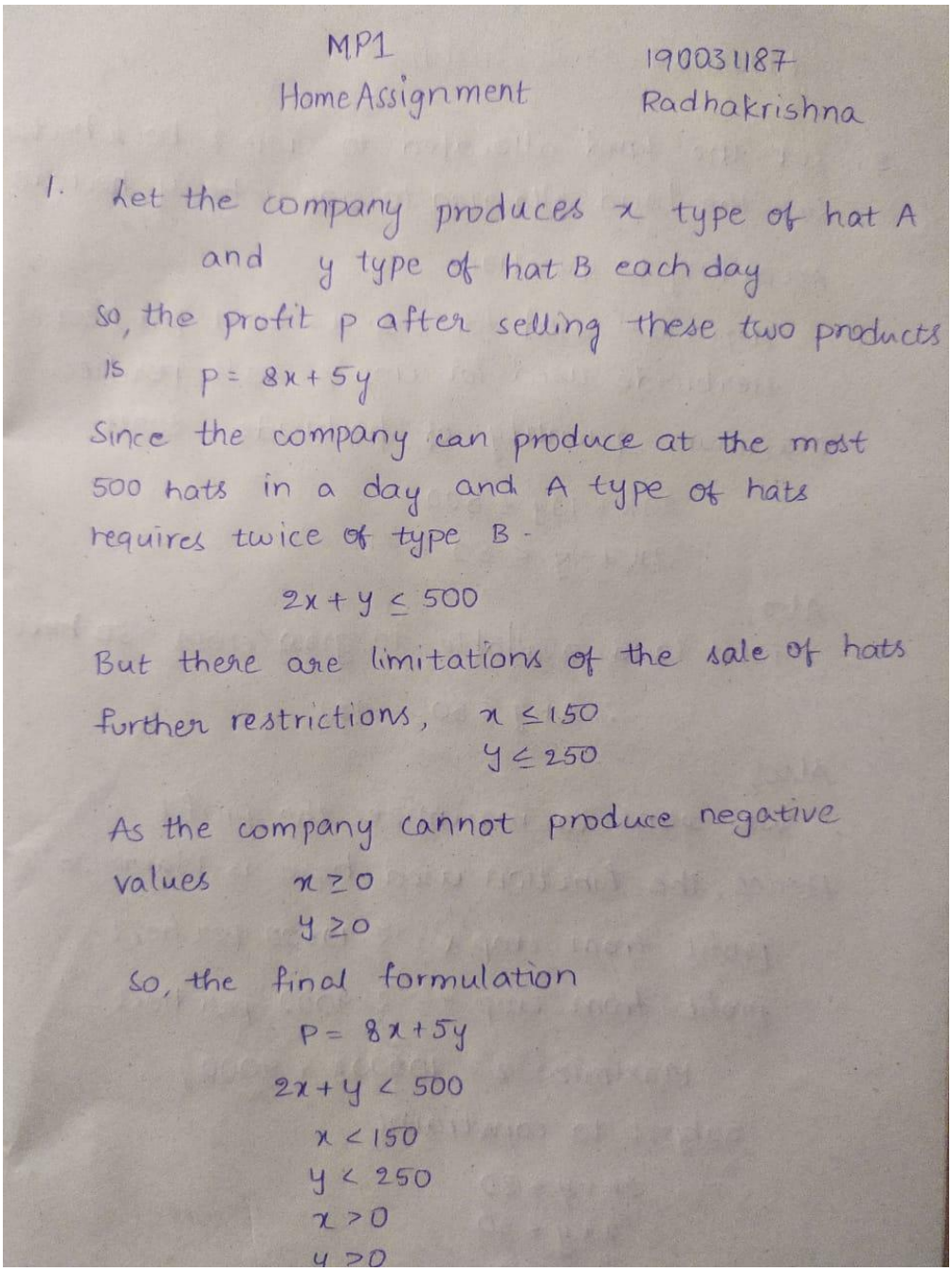
CO1 HOME ASSIGNMENT

1. A company produces 2 types of cowboy hats. Each hat of the first type requires twice as much labour time as the second type. The company can produce a total of 500 hats a day. The market limits the daily sales of first and second types to 150 and 250 hats. Assuming that the profits per hat are $8 per type A and $5 per type B, formulate the problem as Linear Programming model in order to determine the number of hats to be produced of each type so as to maximize the profit.



MP1 Home Assignment

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1. Let the company produces x type of hat A and y type of hat B each day

So, the profit p after selling these two products is $p = 8x + 5y$

Since the company can produce at the most 500 hats in a day and A type of hats requires twice of type B.

$$2x + y \leq 500$$

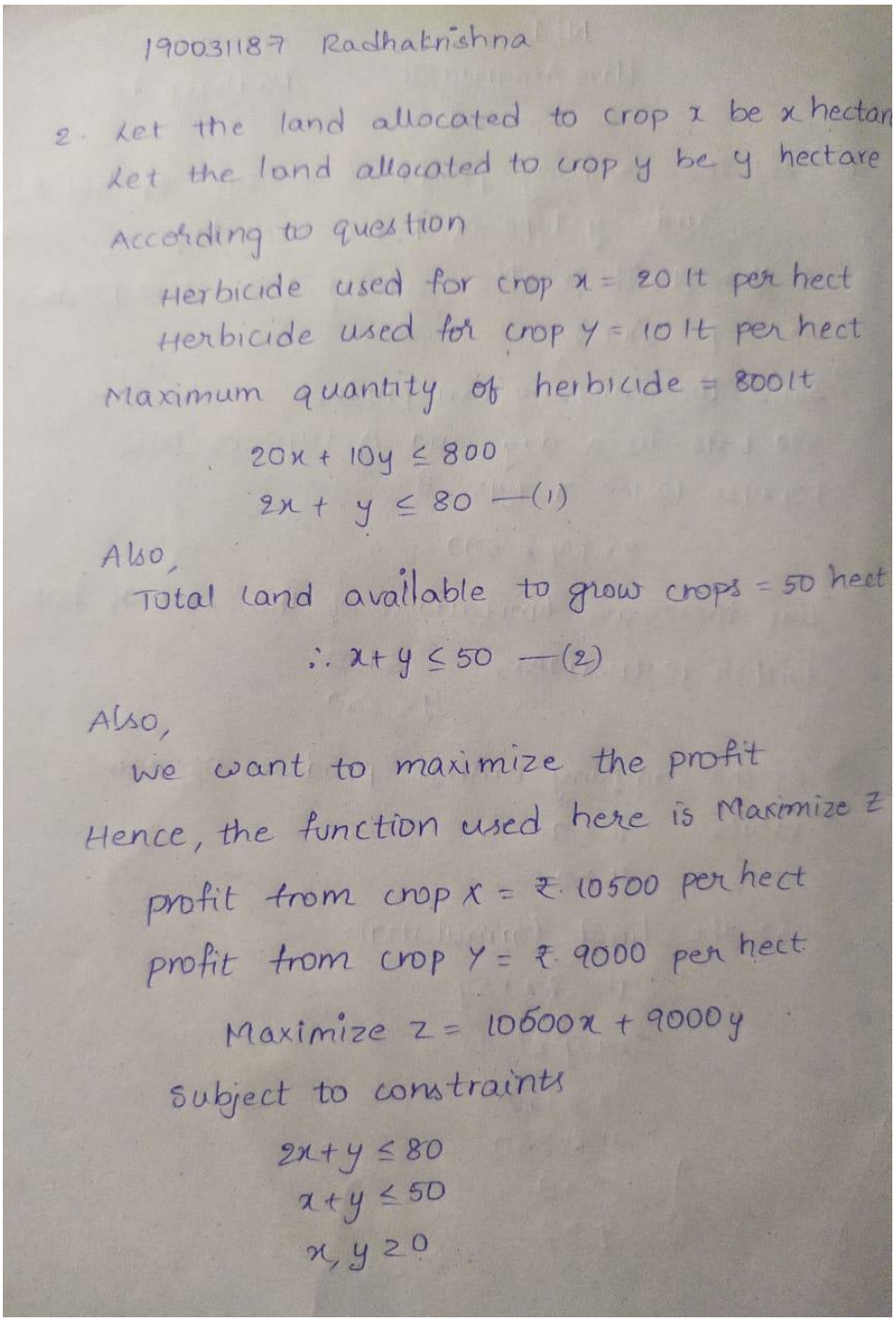
But there are limitations of the sale of hats further restrictions, $x \leq 150$, $y \leq 250$

As the company cannot produce negative values $x \geq 0$, $y \geq 0$

So, the final formulation

$$p = 8x + 5y$$
$$2x + y < 500$$
$$x < 150$$
$$y < 250$$
$$x > 0$$
$$y > 0$$

2. A cooperative society of farmers has 50 hectares of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide must be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used to protect fish and wildlife using a pond which collects drainage from this land. How much land should be allocated to each crop to maximise the total profit of the society? (formulating Mathematical modelling of LPP)



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2. Let the land allocated to crop x be x hectar
Let the land allocated to crop y be y hectare

According to question

Herbicide used for crop x = 20 lt per hect
Herbicide used for crop y = 10 lt per hect

Maximum quantity of herbicide = 800 lt

$$20x + 10y \leq 800$$
$$2x + y \leq 80 \quad —(1)$$

Also,
Total land available to grow crops = 50 hect

$$\therefore x + y \leq 50 \quad —(2)$$

Also,
We want to maximize the profit

Hence, the function used here is Maximize Z

profit from crop X = ₹ 10500 per hect
profit from crop Y = ₹ 9000 per hect

$$\text{Maximize } Z = 10500x + 9000y$$

Subject to constraints

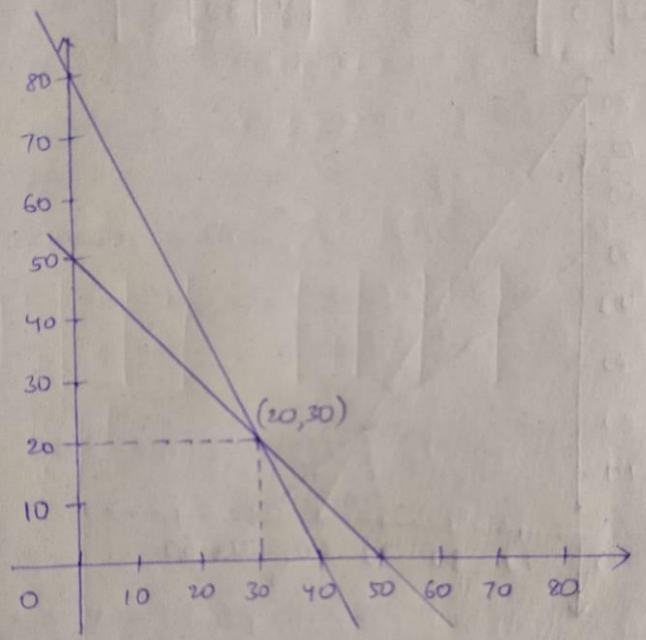
$$2x + y \leq 80$$
$$x + y \leq 50$$
$$x, y \geq 0$$

$x + y \leq 50$

x	0	50
y	50	0

$2x + y \leq 80$

x	0	40
y	80	0



Corner points	Value of z	
(0, 50)	450000	
(30,20)	495000	→ maximum
(40,0)	420000	
(0,0)	0	

Hence the profit will be maximum if
land allocated to crop x = 30 hectare
land allocated to crop y = 20 hectare