

MATH 1010 Assignment 2 Solutions

1. If the company sells x compact disc players per year, its revenue is $50x$. The yearly cost for manufacturing the x players is $900,000 + 35x$. Thus, the profit is

$$P(x) = 50x - (900,000 + 35x) = 15x - 900,000.$$

The company breaks even when profit is zero,

$$15x - 900,000 = 0$$

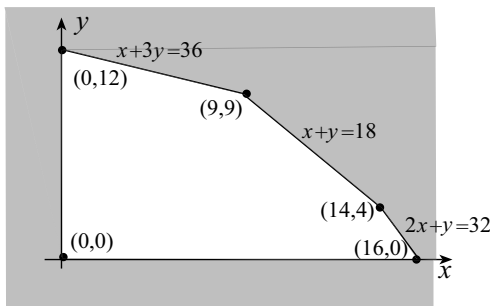
$$x = \frac{900,000}{15} = 60,000.$$

Hence, the company must sell at least 60,000 compact disc players to make a profit.

2. An equivalent system of constraints is

$$2x + y \leq 32, \quad y + x \leq 18, \quad x + 3y \leq 36, \quad y \geq 0, \quad x \geq 0.$$

The feasible set is shown in the figure below. From the table, we conclude that the largest value of f is 900.

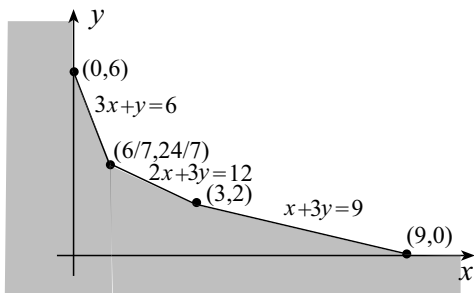


Corner	$f = 80x + 70y - 500$
(0, 0)	-500
(0, 12)	340
(9, 9)	850
(14, 4)	900
(16, 0)	780

3. An equivalent system of constraints is

$$2x + 3y \geq 12, \quad 3x + y \geq 6, \quad x + 3y \geq 9, \quad x \geq 0, \quad y \geq 0.$$

The feasible set is shown in the figure below. From the table, we conclude that the smallest value of f is 66.



Corner	$f = 21x + 14y$
(0, 6)	84
(6/7, 24/7)	66
(3, 2)	91
(9, 0)	189

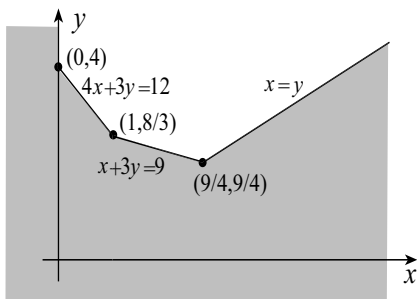
4. Let x be the number of hours that she jogs (per week) and y be the number of hours that she cycles.

	Jogging	Cycling	Minimum
Number of hours/week	x	y	
Aerobic points/hour	12	9	36
Speed (mpr)	6	18	54 miles

The objective function is to minimize $f = x + y$. Constraints on the variables are:

$$\begin{aligned}
 12x + 9y &\geq 36, & 4x + 3y &\geq 12, \\
 6x + 18y &\geq 54, & x + 3y &\geq 9, \\
 y &\geq x, & y &\geq x, \\
 x &\geq 0, & x &\geq 0, \\
 y &\geq 0, & y &\geq 0.
 \end{aligned}$$

The feasible set is shown below. The table indicates that she should jog for 1 hour and cycle for 2 hours and 40 minutes.



Corner	$f = x + y$
$(0, 4)$	4
$(1, 8/3)$	11/3
$(9/4, 9/4)$	9/2