Today's LPP is a resource allocation problem:

A farmer has 100 acres, $6000, and 2400 labor hours available. Crop A costs him $50/acre and 20hrs/acre in labor, but earns him $150/acre of profit. Crop B costs him $60/acre and 25hrs/acre in labor, but earns him $200/acre of profit. How many acres of each crop should he plant in order to maximize profit?

1. Setup this problem:

Variables:

Constraints:

Objective:

2. Write out the constraints in equation form using the new variables "T" for how many hours of labor is leftover, "M" for how many dollars of capital is leftover, "S" for how many acres of land leftover. Then write out the profit "P" as an equation.

Constraints:

Objective:

3. Now as a matrix:

	Decisions			Leftover			
Crop A	**Crop B**	**Time**	**Money**	**Space**	**Profit**	**RHS**
20	25	1	0	0	0	100
50	60	0	1	0	0	6000
1	1	0	0	1	0	2400
-150	-200	0	0	0	1	0

4. Now solve this matrix, pretending it is already in RREF!

$(A =$ _____ $, B =$ _____ ,

$T =$ _____ $, M =$ _____ $, S =$ _____ ,

$P =$ _____)

5. This was a useless RREF! So we choose new pivots!

$$\begin{pmatrix}
& \textbf{Decisions} & & & \textbf{Leftover} & & & \\
\textbf{Crop A} & \textbf{Crop B} & \textbf{Time} & \textbf{Money} & \textbf{Space} & \textbf{Profit} & \textbf{RHS} \\
20 & 25 & 1 & 0 & 0 & 0 & 2400 \\
50 & 60 & 0 & 1 & 0 & 0 & 6000 \\
1 & 1 & 0 & 0 & 1 & 0 & 100 \\
-150 & -200 & 0 & 0 & 0 & 1 & 0
\end{pmatrix}$$

$$\xrightarrow[\substack{R_4 + 8R_1 \\ R_1/25}]{\substack{R_2 - 2.4R_1 \\ R_3 - 0.04R_1}}
\begin{pmatrix}
& \textbf{Decisions} & & & \textbf{Leftover} & & & \\
\textbf{Crop A} & \textbf{Crop B} & \textbf{Time} & \textbf{Money} & \textbf{Space} & \textbf{Profit} & \textbf{RHS} \\
4/5 & ① & 1/25 & 0 & 0 & 0 & 96 \\
2 & 0 & -12/5 & ① & 0 & 0 & 240 \\
1/5 & 0 & -1/25 & 0 & ① & 0 & 4 \\
10 & 0 & 8 & 0 & 0 & ① & 19200
\end{pmatrix}$$

6. Now solve this matrix, pretending it is already in RREF!

$(A =$ _____ $, B =$ _____ ,

$T =$ _____ $, M =$ _____ $, S =$ _____ ,

$P =$ _____)

7. Now what should we make the free variables be in order to maximize profit? What happens to the other variables?

$(A =$ _____ $, B =$ _____ ,

$T =$ _____ $, M =$ _____ $, S =$ _____ ,

$P =$ _____)