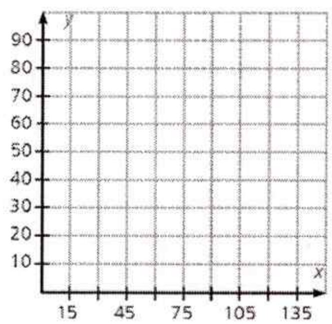
NAME ______________________ CLASS __________ DATE __________

ENRICHMENT 8.4 LINEAR PROGRAMMING Lab

A local soup kitchen is reviewing its budget. Meals are generally based around either beef or chicken. One pound of chicken will feed two people and one pound of beef will feed three people. The kitchen can feed no more than 300 people in one sitting. The cook always buys more than 75 pounds of chicken, but never more than 105 pounds. The cook always buys at least 10 pounds of beef. The cost of chicken is \$5 per pound. The cost of beef is \$3.50 per pound.

1. Graph this information using a system of inequalities
   Let x = pounds of chicken purchased and y = pounds of beef purchased.



System of inequalities:

2. Write a function which will determine the cost of meat for a meal served by the soup kitchen.

3. What amount of chicken and beef would minimize costs? What is the cost of this purchase?

4. Why is this cost minimization not an optimal choice for the soup kitchen?

5. Would it be possible for the soup kitchen to increase the number of people that it can feed while keeping costs low? Explain.

6. After some consideration, the cook decided that he is never going to buy more than 40 pounds of beef. Would this affect the outcome of the situation? Explain.

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RETEACHING 8.4 LINEAR PROGRAMMING Lab

Linear programming is a process used to find the optimum value of an **objective function** over a set of **constraints** represented by linear inequalities. The **feasible region** of an objective function is the region that satisfies all of the constraints.

EXAMPLE

Find the minimum and maximum values of the objective function $C = 5x + 2y$ in the region determined by the constraints shown at the right.

$x \geq 0$

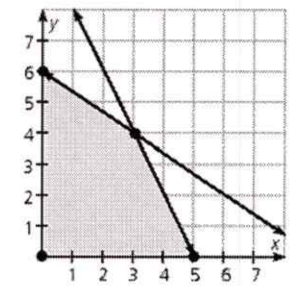
$y \geq 0$

$2x + y \leq 10$

$2x + 3y \leq 18$

SOLUTION

Graph the system of linear inequalities to determine the feasible region and its vertices. The vertices have coordinates (0, 0), (0, 6), (3, 4), and (5, 0).



Evaluate the objective function at each vertex to determine the maximum and minimum values. The minimum value of 0 occurs at (0, 0) and the maximum value of 25 at (5, 0).

(0, 0)	$C = 5(0) + 2(0) = 0$
(0, 6)	$C = 5(0) + 2(6) = 12$
(3, 4)	$C = 5(3) + 2(4) = 23$
(5, 0)	$C = 5(5) + 2(0) = 25$

EXERCISES

Find the feasible region for each objective function. Then determine the minimum and maximum values of the function under the given constraints.

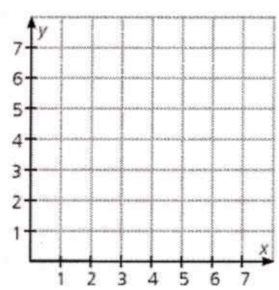
1. $C = 5x - 2y$

$x \geq 0$

$y \geq 0$

$x + y \leq 4$

$2x + y \leq 6$



2. $C = 2x + 2y$

$x \geq 0$

$y \geq 0$

$x - y \leq 5$

$4x + 8y \leq 32$