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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 hats per day for Type 1 and Type 2 respectively. The profit \$8 per day Type 1 hat and \$5 per Type 2 hat. Determine the number of hats of each type that would max profit.

i. Build the mathematical model of the problem.

ii. Solve the problem generally.

Answer:

i) Type 1 hat : x_1

Type 2 hat : x_2

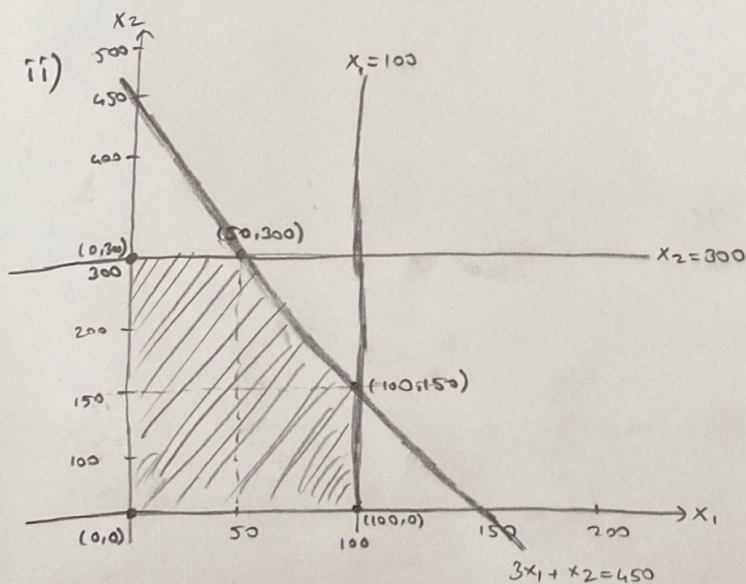
Maximize : $z = 8x_1 + 5x_2$

s.t $3x_1 + x_2 \leq 450$

$x_1 \leq 100$

$x_2 \leq 300$

$x_1 \geq 0, x_2 \geq 0$



Critical points:

$(0,0) \rightarrow 8 \cdot 0 + 5 \cdot 0 = 0$

$(100,0) \rightarrow 8 \cdot 100 + 5 \cdot 0 = 800$

$(0,300) \rightarrow 8 \cdot 0 + 5 \cdot 300 = 1500$

$(50,300) \rightarrow 8 \cdot 50 + 5 \cdot 300 = 1900$

$(100,150) \rightarrow 8 \cdot 100 + 5 \cdot 150 = 1550$

Optimum

$(50,300)$

$z = 1900$

$x_1 = 50, x_2 = 300$

$8 \cdot 0 + 300$
 $\underline{1500}$

$8 \cdot 100$
 $\underline{800}$

$8 \cdot 50$
 $\underline{400}$
 $5 \cdot 300$
 $\underline{1500}$
 1900