

Optimizing an Advertising Campaign

Math 1010 Intermediate Algebra Group Project

Background Information:

Linear Programming is a technique used for optimization of a real-world situation. Examples of optimization include maximizing the number of items that can be manufactured or minimizing the cost of production. The equation that represents the quantity to be optimized is called the objective function, since the objective of the process is to optimize the value. In this project the objective is to maximize the number of people who will be reached by an advertising campaign.

The objective is subject to limitations or constraints that are represented by inequalities. Limitations on the number of items that can be produced, the number of hours that workers are available, and the amount of land a farmer has for crops are examples of constraints that can be represented using inequalities. Broadcasting an infinite number of advertisements is not a realistic goal. In this project one of the constraints will be based on an advertising budget.

Graphing the system of inequalities based on the constraints provides a visual representation of the possible solutions to the problem. If the graph is a closed region, it can be shown that the values that optimize the objective function will occur at one of the "corners" of the region.

The Problem:

In this project your group will solve the following situation:

A local business plans on advertising their new product by purchasing advertisements on the radio and on TV. The business plans to purchase at least 60 total ads and they want to have at least twice as many TV ads as radio ads. Radio ads cost \$20 each and TV ads cost \$80 each. The advertising budget is \$4320. It is estimated that each radio ad will be heard by 2000 listeners and each TV ad will be seen by 1500 people. How many of each type of ad should be purchased to maximize the number of people who will be reached by the advertisements?

Modeling the Problem:

Let X be the number of radio ads that are purchased and Y be the number of TV ads.

1. Write down a linear inequality for the total number of desired ads.

$$X + Y \geq 60$$

2. Write down a linear inequality for the cost of the ads.

$$20X + 80Y \leq 4320$$