

Honors Algebra 2/Trig
4.11 Linear Programming

Name: Key

1. A manufacturer produces two models of mountain bicycles. The time (in hours) required for assembling and painting each model are given in the following table:

	Model A	Model B
Assembling	5	4
Painting	2	3

The maximum total weekly hours available in the assembly department and the paint department are 200 hours and 108 hours, respectively. The manufacturer must produce at least 12 of Model A and 10 of Model B. The profits per unit are \$25 for model A and \$15 for model B. How many of each type should be produced to maximize profit?

- a. Define the variables

$x = \text{Model A}$
 $y = \text{Model B}$

- b. Constraints

$5x + 4y \leq 200$
 $2x + 3y \leq 108$
 $x \geq 12$
 $y \leq 10$

- c. Objective Function

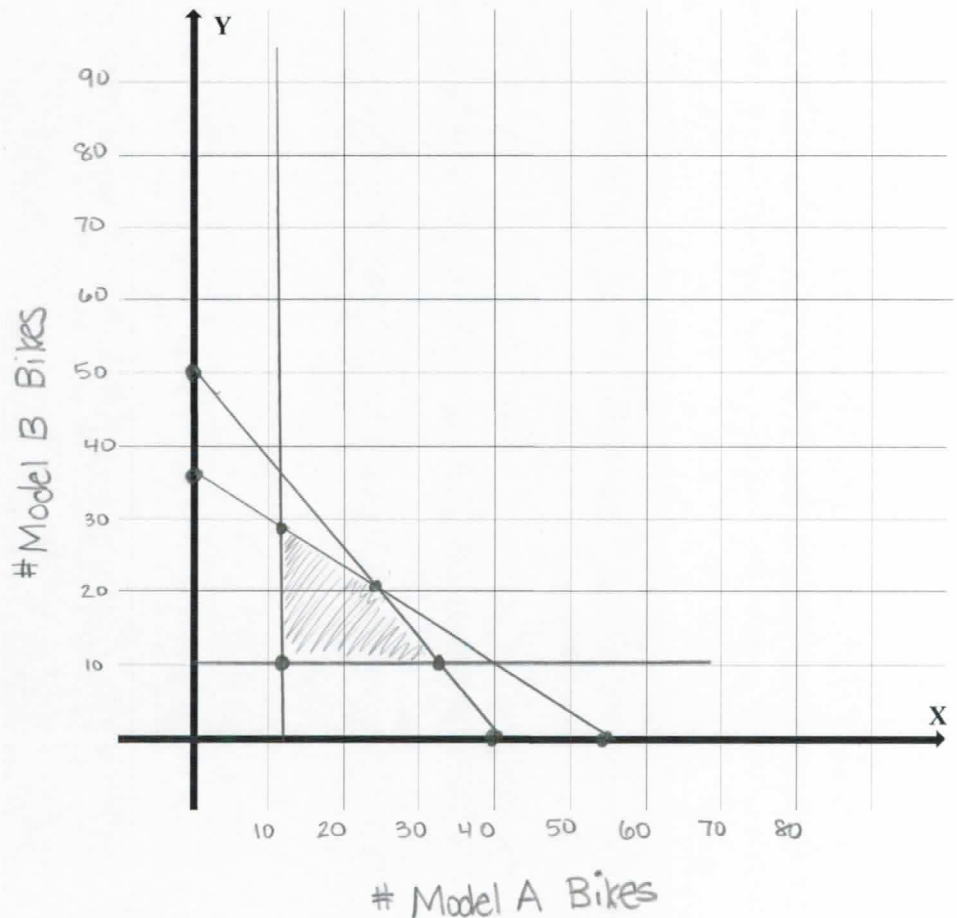
$P = 25x + 15y$

- d. Graph

$-3(5x + 4y = 200)$
 $4(2x + 3y = 108)$
 $-15x - 12y = -600$
 $8x + 12y = 432$

 $-7x = -168$
 $-7 \quad -7$
 $x = 24$

$5(24) + 4y = 200$
 $120 + 4y = 200$
 $4y = 80$
 $y = 20$



- e. Maximize

$(24, 20) \quad 900$

$(12, 10) \quad 450$

$(12, 28) \quad 720$

$(32, 10) \quad 950$

2. Food and clothing are shipped to survivors of a natural disaster. Each carton of food will feed 12 people, while each carton of clothing will help 5 people. Each 20-cubic-foot box of food weighs 50 pounds and each 10-cubic-foot box of clothing weighs 20 pounds. The commercial carriers transporting food and clothing are bound by the following constraints:

- The total weight per carrier cannot exceed 19,000 pounds.
- The total volume must be no more than 8000 cubic feet.

How many cartons of food and clothing should be sent with each plane shipment to maximize the number of people who can be helped?

a. Define the variables

$$x = \# \text{ cartons food}$$

$$y = \# \text{ cartons clothing}$$

b. Constraints

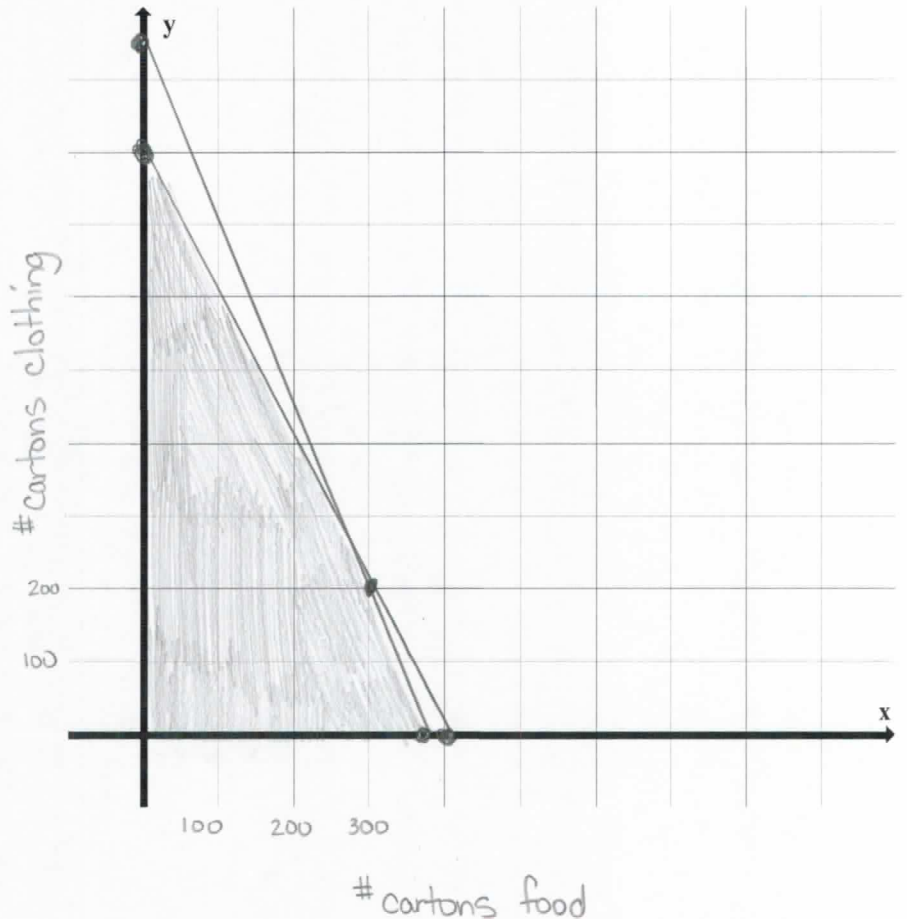
$$50x + 20y \leq 19,000$$

$$20x + 10y \leq 8000$$

c. Objective Function

$$P = 12x + 5y$$

d. Graph



a. Maximize

(300, 200)	4600 people
(0, 800)	4000 people
(380, 0)	4560 people

$$50x + 20y = 19000$$

$$-2(20x + 10y = 8000)$$

$$-40x - 20y = -16000$$

$$10x = 3000$$

$$x = 300$$

$$6000 + 10y = 8000$$

$$10y = 2000$$

$$y = 200$$