Independent Practice: Monthly Cost Analysis Report

You are the assistant manager of TecTown Technologies. The manager has asked you to do a cost analysis to determine what stereo systems the store should order. Next month you will order two types of stereo systems, Home Theater Audio System and Shelf System. As assistant manager you must determine how many of each brand to purchase to maximize profit.

You expect to sell at least 5 but no more than 10 of the Shelf System units. Also, you expect your sales of the Home Theater System will not exceed 12. The number of Shelf Systems cannot exceed the number of Home Theater Audio Systems. Each Home Theater Audio System produces a $70 profit for the store while each Shelf System produces a $30 profit.

What is your ultimate goal? _______________________________________________________

A. The first task is to identify the decision variables.

Let \( x = \) ___________________________________

Let \( y = \) ___________________________________

B. The next task is to write the objective function. The objective of a linear programming problem will always be to maximize or minimize a quantity. Write a linear function that will maximize the profit.

C. Now you have to translate all the limitations or constraints. A table might help you organize this information. What are your constraints?

D. Graph the system of inequalities to determine the feasible region. This area contains all the solutions to the system of constraints. Be sure to label the axes.
E. Find each vertex of this region. We call these vertices the **corner points**. (If integer solutions are required and a vertex doesn’t have integer coefficients, identify an integer point near the vertex.) If there is a minimum or maximum, it will occur at a corner point.

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<th>Corner Points</th>
<th>Profit =</th>
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F. Questions.

1. What does a point in the feasible region represent?

   How does it compare to a point that is not in your solution region?

2. Find the maximum and minimum profit (if they exist).

3. How many of each model should you order to maximize profit?

G. Extension.

After reviewing your report, the manager decides that the store must order no more than 20 Home Theater Audio System stereos even if it decreases the maximum profit. You go back to the drawing board to revise your analysis. Now, how many of each model should be ordered to maximize profit?