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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 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 limit for the two types are 100 and 300 hats per day for Type 1 and 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 maximize profit.

- Build the mathematical model of the problem.
- Solve the problem graphically.

Answer:

i.

	labor time	profit
Type 1	$3n$	\$8
Type 2	n	\$5

x_1 : number of Type 1 hats produced
 x_2 : " " Type 2 " "

Available labor time = 450n

Objective function = $z = 8x_1 + 5x_2$ (maximize)

$$3n x_1 + n x_2 = 450n$$

$$3x_1 + x_2 = 450$$

$$x_1 \leq 100$$

$$x_2 \leq 300$$

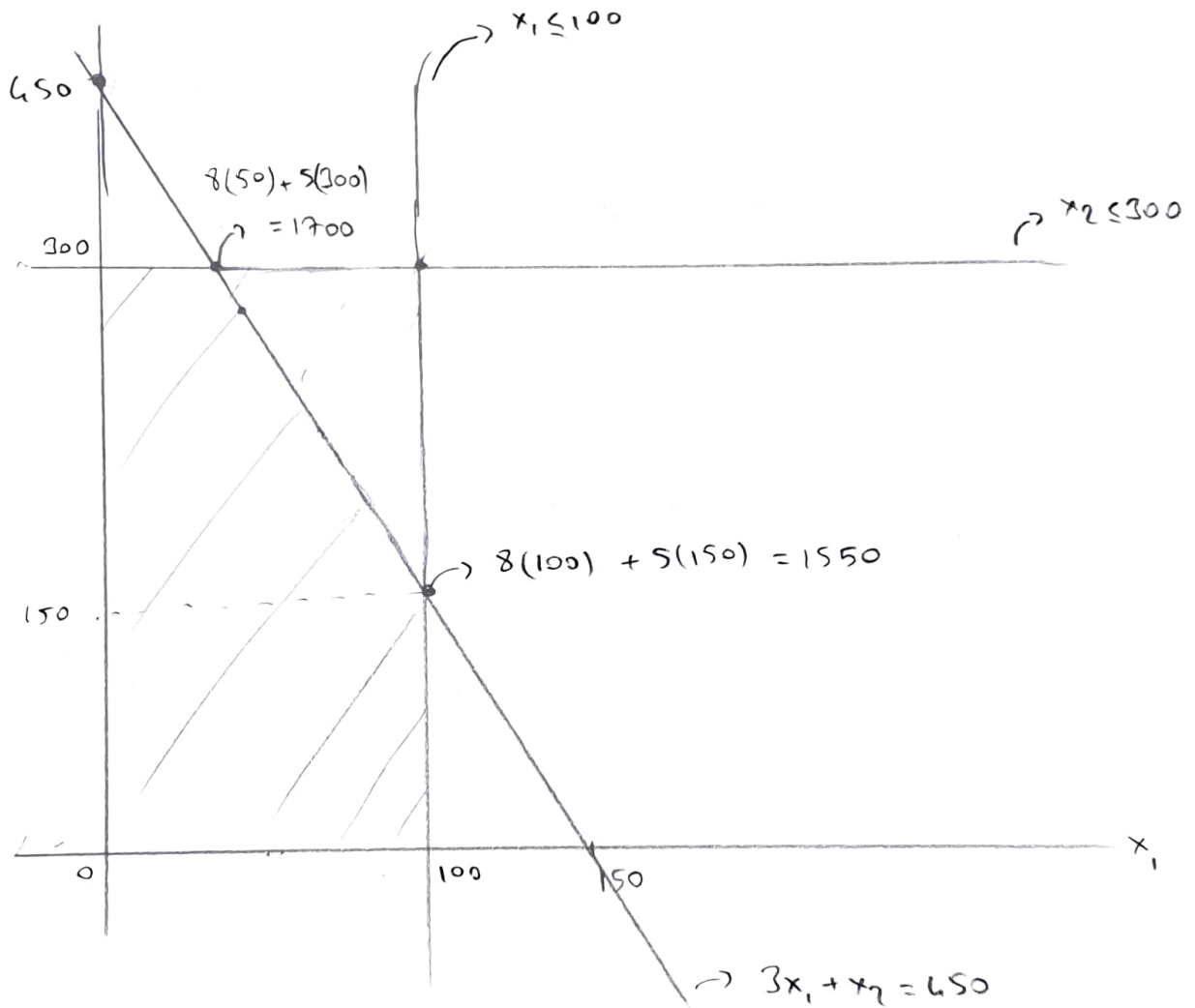
$$x_1, x_2 \geq 0 \text{ (nonnegativity)}$$

$$x_1, x_2 \in \mathbb{Z}^+ \text{ (integer)}$$

ii. $3x_1 + x_2 = 450$

$x_1 \leq 100$

$x_2 \leq 300$



$z = 8x_1 + 5x_2$

$x_1 = 60$

$x_2 = 270$

$z = 8(60) + 5(270) = 1830$

$x_1 = 55$

$x_2 = 285$

$\star z = 1865$ max profit

$x_1 = 70$

$x_2 = 240$

$z = 8(70) + 5(240) = 1760$

$x_1 = 55$

$x_2 = 285$

$z = 8(55) + 5(285) = 1865$