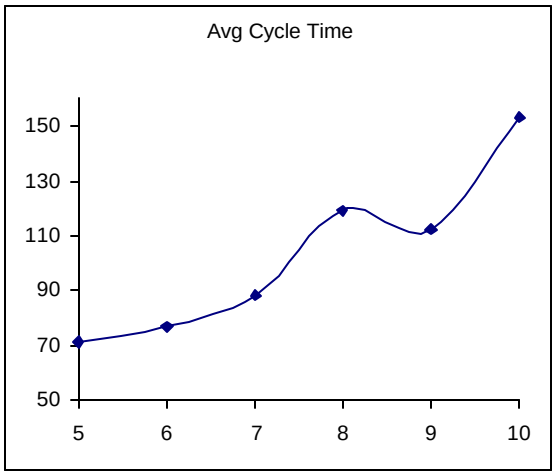
Computer Lab 03

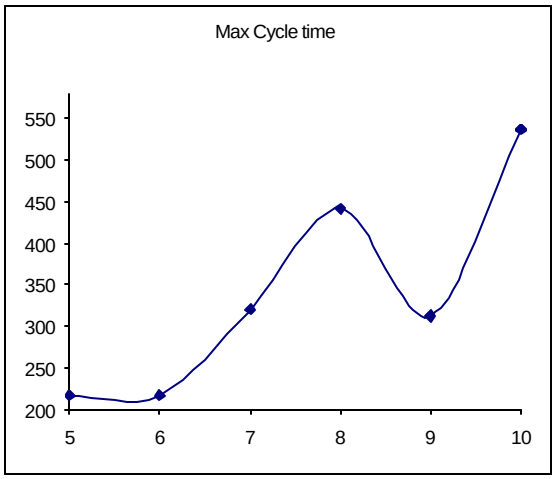
For this lab you will create the model described in Exercise 4-7 of the text.[1] This will involve the use of Create, Assign, Process (seize-Delay-Release), Decide, Record, and Dispose modules from the Basic Processes palette.

Name your entities "Part," and your Process modules "Workstation 1" "Workstation 2", etc. Name your Resources "Machine 1" "Machine 2"" etc. The Decide Modules may be a bit tricky. You can have "True" mean a Part is "good" or have it mean a part is "bad." Whichever you choose, be consistent for the four Decide blocks. Note that if a part needs rework, it goes to the Workstation *preceding* the one it just finished. Note that there is no Decide block for rework after the first Workstation. The model may have a tendency to look a bit "spaghetti-ish". Just make sure that the exit points of the Decision modules are correctly hooked up.

To estimate the average time in system, use an Assign module right after the Create one to add an "Arrival Time" attribute, then a Record module right before the Dispose to tally the times in system. Be sure that *both* "Time Units" and "Base Time Units" are set to "minutes" in the Run | Setup | Replication Parameters dialog for your runs.

Once your model is working, run it for 10,000 minutes for rework frequencies of 5%, 6%, 7%, 8%, 9%, and 10%, as described in the problem. Graph your results for average and maximum cycle times in Excel (note: use separate graphs, not a single one as asked by the problem); your graphs should look like this:





Copy-and-Paste your graph into your Arena model.

Deliverable

Only submit one .doe file (electronically) using the standard naming format (<name>_lab03.doe). Submit the model with 10% rework probability, but with the Excel graph pasted in and a text label with the submission information, like this:

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Computer Lab 03
Exercise 4-7

[1] For completeness, the problem is on the back of this page

Problem Description

4-7 A proposed production system consists of five serial automatic workstations. The processing times at each workstation are constant: 11, 10, 11, 11, and 12 (all times given in this problem are in minutes). The part interarrival times are UNIF(13, 15). There is an unlimited buffer in front of all workstations, and we will assume that all transfer times are negligible or zero. The unique aspect of this system is that at workstations 2 through 5 there is a chance that the part will need to be reprocessed by the workstation that precedes it. For example, after completion at Workstation 2, the part can be sent back to the queue in front of Workstation 1. The probability of revisiting a workstation is independent in that the same part could be sent back many times with no change in the probability. At the present time, it is estimated that this probability, the same for all workstations, will be between 5% and 10%. Develop a simulation model and make six runs of 10,000 minutes each for probabilities of 5, 6, 7, 8, 9, and 10%. Using the results, construct a plot of the average cycle time (system time) against the probability of a revisit. Also include the maximum cycle time for each run in your plot.