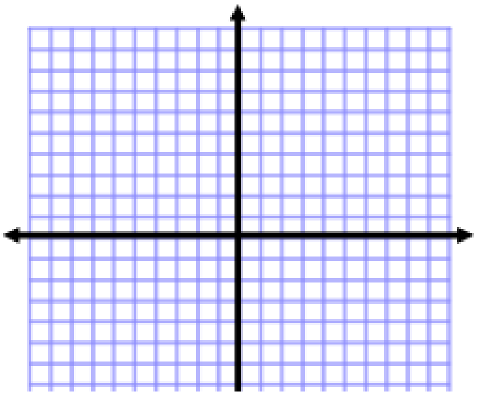
Name: ______________________________ Worksheet: Linear Programming

1. An investor invests in stock at 5% and in bonds at 8% in order to maintain an income of at least $20,000. Write the linear inequality that expresses the relationship between the amounts invested in stocks and bonds.

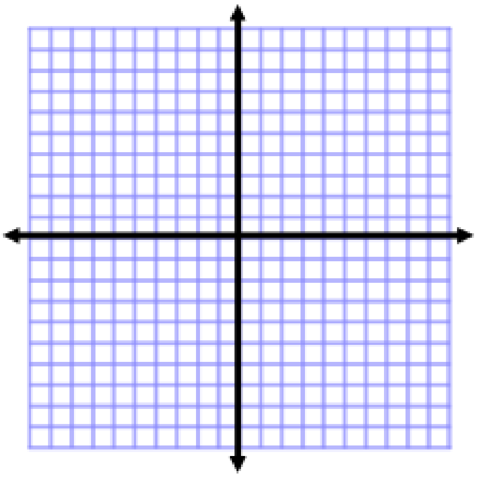
2. Find the corner points of the system

$$2x + 3y \leq 12$$
$$x - y \leq 6$$
$$x \geq 0$$



3. Maximize: $z = 5x + 3y$,
Subject to:

$$x + y \leq 4$$
$$x \geq 0$$
$$y \geq 0$$



Maximum of ____________ when _______________.

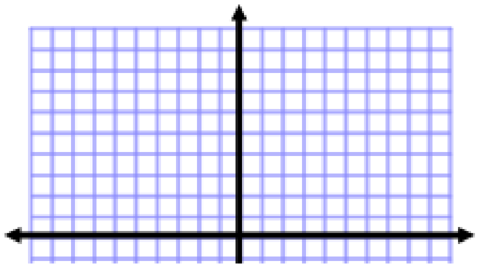
4. Given the following linear programming problem, determine which situation occurs: (choose one)

a. An optimal solution exists at a single vertex point.
b. There is more than one optimal solution.
c. There is no optimal solution because the feasible region does not exist.
d. There is no optimal solution because the feasible region is unbounded.

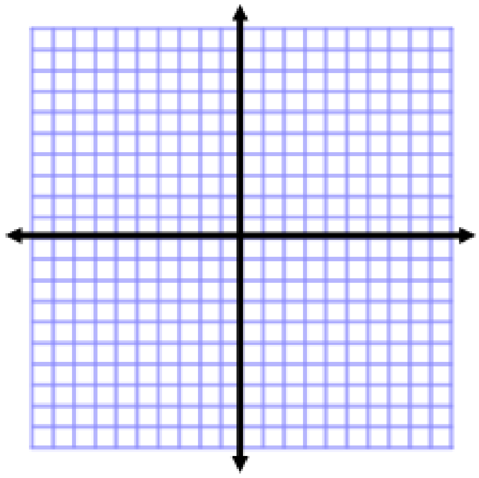
Maximize: $z = 2x + 3y$

Subject to:

$$x + y \le 5$$
$$x + 2y \ge 8$$
$$x \ge 0$$

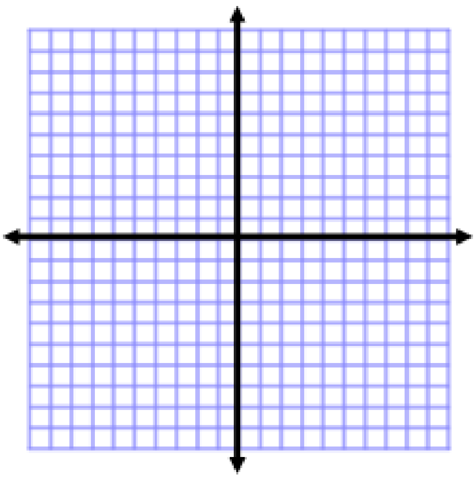


5. Graph the inequality: $2x + 3y > 12$



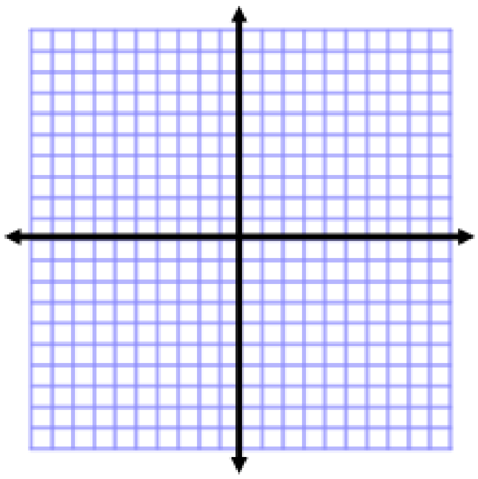
6. Graph the system of inequalities:

$$2x + y \ge 4$$
$$x - y \le -1$$



7. Graph the system of inequalities

$$x + y \le 7$$
$$x \ge 2$$
$$y \ge 0$$



8. Solve the following linear programming problem using the geometric method. Graphs of the appropriate equations are given.

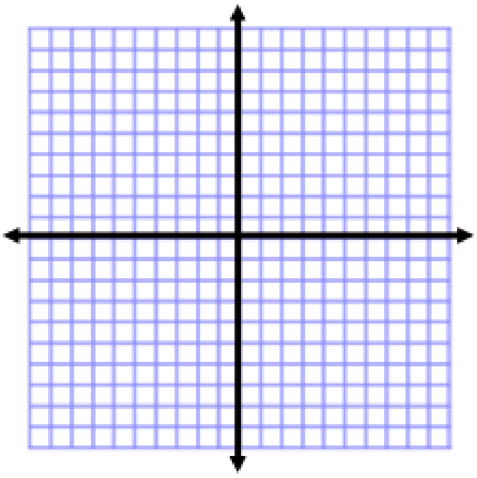
Minimize: $z = -2y + 2x$

Subject to:

$$x - y \geq -2$$

$$4x + 3y \leq 20$$

$$y \geq -2$$



9. *Write the following as a linear programming problem. DO NOT SOLVE!!*

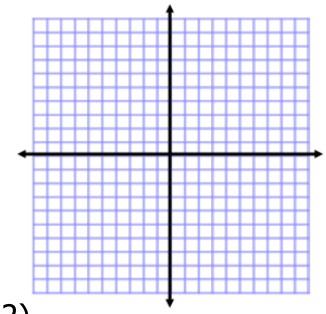
A dietician has two foods with which to prepare a diet containing at least 400 units of calcium, 175 units of iron and 280 units of vitamin A. The table below gives the units of calcium, iron and vitamin A per ounce for the two foods.

	Food I	**Food II**
Calcium	12	20
Iron	14	12
Vitamin A	10	25

Food I costs 35 cents an ounce and Food II costs 42 cents an ounce. What combination of the two foods gives the diet, meeting the above requirements, of minimum costs?

10. Select the point that is in the feasible region of the system of inequalities.

$$2x + 3y \leq 8$$
$$5x + 2y \leq 7$$
$$x \geq 0, y \geq 0$$

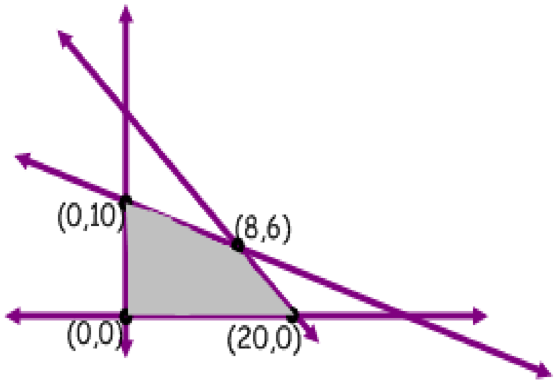


a. (1, 2) b. (1, 1) c. (0, 3) d. (3, 2)

11. Write the following information as a system of inequalities.
DO NOT SOLVE!!

A manufacturer makes regular and thermal efficient windows. The regular windows cost $75 each and the thermal efficient cost $140 each. The production capacity is 135 windows per day and the costs are to be held to $15,000 per day.

13. Find the maximum value of $z = 6x + 10y$ in the feasible region shown.



15. Set up the objective function and constraints for the following problem.
DO NOT SOLVE!!

A patient is restricted to three foods, A, B, & C. Food A contains 2 mg of salt, 80 calories, and 40 mg of protein per unit. Food B contains 1 mg of salt, 90 calories, and 25 mg protein per unit. Food C contains 4 mg salt, 60 calories, and 50 mg protein per unit. The patient is to have no more than 20 mg salt and 900 calories. How many units of each food should be served in order to maximize protein?

16. In the following linear programming problem, identify each of the following:

Objective function: ______________________________

Linear Constraints: ______________________________

Optimal Solution: ______________________________

Maximize: $z = 4x + 4y$

Subject to:

$x + y \leq 8$

$x - y \geq 0$

$x \geq 0$

$y \geq 2$

<u>Corner Points</u>
(6, 2)
(4, 4)
(2, 2)