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Q.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 alone the company can produce a total of 450 type II hats a day. The market limits for the two types are 100 and 300 hats per day for type I and type II respectively. The profit is \$9 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
- ii. Solve the problem graphically

Harol Bahadur

## Solution

	Produce	profit	max limit
$x_1$ Type 1		8 \$	100
$x_2$ type 2		5 \$	300

$$8x_1 + 5x_2 \rightarrow \max$$

$$2x_1 + x_2 \leq 450$$

$$x_1 \leq 100$$

$$x_2 \leq 300$$

$$x_1, x_2 \geq 0$$

$$2x_1 + x_2 = 450$$

$$x_1 = 0 \quad x_2 = 450 \quad (0, 450)$$

$$x_2 = 0 \quad x_1 = 225 \quad (225, 0)$$

$$\text{for } x_1 = 100 \quad x_2 = (100, 250)$$

$$\text{for } x_2 = 300 \quad x_1 = 75 \quad (75, 300)$$

$$8x_1 + 5x_2 = Z$$

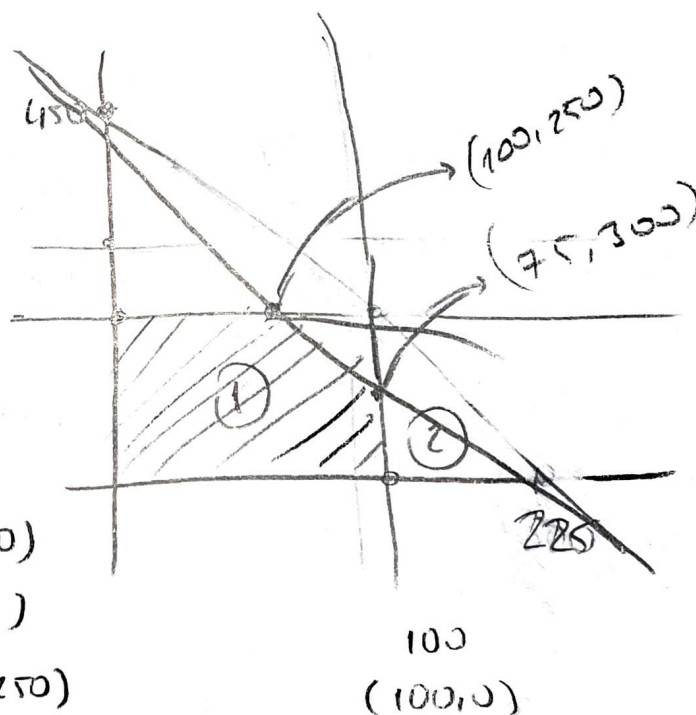
$$x(0, 450) \rightarrow 0 + 5 \cdot 450 = 2250$$

$$x(225, 0) \rightarrow 225 \cdot 8 + 0 = 1800$$

$$(100, 250) = 800 + 1250 = 2050$$

$$(75, 300) = 75 \cdot 8 + 300 \cdot 5 = 2100$$

600 + 1500



$$\begin{array}{r} 4 \\ 225 \\ \times 8 \\ \hline 1800 \end{array}$$