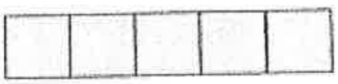
Name ______________________________ Date __________ Period ________

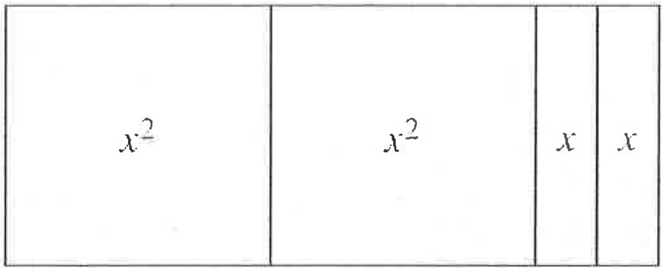
6.2.2 What is area? Introduction to Algebra Tiles

Follow your teacher's directions to label and find the perimeter and area of each of the Algebra tiles.

	Perimeter	Area
		
		
		
		

HOMEWORK:

6-86. On your paper, label the shape made with algebra tiles at right. Then answer the questions below.

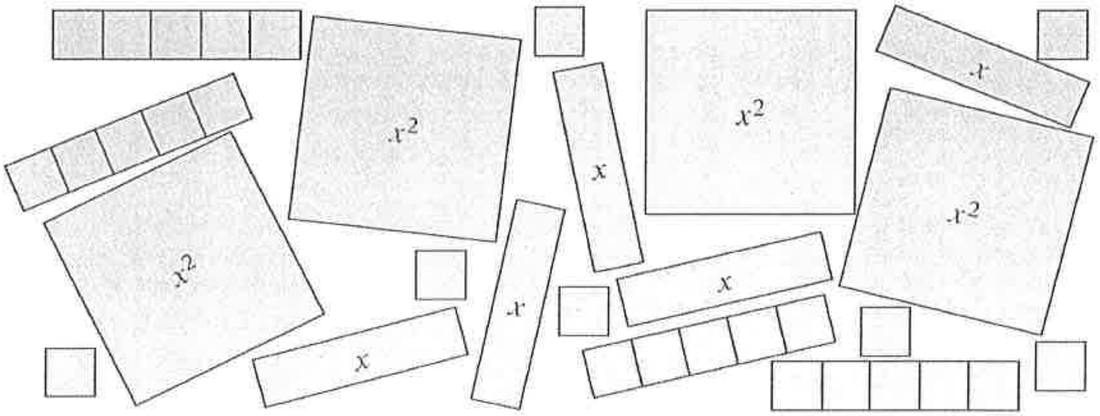


1. Find the area of the shape.

2. If the algebra tiles were rearranged into a different shape, would the area change?

3. Find the perimeter of the shape.
4. If the algebra tiles were rearranged into a different shape, would/could the perimeter change?

6-87 Your team members forgot to clean up their algebra tiles, and now the tiles are all over your desk.



Count the number of each type of tiles:

x^2 –

x –

1's –

5's –

What would you have to do to find the area of all of the tiles?

6-90. There were 25 words on a recent vocabulary test in English class, and Owen got four words wrong. What percent did he get correct?

7.3.1 Why Does It Work?

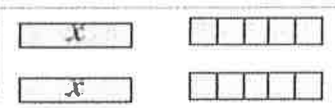
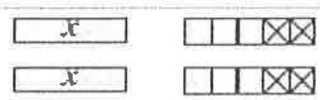
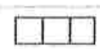
7-79 THE MATHEMATICAL MAGIC TRICK Follow your teacher's directions to answer questions and complete the magic trick.

Steps	Trial 1	Trial 2	Trial 3
1. Pick a number.			
2. Add 5.			
3. Double it.			
4. Subtract 4.			
5. Divide by 2.			
6. Subtract the original number.			

c. Which steps made the number you chose increase? When did the number decrease? What connections do you see between the steps in which the number increased and the steps in which the number decreased?

d. Consider how this trick could be represented with math symbols. To get started, think about different ways to represent just the first step, "Pick a number."

7-80 Now you get to explore why the magic trick from problem 7-79 works.

• • Steps	Trial 1	Trial 2	Trial 3	Algebra Tile Picture
1. Pick a number				
2. Add 5				
3. Double it				
4. Subtract 4				
5. Divide by 2				
6. Subtract the original number				

a. For the second step, "Add 5," what did Shakar do with the tiles?

b. What did Shakar do with his tiles to "Double it"? Explain why that works.

c. How can you tell from Shakar's table that this trick will always end with 3? Explain why the original number does not matter.

7-81 The table below has the steps for a new "magic trick."

A. Pick a number and place it in the top row of the "Trial 1" column. Then follow each of the steps for that number. What was the end result?

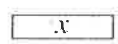
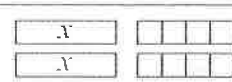
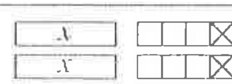
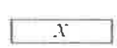
B. Now repeat this process for two new numbers in the "Trial 2" and "Trial 3" columns. Remember to consider trying fractions, decimals, and zero. What do you notice about the end result?

C. Use algebra tiles to see why your observation from part (b) works. Let an *x*-tile represent the number chosen in Step 1 (just as Shakar did in problem 7-80). Then follow the instructions with the tiles. Be sure to draw diagrams on your resource page to show how you built each step.

Steps	Trial 1	Trial 2	Trial 3	Algebra Tile Picture
1. Pick a number.				
2. Add 2.				
3. Multiply by 3.				
4. Subtract 3.				
5. Divide by 3.				
6. Subtract the original number.				

D. Explain how the algebra tiles help show that your conclusion in part (b) will always be true no matter what number you originally select.

7-82 Use words to fill in the steps of the trick like those in the previous tables. Why does this result occur? Use the algebra tiles to help explain this result.

Steps	Trial 1	Trial 2	Trial 3	Algebra Tile Picture
1. Pick a number.				
2.				
3.				
4.				
5.				
6.				

7-83 Inverse Operations

A. What is the inverse operation for addition?

B. What is the inverse operation for multiplication?

C. What is the inverse operation for "Divide by 2"?

D. What is the inverse operation for "Subtract 9"?

7-84 Now you get to explore one more magic trick. For this trick:

- Complete three trials using different numbers. Use at least one fraction or decimal.
- Use algebra tiles to help you analyze the trick, as you did in problem 7-81. Draw the tiles in the table on the resource page.

Steps	Trial 1	Trial 2	Trial 3	Algebra Tile Picture
1. Pick a number.				
2. Double it.				
3. Add 4.				
4. Multiply by 2.				
5. Divide by 4.				
6. Subtract the original number.				

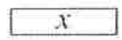
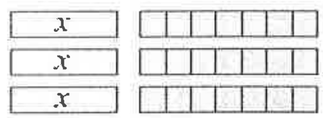
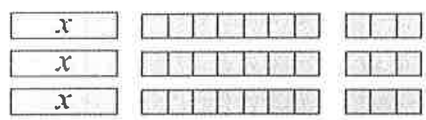
- What are two pairs of inverse operations that are "undoing" each other? Identify the steps and the operations.

  1.

  2.

7.3.2 How Can I Write It?

7-91 Today you will consider a more complex math magic trick. The table you use to record your steps will have only two trials, but it will add a new column to represent the algebra tiles with an algebraic expression.

Steps	Trial 1	Trial 2	Algebra Tile Picture	Algebraic Expression
1. Pick a number.				
2. Add 7.				
3. Triple the result.				
4. Add 9.				
5. Divide by 3.				
6. Subtract the original number.				

7-92 For this number trick, the steps and trials are left for you to complete by using the algebraic expressions.

1. Describe Steps 1, 2, and 3 in words.
2. Look at the algebra tiles you used to build Step 3. Write a different expression to represent those tiles.
3. What tiles do you have to add to build Step 4? Complete Steps 4, 5, and 6 in the chart.
4. Complete two trials and record them in the chart.

Steps (words)	Trial 1	Trial 2	Algebraic Expression	Tiles
1.			x	
2.			$x + 4$	
3.			$2(x + 4)$	
4.			$2x + 20$	
5.			$x + 10$	
6.			10	

7-93 In Step 3 of the last magic trick (problem 7-92) you rewrote the expression $2(x + 4)$ as $2x + 8$.

- Can all expressions like $2(x + 4)$ be rewritten without parentheses? For example, can $3(x + 5)$ be rewritten without parentheses?

- Build $3(x + 5)$ with tiles and write another expression to represent it. Does this work for all expressions?

7-94 Diana, Sam, and Elliot were working on two different mathematical magic tricks shown below. Compare the steps in their magic tricks. You may want to build the steps with algebra tiles.

Magic Trick A

Steps (words)		Algebraic Expression	Tiles
1.			
2.			
3.			

Magic Trick B

Steps (words)		Algebraic Expression	Tiles
1.			
2.			
3.			

a. Each student had completed one of the tricks. After the third step, Diana had written $2x + 6$, Sam had written $2(x + 3)$, and Elliot had written $2x + 3$. Which expression(s) are valid for Magic Trick A? Which one(s) are valid for Magic Trick B? How do you know? Use tiles, sketches, numbers, and reasons to explain your thinking.

b. How are the steps and results of the two magic tricks different? How can this difference be seen in the expression used to represent each trick?

7-95 Parentheses allow us to consider the number of groups of tiles that are present. For example, when the group of tiles $x + 3$ in problem 7-94 is doubled in Magic Trick A, the result can be written: $2(x + 3)$. However, sometimes it is more efficient to write the result as $2x + 6$ instead of $2(x + 3)$. You may remember this as an application of the Distributive Property that you first learned about in Chapter 2, only now with variables instead of just numbers.

A. Show at least two ways to write the result of these steps:

1. Pick a number.
2. Add 5.
3. Multiply by 3.

B. Write three steps that will result in $4(x + 2)$. How can the result be written so that there are no parentheses?

HOMEWORK

7-96. Complete two trials by reading the algebraic expressions. Write in the steps.

Steps	Trial 1	Trial 2	Algebraic Expression
1.			x
2.			$6x$
3.			$6x + 24$
4.			$6x + 18$
5.			$x + 3$
6.			3

7-97. Translate each of these situations into a variable expression such as those found in a magic number chart.

1. Pick a number and multiply it by 7.
2. Pick a number and divide it by 8.
3. Pick a number and reduce it by 10.
4. Pick a number, add 2, then multiply by 5.

7-100. For each of the following pairs of fractions, complete the fraction on the right so that the two fractions are equivalent. Using a Giant One might be helpful.

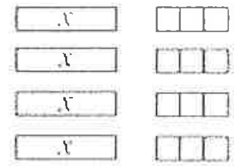
1. $\frac{15}{20} = \frac{\square}{4}$

2. $\frac{8}{40} = \frac{\square}{5}$

3. $\frac{30}{35} = \frac{6}{\square}$

7.3.3 How Can I Talk About It?

7-101 At right is an algebra tile drawing that shows the result of the first three steps of a number trick.



a. What are three possible steps that led to this drawing?

b. Use a variable to write at least two expressions that represent the tiles in this problem. Write your expressions so that one of them contains parentheses.

c. If the next step in the trick is "Divide by 2," what should the simplified drawing and two algebraic expressions look like?

7-102

a. Below are four steps of a math magic trick. Write the result of the steps in two different ways. Build it with tiles if it helps you.

1. Pick a number.		
2. Triple it.		
3. Add 1.		
4. Multiply by 2.		

b. Write $4(2x + 3)$ in another way.

c. Build $9x + 3$ with algebra tiles. How many groups can you divide the tiles into evenly? Write the expression two ways, one with parentheses and one without.

d. Build $15x + 10$ with tiles and write the expression another way.

7-103

a. $6(8+x)$

b. $12x + 4$

c. $21x + 14$

d. $18 + 12x$

e. Now, write the following number trick as two different expressions.

1. Pick a number.
2. Multiply by 4.
3. Add 7.
4. Multiply by 3.

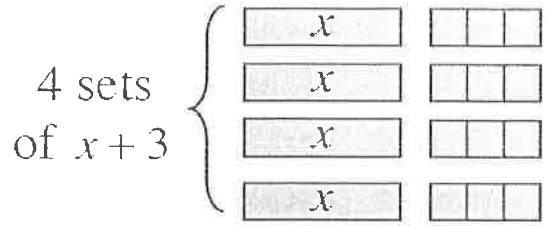
The following information will be helpful as we continue our study of variables:

Distributive Property with Variables

Remember that the **Distributive Property** states that multiplication can be "distributed" as a multiplier of each term in a sum or difference. Symbolically, this can be written as:

$a(b + c) = ab + ac$ and $a(b - c) = ab - ac$

- For example, the collection of tiles at right can be represented as 4 sets of $x + 3$, written as $4(x + 3)$. It can also be represented by 4 x-tiles and 12 unit tiles, written as $4x + 12$.



$$4(x + 3) = 4x + 12$$

Math Vocabulary

Variable: A letter or symbol that represents one or more numbers.

Expression: A combination of numbers, variables, and operation symbols. For example, $2x + 3(5 - 2x) + 8$. Also, $5 - 2x$ is a smaller expression within the larger expression.

Term: Parts of the expression separated by addition and subtraction. For example, in the expression $2x + 3(5 - 2x) + 8$, the three terms are 2x, $3(5 - 2x)$, and 8. The expression $5 - 2x$ has two terms, 5 and $-2x$.

Coefficient: The numerical part of a term. In the expression $2x + 3(5 - 2x) + 8$, for example, 2 is the coefficient of $2x$. In the expression $7x - 15x^2$, both 7 and 15 are coefficients.

Constant: A number that is not multiplied by a variable. In the expression $2x + 3(5 - 2x) + 8$, the number 8 is a constant term. The number 3 is not a constant term, because it is multiplied by a variable inside the parentheses.

Factor: Part of a multiplication expression. In the expression $3(5 - 2x)$, 3 and $5 - 2x$ are factors.