Solutions to Problems in Chapter 5 of
Simulation Modeling and Analysis, 5th ed., 2015, McGraw-Hill, New York
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5.1. It is likely that a worker on an assembly line will work more efficiently when being observed than under normal circumstances.

5.2. Since a computer is a system whose operations are well understood, it should be possible (given enough effort) to develop a valid model. (A possible difficulty might be in developing a model of the workload that the computer will experience.) On the other hand, the detailed interactions that take place between two opposing forces in an actual military battle are not at all well understood. Modeling troop behavior is a difficult task and the terrain on which a battle will take place will generally not be known. Furthermore, it is easier to collect output data from an existing computer system than from a battle (or a field test) to validate a model.

5.3. (*a*) Yes.
(*b*) Yes.
(*c*) Yes.
(*d*) No.
(*e*) Yes.
(*f*) Yes.

5.4. $\bar{X}_1(5) = 0.83$, $\bar{X}_2(10) = 0.45$, $S_1^2(5) = 0.02$, $S_2^2(10) = 0.02$, and $\hat{f} = 7.38$. An approximate 90 percent confidence interval for $\zeta = \mu_X - \mu_Y$ is 0.38 ± 0.15, which is statistically significant.

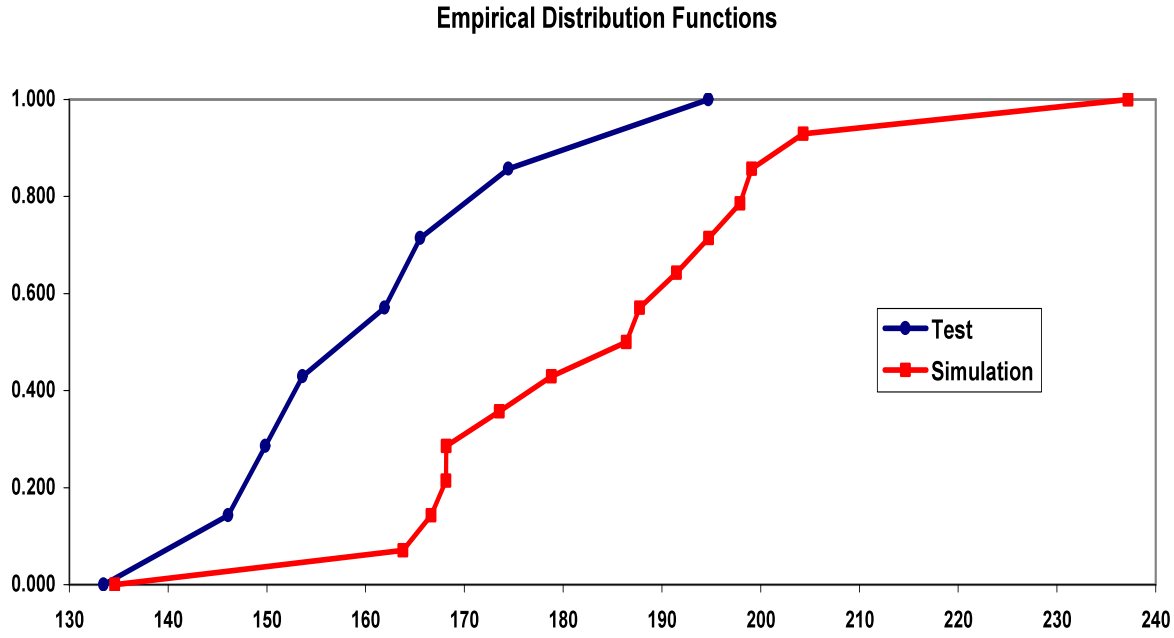
5.5. Use one random-number stream to generate interarrival times, which will ensure the same interarrival times for both simulation models. Use a second stream and the inverse-transform method to generate service times for the two models, which will make the gamma and lognormal service times positively correlated for a particular customer (as desired).

Suppose that average delay in queue is the performance measure of interest. Then the suggested approach should make the average delays in queue positively correlated, which is desirable. This is similar to the statistical behavior for the correlated-inspection approach.

5.6. Let $W_j' = X_j - Y_j'$. Then $\overline{W}'(10) = 0.40$, $\widehat{\text{Var}}\left[\overline{W}'(10)\right] = 0.75$, and a 90 percent confidence interval for ζ is 0.40 ± 1.59, which contains 0. Thus, the observed difference between μ_X and μ_Y is not statistically significant here. Note also that the half-length is much larger than in Example 5.38.

5.7. If the queue of the first machine in the second submodel becomes full, then the last machine in the first submodel may become blocked affecting the departure time of a part being processed on this machine. Thus, this approach is *not* valid in general.

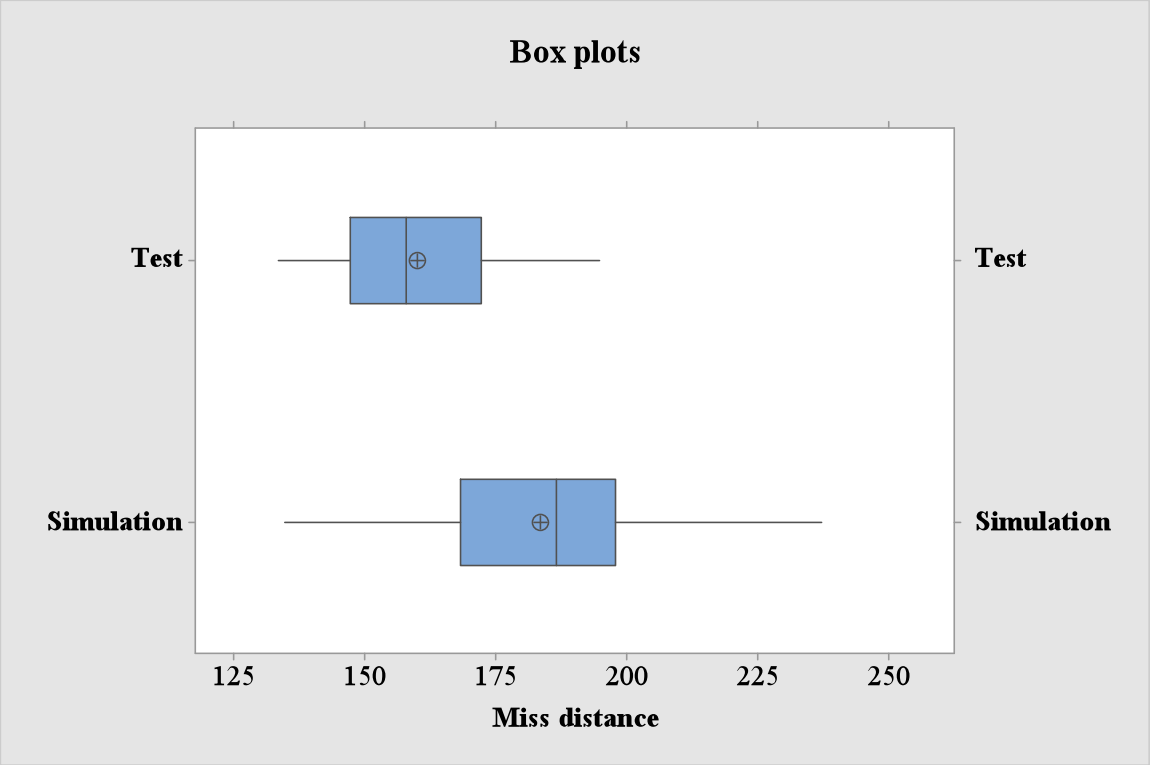
5.8.



Miss distance

The test miss distances tend to be smaller, since their distribution function lies above the one for the simulation miss distances.

5.9.



Box plots are shown for the test and simulation miss distances, which were made using the Minitab statistical package. For each data set, the location of the mean is indicated by a plus sign within a small circle, but the octiles are not shown. The simulation miss distances have a larger mean (central tendency) and variance (spread).