Warm-up: Write a function that represents the area of the bottom of the box.
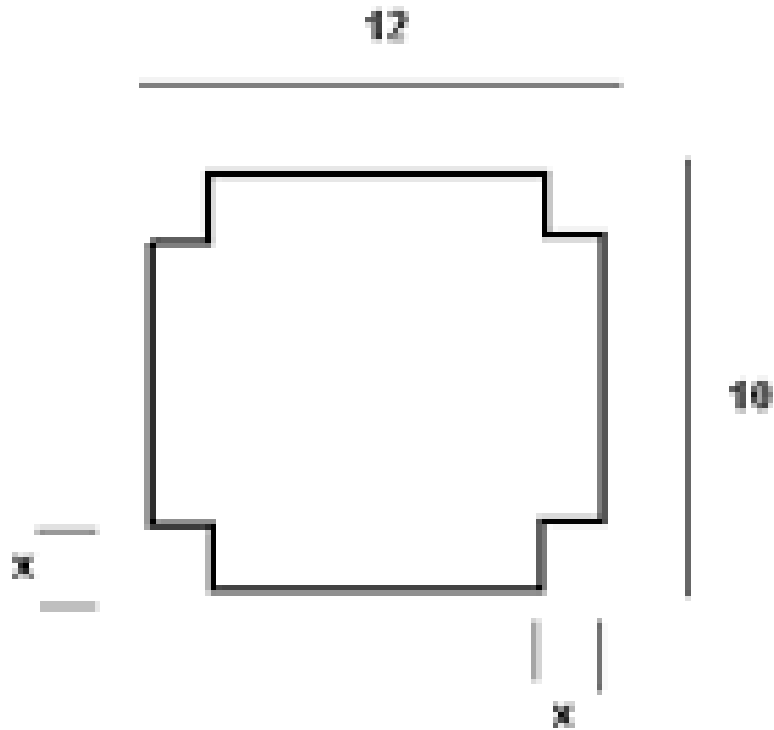
The Jacobson brothers own and operate their own ghost tour business. They take tour groups around town on a bus to visit the most notorious "haunted" spots throughout the city. They charge $50 per tour. Each summer, they book 100 tours at that price. The brothers are considering a decrease in the price per tour because they think it will help them book more tours. They estimate that they will gain 10 tours for every $1 decrease in the price per tour.

1. **According to the scenario, how much money do the Jacobson brothers currently generate each summer with their ghost tour business?**

   $5000

Revenue is the amount of money regularly coming into a business. In the ghost tour business, the revenue is the number of tours multiplied by the price per tour. Your response to Question 1 can be referred to as revenue. Because the Jacobson brothers are considering different numbers of tours and prices per tour, the revenue can be modeled by a function.

2. **Write a function, $r(x)$, to represent the revenue for the ghost tour business.**

   a. **Let x represent the decrease in the price per tour. Write an expression to represent the number of tours booked if the decrease in price is x dollars per tour.**

   $$10x + 100$$

b. Write an expression to represent the price per tour if the brothers decrease the price x dollars per tour.

$$50 - x$$

c. Use your expressions from parts (a) and (b) to represent the revenue, $r(x)$, as the number of tours times the price per tour.

Think about:

You can always check your function by testing it with values of x. What is the value of $r(x)$ when $x = 0$? Does it make sense?

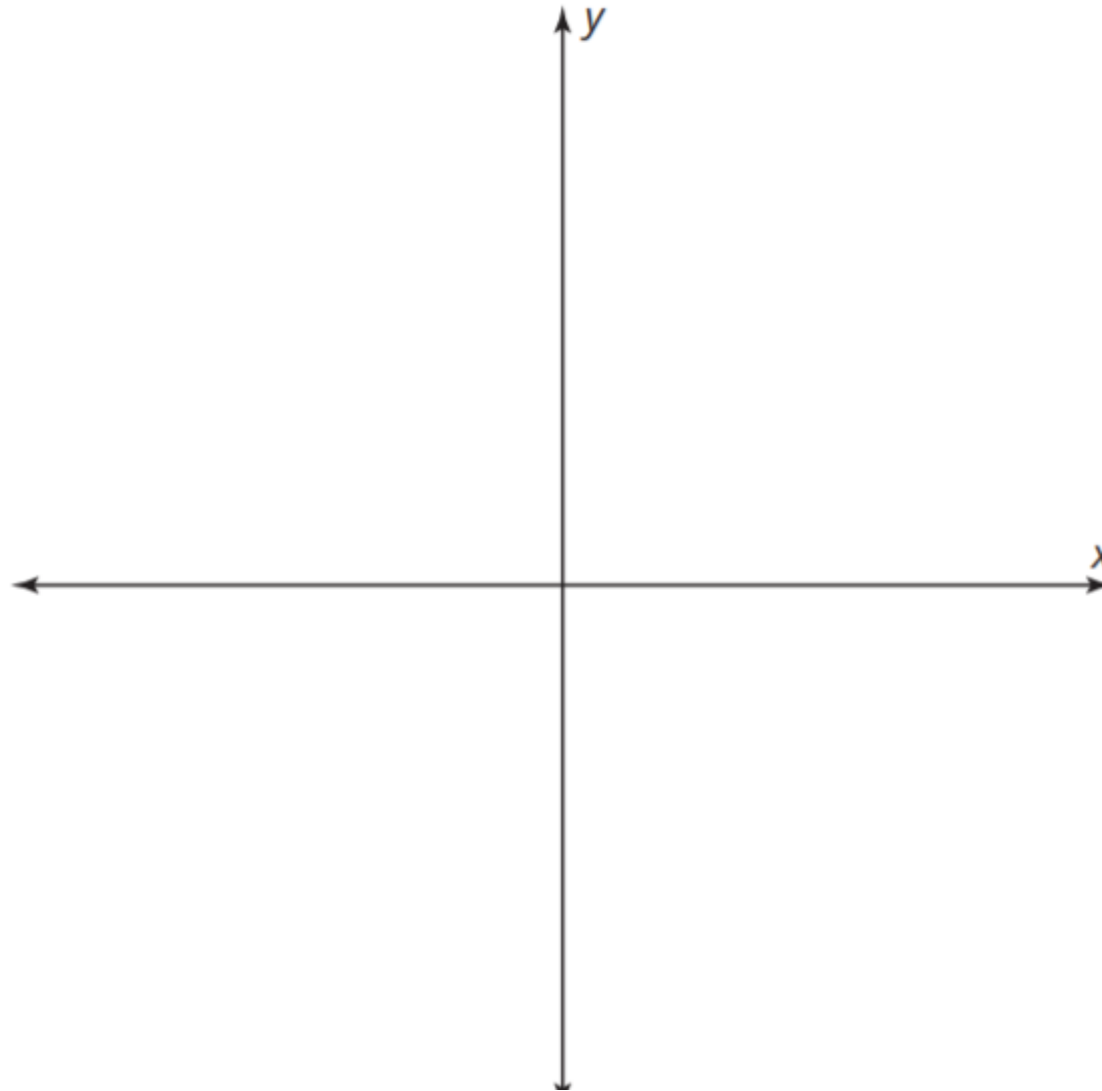| Revenue	=	Number of Tours	•	Price per Tour
$r(x)$	=	$(10x + 100)$	•	$(50 - x)$

3. Use technology to graph the function $r(x)$. Sketch your graph and label the axes.

Ghost Tour

Remember:

Don't forget to label key points!

4. Assume that the Jacobson brothers' estimate that for every $1 decrease in the price per tour, they will gain 10 tours is accurate.

   a. What is the maximum revenue that the Jacobson brothers could earn for the summer?

b. Katie and Bryce are calculating the number of tours that would yield the maximum revenue.

Katie said that according to the graph, a tour should cost $20. Since $9000 ÷ $20 = 450, the number of tours would be 450.

Bryce said that the cost of a tour should be $30, and $9000 divided by $30 per tour is 300 tours.

Who is correct? Explain your reasoning.

c. Would you advise the Jacobson brothers to adjust their cost per tour to make the maximum revenue? Why or why not?

5. Identify each key characteristic of the graph. Then, interpret its meaning in terms of the context.

   a. *x*-intercepts

   b. *y*-intercept

   c. increasing and decreasing intervals