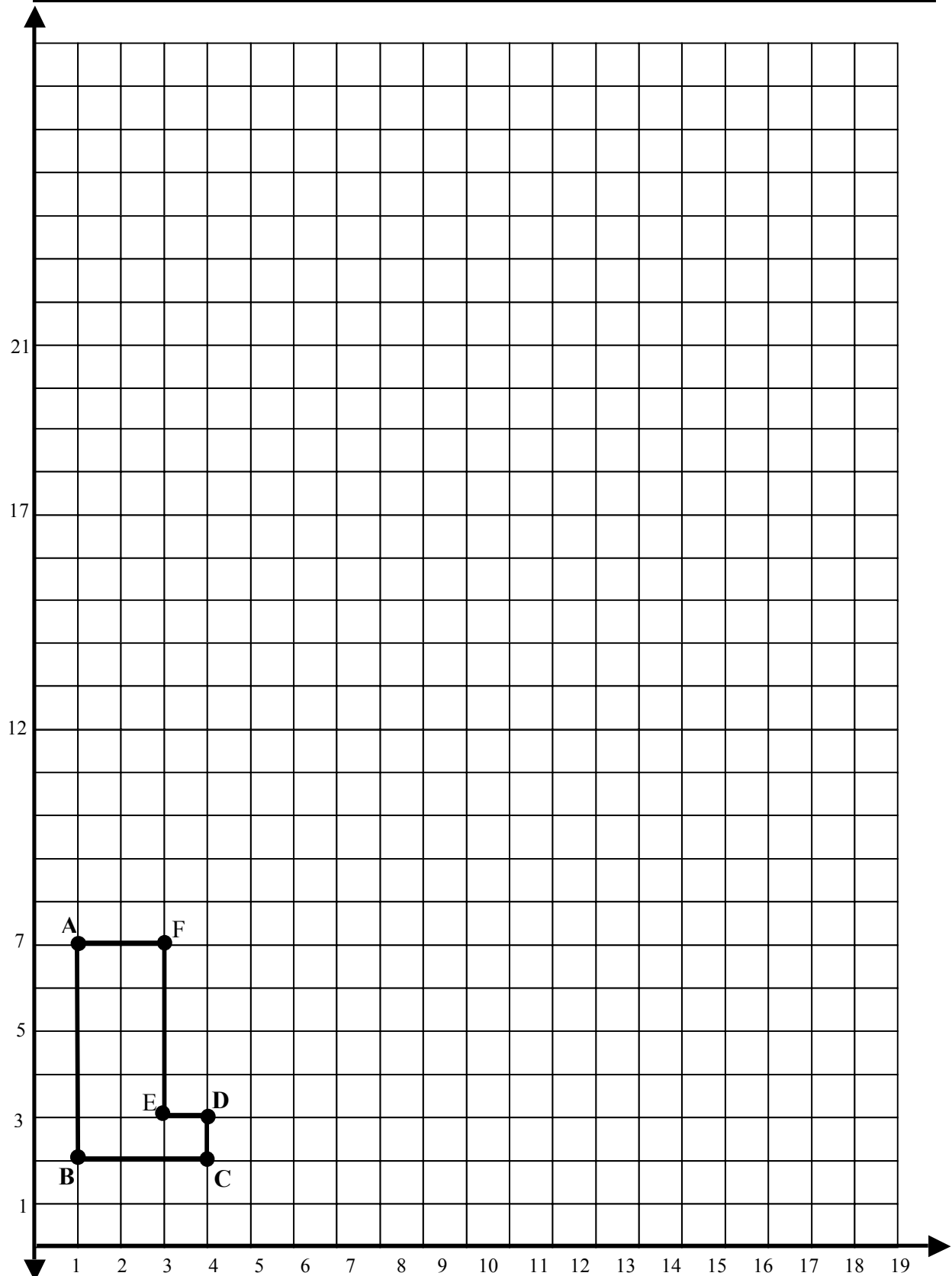


TASK 1.3.4: CHANGING PERIMETERS X AND Y — STUDENT ACTIVITY

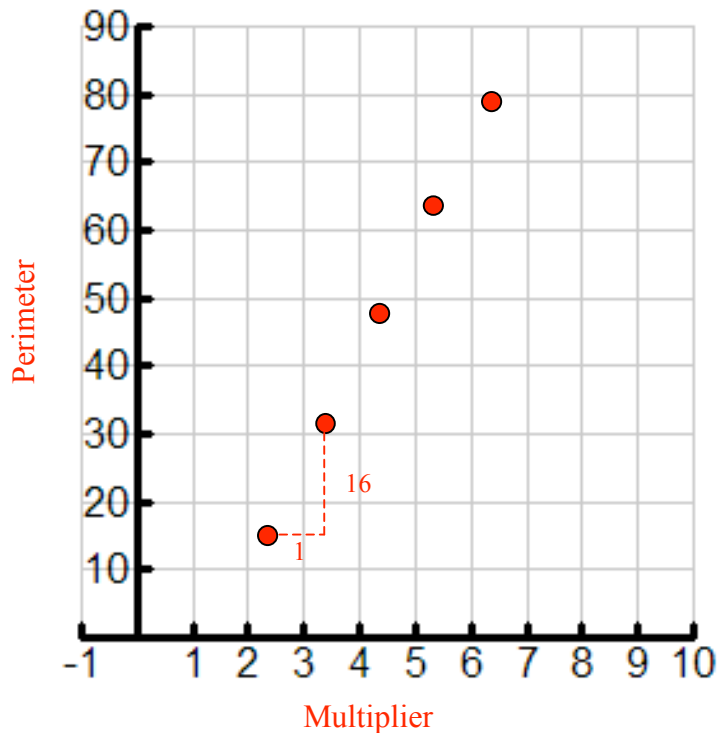
Task 1.3.4: Changing Perimeters x and y —Student Activity**Changes in the x - and y -coordinates**

Segment lengths	AB	BC	CD	DE	EF	FA	Perimeter
Original lengths	5	3	1	1	4	2	16
When the x - and y -coordinates are multiplied by 2	10	6	2	2	8	4	32
When the x - and y -coordinates are multiplied by 3	15	9	3	3	12	6	48
When the x - and y -coordinates are multiplied by 4	20	12	4	4	16	8	64
When the x - and y -coordinates are multiplied by 5	25	15	5	5	20	10	80

1. Record the lengths and perimeter of polygon ABCDEF (Figure 1) in the table.
2. Multiply each x - and y -coordinate of the vertices in Figure 1 by 2. Using a colored pencil, draw the new figure (Figure 2). Determine the side lengths and perimeter of Figure 2 and enter them in the table.
3. Multiply each original x - and y -coordinate of the vertices in Figure 1 by 3. Using a different colored pencil, draw the new figure (Figure 3). Determine the side lengths and perimeter of Figure 3 and enter them in the table.
4. Multiply each original x - and y -coordinate of the vertices in Figure 1 by 4. Using a different colored pencil, draw the new figure (Figure 4). Determine the side lengths and perimeter of Figure 4 and enter them in the table.
5. Multiply each original x - and y -coordinate of the vertices in Figure 1 by 5. Without drawing the new figure, determine its perimeter. Enter the perimeter in the table.

Algebra I: Strand 1. Foundations of Functions; Topic 3. Changing Perimeter; Task 1.3.4

6. On the grid, provided create a scatter plot of perimeter vs. x and y -multiplier. Label the axes.



7. Describe the functional relationship and include a reasonable range and domain.
The perimeter depends on the multiplier. For this specific data, the domain is the set of integers from 1 to 5 and the range is 16, 32, 48, 64, 80.
8. How is the perimeter changing? Make a generalization about the growth of the perimeter when x and y coordinates are both multiplied by the same factor.
Each time the x and y coordinates are multiplied, the perimeter grows by 16 units. Thus the multiplier becomes a scale factor for the growth of the polygon.
9. Use your drawings to show how the perimeter is changing.
Answers may vary, check drawings.
10. Use the table to show how the perimeter is changing.
See table.
11. Show on the scatter plot how you see the perimeter changing.
See graph.
12. What would happen if the x - y -multiplier were zero?
If both x and y were multiplied by 0, the perimeter would be 0 and the coordinate point $(0, 0)$ would be on the graph.
13. Create an algebraic expression that shows the pattern of the perimeter growing.
 $y = 16x$

14. If the perimeter were 144 what would the x- and y-multiplier be? How did you determine this?

Using $y = 16x$ and substituting 144 (an output value) for y then solving. You can also use the table function on the calculator to find the corresponding value for x when y is 144. By using the trace feature on the graphing calculator, and tracing to a range of 144 to determine the corresponding x value. The x value (the multiplier) would be 9.

15. If the x-y-multiplier were 14 what would the perimeter be? How did you determine this?

Fourteen is an input value. You can use the table function on the calculator, or the trace feature to find the corresponding range value for a domain value of 14. You can substitute 14 into the function rule $y = 16x$ to determine the perimeter. The perimeter would be 224 units.

16. Did doubling the x and y values create a dilation? Explain.

A dilation occurs when all the dimensions of a figure are increased by the same scale factor. By multiplying both the x and y coordinates by the same value, all the dimensions of the figure increase at the same rate. The multiplier works as a scale factor and creates a similar enlarged figure.

17. Is this a proportional situation? Explain. This is a proportional situation. The multiplier

works as the constant of proportionality. Ex. $\frac{5}{16} = \frac{AB}{48}$, $\frac{9}{Perimeter} = \frac{15}{80}$. The

function rule is in the form $y = kx$ and a graph of the function rule is a linear line passing through the origin. The $\Delta x/\Delta y$ is the same as x/y .

Teaching notes

Dilations are included in the 8th grade TEKS, however students may not have significant exposure and hands-on experiences to understand the concept. As an introduction to this activity, the teacher may need to review dilations.

Note in this instance the use of x and y to indicate coordinates and also in the algebraic expression to indicate perimeter and multiplier. The use of the same symbols for different objects can easily confuse students who are not comfortable with abstraction or not precise in identifying the objects in question. One tool to use to help differentiate these differences is the set of two graphs, the first one with the polygon, the second one with the perimeter and multiplier relationship.

Technology notes

Refer to the activity “Stacking Hexagons” for detailed technology notes on using the graphing calculator to find the $\Delta L1/\Delta L2$ as well as $L1/L2$.

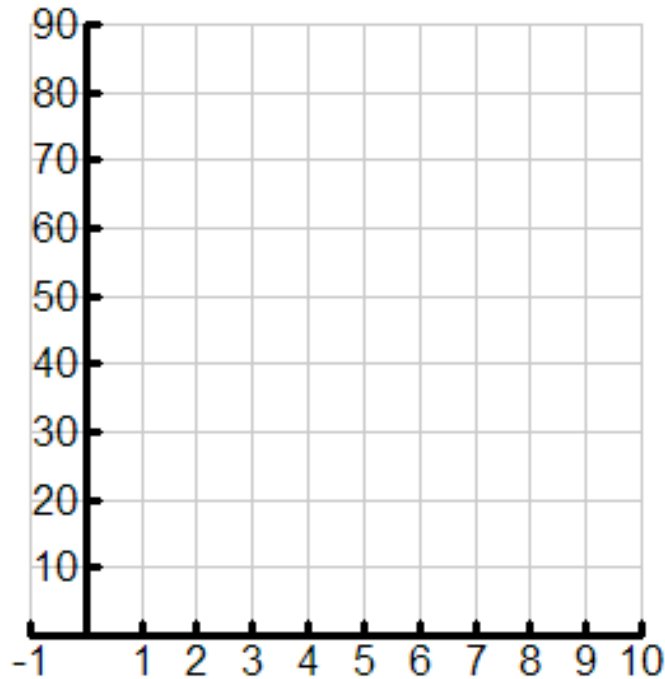
TASK 1.3.4: CHANGING PERIMETERS X AND Y — STUDENT ACTIVITY**Changes in the x - and y -coordinates**

Segment lengths							Perimeter
Original							
When the y -coordinates are multiplied by 2							
When the y -coordinates are multiplied by 3							
When the y -coordinates are multiplied by 4							
When the y -coordinates are multiplied by 5							

- Record the lengths and perimeter of polygon ABCDEF (Figure 1) in the table.
- Multiply each x and y coordinate of the vertices in Figure 1 by 2. Using a colored pencil, draw the new figure (Figure 2). Determine the side lengths and perimeter of Figure 2 and enter them in the table.
- Multiply each original x and y coordinate of the vertices in Figure 1 by 3. Using a different colored pencil, draw the new figure (Figure 3). Determine the side lengths and perimeter of Figure 3 and enter them in the table.
- Multiply each original x and y coordinate of the vertices in Figure 1 by 4. Using a different colored pencil, draw the new figure (Figure 4). Determine the side lengths and perimeter of Figure 4 and enter them in the table.
- Multiply each original x and y coordinate of the vertices in Figure 1 by 5. Without drawing the new figure, determine its perimeter. Enter the perimeter in the table.

Algebra I: Strand 1. Foundations of Functions; Topic 3. Changing Perimeter; Task 1.3.4

6. On the grid provided, create a scatter plot of perimeter vs. x and y -multiplier. Label the axes.



7. Describe the functional relationship and include a reasonable range and domain.
8. How is the perimeter changing? Make a generalization about the growth of the perimeter when the values of x and y are both multiplied by the same factor.
9. Use your drawings to show how the perimeter is changing.
10. Use the table to show how the perimeter is changing.
11. Show on the scatter plot how you see the perimeter changing.
12. What would happen if the x - and y -multiplier were zero?
13. Create an algebraic expression that shows the pattern of the perimeter growing.
14. If the perimeter were 144 what would the x -multiplier be? How did you determine this?
15. If the x - y -multiplier were 14 what would the perimeter be? How did you determine this?
16. Did doubling the x and y values create a dilation? Explain.
17. Is this a proportional situation? Explain.