WST211
Practical 4

Date: 14 March 2016

Due: 4 April 2016

Instructions:

- **Answer all questions.**
- **Hand in a typed document with your answers which includes the following:**
- **Table of contents**
- **Answers**
- **SAS program**
- **SAS output**
- **Attach a copy of the SAS program in an appendix.**
- **Attach the relevant outputs of the SAS output.**
- **According to the question, make interpretations about the SAS output.**
- **Round the answers to 3 decimal places.**
- **Hand in a typed document with your answers and include the SAS programs.**

Section A:

Questions:

1. A game consists of first rolling a ten-sided die once and then tossing a balanced coin once. Let X be the random variable which is equal to the number of spots showing on the die plus the number of heads showing on the coin (0 or 1).

Use SAS to simulate this experiment 10000 times using a seed value of 1.

(a) Give the empirical probability mass function;
(b) Calculate P ($|X - 3| > 2$) empirically;
(c) Calculate P ($|X - 4| < 1$) empirically;
(d) Calculate $E(X^4)$ empirically.

2. An office has 10 employees, three men and seven women. The manager chooses four at random to attend a short course on quality improvement.

(a) What is the probability that an equal number of men and women are selected?
(b) What is the probability that more women than men are chosen?
(c) Determine through simulation empirical values for a) and b). Do 2000 simulations (use the rand function) of the experiment and compare the results with the theoretical values calculated in (a).

3. The number of vehicles passing a certain intersection in the time interval [0,t] is a Poisson process X(t) with mean $E[X(t)] = 3t$, where the unit of time is in minutes.

(a) What is the probability that at least two vehicles will pass during a given minute.
(b) Define event A = at least four vehicles pass during the first minute and B = at most two vehicles pass during the second minute. Find the probability that both A and B occur.
(c) Determine through simulation empirical values for questions a) and b). Do 2000 simulations of the experiment and compare the results with the theoretical values calculated in a) and b).

Section B:

The dataset **titanic2.xls** is given on ClickUP.

DESCRIPTIVE ABSTRACT:
For each person on board the fatal maiden voyage of the ocean liner Titanic, this dataset records sex, age [adult/child], economic status [first/second/third class, or crew] and whether or not that person survived.

SOURCE:
"Report on the Loss of the `Titanic' (S.S.)" (1990), _British Board of Trade Inquiry Report_ (reprint), Gloucester, UK: Allan Sutton Publishing.

VARIABLE DESCRIPTIONS:
Class (0 = crew, 1 = first, 2 = second, 3 = third)
Age (1 = adult, 0 = child)
Sex (1 = male, 0 = female)
Survived (1 = yes, 0 = no)

SPECIAL NOTES:
There is no complete agreement among primary sources as to the exact numbers on board, rescued, or lost.

STORY BEHIND THE DATA:
The sinking of the Titanic is a famous event, and new books are still being published about it. Many well-known facts from the proportions of first-class passengers to the "women and children first" policy, and the fact that that policy was not entirely successful in saving the women and children in the third class are reflected in the survival rates for various classes of passenger. These data were originally collected by the British Board of Trade in their investigation of the sinking.

Question:

Use SAS to complete the following table:

	Population exposed to risk			**Number of deaths**			**Deaths per 100 exposed to risk (two decimal places)**		
Economic Status	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**
I (high)									
II									
III									
Other	**853**	**20**	**873**	**661**	**3**	**664**	**77.49**	**15.00**	**76.06**
Total									