

The entry on the pivot column and row is called the pivot entry.

Step 4: Use basic row operations to obtain 1 in the pivot position and zeros in the other positions of the pivot column.

$$\begin{array}{c}
 \begin{array}{c} R_1 \\ R_2 \\ P \end{array}
 \begin{pmatrix}
 x_1 & x_2 & s_1 & s_2 & P \\
 8 & 8 & 1 & 0 & 0 \\
 4 & 12 & 0 & 1 & 0 \\
 -5 & -10 & 0 & 0 & 1
 \end{pmatrix}
 \begin{array}{c}
 160 \\
 180 \\
 0
 \end{array}
 \end{pmatrix}
 \begin{array}{l}
 R_2 \leftrightarrow \frac{1}{12}R_2 \\
 \longrightarrow
 \end{array}$$

$$\begin{pmatrix}
 8 & 8 & 1 & 0 & 0 \\
 \frac{1}{3} & 1 & 0 & \frac{1}{12} & 0 \\
 -5 & -10 & 0 & 0 & 1
 \end{pmatrix}
 \begin{array}{c}
 160 \\
 15 \\
 0
 \end{array}
 \begin{array}{l}
 R_1 \leftrightarrow -8R_2 + R_1 \\
 \hline
 R_3 \leftrightarrow 10R_2 + R_3
 \end{array}$$

After the row operations:

$$\begin{array}{c}
 \left(\begin{array}{cccc|c}
 5.333\ldots & 0 & 1 & -0.666\ldots & 0 & 40 \\
 0.333\ldots & 1 & 0 & 0.0833\ldots & 0 & 15 \\
 -1.666\ldots & 0 & 0 & 0.833\ldots & 1 & 150
 \end{array} \right) \\
 \begin{array}{ccccccc}
 & x_1 & x_2 & \lambda_1 & \lambda_2 & P & \\
 \lambda_1 & \left(\begin{array}{cccc|c}
 \frac{16}{3} & 0 & 1 & -\frac{2}{3} & 0 & 40 \\
 \frac{1}{3} & 1 & 0 & \frac{1}{12} & 0 & 15 \\
 -\frac{5}{3} & 0 & 0 & \frac{5}{6} & 1 & 150
 \end{array} \right)
 \end{array}
 \end{array}$$

Step 5: If there are still negative numbers on the bottom row, repeat the process until there are no more negative #'s on the bottom row.

Wednesday, October 25, 2017 1:19 PM

entering x_1 pivot position \rightarrow Pivot row

exiting λ_1

$$\begin{array}{c}
 \lambda_1 \\
 x_2 \\
 P
 \end{array}
 \left(
 \begin{array}{cccc|c}
 x_1 & x_2 & \lambda_1 & \lambda_2 & \\
 \hline
 16 & 0 & 1 & -\frac{2}{3} & 40 \\
 \frac{1}{3} & 1 & 0 & \frac{1}{12} & 15 \\
 -\frac{5}{3} & 0 & 0 & \frac{5}{6} & 150
 \end{array}
 \right)
 \begin{array}{l}
 \frac{40}{\frac{16}{3}} = 7.5 \\
 \frac{15}{\frac{1}{3}} = 45 \\
 \\
 \frac{3}{16} \cdot \left(-\frac{2}{3}\right) \cdot \frac{3}{16} \cdot 40
 \end{array}$$

Pivot column

$R_1 \leftrightarrow \frac{3}{16} R_1$

$$\left(
 \begin{array}{cccc|c}
 1 & 0 & \frac{3}{16} & -\frac{1}{8} & 0 & 7.5 \\
 \frac{1}{3} & 1 & 0 & \frac{1}{12} & 0 & 15 \\
 -\frac{5}{3} & 0 & 0 & \frac{5}{6} & 1 & 150
 \end{array}
 \right)
 \begin{array}{c}
 \\
 \\
 P
 \end{array}$$

$R_2 \rightarrow -\frac{1}{3} R_1 + R_2$

$R_3 \rightarrow \frac{5}{3} R_1 + R_3$

$$\begin{array}{c}
 x_1 \\
 x_2 \\
 P
 \end{array}
 \left(
 \begin{array}{cccc|c}
 x_1 & x_2 & \lambda_1 & \lambda_2 & \\
 \hline
 1 & 0 & 0.1875 & -0.125 & 0 & 7.5 \\
 0 & 1 & -0.0625 & 0.125 & 0 & 12.5 \\
 0 & 0 & 0.3125 & 0.625 & 1 & 162.5
 \end{array}
 \right)$$

$$R_3 \rightarrow \frac{5}{3} R_1 + R_3 \quad \begin{array}{c} \text{2} \\ \text{1} \end{array} \left| \begin{array}{cc} 0 & 0 \end{array} \right. \begin{array}{cc} 0.3125 & 0.625 \end{array} \quad 1 \mid 162.5$$

Step 6: Once we get no more negative in the bottom row, the right most column gives us the optimal solution.

$$x_1 = 7.5; \quad x_2 = 12.5, \quad P = 162.5.$$

HW # 8

$$\text{Maximize } P = 7x_1 + 8x_2 + 10x_3$$

$$\text{Constraints: } 2x_1 + 3x_2 + 2x_3 \leq 950$$

$$x_1 + x_2 + 2x_3 \leq 750$$

$$x_1, x_2, x_3 \geq 0$$

$$2x_1 + 3x_2 + 2x_3 + A_1 = 950$$

$$x_1 + x_2 + 2x_3 + A_2 = 750$$

$$-7x_1 - 8x_2 - 10x_3 + P = 0$$

Simplex Tableau

Annotations: Λ_1 , Λ_2 , P are circled in red. x_3 is circled in black. The pivot element 2 in the second row, third column is circled in green. Arrows point to the pivot column and pivot row.

	x_1	x_2	x_3	Λ_1	Λ_2	P	
Λ_1	2	3	2	1	0	0	950
Λ_2	1	1	2	0	1	0	750
P	-7	-8	-10	0	0	1	0

Annotations: $R_2 \leftrightarrow \frac{1}{2}R_2$ and $R_1 \leftrightarrow -2R_2 + R_1$ are circled in green. x_3 is circled in red. The pivot element 2 in the first row, second column is circled in green. An arrow points to the pivot column.

$R_2 \leftrightarrow \frac{1}{2}R_2$	1	2	0	1	-1	0	200
$R_1 \leftrightarrow -2R_2 + R_1$	$\frac{1}{2}$	$\frac{1}{2}$	1	0	$\frac{1}{2}$	0	375
$R_3 \leftrightarrow 10R_2 + R_3$	-2	-3	0	0	5	1	3750