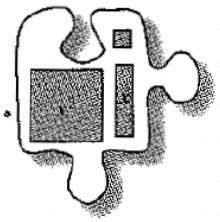
Name: _____

4.3.1 How can I simplify?



Combining Like Terms

Mathematics can be used to describe patterns in the world. Scientists use math to describe various aspects of life, including how cells multiply, how objects move through space, and how chemicals react. Often, when scientists try to describe these patterns, they need to describe something that changes or varies. Scientists call the quantities that change **variables**, and they represent them using letters and symbols.

In this course, you will spend time learning about variables, what they can represent, and how they serve different purposes. To start, you will use variables to describe the dimensions and areas of different shapes. You will begin to organize the descriptions into **algebraic expressions**.

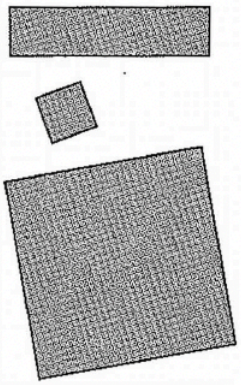
As you work with your teammates, use these questions to help focus your team's discussion:

How can you organize groups of things?

What is the area?

Which lengths can vary?

4-70. AREA OF ALGEBRA TILES



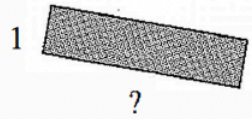
Your teacher will provide your team with a set of algebra tiles. Remove one of each shape from the bag and put it on your desk. Trace around each shape on your paper. Look at the different sides of the shapes.

a. With your team, discuss which shapes have the same side lengths and which ones have different side lengths. Be prepared to share your ideas with the class. On your traced drawings, color-code lengths that are the same.

b. Each type of tile is named for its area. In this course, the smallest square will have a side length of 1 unit, so its area is 1 square unit. This tile will be called "one" or the "unit tile." Can you use the unit tile to find the side lengths of the other rectangles? Why or why not?

c. If the side lengths of a tile can be measured exactly, then the area of the tile can be calculated by multiplying these two lengths together. The area is measured in square units. For example, the tile at right measures 1 unit by 5 units, so it has an area of 5 square units.

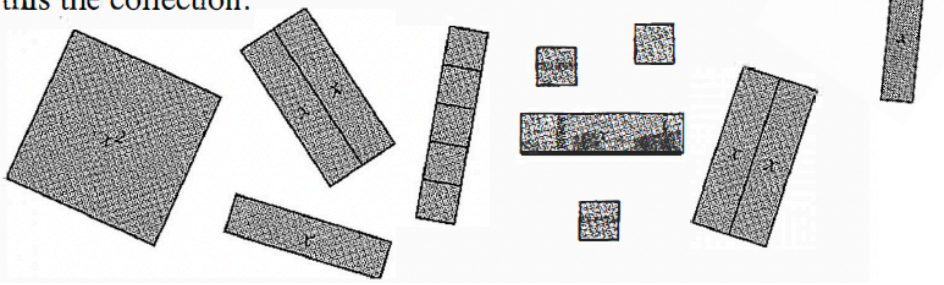
The next tile at right has one side length that is exactly one unit long. If the other side length cannot have a numerical value, what can it be called?



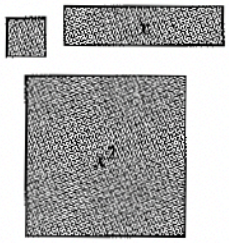
d. If the unknown length is called "x," label the side lengths of each of the four algebra tiles you traced. Find each area and use it to name each tile. Be sure to include the name of the type of units it represents.

4-71. When a collection of algebra tiles is described with mathematical symbols, it is called an **algebraic expression**. Take out the tiles shown in the picture below. Then work with your team to do the following tasks.

- Use mathematical symbols (numbers, variables, and operations) to record the area of this collection of tiles.
- Write at least three different algebraic expressions that represent th area of this tile collection.



4-73. The perimeter of each algebra tile can be also written as an expression using variables and numbers.

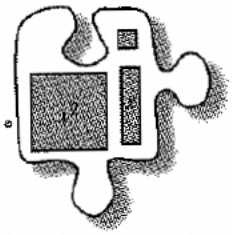


a. Write at least two different expressions for the perimeter of each tile shown at right.

b. Which way of writing the perimeter seems clearest to you? What information can you get from each expression?

Name: _____

4.3.2 How can I group them?



Distributive Property

In Lesson 4.3.1, you used variables to name lengths that could not be precisely measured. Using variables allows you to work with lengths that you do not know exactly. Today you will work with your team to write expressions for the perimeters of different shapes using variables. As you work with your teammates, use these questions to help focus your team's discussion:

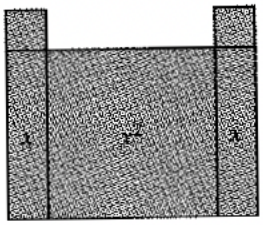
Which lengths can vary?

How can you see the perimeter?

How can you organize groups of things?

4-85. Using algebra tiles on your desk, make the shapes shown below. Trace each shape and label the length of each side on your drawing. With your team, find and record the total perimeter and area for each shape. If possible, write the perimeter in more than one way.

a.



4-86. In problem 4-85, x is a variable that represents a number of units of length. The value of x determines the size of the perimeter and area of the shape.

Using the shapes from problem 4-85, sketch and label each shape with the new lengths given below. Then **evaluate** each expression for the given value of the variable. That is, rewrite the expressions, replacing the variable with the number given, and then simplify them to determine the perimeter and area of each shape.

a. $x = 6$ for figure 4-85a ~~all three shapes~~

b. $x = \frac{1}{2}$ for figure 4-85a ~~all three shapes~~

c. Compare your method for finding perimeter and area with the method your teammates used. Is your method the same as your teammates' methods? If so, is there a different way to find the perimeter and area? Explain the different methods.

4-89. Parentheses in an algebraic expression allow you to show that tiles are grouped together.

a. Build these steps with algebra tiles. Use an x tile to represent "any number."

1. Think of any number.
2. Triple it.
3. Add 1.
4. Multiply by 2.

b. Look at the algebra tiles you used to build the final step of part (a). Write two different algebraic expressions to represent those tiles.

4-91. You have been writing expressions in different ways to mean the same thing. These expressions depend on whether you see tiles grouped (like four sets of $2x+3$ in part (a) of problem 4-90) or whether you see separate tiles (eight x-tiles and 12 unit tiles). These two expressions are equivalent based on a mathematical property called the **Distributive Property**.

Use the Distributive Property to write an equivalent expression for $21x+7$. See if you can do it by visualizing tiles.