1. Lee y realiza una explicación detallada, paso a paso y con tus propias palabras, de cómo los ejemplos 4 y 5 se formulan y resuelven.

EXAMPLE 4 **An Application of a System of Inequalities**

See LarsonLinearAlgebra.com for an interactive version of this type of example.

The liquid portion of a diet is to provide at least 300 calories, 36 units of vitamin A, and 90 units of vitamin C daily. A cup of dietary drink X provides 60 calories, 12 units of vitamin A, and 10 units of vitamin C. A cup of dietary drink Y provides 60 calories, 6 units of vitamin A, and 30 units of vitamin C. Set up a system of linear inequalities that describes the minimum daily requirements for calories and vitamins.

SOLUTION

Let

x = number of cups of dietary drink X and

y = number of cups of dietary drink Y.

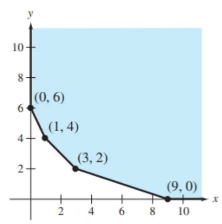
To meet the minimum daily requirements, the inequalities listed below must be satisfied.

$$\begin{array}{ll} \text{For calories:} & 60x + 60y \geq 300 \\ \text{For vitamin A:} & 12x + 6y \geq 36 \\ \text{For vitamin C:} & 10x + 30y \geq 90 \\ & x \geq 0 \\ & y \geq 0 \end{array}$$

REMARK

Any point inside the shaded region (or on its boundary) meets the minimum daily requirements for calories and vitamins. For example, 3 cups of dietary drink X and 2 cups of dietary drink Y supply 300 calories, 48 units of vitamin A, and 90 units of vitamin C.

The last two inequalities are included because x and y cannot be negative. The graph of this system of linear inequalities is shown at the right.



Escribe tu explicación del ejemplo 4 en este espacio:

De acuerdo al procedimiento visto en clase, clasificamos el problema de la siguiente manera:

Variables independientes: X, Y (# Tazas de bebidas de dieta).

Es un problema de: **Minimización** requerimientos diarios para las calorias y vitaminas

Restricciones de Igualdad estan dadas por:
60X + 60Y >= 300
12X + 6Y >= 36
10X + 30Y >= 90

Restricciones de no negatividad:
X >= 0
Y >= 0

Como es un problema de dos variables se puede graficar e identificar el punto que minimiza, podemos evaluar los puntos en la función 60X + 60Y >= 300 y al final el punto que minimizo fue (3,2) [tazas de dieta X, Y] dando como resultado 300 (calorías), si sustituimos de igual manera en la ecuación 2 y 3, nos minimiza 48 unidades de vitamina A y 90 de Vitamina C respectivamente.

EXAMPLE 5 **An Application: Optimal Cost**

Example 4 in Section 9.1 set up a system of linear equations for the problem below. The liquid portion of a diet is to provide at least 300 calories, 36 units of vitamin A, and 90 units of vitamin C daily. A cup of dietary drink X provides 60 calories, 12 units of vitamin A, and 10 units of vitamin C. A cup of dietary drink Y provides 60 calories, 6 units of vitamin A, and 30 units of vitamin C. Now, assume that dietary drink X costs \$0.12 per cup and drink Y costs \$0.15 per cup. How many cups of each drink should be consumed each day to minimize the cost and still meet the daily requirements?

SOLUTION

Begin by letting x be the number of cups of dietary drink X and y be the number of cups of dietary drink Y. Moreover, to meet the minimum daily requirements, the inequalities listed below must be satisfied.

$$\left.\begin{array}{ll} \text{For calories:} & 60x + 60y \geq 300 \\ \text{For vitamin A:} & 12x + 6y \geq 36 \\ \text{For vitamin C:} & 10x + 30y \geq 90 \\ & x \geq 0 \\ & y \geq 0 \end{array}\right\} \quad \text{Constraints}$$

The cost C is

$$C = 0.12x + 0.15y. \quad \text{Objective function}$$

The graph of the region corresponding to the constraints is shown in Figure 9.8. To determine the minimum cost, test C at each vertex of the region, as shown below.

At $(0, 6)$: $C = 0.12(0) + 0.15(6) = 0.90$

At $(1, 4)$: $C = 0.12(1) + 0.15(4) = 0.72$

At $(3, 2)$: $C = 0.12(3) + 0.15(2) = 0.66$ (Minimum value of C)

At $(9, 0)$: $C = 0.12(9) + 0.15(0) = 1.08$

So, the minimum cost is \$0.66 per day, and this occurs when three cups of drink X and two cups of drink Y are consumed each day.

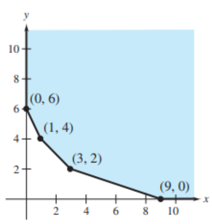


Figure 9.8

Escribe tu explicación del ejemplo 5 en este espacio:

De acuerdo al procedimiento visto en clase, clasificamos el problema de la siguiente manera:

Variables independientes: X, Y (# Costo de consumo diario de tazas de bebidas de dieta).

X = 0.12

Y = 0.15

Es un problema de: **Minimización** de el costo de consumo diario

Funcion objetivo para el costo <u>*C = 0.12X + 0.15Y*</u>

Restricciones (vease ejemplo anteriror)

De igual manera en la grafica, evaluamos todos los puntos encontrados en la grafica para identificar cuál punto nos minimiza el costo diario de consumo y de igual manera se encontro que el punto (3,2) satisface minimizar la ecuación de costo C = 0.12X + 0.15Y siento \$ 0.66 el costo de consumo diario para satisfacer los requerimientos minimos de vitaminas y calorias.

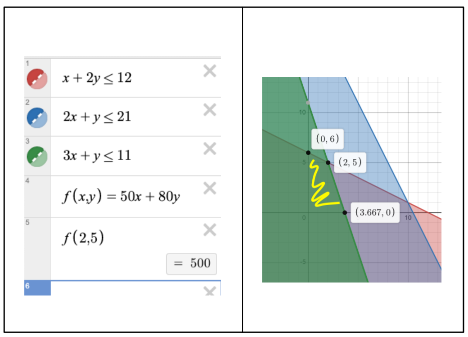
2. Resuelve los ejercicios 43, 44 y 50. Escribe el procedimiento completo y coloca los resultados en los espacios indicados. Si es posible, resuélvelo con método gráfico.

43. Optimal Revenue A tailor has 12 square feet of cotton, 21 square feet of silk, and 11 square feet of wool. A vest requires 1 square foot of cotton, 2 square feet of silk, and 3 square feet of wool. A purse requires 2 square feet of cotton, 1 square foot of silk, and 1 square foot of wool. The purse sells for $80 and the vest sells for $50.

(a) How many purses and vests should the tailor make to maximize revenue?

(b) What is the maximum revenue?

Escribe aquí tu procedimiento:



Si evaluamos el punto (2,5), nos damos cuenta de que es el punto que maximiza la ecuación y que cumple con las restricciones.

Formulación matemática del problema

Variables de decisión:

X = vest, Y = Pursue

Función objetivo: **50X + 80Y**

Problema min/max: **Maximización**

Restricciones:
X + 2Y <= 12
2X + Y <= 21
3X + Y <= 11
X,Y >= 0

Solución

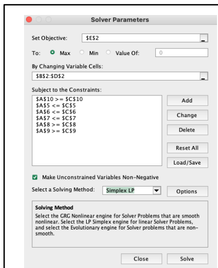
Valores óptimos:
X = 2
Y = 5
Valor de la función objetivo: **500**

44. Optimal Income A wood carpentry workshop has 400 board-feet of plywood, 487 board-feet of birch, and 795 board-feet of pine. A bar stool requires 1 board-foot of plywood, 2 board-feet of birch, and 1 board-foot of pine. A step stool requires 1 board-foot of plywood, 1 board-foot of birch, and 3 board-feet of pine. An ottoman requires 2 board-feet of plywood, 1 board-foot of birch, and 1 board-foot of pine. The bar stool sells for $22, the step stool sells for $42, and the ottoman sells for $29. What combination of products yields the maximum income?

Escribe aquí tu procedimiento:
Usando Solver

VARIABLES	X	Y	Z	FUNCION OBJ
	120	214	33	12585
RESTRICCIONES				
400	<=	400		
487	<=	487		
795	<=	795		
120	>=	0		
214	>=	0		
33	>=	0		

Configuración en Solver



Formulación matemática del problema

Variables de decisión:
X = # bar stools
Y = # step stools
Z = # ottoman
Función objetivo: **22X + 42Y + 29Z**

Problema min/max: **Maximizar**

Restricciones:

X +Y + 2Z <= 400
2X + Y + Z <=487
X + 3Y + Z <=795
X, Y, Z>=0

Solución

Valores óptimos: **x=120 , y=214, z=33**
Valor de la función objetivo: **12,585**

50. Investment An investor has up to \$250,000 to invest in three types of investments. Type A investments pay 8% annually and have a risk factor of 0. Type B investments pay 10% annually and have a risk factor of 0.06. Type C investments pay 14% annually and have a risk factor of 0.10. To have a well-balanced portfolio, the investor imposes some conditions. The average risk factor should be no greater than 0.05. Moreover, at least one-fourth of the total portfolio is to be allocated to type A investments and at least one-fourth of the portfolio is to be allocated to type B investments. How much should the investor allocate to each type of investment to obtain a maximum return?

Escribe aquí tu procedimiento:

Usando Solver

VARIABLES	X	Y	Z	FUNCION OBJ
	100000	62500	87500	26500
RESTRICCIONES				
250000	<=	250000		
12500	<=	12500		
100000	>=	62500		
62500	>=	62500		
87500	>=	0		

Formulación matemática del problema

Variables de decisión:
x=type A
y=type B
z=type C
Función objetivo: **0.80x + 0.10y + 0.14z**

Problema min/max: **Maximizar**

Restricciones:
x+y+z<=250000
0.06y+0.1z=12500
x,y>=12500
z>=0

Solución

Valores óptimos: **x=100000 y=62500 z=87500**
Valor de la función objetivo: **26,500**

Configuración del solver