

8.3

Dog Run

Comparing Linear and Quadratic Functions

Objectives

In this lesson, you will:

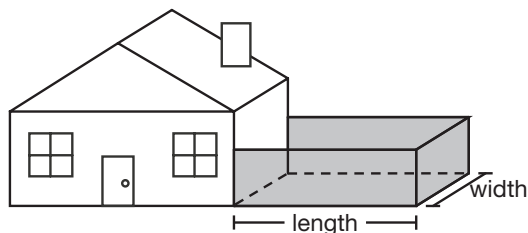
- Use linear and quadratic functions to model a situation.
- Determine the effect on the area of a rectangle when its length or width doubles.

Key Terms

- linear function
- quadratic function



SCENARIO Two dog owners have 16 yards of fencing to build a dog run beside their house. The dog owners want the run to be in the shape of a rectangle, and they want to use the side of their house as one side of the dog run. A rough sketch of what they have in mind is shown below.



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Problem 1 Deciding on the Dimensions



- A. Suppose that the width of the dog run is 2 yards. Find the length of the dog run and the area of the dog run. Show all your work and use a complete sentence in your answer.
- B. Suppose that the width of the dog run is 4 yards. Find the length of the dog run and the area of the dog run. Show all your work and use a complete sentence in your answer.
- C. Suppose that the width of the dog run is 7 yards. Find the length of the dog run and the area of the dog run. Show all your work and use a complete sentence in your answer.
- D. Suppose that the width of the dog run is 8 yards. Find the length of the dog run and the area of the dog run. Show all your work and use a complete sentence in your answer.

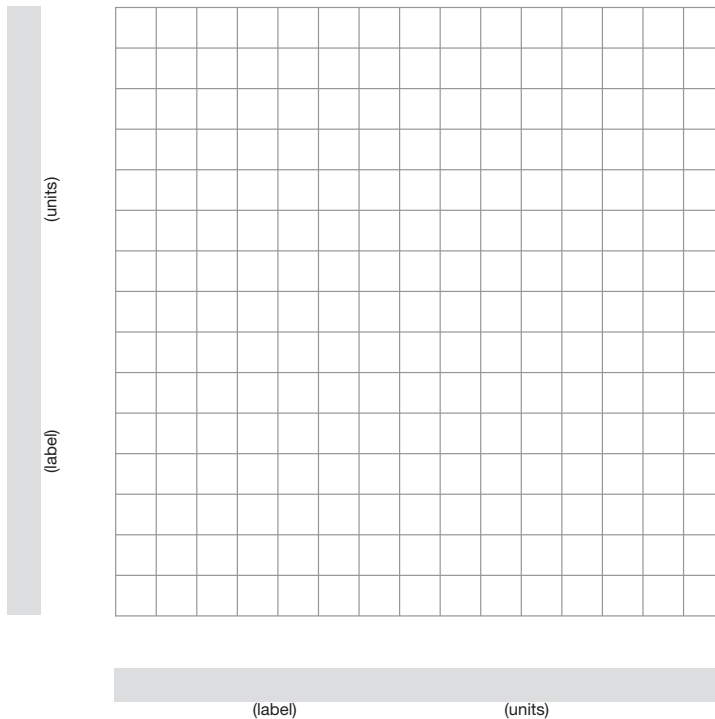
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Width	Area
yards	square yards

Investigate Problem 1

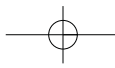
8. Create a graph that shows the area as a function of the width on the grid below. First, choose your bounds and intervals. Be sure to label your graph clearly.

Variable quantity	Lower bound	Upper bound	Interval



9. What kind of function is represented by the graph in Question 8? How do you know? Use a complete sentence in your answer.

10. Determine the x-intercepts of each graph. What is the meaning of each x-intercept in the problem situation? Use complete sentences in your answer.



Investigate Problem 1

11. How many x -intercepts can the graph of a linear function have? Use complete sentences to explain your reasoning.
12. How many x -intercepts can the graph of a quadratic function have? Use complete sentences to explain your reasoning.
13. Determine the y -intercepts of each graph. What is the meaning of each y -intercept in the problem situation? Use complete sentences in your answer.
14. Describe the rates of change for each graph. Use complete sentences in your answer.
15. What is the greatest possible area? What are the length and width of the dog run with the greatest possible area? Use complete sentences to explain how you found your answer.

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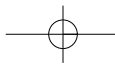
Problem 2 A Change in Plans

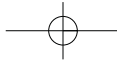


The owners read about a sale on the same exact fencing that they already have and decide to buy an additional 16 yards of fencing.



- A. How many yards of fencing do they have now? Use a complete sentence in your answer.





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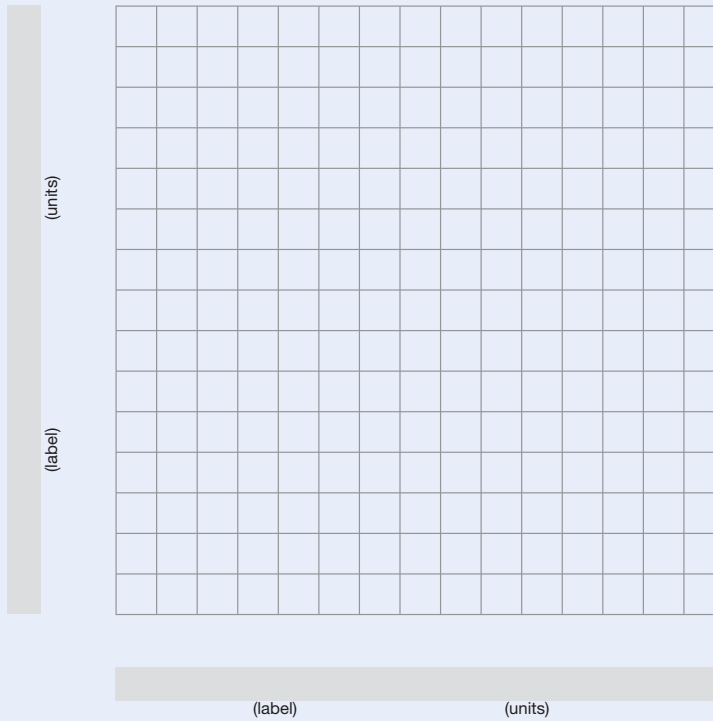
Problem 2 A Change in Plans

B. Complete the table below to show different widths, lengths, and areas that can be made with the new amount of fencing.

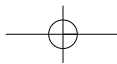
Width	Length	Area
yards	yards	square yards
0		
8		
16		
24		
32		

C. Create a graph that shows the length as a function of the width on the grid below. First, determine your bounds and intervals. Be sure to label your graph clearly.

Variable quantity	Lower bound	Upper bound	Interval



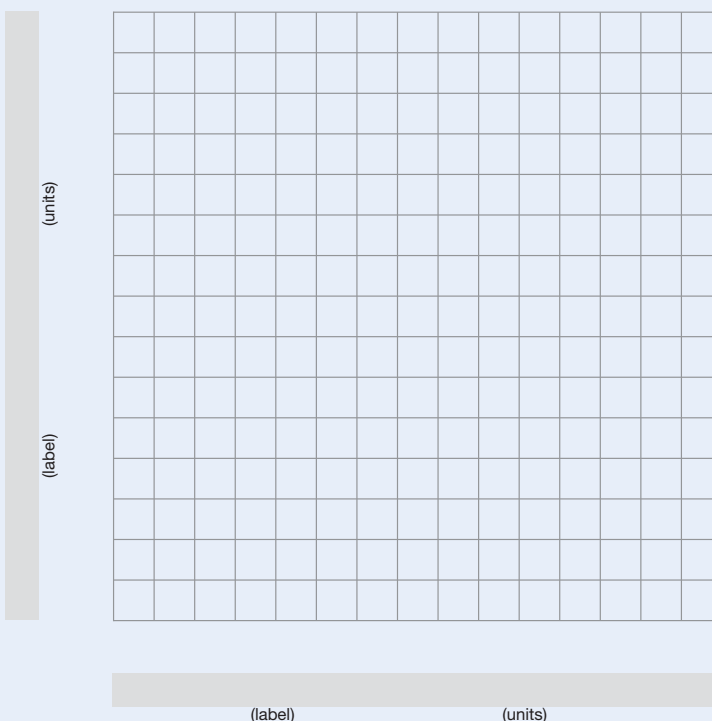
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Problem 2 A Change in Plans

D. Create a graph that shows the area as a function of the width on the grid below. First, choose your bounds and intervals. Be sure to label your graph clearly.

Variable quantity	Lower bound	Upper bound	Interval

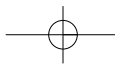


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Investigate Problem 2

- Describe the rates of change for each of the graphs. Use complete sentences in your answer.
- What are the x - and y -intercepts of the graph of the linear function? What is their meaning in this problem situation? Use complete sentences in your answer.



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Investigate Problem 2

3. What are the x - and y -intercepts of the graph of the quadratic function? What is their meaning in the problem situation? Use complete sentences in your answer.

4. What is the greatest possible area? What are the length and width of the dog run with the greatest possible area? Use a complete sentence to explain how you found your answer.

5. How does the amount of fencing the owners have now compare to the amount of fencing the owners had in Problem 1? Use a complete sentence in your answer.

6. How do the length and width of the dog run with the greatest possible area in this problem compare to the length and width of the dog run with the greatest possible area in Problem 1? Use a complete sentence in your answer.

7. How do the greatest possible areas in this problem and Problem 1 compare?

8. Use complete sentences to explain why the difference in the areas is more than the differences in the lengths and widths.

