Grade 6- Additive versus Multiplicative Relationships

6(4)(A) **Proportionality.** The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to compare two rules verbally, numerically, graphically, and symbolically in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships.

6(5)(A) **Proportionality.** The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to represent mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions.

Materials:

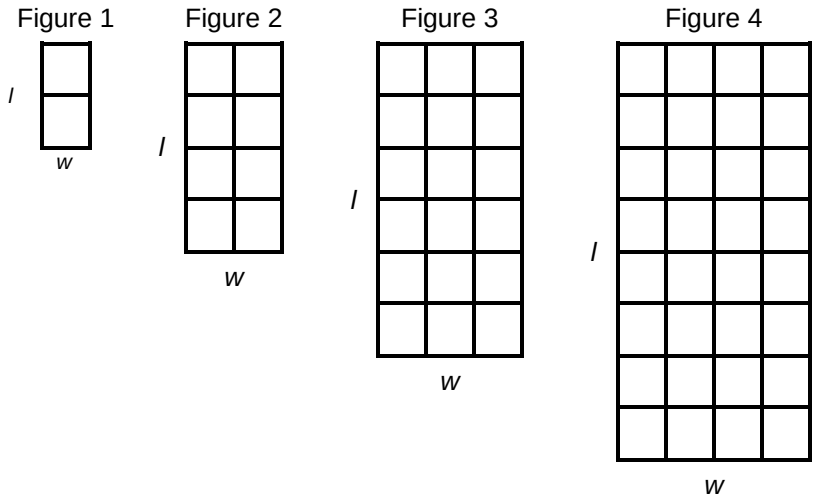
- **Additive versus Multiplicative Relationships** – one per group of two
- Colored Tiles – approximately 25 tiles per group of two

Additive Versus Multiplicative Relationships

- With a partner, determine who will be partner A and who will be partner B.
- Partner A completes **Activity A**. Partner B completes **Activity B**.
- Color tiles are provided to build the figures.

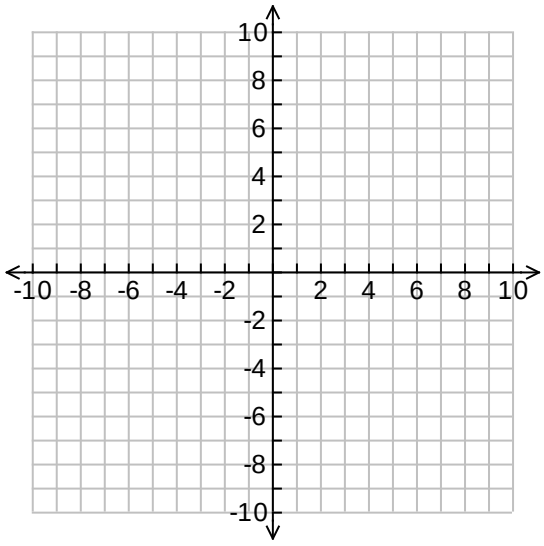
Activity A

1. What is the relationship between the length and width of this "family" of rectangles?



2. Use the relationship between the width and the length to complete the table and the graph.

Width x	Sketch	Length y
1		
2		
3		
4		
5		
x		



3. Based on your graph, if you were to continue the pattern, what ordered pair represents the length of a rectangle with a width of zero?

4. Does the ordered pair make sense in this situation? Why or why not?

5. Write an equation that could be used to determine y, the length of the rectangle, given x, the width of a rectangle, in this "family."

6. With your partner, compare and contrast the two "families of rectangles." How are the graphs, tables, and equations similar and different?

Additive Versus Multiplicative Relationships

- With a partner, determine who will be partner A and who will be partner B.
- Partner A completes **Activity A**. Partner B completes **Activity B**.
- Color tiles are provided to build the figures.

Activity B

1. What is the relationship between the length and the width of this "family" of rectangles?

Figure 1

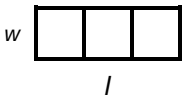


Figure 2

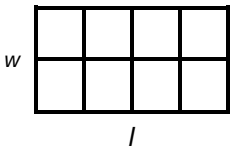


Figure 3

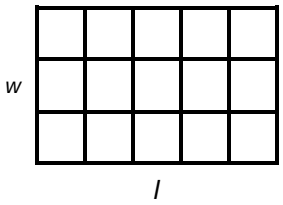
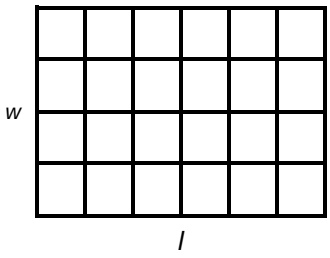
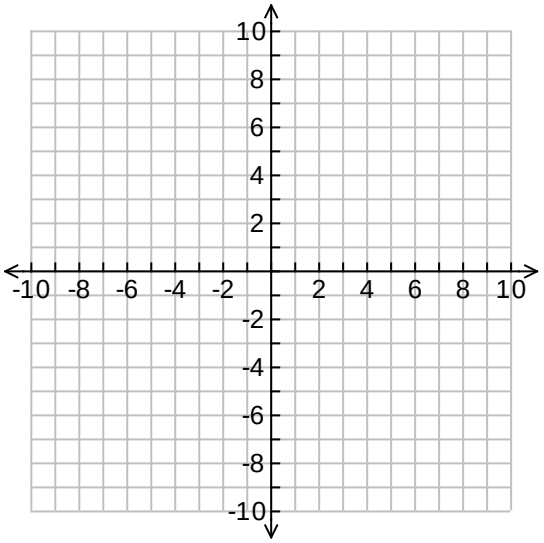


Figure 4



2. Use the relationship between the width and the length to complete the table and the graph.

Width *x*	Sketch	Length *y*
1		
2		
3		
4		
5		
x		



3. Based on your graph, if you were to continue the pattern, what ordered pair represents the length of a rectangle with a width of zero?

4. Does the ordered pair make sense in this situation? Why or why not?

5. Write an equation that could be used to determine *y*, the length of the rectangle, given *x*, the width of a rectangle, in this "family."

6. With your partner, compare and contrast the two "families of rectangles." How are the graphs, tables, and equations similar and different?

Answer key:

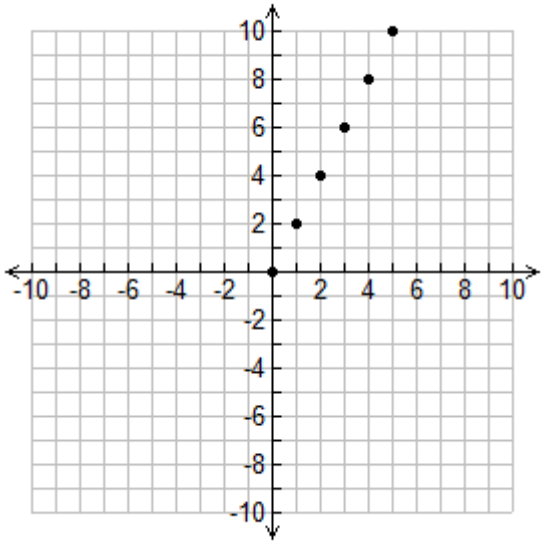
Additive Versus Multiplicative Relationships

Activity A

1. What is the relationship between the length and width of this "family" of rectangles?
   The length of each rectangle is two times the width.

2. Use the relationship between the width and the length to complete the table and the graph.

Width *x*	Length *y*
1	**2**
2	**4**
3	**6**
4	**8**
5	**10**



3. Based on your graph, if you were to continue the pattern, what ordered pair represents the length of a rectangle with a width of zero? **(0,0)**

4. Does the ordered pair make sense in this situation? Why or why not? **Yes, because if a rectangle does not have a width, then it cannot have a length.**

5. Write an equation that could be used to determine *y*, the length of the rectangle, given *x*, the width of a rectangle, in this "family." ***y* = 2*x*.**

6. With your partner, compare and contrast the two "families of rectangles." How are the graphs, tables, and equations similar and different?
   In both rules, the data points on the graph form a straight line.

   Rule A**:**
   2*x* The origin is represented in the table and in the graph.

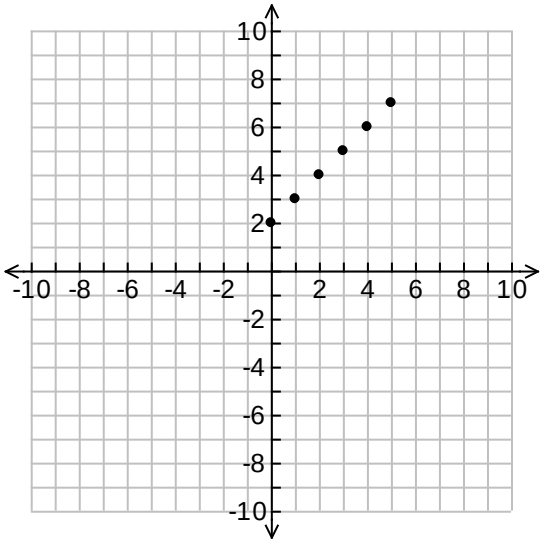
   Rule B**:**
   ***x* + 2 The origin is not represented in the table and the graph.**

Activity B

1. What is the relationship between the length and width of this "family" of rectangles?
   The length of each rectangle is two more than the width of each rectangle.

2. Use the relationship between the width and the length to complete the table and the graph.
   Note: In context, (0, 2) does not make sense; however, having this conversation with students prepares them to think about what numbers may work in context.

Width *x*	Length *y*
1	**3**
2	**4**
3	**5**
4	**6**
5	**7**



3 Based on your graph, if you were to continue the pattern, what ordered pair represents the length of a rectangle with a width of zero? **(0, 2)**

4. Does the ordered pair make sense in this situation? Why or why not? **No, because a rectangle that has a width of zero cannot have a length of two.**

5. Write an equation that could be used to determine *y*, the length of the rectangle, given *x*, the width of a rectangle, in this "family."
   ***y* = *x* + 2**

6. With your partner, compare and contrast the two "families of rectangles." How are the graphs, tables, and equations similar and different?
   In both rules, the data points on the graph form a straight line.

   Rule A:
   2x The origin is represented in the table and in the graph.

   Rule B:
   x + 2 The origin is not represented in the table and the graph.