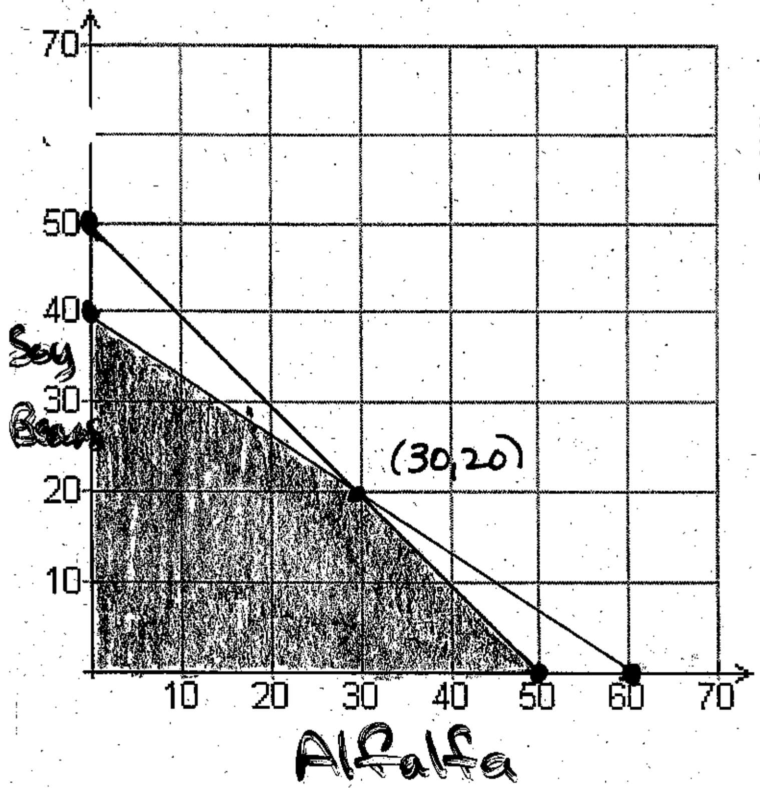
Name ___________



1. suppose that a farmer has no more than 50 acres for planting alfalfa and soy beans and has a maximum of \$1200 to spend on the planting. It costs \$20 per acre to plant alfalfa and \$30 per acre to plant soy beans. The profit per acre for alfalfa is \$250 and for soy beans is \$300. If A is the number of acres of alfalfa and S is the number of acres of soy beans that the farmer plants, the system for this problem is:

$$\begin{cases} A + S \le 50 \\ 20A + 30S \le 1200 \\ A \ge 0 \\ S \ge 0 \end{cases}$$

A Match each inequality in the system with its meaning.

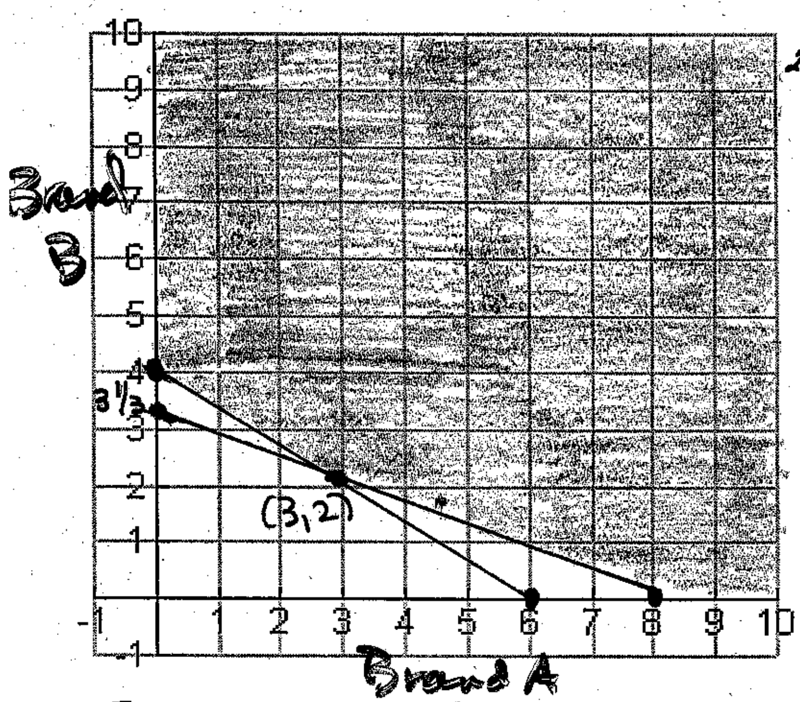
a. $A + S \le 50$
b. $20A + 30S \le 1200$
c. $A \ge 0$
d. $S \ge 0$

(i) The number of acres of soybeans is not negative. D
(ii) The total number of acres is not more than 50. A
(iii) The cost of planting must be no more than \$1200. B
(iv) The least number of acres of alfalfa is zero. C

B. Graph the feasible region. Let A be the independent variable.

C. a. Find the vertices of the feasible region.
b. The profit formula is $P = 250A + 300S$. At which vertex is P maximized?

(0,40) 12,000
max. * (30,20) 13,500
(50,0) 12,500



2. A landscaping contractor uses a combination of two brands of fertilizers, each containing different amounts of phosphates and nitrates, as shown in the table below. A certain lawn requires a mixture of at least 24 lb of phosphates and at least 16 lb of nitrates.

	Phosphate content per package	Nitrate content per package
Brand A	4 lb	2 lb
Brand B	6 lb	5 lb

If x is the number of packages of Brand A and y is the number of packages of Brand B, then the conditions of the problem can be modeled by the following system of inequalities:

$$\begin{cases} x \ge 0 \\ y \ge 0 \\ 4x + 6y \ge 24 \\ 2x + 5y \ge 16 \end{cases}$$

a. Graph the feasible region.
b. If a package of Brand A costs \$6.99 and a package of Brand B costs \$17.99, then the cost C is found by the equation $C = 6.99x + 17.99y$. Which pair (x, y) in the feasible region gives the lowest cost?

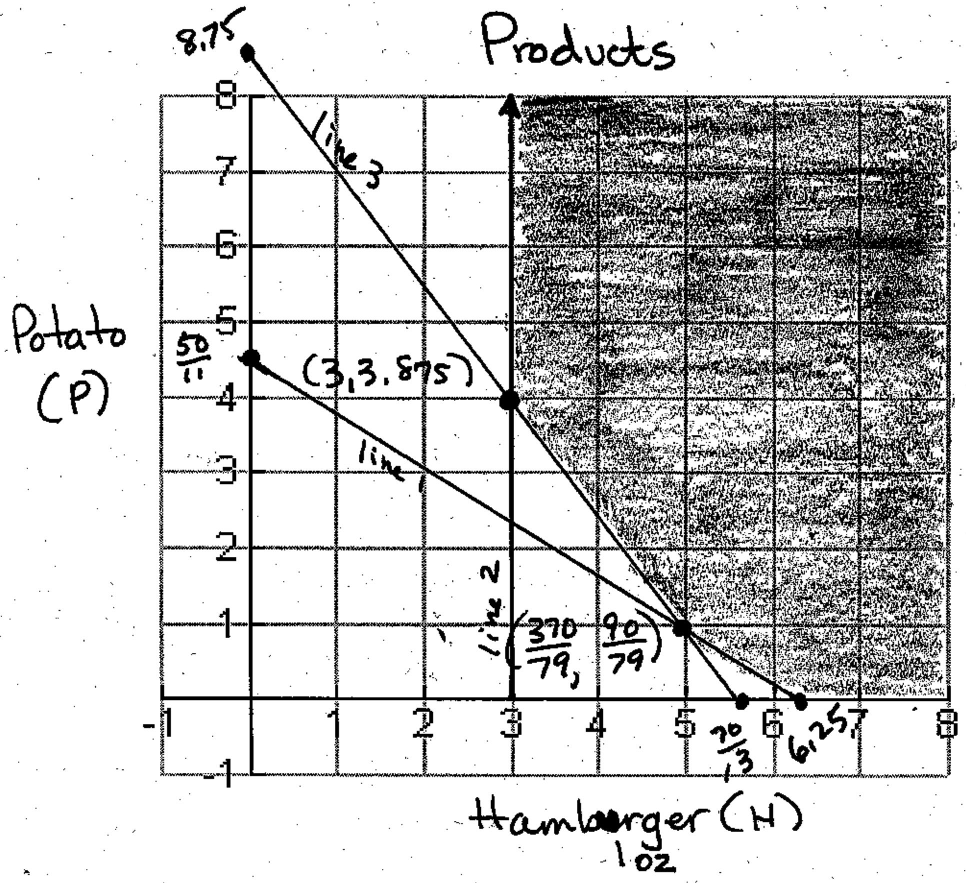
$$\begin{bmatrix} 4 & 6 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 24 \\ 16 \end{bmatrix}$$

$$[A]^{-1}[A]\begin{bmatrix} x \\ y \end{bmatrix} = [A]^{-1}[B]$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

$C = 6.99x + 17.99y$

(0,4) = 71.96
(3,2) = 56.95
Lowest * (8,0) = 55.92



H = Hamburger (1oz)
P = Potato

$C = .11H + .05P$

$*(3, 3.875) = .5237$

$\left(\frac{370}{79}, \frac{90}{79}\right) = .5723$

$(6.25, 0) = .6875$

3. Some parents shopping for their family want to know how much hamburger and how many potatoes to buy. From a food-value table they find that one ounce of hamburger has 0.8 mg or iron, 10 units of vitamins A and 6.5 grams of protein. One medium potato has 1.1 mg of iron, 0 units of vitamin A and 4 grams of protein. For this meal the parents want to serve at least 5 mg of iron, 30 units of vitamin A and 35 grams of protein. One potato costs \$0.05 and 1 ounce of hamburger costs \$0.11. The parents want to be economical (minimize their costs), yet meet daily requirements. They need a program for the quantity of hamburger and potatoes to buy for the family. Decide what they should do.

	Iron	Vit. A	Protein
Hamburger	.8	10	6.5
Potato	1.1	0	4
	≥ 5	≥ 30	≥ 35

Line 1 $\quad .8H + 1.1P \geq 5$

$10H \geq 30$

Line 3 $\quad 6.5H + 4P \geq 35$

Intersection Line 1 & Line 3

$$\begin{bmatrix} .8 & 1.1 \\ 6.5 & 4 \end{bmatrix}\begin{bmatrix} H \\ P \end{bmatrix} = \begin{bmatrix} 5 \\ 35 \end{bmatrix}$$

$$[A]^{-1}[A]\begin{bmatrix} H \\ P \end{bmatrix} = [A]^{-1}[B]$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} H \\ P \end{bmatrix} = \begin{bmatrix} \frac{370}{79} \\ \frac{90}{79} \end{bmatrix}$$

Intersection Line 2 + Line 3

$$\begin{bmatrix} 10 & 0 \\ 6.5 & 4 \end{bmatrix}\begin{bmatrix} H \\ P \end{bmatrix} = \begin{bmatrix} 30 \\ 35 \end{bmatrix}$$

$$[A]^{-1}[A]\begin{bmatrix} H \\ P \end{bmatrix} = [A]^{-1}[B]$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} H \\ P \end{bmatrix} = \begin{bmatrix} 3 \\ 3.875 \end{bmatrix}$$