HOMEWORK Questions...

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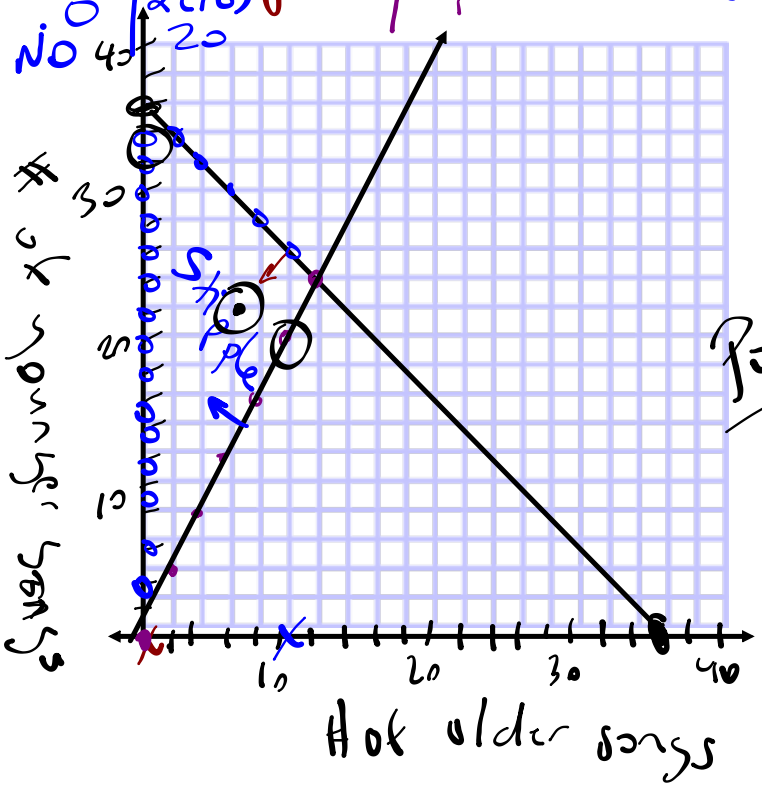
NOTE: Each question requires a graph to get possible solutions!

10. Spence, a disc jockey, is often hired to play weddings.

- His contract states that he will play no longer than 3 h, with no more than 12 songs each hour.
- He likes to play two or more songs for young listeners for every one song he plays for older listeners.

Determine three possible combinations of numbers of songs he could play.



Notes - Optimization Problems.pdf

5.4 Optimization Problems I: Creating the Model

Problem

optimization problem

A problem where a quantity must be maximized or minimized following a set of guidelines or conditions.

Inequations

constraint

A limiting condition of the optimization problem being modelled, represented by a linear inequality.

Equation

objective function

In an optimization problem, the equation that represents the relationship between the two variables in the system of linear inequalities and the quantity to be optimized.

Overlap

feasible region

The solution region for a system of linear inequalities that is modelling an optimization problem.

Need to Know

- You can create a model for an optimization problem by following these steps:

Step 1. Identify the quantity that must be optimized. Look for key words, such as *maximize* or *minimize*, *largest* or *smallest*, and *greatest* or *least*.

Step 2. Define the variables that affect the quantity to be optimized. Identify any restrictions on these variables.

Step 3. Write a system of linear inequalities to describe all the constraints of the problem. Graph the system.

Step 4. Write an objective function to represent the relationship between the variables and the quantity to be optimized.

APPLY the Math

EXAMPLE 1 Creating a model for an optimization problem with whole-number variables

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Three teams are travelling to a basketball tournament in cars and minivans.

- Each team has no more than 2 coaches and 14 athletes.
- Each car can take 4 team members, and each minivan can take 6 team members.
- No more than 4 minivans and 12 cars are available.

The school wants to know the combination of cars and minivans that will require the minimum and maximum number of vehicles. Create a model to represent this situation.

TOTAL 3x16 = 48

$m \leq 4$
$c \leq 12$
$4c + 6m \leq 48$

Juanita's Solution

Graph

Let m represent the number of minivans.
Let c represent the number of cars.

The two variables in the problem are the number of cars and the number of minivans. The values of these variables are whole numbers.

$m \in W$ and $c \in W$

Constraints:
Number of cars available:
$c \leq 12$
Number of minivans available:
$m \leq 4$
Number of team members:
$4c + 6m \leq 48$

I knew that this is an **optimization problem** because the number of vehicles has to be minimized and maximized.

I wrote three linear inequalities to represent the three limiting conditions, or **constraints**.

The maximum number of team members is the number of teams multiplied by the maximum number of coaches and athletes:
$3(14) + 3(2) = 48$

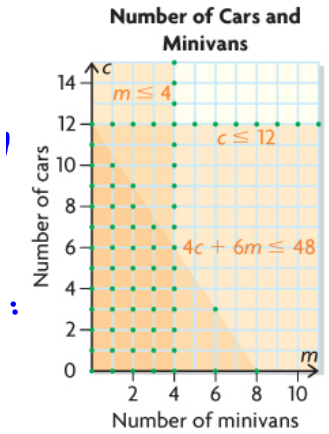
optimization problem
A problem where a quantity must be maximized or minimized following a set of guidelines or conditions.

constraint
A limiting condition of the optimization problem being modelled, represented by a linear inequality.

Objective function:
Let V represent the total number of vehicles.
$V = c + m$

I created an equation, called the **objective function**, to represent the relationship between the two variables (number of minivans and number of cars) and the quantity to be minimized and maximized (number of vehicles).

objective function
In an optimization problem, the equation that represents the relationship between the two variables in the system of linear inequalities and the quantity to be optimized.



I graphed the system of three inequalities.

One of the solutions in the **feasible region** represents the combination of cars and minivans that results in the minimum total number of vehicles and another solution represents the maximum. I think I could use the objective function to determine each point, but I am not certain how yet.

feasible region
The solution region for a system of linear inequalities that is modelling an optimization problem.

QUIZ TIME...

When finished pass your quiz in and work on the following:

HOMEWORK...

Page 248: #1, #2, #3, #5

NOTE:

Create a model means graph the solution region

Attachments

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