Due: February 8, 2005

1. The random-number generator u16807. Download the HW#2 C codes from the course web page:
   "gilbreth.ecn.purdue.edu/~ie581". Look under "Homework". There are two files: the driver program and "u16807d.c".

   Get the code to run using the compiler of your choice.

   (a) Check that beginning with the random-number seed "1" that 10,000 calls later you get the seed "1043618065". If not, your implement is faulty. Check with the TAs to get it running. (Nothing to turn in here.)

   (b) What is the seed value that follows random-number seed 555555555?

   (c) Modify the program. Submit the source code and the last page of your output with \( n=1000000 \) after making these modifications.

      (i) Save and print the initial random-number seed in the summary table.

      (ii) Calculate and print the sample variance in the summary table.

      (iii) Estimate \( E(U_1/2) \). (The point estimator should be printed in the summary table).

2. Uniform (0, 1) random numbers. Send this spreadsheet to "ie581@ecn.purdue.edu" with the subject heading "your name, hw2, p2".

   (a) Start a new MSExcel spreadsheet. Enter header information, which should include at least your name, date, course, and homework number. As with the first assignment, use Column A for "trial #" and Columns B, C, and D for random numbers. Fill 100 rows with trial numbers and "=rand()".

   (b) Above Columns B, C, and D calculate the sample mean ("=average"), sample variance ("=var"), and \( P(0.3 < U < 0.4) \). Hit "F9" several times to ensure that the point estimates are all reasonable. (If \( U \) is the random number, then \( E(U) = 1/2 \), \( V(U) = 1/12 \), and \( P(0.3 < U < 0.4) = 1/10 \).)

   (c) We will examine 3-dimensional uniformity using three 2-dimensional scatter plots. Create the three scatter plots (using the Chart Wizard): Columns B and C, Columns C and D, and Columns D and B. Hit "F9" several times to convince yourself that any patterns seen one time do not repeat.

   (d) The three random numbers in every row should be independent, which implies that \( \text{corr}(U_B,U_C) = \text{corr}(U_C,U_D) = \text{corr}(U_D,U_B) = 0 \). Above the random numbers in Columns B, C, and D place these three correlation estimates ("=correl"). Hit "F9" several times to check that the point estimates are reasonable.

   (e) The random numbers within a column should also be independent. We will check by computing the lag-1 and lag-2 autocorrelations.

      In Column E, enter into (for example) cell E12 the command "=D13", into cell E13 enter "=D14", continuing for 99 cells. You now have 99 pairs of numbers, with each pair being adjacent random numbers from Column D. We say that these pairs have "lag 1". Similarly in Column F create 98 entries with lag 2 from Column D.

      Above Column E compute the lag-1 autocorrelations ("=correl"). Above Column F compute the lag-2 autocorrelations. Hit "F9" several times to check whether these correlation estimates are reasonable.