Technology Project

a. Simulate the following process for 20 days: Each day, 200 calculators are manufactured with a 5% rate of defects, and the proportion of defects is recorded for each of the 20 days. The calculators for one day are simulated by randomly generating 200 numbers, where each number is between 1 and 100. Consider an outcome of 1, 2, 3, 4, or 5 to be a defect, with 6 through 100 being acceptable. This corresponds to a 5% rate of defects. (See the technology instructions below.)

b. Construct a p chart for the proportion of defective calculators, and determine whether the process is within statistical control. Since we know the process is actually stable with $p = 0.05$, the conclusion that it is not stable would be a type I error; that is, we would have a false positive signal, causing us to believe that the process needed to be adjusted when in fact it should be left alone.

c. The result from part (a) is a simulation of 20 days. Now simulate another 10 days of manufacturing calculators, but modify these last 10 days so that the defect rate is 10% instead of 5%.

d. Combine the data generated from parts (a) and (c) to represent a total of 30 days of sample results. Construct a p chart for this combined data set. Is the process out of control? If we concluded that the process was not out of control, we would be making a type II error; that is, we would believe that the process was okay when in fact it should be repaired or adjusted to correct the shift to the 10% rate of defects.

Technology Instructions for Part (a):

STATDISK: Select **Data, Uniform Generator,** and generate 200 values with a minimum of 1 and a maximum of 100. Copy the data to the data window, then sort the values by clicking on **Data** and selecting the menu item of **Sort Data.** Repeat this procedure until results for 20 days have been simulated.

Minitab: Select **Calc, Random Data,** then **Integer.** Enter 200 for the number of rows of data, enter C1 as the column to be used for storing the data, enter 1 for the minimum value, and enter 100 for the maximum value. Repeat this procedure until results for 20 days have been simulated.

Excel: Click on the fx icon on the main menu bar, then select the function category **Math & Trig,** followed by **RANDBETWEEN.** In the dialog box, enter 1 for bottom and 100 for top. A random value should appear in the first row of column A. Use the mouse to click and drag the lower right corner of that cell, then pull down the cell to cover the first 200 rows of column A. When you release the mouse button, column A should contain 200 random numbers. You can also click/drag the lower right corner of the bottom cell by moving the mouse to the right so that you get 20 columns of 200 numbers each. The different columns represent the different days of manufacturing.