**Finding the Maximum Profit**

What are some factors that companies must consider when setting a price for a product? How much would you charge for a new brand of sweatshirts that you created?

1. Let’s assume that when the price of a sweatshirt is $20, you can sell 30 of them. Every time you decrease the price of the sweatshirt by $1, you can sell 5 more. What price should you set the sweatshirt to in order to obtain a maximum profit?

In this exercise, *x* represents the amount the price of a sweatshirt is dropped from its original price of $20.

1. Write an expression to represent the price of a sweatshirt if you decrease the original price of $20 by *x* dollars.
2. Write an expression to represent the number of sweatshirts that you can sell if you decrease the price by *x* dollars.
3. Use the function $f\left(x\right)=(20-x)(30+5x)$ to create a table and a graph of the effect of changing the price of the sweatshirts. Label and scale the axes of the graph.

|  |  |
| --- | --- |
| *x* | *f*(*x*) |
| -10 |  |
| -5 |  |
| 0 |  |
| 5 |  |
| 10 |  |
| 15 |  |
| 20 |  |



1. Use your table, graph, or equation to determine the best price for selling the sweatshirts and the amount of money you will earn at that selling price.
2. Use your table, graph, or equation to determine the *y*-intercept of the function. What does the *y*-intercept mean in this situation?
3. Use your table, graph, or equation to determine the *x*-intercepts of the function. What do the *x*-intercepts mean in this situation?
4. Recall that the *y*-coordinate of an *x*-intercept is \_\_\_\_\_\_.
5. Show how you can use algebra to calculate the *x*-intercepts of $f\left(x\right)=(20-x)(30+5x)$.
6. Recall the *x*-coordinate of the vertex is the average of the *\_\_\_*-intercepts.
7. Show how you can use algebra to calculate the vertex of the function

$f\left(x\right)=(20-x)(30+5x)$.