Simplify: $(-16)(5) \div (4)(2)$	<p><b>The student has failed to follow the order of operations and treated (-16)(5) and (4)(2) as if those 'chunks' were in parentheses or brackets: <math>[(-16)(5)] \div [(4)(2)]</math>. This is not the case and the operations of multiplication and division should be followed, left to right.</b></p>	$(-16)(5) \div (4)(2)$ $= -80 \div 4 \cdot 2$ $= -20 \cdot 2$ $= -40$
<b>Worked Solution</b> (What is wrong here?)		
$(-16)(5) \div (4)(2)$ $= -80 \div 8$ $= -10$		