PIVOTS

Suppose that $-Z$, X_4, X_5, & X_6 are basic in the current tableau:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	2	10	3	0	0	0	0
0	9	8	7	1	0	0	12
0	5	7	4	0	1	0	5
0	10	4	3	0	0	1	8

If we pivot on "10" in row 4, column 2, the result is

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	0	9.2	2.4	0	0	−0.2	−1.6
0	0	4.4	4.3	1	0	−0.9	4.8
0	0	5	2.5	0	1	−0.5	1
0	1	0.4	0.3	0	0	0.1	0.8

As a result of this pivot, X_6 (which was previously basic in row 4) has become nonbasic, replaced by X_1.

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This pivot operation consisted of ***4 elementary row operations***:

1. Multiply row #4 by 0.1 to replace the pivot element by 1:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	2	10	3	0	0	0	0
0	9	8	7	1	0	0	12
0	5	7	4	0	1	0	5
0	1	0.4	0.3	0	0	0.1	0.8

2. Subtract 5 times row 4 from row 3:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	2	10	3	0	0	0	0
0	9	8	7	1	0	0	12
0	0	5	2.5	0	1	−0.5	1
0	1	0.4	0.3	0	0	0.1	0.8

3. Subtract 9 times row 4 from row 2:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	2	10	3	0	0	0	0
0	0	4.4	4.3	1	0	−0.9	4.8
0	0	5	2.5	0	1	−0.5	1
0	1	0.4	0.3	0	0	0.1	0.8

4. Subtract 2 times row 4 from row 1:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	0	9.2	2.4	0	0	−0.2	−1.6
0	0	4.4	4.3	1	0	−0.9	4.8
0	0	5	2.5	0	1	−0.5	1
0	1	0.4	0.3	0	0	0.1	0.8

After the first row operation, the sequence of the other three is arbitrary!

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-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	2	10	3	0	0	0	0
0	9	8	7	1	0	0	12
0	5	7	4	0	1	0	5
0	10	4	3	0	0	1	8

Other sequences of elementary row operations can result in 1 in the pivot location and zero elsewhere in the column—they are NOT pivot operations!

Suppose we subtract 0.4 times row 3 from row 1:

-Z	X_1	X_2	X_3	X_4	X_5	X_6	RHS
1	0	7.2	1.4	0	−0.4	0	−2
0	9	8	7	1	0	0	12
0	5	7	4	0	1	0	5
0	1	0.4	0.3	0	0	0.1	0.8

This gives us the desired "0" in row 1 of the X_1 column… but notice what has happened to the column for X_5!