Kadir Berk Yağar 150120016

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K.B.Yağar

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 450 Type 2 hats a day. The market limits for the two types are 100 and 300 per day for Type 1 and Type 2, respectively. The profit is $8 per Type 1 hat and $5 per Type 2 hat. Determine the number of hats of each type that would maximise the profit.

I. Build the mathematical model of the problem.

II. Solve the problem graphically.

Answer

I. $x_1 \rightarrow$ Type 1 $\quad x_2 \rightarrow$ Type 2

$$3x_1 + x_2 \leq 450$$

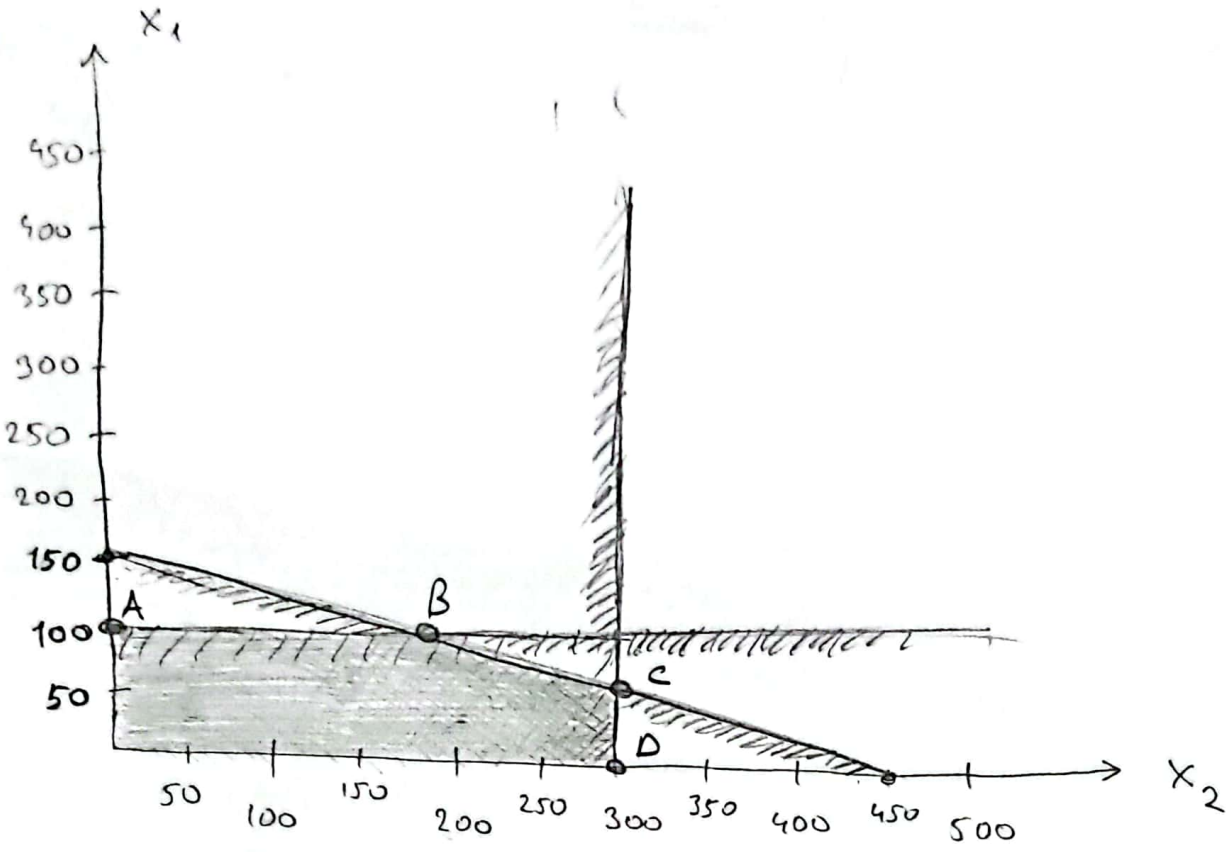
$$x_1 \leq 100$$

$$x_2 \leq 300$$

$$x_1, x_2 \geq 0$$

$$\text{Max } z = 8x_1 + 5x_2$$

II



- $3x_1 + x_2 \leq 450 \Rightarrow 3x_1 + x_2 = 450$ $\quad x_1 = 150,\ x_2 = 0$; $x_1 = 0,\ x_2 = 450$
- $x_1 \leq 100 \Rightarrow x_1 = 100$
- $x_2 \leq 300 \Rightarrow x_2 = 300$ $\quad x_1, x_2 \geq 0$

Max $8x_1 + 5x_2$

Lets try for points A, B, C, D :

A $\Rightarrow 8.(100) + 5(0) = \underline{800}$

B $\Rightarrow 8.(100) + 5(150) = 800 + 750 = \underline{1550}$

C $\Rightarrow 8.(50) + 5.(300) = 400 + 1500 = \underline{1900}$

D $\Rightarrow 8.(0) + 5.(300) = 0 + 1500 = \underline{1500}$

The maximum is 1900 for a day