



Chapter 9 Project

Breaking Even

An activity to demonstrate the use of linear equations and inequalities in business.

In manufacturing, the production cost for an item usually has two components: a fixed cost and a variable cost. You can think of the fixed cost as money that must be spent to operate the business regardless of production level. Examples of fixed cost include paying the rent or mortgage for the manufacturing facility or insurance on the property. The variable cost reflects the funds that must be spent to produce one unit of the product. Variable cost should account for things like raw materials and labor costs.

1. A guitar manufacturer has daily fixed cost of \$12,000 and each guitar costs \$230 to build.
 - a. Determine the total cost of producing 10 guitars in one day.
 - b. How many guitars were produced in a day when the total cost was \$21,890?
 - c. What is the minimum number of guitars produced in a day that will make the total cost exceed \$50,000?
2. The revenue for a manufacturer is the income generated from selling products. Revenue is defined as the price per unit times the number of units sold. The guitar manufacturer from our previous problem can sell each guitar for \$400.
 - a. Determine the revenue when 10 guitars are sold.
 - b. What is the minimum number of guitars that the manufacturer must sell in a day so that revenue is at least \$50,000?
3. Profit is defined as revenue minus cost. The break-even point is the production level at which the profit is exactly zero. Above that level, the manufacturer returns a profit. Determine the break-even point for this guitar manufacturer. In other words, find the number of guitars that must be manufactured and sold in a day to cover all the manufacturing cost.
4. If the manufacturer could decrease fixed cost from \$12,000 to \$10,000, would you expect the break-even point to go up or down? Explain. Use a linear equation to verify your prediction.
5. Assume that the manufacturer keeps fixed cost at \$12,000 with a production cost of \$230 per guitar. What should the sale price be to keep a break-even point of 80 units?
6. Write a linear inequality that represents the company returning a positive profit if the fixed cost is \$12,000 with a production cost of \$230 per guitar and a sale price of \$400 per guitar.
7. Solve the inequality found in Problem 6. Round to the nearest integer and write the solution set in interval notation. Explain what this solution set represents.
8. Based on the solution set found in Problem 7, is there a limit to the number of guitars that can be manufactured and sold and still return a profit? Do you think this is realistic? Explain your answer.