Name:____ Date:________________

Honors Algebra II Period :_______________

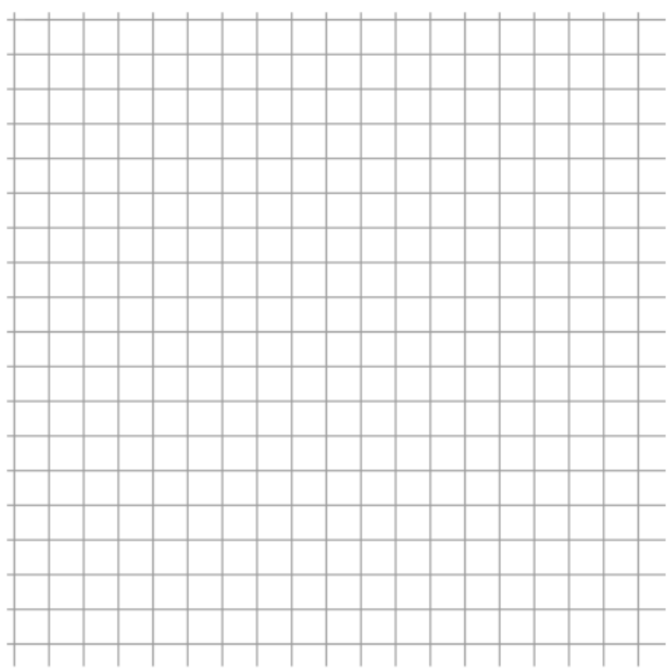
Linear Programming Word Problems

1.) At a certain refinery, the refining process requires the production of at least two gallons of gasoline for each gallon of fuel oil. To meet the anticipated demands of winter, at least three million gallons a day of fuel oil will need to be produced. The demand for gasoline, on the other hand, is not more than 6.4 million gallons a day.

If gasoline is selling for $1.90/gal and fuel oil sells for $1.50/gal, how much of each should be produced in order to maximize revenue?

x: gallons of gasoline produced

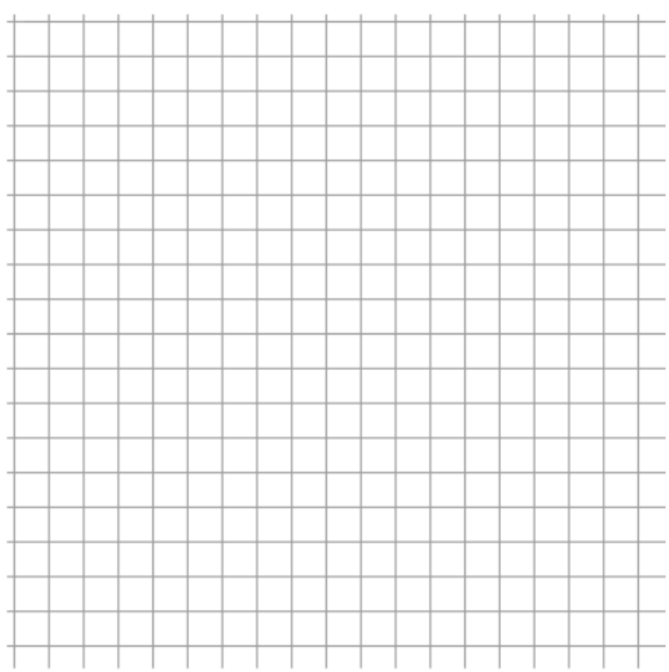
y: gallons of fuel oil produced



2.) A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators much be shipped each day.

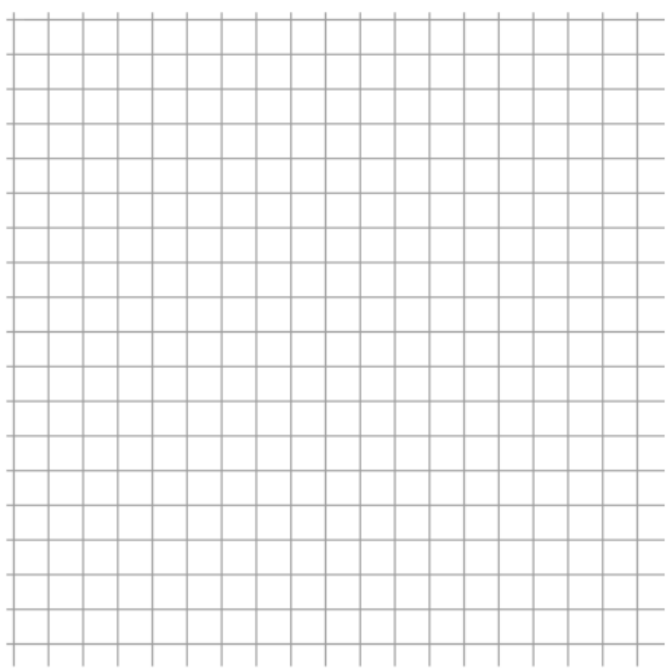
If each scientific calculator sold results in a \$2 loss, but each graphing calculator produces a \$5 profit, how many of each type should be made daily to maximize net profits?

x: number of scientific calculators produced
y: number of graphing calculators produced



3.) You need to buy some filing cabinets. You know that Cabinet X costs $10 per unit, requires six square feet of floor space, and holds eight cubic feet of files. Cabinet Y costs $20 per unit, requires eight square feet of floor space, and holds twelve cubic feet of files. You have been given $140 for this purchase, though you don't have to spend that much. The office has room for no more than 72 square feet of cabinets.
How many of which model should you buy, in order to maximize storage volume?

x: number of model X cabinets purchased
y: number of model Y cabinets purchased

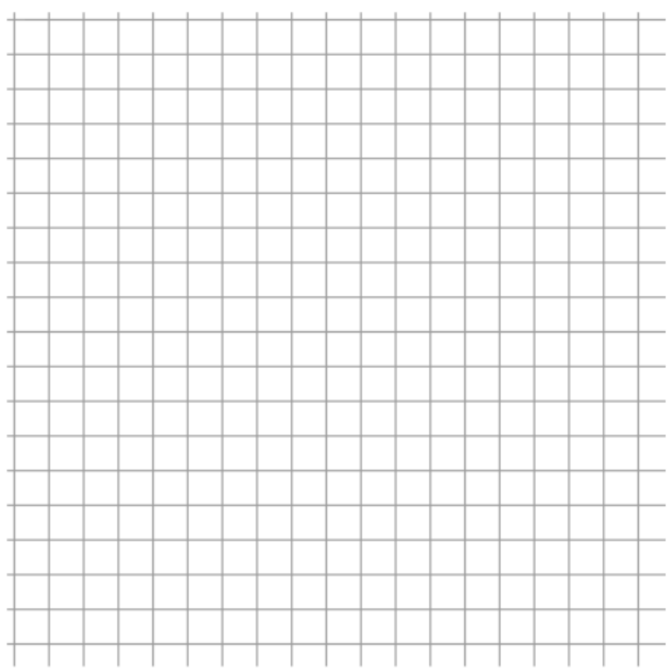


4.) In order to ensure optimal health (and thus accurate test results), a lab technician needs to feed the rabbits a daily diet containing a minimum of 24 grams (g) of fat, 36 g of carbohydrates, and 4 g of protein. But the rabbits should be fed no more than five ounces of food a day.

Rather than order rabbit food that is custom-blended, it is cheaper to order Food X and Food Y, and blend them for an optimal mix. Food X contains 8 g of fat, 12 g of carbohydrates, and 2 g of protein per ounce, and costs $0.20 per ounce. Food Y contains 12 g of fat, 12 g of carbohydrates, and 1 g of protein per ounce, at a cost of $0.30 per ounce.

What is the optimal blend?

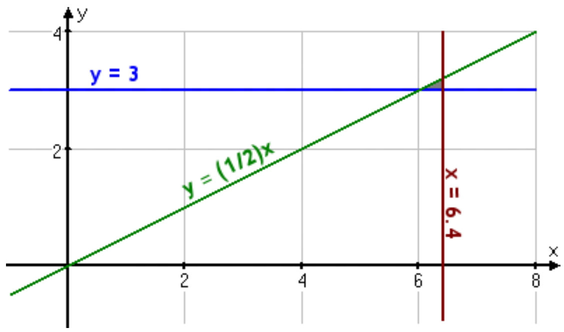
x: number of ounces of Food X
y: number of ounces of Food Y

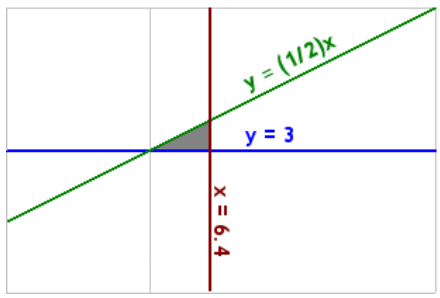


Answers

1.) $x \geq 0$
$x \leq 6{,}400{,}000$
$y \geq 3{,}000{,}000$
$y \leq (\frac{1}{2})x$

$R(x,y) = 1.9x + 1.5y$

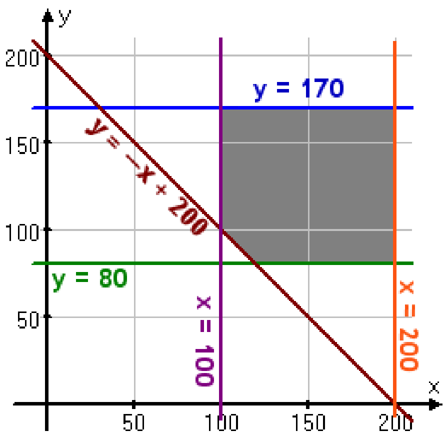




When you test the corner points at (6.4m, 3.2m), (6.4m, 3m), and (6m, 3m), you should get a maximal solution of R = \$16.96m at (x, y) = (6.4m, 3.2m).

2.) $100 \leq x \leq 200$
$80 \leq y \leq 170$
$y \geq -x + 200$

$R(x,y) = -2x + 5y$



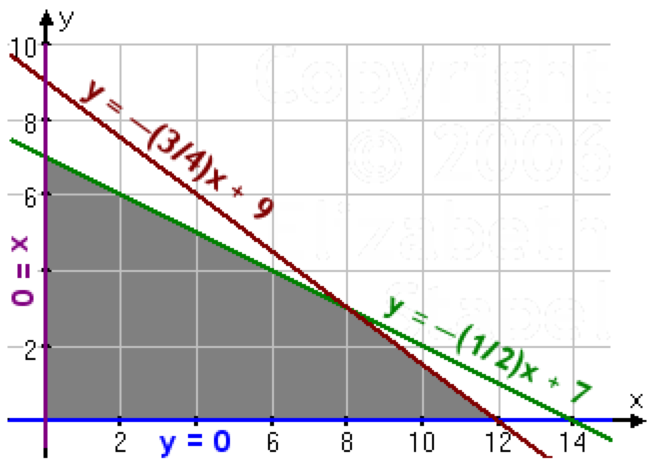
When you test the corner points at (100, 170), (200, 170), (200, 80), (120, 80), and (100, 100), you should obtain the maximum value of R = 600 at (x, y) = (100, 170). That is, the solution is "100 scientific calculators and 170 graphing calculators".

3.) $10x + 20y \leq 140$

$6x + 8y \leq 72$ $\qquad$ V(x,y) = 8x + 12y

$x \geq 0$

$y \geq 0$



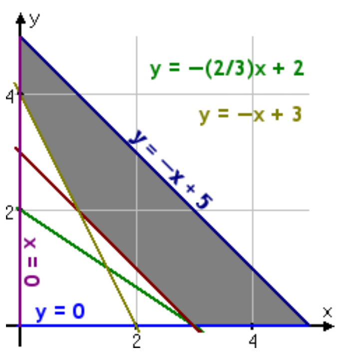
When you test the corner points at (8, 3), (0, 7), and (12, 0), you should obtain a maximal volume of 100 cubic feet by buying eight of model X and three of model Y.

4.) $8x + 12y \geq 24$

$12x + 12y \geq 36$ $\qquad$ $C(x,y) = 0.2x + 0.3y$

$2x + 1y \geq 4$

$x + y \leq 5$



When you test the corners at (0, 4), (0, 5), (3, 0), (5, 0), and (1, 2), you should get a minimum cost of sixty cents per daily serving, using three ounces of Food X only.