

LINEAR PROGRAMMING NOTES

STEPS IN SOLVING LINEAR PROGRAMMING PROBLEMS

1. Read the problem. Then READ again!
2. Define variables.
3. Find the objective quantity (this is what you are trying to min/max).
4. Find constraints (these are inequalities).
5. Graph the inequalities.
6. Find all corner points of your feasible region (solve a system!).
7. Test all corner points in your objective quantity (to find the max/min).
8. Answer the question in a sentence.

TICKETS PROBLEM

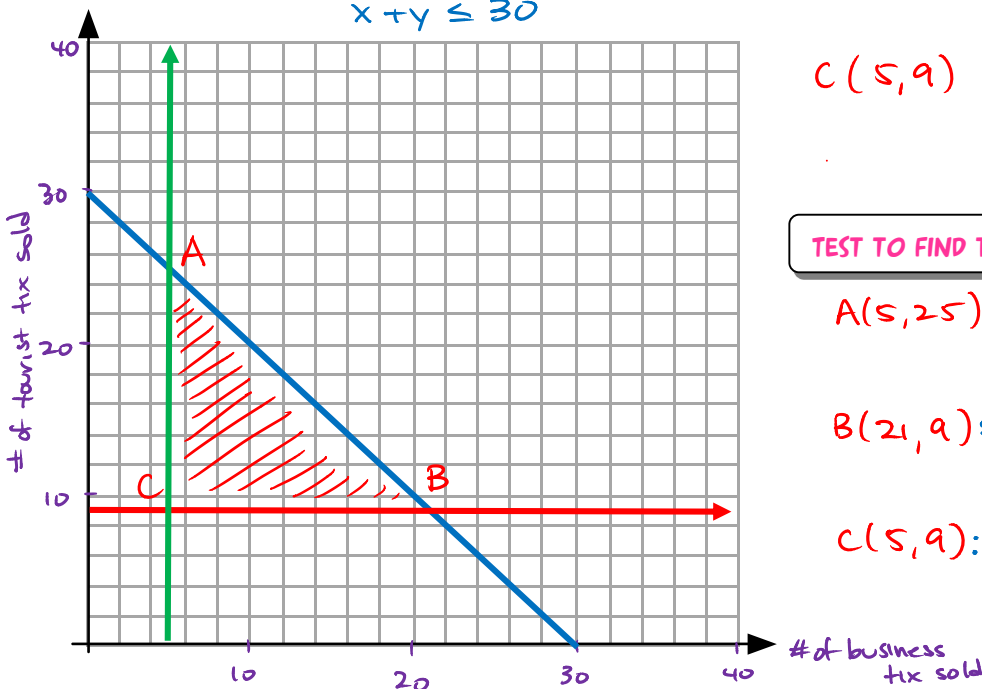
Fly High Airlines sells business class and tourist class seats for its charter flights. To charter a plane, at least 5 business class tickets must be sold and at least 9 tourist class tickets must be sold. The plane does not hold more than 30 passengers. Fly-High makes \$40 profit for each business class ticket sold and \$45 profit for each tourist class ticket sold. In order for Fly-High Airlines to maximize profits, how many tourist class seats should they sell?
 $x = \#$ of business class tickets sold
 $y = \#$ of tourist class tickets sold

OBJECTIVE QUANTITY

$$40x + 45y = \text{Profit}$$

CONSTRAINTS

$$\begin{aligned} x &\geq 5 \\ y &\geq 9 \\ x + y &\leq 30 \end{aligned}$$



CORNER POINTS - SOLVING SYSTEMS!

$$A(5, 25) - \begin{cases} x = 5 \\ x + y = 30 \end{cases}$$

$$B(21, 9) - \begin{cases} x + y = 30 \\ y = 9 \end{cases}$$

$$C(5, 9) - \begin{cases} x = 5 \\ y = 9 \end{cases}$$

Solve these systems for corner points

TEST TO FIND THE MAX/MIN

Test in obj. quantity
 $40x + 45y = P$

$$A(5, 25): 40(5) + 45(25) \\ P = \$1325 *$$

$$B(21, 9): 40(21) + 45(9) \\ P = \$1245$$

$$C(5, 9): 40(5) + 45(9) \\ P = \$605$$

* Max profit when selling 5 business tickets & 25 tourist tickets.

HAMBURGERS AND HOT DOGS PROBLEM

A snack bar cooks and sells hamburgers and hot dogs during football games. To stay in business, it must sell at least 10 hamburgers but cannot cook more than 40. It must also sell at least 30 hot dogs but cannot cook more than 70. It cannot cook more than 90 sandwiches all together. The profit on a hamburger is \$0.33 and \$0.21 on a hot dog. How many of each kind of sandwich should the stand sell to make the maximum profit?

$x = \#$ of hamburgers

$y = \#$ of hotdogs

Objective quantity:

$$\text{Max Profit} = .33x + .21y$$

Constraints:

$$\begin{cases} x \geq 10 & x \leq 40 \\ y \geq 30 & y \leq 70 \\ x + y \leq 90 \end{cases}$$

Corner points

- A) (10, 70)
- B) (20, 70) - $\begin{cases} x+y=90 \\ y=70 \end{cases}$
- C) (40, 50) - $\begin{cases} x+y=90 \\ x=40 \end{cases}$
- D) (40, 30)
- E) (10, 30)

Testing Corner Points: $P = .33x + .21y$

- A) (10, 70) - \$18.00
- B) (20, 70) - \$21.30
- C) (40, 50) - \$23.70 *
- D) (40, 30) - \$19.50
- E) (10, 30) - \$9.60

* They will get a max profit of \$23.70 when they sell 40 hamburgers and 50 hotdogs.

