

### Goal Seek in Excel Review (Post Office Problem):

Goal Seek is a tool in Excel where you can set one cell to a fixed value (i.e., a goal), solving for another cell (which will be variable). Note that for this to work, the goal cell must depend via formulas/functions on the variable cell. The variable cell must be a regular (non-formula based) cell. For example, in our queuing template any of the yellow cells can be variable cells; and any of the green (or other cell that is derived from formulas based off the yellow cells) can be the goal cell.

Using the Data Table from Post Office Problem:

Template MMs		
Input Data		
Arrival rate ( $\lambda$ )	100	per hour
Service rate ( $\mu$ )	45	per hour
Number of servers ( $s$ )	3	nmbr
Cost of Service	30	hour
Cost of Waiting	10	minute

Operating Characteristics		
Average server utilization ( $\rho$ )	74.1%	%
Average number of customers in the queue ( $L_q$ )	1.581	in queue
Average number of customers in the system ( $L$ )	3.804	in system
Average waiting time in the queue ( $W_q$ )	0.016	hour
Average time in the system ( $W$ )	0.038	hour
Probability (% of time) system is empty ( $P_0$ )	0.078	empty

Probabilities		
Number In System	Prob	Cum. Prob
0	0.0785	0.0785
1	0.1743	0.2528
2	0.1937	0.4465
3	0.1435	0.5900
4	0.1063	0.6963
5	0.0787	0.7750
6	0.0583	0.8334
7	0.0432	0.8766
8	0.0320	0.9086
9	0.0237	0.9323
10	0.0176	0.9498

Costs		
s	Total Cost ( $C_s + C_w$ )	Cs
3	\$ 2,372.16	\$ 90.00
4	\$ 1,628.18	\$ 120.00
5	\$ 1,525.07	\$ 150.00
6	\$ 1,523.47	\$ 180.00
7	\$ 1,545.68	\$ 210.00

Recall,

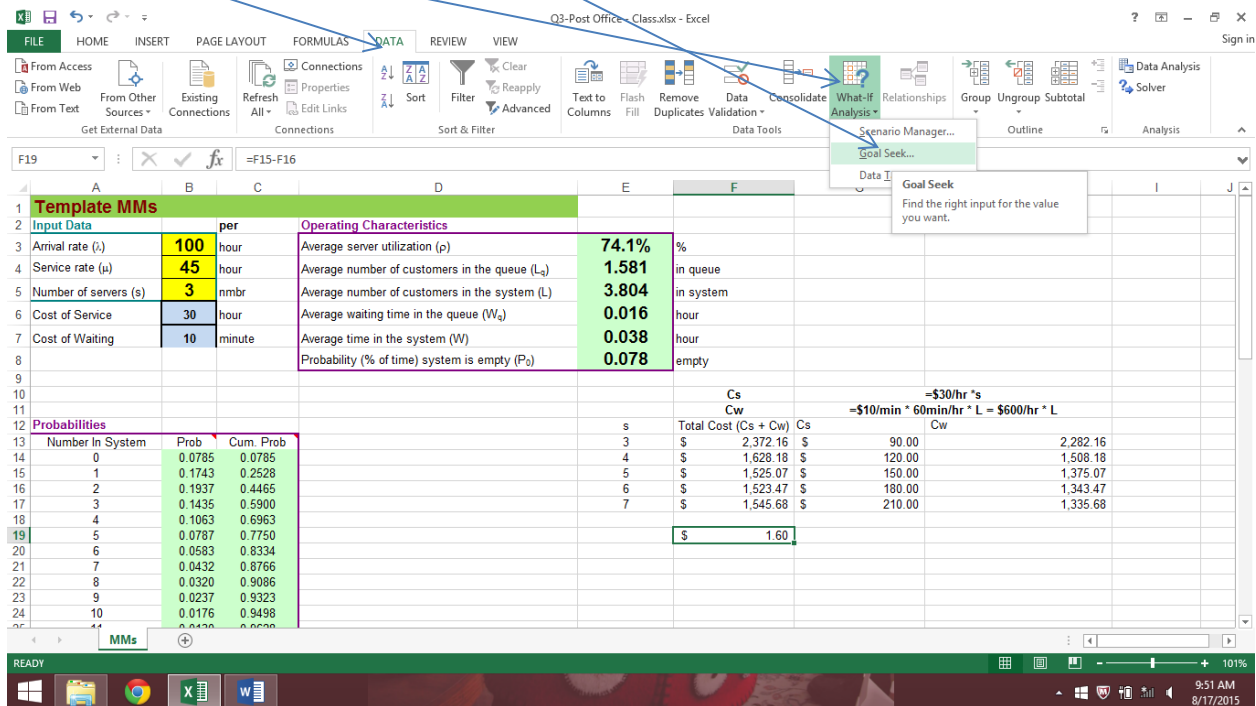
The formula for  $C_s$  is  $\$30/\text{hr} * \# \text{ of servers}$ . The # of servers is cell B5.

The formula for  $C_w$  is  $\$600/\text{hr} * L$ . L is cell E5.

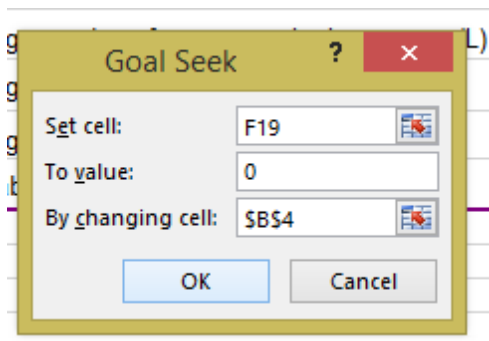
First, we need to setup a cell to determine the difference (via formula). So underneath the data table in cell F19; I do cell F15 MINUS (-) F16.

Now to setup Goal Seek, we need to highlight the difference cell and select “Goal Seek.”

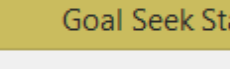
Select “Data” ; “What-If Analysis”; then “Goal Seek.”



An input window will appear. F19 should be our “Set Cell,” we want the difference to be 0 (setting F15 and F16 equal to one another), and we want to change cell B4 (or \$B\$4) since that is our service rate cell.



Then click “OK”



The image shows the 'Goal Seek Status' dialog box. It has a title bar with a question mark icon and a close button (X). The main text area contains the message: 'Goal Seeking with Cell F19 found a solution.' Below this, there are two rows of information: 'Target value: 0' and 'Current value: \$0.00'. To the right of the text are three buttons: 'Step', 'Pause', and 'OK'. The 'OK' button is highlighted with a blue dashed border. At the bottom right is a 'Cancel' button.

And now you have your solution.

Note, the above example's service rate is ~45.5/hour (notice in the formula bar it is 45.4609 ...)

At that service rate,  $s = 6$  and  $s = 5$  are equivalent at a total cost of \$1509.35.