

## Algebraic Fractions

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### Lesson Summary

Students will use the idea of building up the whole in fractions to solve algebraic expressions. Students will be given and create algebraic expressions to solve, including fractions. The student will use the ideas of how to build up the whole out of parts in order to find the value of the expressions.

### Major Topic and SOL

Math SOL (2009)

5.6, 5.18

### Length of Unit

2-50 minute class periods

### Student Objectives

#### **In Mathematics the student will be able to:**

- solve algebraic expressions consisting of fractions without changing the denominators
- create algebraic expressions consisting of fractions
- apply knowledge of the whole to solve algebraic fraction equations
- use manipulatives to model and demonstrate how to solve problems

#### **In Language the students will be able to:**

- communicate using manipulatives and examples to show how to solve algebraic expressions involving fractions
- exchange and discuss self-created problems with fellow students
- help and discuss strategies of solving problems with classmates

### 21<sup>st</sup> Century Skills

- Critical-thinking and Problem Solving
- Communication
- Creativity and Innovation
- Collaboration
- Information and Media Literacy
- Contextual Learning

## Assessment Evidence

- **Review:** Students will be asked to turn in a paragraph reflection on the activity. This reflection will discuss the concepts covered, what they liked, what they did not like, and what they would change about the activity.
- **Assessment:** Students will turn in their self-created problems and attach partner's solutions to it. Teacher will review questions created by students. Questions must lead into creating an algebraic expression with fractions. Questions must have a few mixed numbers as well as just basic fractions.
  - Informal assessment will also be done by observing and listening to students during the activity to make sure they understand and comprehend the concepts.

## Supplies/Materials/Technology

- **Teacher Material:**
  - Document Camera
  - Projector
  - Sample Equations
- **Student Material:**
  - Circle Fractions
  - Fraction Bars
  - Equations Worksheet
  - Math Notebook
  - Pencils
  - Highlighter

## Lesson Plan

### Motivation & Building Background:

- **Background:**
  - The students have studied algebraic expressions with whole numbers.
  - Students understand how to read, solve, and create algebraic expressions.
  - The students have studied the concepts of fractions. Students have solved addition and subtraction problems with fractions and mixed numbers.
- **Motivation:**
  - The students will be told we are going to take our knowledge of fractions and algebraic expressions and push them to the next level.
  - Students will be asked to share ideas on how we might go about doing this linking it to what they already know.
  - Discuss ideas students have come up with. Debate with the class on whether ideas will work and be possible for the topic being studied.

- Read and discuss objectives of the lesson with class.

### Presentation

- Using the document camera, show class two algebraic expressions using whole numbers. ( $2+X=15$ ,  $39.6-Z= 13.4$ )
  - Ask the students to think about what the question is asking you to find.
  - Have the students write down the solution to the problems in math notebooks.
  - Walk around the class as students are solving the problems to check their responses.
  - Call on two students to tell the class the solution to the problems.
- Again, using the document camera show the class two fraction problems to solve.
  - One problem is addition of fractions and the other is subtraction of fractions. ( $1/4+1/2=$ ,  $3\ 1/2-2\ 2/4=$ )
  - Ask the students to think about what is needed to be done to solve each problem.
    - Remind the students to think about the value of the whole in the solution.
  - Have the students use fraction circles or fraction bars to solve the problem.
  - Students are to write and solve the problem in their math notebooks.
  - Circle the room verifying answers students are putting in their notebooks and methods being used to solve the equations.
  - Call on two students to model using their fraction circles or fraction bars how to solve the problem.
- Ask students for any questions so far.
- Read the following problem to the class.
  - *Tyler needs to finish building his tree house before his birthday party. He has finished  $2/7$  of the tree house structure. How much more work does Tyler need to put into his tree house before he has completed  $5/7$  of the tree house?*
  - Ask the class what the question is asking you to find.
    - (How much does Tyler need to complete before he has finished  $5/7$  of the tree house.)
  - Ask the class how they believe we should write this as an algebraic expression. ( $2/7+T=5/7$ ).
    - Model how this should be written on the document camera.
  - Have students also write this into their math notebooks.
- Now that the expression has been created, tell the class it is time to solve the equation.
  - Ask the students to use their fraction circles or fraction bars to show how they will figure this problem out.
  - Circle the room discussing and watching students as they work.

- Choose a student to show their model on the document camera for everyone to see.
  - (Student shows  $\frac{2}{7}$  and adds 7ths pieces until the fraction shows  $\frac{5}{7}$ )
- Ask students how many pieces were added to create  $\frac{5}{7}$ . (3)
- Tell the students the solution to the problem is  $\frac{3}{7}$ .
- Ask for questions on this problem.
- Next model a harder problem for the students.
  - Read the following to the class.
    - *Fallon loves to bake. She found a new recipe that requires her to use  $1\frac{3}{4}$  cups of flour. She looks in the cabinet and only has  $\frac{1}{2}$  cups of flour. How much more flour does she need before she can follow her recipe?*
  - Allow think time to students.
  - Ask students what is the question asking for
    - (How much flour Fallon needs).
  - Ask the students to write an algebraic expression into their math notebooks for this problem.
  - Circle the room looking at the responses students are putting down.
  - Call on a few students for their ideas ( $1\frac{3}{4}-\frac{1}{2}=F$ ,  $\frac{1}{2}+F=1\frac{3}{4}$ ,  $1\frac{3}{4}-F=\frac{1}{2}$ ).
  - Explain to the students how all three algebraic expressions are correct and can be used.
- Ask students to pick one of the expressions and solve the problem using their manipulatives.
  - Walk around the room discussing and helping students with these problems.
  - Choose a student using  $1\frac{3}{4}-F=\frac{1}{2}$  to show using their model under the document camera.
  - Discuss how the student put down  $1\frac{3}{4}$  pieces and compared them to  $\frac{1}{2}$  to get the solution.
  - Ask the students the answer of the problem ( $1\frac{1}{4}$ ).
  - Discuss with the class how they never changed the denominator.
    - They used the knowledge of the values of each fraction and their models to solve the problem.

### Practice/Application

- Students receive a worksheet of problems to work in pairs to complete.
  - Students will be grouped based on their academic ability.
    - Higher students will be put with lower students to help them as needed.
  - Students are to use their fraction bars or circles to help them solve each problem.

- Allow students time to complete this sheet and then go over each question as modeled with the previous questions.
- Students will then independently create their own algebraic expression fraction problems for partners to solve.
  - Remind students to also use mixed numbers in their problems.
  - Students will be given 15 minutes to create 6 problems for partners to solve.
  - Partners for this activity will also be divided up based on academic ability.
    - Higher level students will switch with higher level students, middle with middle, and lower with lower. This is to make sure students given a fair challenge in the self-created problems being solved.
  - Students will solve the problems given to them from their partner using manipulatives.
  - Students will write out the algebraic expression and discuss how they solved the problems with their partners.
- Once all groups have completed this activity, select students to share their problems and the partners to discuss with the class how they set up the algebraic expression, model solving the problem, and tell the class the solution to the problem.
  - Allow as many students to volunteer as there is time left during the class period.

Name: \_\_\_\_\_

### Algebraic Fractions

Directions: Read each problem. Highlight key words and important information. Write out algebraic expressions that corresponds with the problem. Solve the algebraic expression. Use fraction circles and bars to help solve the problems.

1. Charlie the cat enjoys eating  $\frac{3}{8}$  of the food in his dish for lunch. Before he goes to bed the dish is only  $\frac{1}{16}$  full. How much food did Charlie eat after lunch?
2. Bob takes a nap during the first  $2\frac{1}{2}$  hours of the morning. Bob spends the next few hours playing and eating. Before Bob knows it  $5\frac{3}{4}$  hours have passed. How much time did Bob spend playing and eating?
3. During the workday Barry spends  $\frac{3}{12}$  of his time servicing customers. He has to spend another  $\frac{1}{4}$  of his day putting up reclaim material. How long has Barry worked so far today?
4. Wedding bells are about to ring for Robin. Her mother gave her a budget for how much she could spend on the wedding. Robin spent  $\frac{3}{4}$  of the money on flowers, her dress, and other decorations. If Robin has  $\frac{1}{8}$  of the money left, how much did she spend on the wedding necessities?
5. Jo Ann quilts pocketbooks to sale to various customers. She spends  $\frac{4}{6}$  of her profit made on materials needed to make more pocketbooks. How much money does she have left if she spends another  $\frac{1}{12}$  of the money made on clothes for herself?
6. Tommy likes to run  $3\frac{1}{12}$  miles each evening before eating supper. He has already ran  $2\frac{3}{4}$  miles. How much more does Tommy need to run before eating supper?
7. Crab Tree Falls hike to the top of the falls is  $1\frac{7}{10}$  miles long. Brad has so far hiked  $1\frac{2}{5}$ . How much further does Brad have to go before he makes it to the top?
8. Alex started her day reading a new novel. She started read another  $\frac{3}{8}$  of her novel during a break at work. She has read a total of  $\frac{5}{8}$ s of her novel. How much did Alex read before her break?