

Working the System
Systems of Linear Inequalities

$x = \#$ of square feet of carpet
 $y = \#$ of square feet of hardwood

1. Samuel is remodeling his basement. One part of the planning involves the flooring. He knows that he would like both carpet and hardwood, but isn't sure how much of each he will use. The most amount of flooring area he can cover is 2000 square feet. The carpet is \$4.50 per square foot and the hardwood is \$8.25 per square foot. Both prices include labor costs. Samuel has budgeted \$10,000 for the flooring.
- a. Write a system of inequalities to represent the maximum amount of flooring needed and the maximum amount of money Samuel wants to spend.

$$\begin{cases} x + y \leq 2000 \\ 4.50x + 8.25y \leq 10,000 \end{cases}$$

- b. One idea Samuel has is to make two rooms; one having 400 square feet of carpeting and the other having 1200 square feet of hardwood. Determine whether this amount of carpeting and hardwood are solutions to the system of inequalities. Explain your reasoning in terms of the problem situation.

Is the point (400, 1200) a solution to the system?

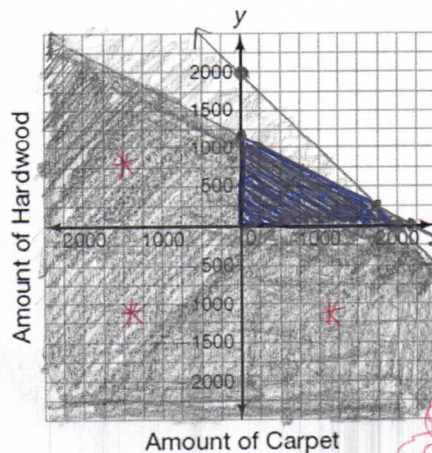
$$\begin{aligned} x + y &\leq 2000 \\ (400) + (1,200) &\leq 2000? \\ 1,600 &\leq 2000 \checkmark \end{aligned}$$

$$\begin{aligned} 4.50x + 8.25y &\leq 10,000 \\ 4.50(400) + 8.25(1200) &\leq 10,000? \\ 1800 + 9900 &\leq 10,000 \\ 11,700 &\leq 10,000 \times \end{aligned}$$

No, having 400 sq. feet of carpet and 1200 sq. feet of hardwood would be too expensive.

- c. Graph this system of inequalities.

$$\begin{array}{r|l} x & y \\ \hline 0 & 2000 \\ 2000 & 0 \end{array}$$



$$\begin{array}{r|l} x & y \\ \hline 0 & 1212.12 \\ 2222.2 & 0 \end{array}$$

$$\begin{aligned} 4.50x + 8.25y &\leq 10,000 \\ 4.50(0) + 8.25y &\leq 10,000 \\ 8.25y &\leq 10,000 \\ \hline 4.50x + 8.25(0) &\leq 10,000 \\ 4.50x &\leq 10,000 \end{aligned}$$

* These solutions don't make sense because you can not order negative amounts of carpet and/or hardwood

- d. Determine the intersection point of the two lines. Is this a solution to this system of inequalities in terms of the problem situation?

about (1,750, 250)

$$\begin{aligned} 1,750 + 250 &\leq 2000? \\ 2000 &\leq 2000 \checkmark \end{aligned}$$

$$\begin{aligned} 4.50(1,750) + 8.25(250) &\leq 10,000 \\ 7875 + 2062.50 &\leq 10,000 \\ 9937.5 &\leq 10,000 \checkmark \end{aligned}$$

e. Identify two different solutions to the system of inequalities. Explain what the solutions represent in terms of the problem situation.

$(1,000, 500)$ and $(250, 750)$

This solution represents 1000 sq feet of carpet and 500 sq feet of hardwood.

This solution represents 250 sq. feet of carpet and 750 sq. feet of hardwood.

f. Determine one combination of amounts of carpet and hardwood that is *not* a solution for the system of inequalities. Explain your reasoning.

$(1,000, -500)$

Although mathematically the point $(1000, -500)$ is a "solution" to ~~both~~ both inequalities, ^{you} ~~one~~ can not buy negative amounts of hardwood, therefore, the point $(1000, -500)$ is not a solution.

Graph the system of inequalities

$$\begin{cases} y \leq -\frac{2}{3}x + 3 \\ y \geq 3x - 4 \end{cases}$$

$$y \leq -\frac{2}{3}x + 3$$

x	y
0	3
3	1
6	-1

$$y \leq -\frac{2}{3}(0) + 3$$

$$y \leq 0 + 3$$

$$y \leq 3$$

$$y \leq -\frac{2}{3}(3) + 3$$

$$y \leq -2 + 3$$

$$y \leq 1$$

$$y \leq -\frac{2}{3}(6) + 3$$

$$y \leq -4 + 3$$

$$y \leq -1$$

$$y \geq 3x - 4$$

x	y
0	-4
1	-1
2	2

$$y \geq 3(0) - 4$$

$$y \geq -4$$

$$y \geq 3(1) - 4$$

$$y \geq 3 - 4$$

$$y \geq -1$$

$$y \geq 3(2) - 4$$

$$y \geq 6 - 4$$

$$y \geq 2$$

