Student Activity: Perimeter of Rectangles

Overview: Students investigate linear relationships using concrete models, tables, diagrams, written descriptions, and algebraic forms.

Objective: **Algebra I TEKS**
(b.1) The student understands that a function represents a dependence of one quantity on another and can be described a variety of ways.
(b.3) The student understands algebra as the mathematics of generalization and recognizes the power of symbols to represent situations.

Terms: function, independent variable, dependent variable, pattern

Materials: color tiles, graphing calculator

Procedures: Students should be seated in groups of 3 – 4.

Activity : Perimeter of Rectangles
Do the activity together as a whole group, bringing out the following points and asking the indicated questions.

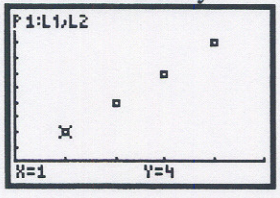
1. Encourage students to write how they found the number of perimeter in the process column. This can often be done in several ways, which will lead to different, yet equivalent algebraic expressions. This is a desired outcome. Possible equivalent expression include:

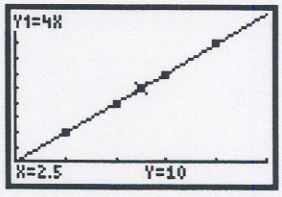
Sample Process
$1+1+1+1$
$2+2+2+2$
$3+3+3+3$
$n+n+n+n$

Sample Process
$4(1)$
$4(2)$
$4(3)$
$4n$

Sample Process

2. Justify: The variable x stands for the figure number and $x$min=0 to $x$max=5 shows the figures 1 – 4 nicely.
   The variable y stands for the perimeter and $y$min= −2 to $y$max=20 shows the perimeters of 4 to 18 nicely.





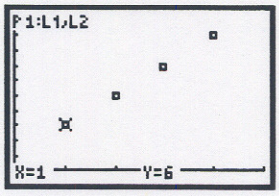
3. The perimeter of figure 11 is 44. $4(11) = 44$
4. Figure 12 has a perimeter of 48. $4n = 48$

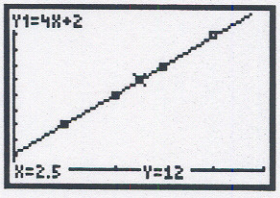
Ask students to use the tiles to physically demonstrate the algebraic rules they found in the table. In this example, they will mainly be pointing to sides on the tiles and relating them to the numbers in the process column.

5.

Sample Process	*Sample Process*	*Sample Process*
$2+1+2+1$	$2(2)+2(1)$	$4(1)+2$
$3+2+3+2$	$2(3)+2(2)$	$4(2)+2$
$4+3+4+3$	$2(4)+2(3)$	$4(3)+2$
$(n+1)+n+(n+1)+n$	$2(n+1)+2(n)$	$4(n)+2$

6.





7. Figure 11 has a perimeter of 46. $4(11)+2=46$.
8. Figure 13 has a perimeter of 54. $4n+2=54$.

Ask students to use the tiles to physically demonstrate the algebraic rules they found in the table. For example, the rule in the first column above is simply adding each side in order. The rule in the second column above is noting that there are two sides of length n+1 and two sides of length n. The rule in the third column above is based on the idea of adding two additional sides to a square of side n.

Ask students to compare the rules, $P=4n$ and $P=4n+2$, and their respective graphs. Note that the lines have the same slope but that the line $P=4n+2$ is the line $P=4n$ shifted up two. The perimeters grow by the same amount each time you change figure numbers by one, but $P=4n+2$ starts 2 higher than $P=4n$.

Summary

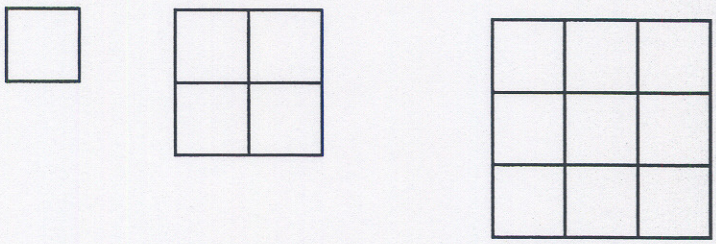
Using multiple representations, students gain added understanding for the linear relationship of a rectangle's perimeter and the length of a side.

Student Activity: Perimeter of Rectangles

Build these squares and the next three squares in the sequence, using color tiles.

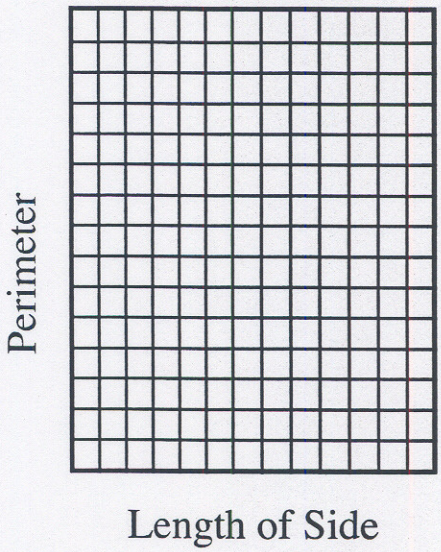
Figure number **1,** **2,** **3**

Figure



1. Complete the table, using the process column to write a function for figure n, and graph the relation.

Figure Number (length of side)	Process	Perimeter
1		
2		
3		
4		
5		
n		



2. On your graphing calculator, make a scatter plot. Graph the function over the scatter plot to confirm. Justify your window choice.

Answer the questions and write the equation that represents the question:

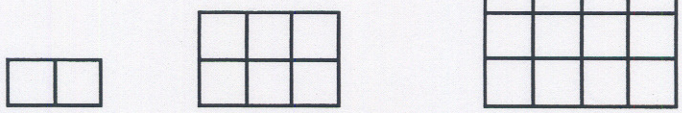
3. What is the perimeter of figure number 11?

4. What figure number has a perimeter of 48?

Build these rectangles and the next three rectangles in the sequence, using color tiles.

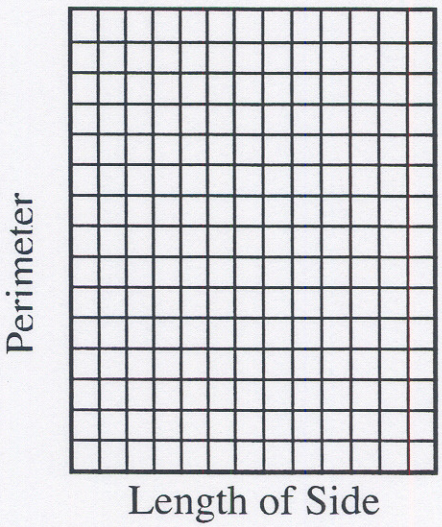
Figure number **1,** **2,** **3**

Figure



5. Complete the table, using the process column to write a function for perimeter of the *n*th figure, and graph the relation.

Figure Number (length of side)	Process	Perimeter
1		
2		
3		
4		
5		
n		



6. On your graphing calculator, make a scatter plot. Graph the function over the scatter plot to confirm.
   Justify your window choice:

Answer the questions and write the equation that represents the question:

7. What is the perimeter of figure number 11?

8. What figure number has a perimeter of 54?