IE 3035 - Operations Research Quiz 1

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Question 1

Wild West produces two types of cowboy hats. A type 1 hat requires three times as much labor time as a type 2. If the all available labor time is dedicated to type 2 alone, the company can produce a total of 460 Type 2 hats a day. The market limits for the two types are 100 and 300 hats per day for Type 1 and Type 2, respectively. The profit $8 per Type 1 hat and $5 per Type 2 hat. Determine the number of hats of each type that would maximize profit.

   i. Build the mathematical model of the problem.

  ii. Solve the problem graphically.

Solution 1

	produced	labor time	market limit	profit
Type 1	x_1	3	100	8
Type 2	x_2	1	300	5

Desicion variables: x_1: number of type 1's produced

                      x_2:   "   "   type 2's   "

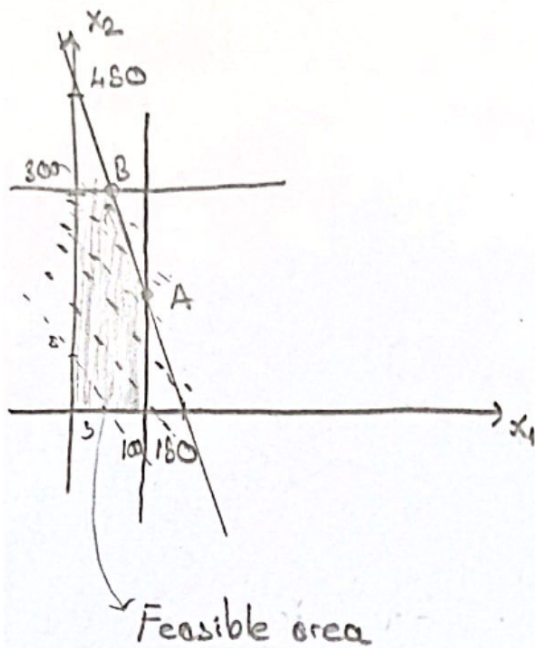Objective function: $z = 8x_1 + 5x_2$

              ↳ profit

Constraints:

| All time = 480 |

$$3x_1 + x_2 \leq 480$$
$$x_1 \leq 100$$
$$x_2 \leq 300$$
$$x_1, x_2 \geq 0$$

①

Solution 1 Cont'd

x_2

450

300   B

A

x_1

3

100 150

Feasible area

For maximizing we need to go far away from origin.

$A (100, 150) \Rightarrow Z = 800 + 750 = \underline{1550 \$}$

$x_2 = 450 - 3x_1$
$x_2 = 450 - 300$
$x_2 = 150$

$B(50, 300) \Rightarrow Z = 400 + 1500 = \underline{1900 \$}$

$x_2 = 450 - 3x_1$

$300 = 450 - 3x_1$

$3x_1 = 150$

$x_1 = 50$

$\underline{Point \ B(50, 300) \ is \ optimum.}$

Answer: The company should produce 50 Type 1 hats and 300 Type 2 hats for maximized profit which is $\underline{\$1900}$.

②