Linear Programming Notes

1. A TV company makes ~~consoles~~ xboxes and ~~wide-screen televisions~~ play station. The equipment in the factory allows for manufacturing of at most 450 ~~TV consoles~~ xboxes and 200 ~~wide-screen TVs~~ PS per month. The chart below shows the profits and costs for each item.

Gaming Console Type	Cost Per Unit	Profit Per Unit
X-Box	$600	$125
Play Station	$900	$250

During the month of October, the company can spend $360,000 to make these items. How many of each type should be produced to maximize profit?

Step 1 Define Variables:

$x \rightarrow$ xboxes

$y \rightarrow$ play stations

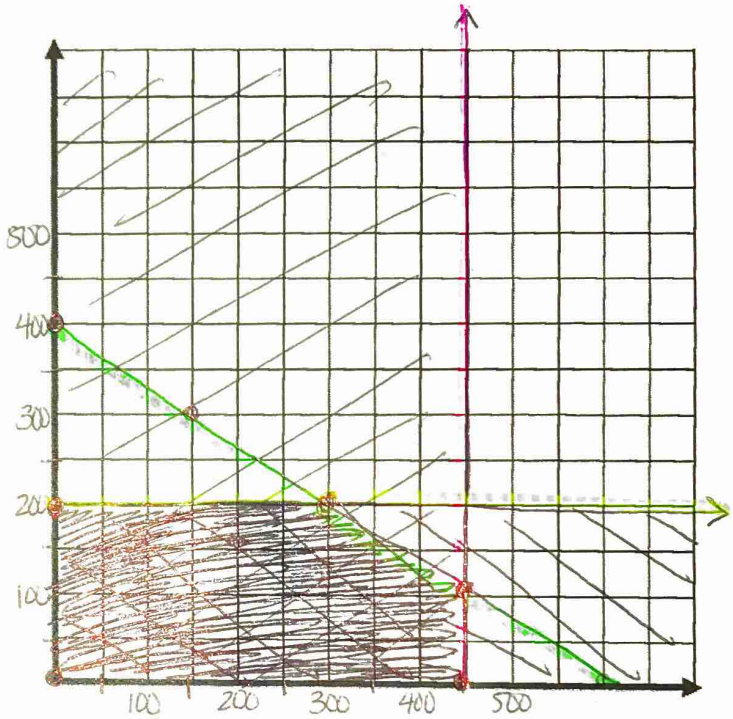
Step 2 List Constraints: (inequalities)

$x \leq 450$

$y \leq 200$

$600x + 900y \leq 360{,}000$

Step 3 Graph Inequalities and Shade the Regions:



Step 4 List Vertices of Feasible Region: (dark shading)

~~(0,0)~~

~~(0,200)~~ (300,200)

~~(450,0)~~ (450,100)

Step 5 Write a Profit Equation:

$P = 125x + 250y$

$600x + 900y \leq 360{,}000$

$900y \leq 360{,}000 - 600x$

$y \leq 400 - \frac{2}{3}x$

Step 6 Plug in all the Vertices (can be a table):

$P = 125(300) + 250(200) = 87{,}500$ ☆

$P = 125(450) + 250(100) = 81{,}250$

Step 7 Final Answer:

300 x-boxes

200 play stations

2. A farmer has 10 acres to plant in wheat and rye. He has to plant at least 7 acres. However, he has only $1200 to spend and each acre of wheat costs $200 to plant and each acre of rye costs $100 to plant. Moreover, the farmer has to get the planting done in 12 hours and it takes an hour to plant an acre of wheat and 2 hours to plant an acre of rye. If the profit is $500 per acre of wheat and $300 per acre of rye how many acres of each should be planted to maximize profits?

Step 1 Define Variables:

$x \rightarrow$ wheat

$y \rightarrow$ rye

Step 2 List Constraints:

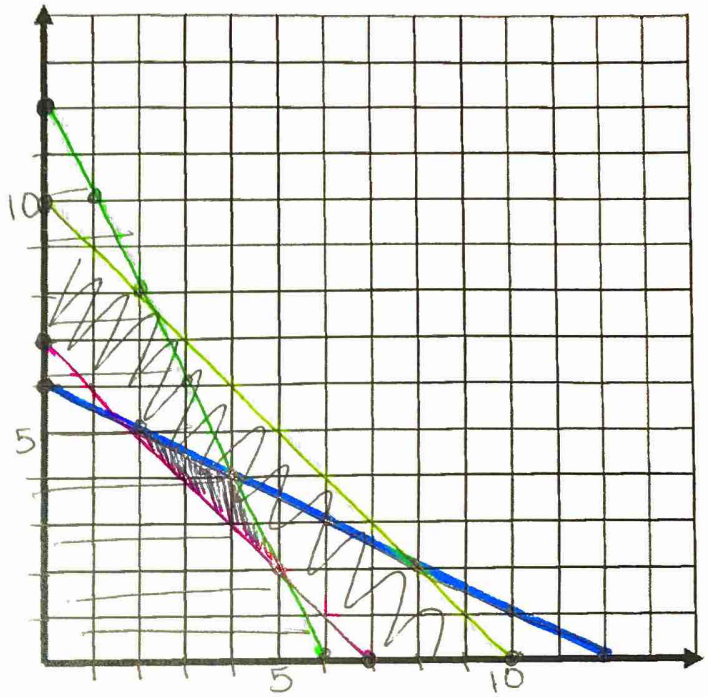
acres $x + y \geq 7 \rightarrow y \geq 7 - x$

$x + y \leq 10 \rightarrow y \leq 10 - x$

$ $200x + 100y \leq 1200$

hrs $x + 2y \leq 12$

Step 3 Graph Inequalities and Shade the Regions:



$200x + 100y \leq 1200$

$100y \leq 1200 - 200x$

$y \leq 12 - 2x$

$x + 2y \leq 12$

$2y \leq 12 - x$

$y \leq 6 - \frac{1}{2}x$

Step 4 List Vertices of Feasible Region:

(2,5)

(4,4)

(5,2)

Step 5 Write a Profit Equation:

$P = 500x + 300y$

Step 6 Plug in all the Vertices (can be a table):

$P = 500(2) + 300(5) = 2500$

$P = 500(4) + 300(4) = 3200$ ★

$P = 500(5) + 300(2) = 3100$

Step 7 Final Answer:

4 acres of wheat

4 acres of rye