Linear Programming Practice   Friday Week 6

A ski manufacturer makes two types of skis and has a fabricating department and a finishing department. A pair of downhill skis requires 6 hours to fabricate and 1 hour to finish. A pair of cross-country skis takes 4 hours to fabricate and 1 hour to finish. The fabricating department has 108 hours of labor available per day. The finishing department has 24 hours of labor available per day. The company makes a profit of $40 on each pair of downhill skis and a profit of $30 on each pair of cross-country skis.

a)   How many of each kind of skis should they make to maximize the profit?

b)   What is the maximum profit?

c)   **Step #1**: Write the constraints (the inequalities)

Let x=# pairs of downhill skis
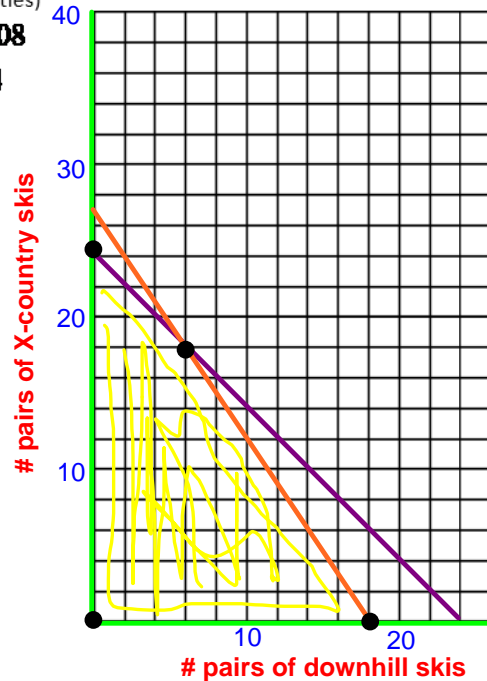**y=# pairs of X-country skis**

$$6x+4y \leq 108$$
$$1x+1y \leq 24$$
$$x \geq 0; y \geq 0$$

Step #2: Write the objective function.

P=40x+30y

Step #3: Graph the constraints

pairs of X-country skis

pairs of downhill skis

Step #4: State the coordinates of each vertex.

(0,0)   (18,0)   (0,24)   (6,18)

Step #5: Test the coordinates of each vertex in the objective function.

Step #6: Answer the question.

You should manufacture 6 pair of downhill skis and 18 pair of X-country skis to get a maximum profit of $780

Vertices	Objective Function P=40x+30y
(0,0)	P=40(0)+30(0)=0
(18,0)	P=40(18)+30(0)=720
(0,24)	P=40(0)+30(24)=720
(6,18)	P=40(6)+30(18)=780

Trenton, Michigan, as small community, is trying to establish a public transportations system of large and small vans. It can spend no more than $100,000 for both sizes of vehicles and no more than $500 per month for maintenance. The community can purchase a small van for $10,000 and maintain it for $100 per month. The large vans cost $20,000 each and can be maintained for $75 per month. Each large van carries a maximum of 15 passengers, and each small van carries a maximum of 7 passengers.

a) How many of each kind of van should they buy to maximize the number of people that can be transported?

b) What is the maximum number of people?

c) **Step #1**: Write the constraints (the inequalities)

$$10,000x + 20,000y \leq 100,000$$
$$100x + 75y \leq 500$$
$$x \geq 0; y \geq 0$$

Let x=# small vans
y=# large vans

Step #2: Write the objective function.

P=7x+15y

Step #3: Graph the constraints

small vans

#large vans
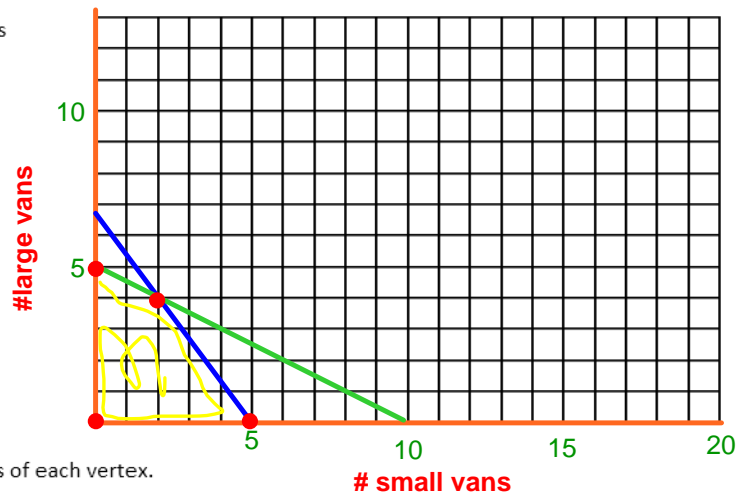
Step #4: State the coordinates of each vertex.

(0,0)   (5,0)   (0,5)   (2,4)

Step #5: Test the coordinates of each vertex in the objective function.

Step #6: Answer the question.

They should purchase 0 small vans and 5 large vans for a maximaum passenger load of 75.

Vertices	Objective Function P=7x+15y
(0,0)	P=7(0)+15(0)=0
(5,0)	P=7(5)+15(0)=35
(0,5)	P=7(0)+15(5)=75
(2,4)	P=7(2)+15(4)=74