University of British Columbia

Sauder School of Business

Introductory Statistics
STAT 230

Assignment 1
Due February 04, 2024

Instructions:

- **You must show significant steps to get full marks!**
- This assignment is out of 42 points.

1. A class in probability theory consists of 6 men and 4 women. An examination is given, and the students are ranked according to their performance. Assume that no two students obtain the same score
   (a) (2 points) How many different rankings are possible?
   (b) (2 points) If the men are ranked just among themselves and the women among themselves, how many different rankings are possible?

2. (2 points) How many different signals, each consisting of 9 flags hung in a line, can be made from a set of 4 white flags, 3 red flags, and 2 blue flags if all flags of the same color are identical.

3. Two fair dice are rolled. The possible outcomes are listed as below:

	1	2	3	4	5	6
1	$(1,1)$	$(1,2)$	$(1,3)$	$(1,4)$	$(1,5)$	$(1,6)$
2	$(2,1)$	$(2,2)$	$(2,3)$	$(2,4)$	$(2,5)$	$(2,6)$
3	$(3,1)$	$(3,2)$	$(3,3)$	$(3,4)$	$(3,5)$	$(3,6)$
4	$(4,1)$	$(4,2)$	$(4,3)$	$(4,4)$	$(4,5)$	$(4,6)$
5	$(5,1)$	$(5,2)$	$(5,3)$	$(5,4)$	$(5,5)$	$(5,6)$
6	$(6,1)$	$(6,2)$	$(6,3)$	$(6,4)$	$(6,5)$	$(6,6)$

Possible combinations of two dice.

   (a) (1 point) What is the probability that sum of two dice is 6 if you roll two dice?
   (b) (2 points) What is the probability that sum of two dice is 3 or 10 if you roll two dice?
   (c) (2 points) What is the probability that sum of two dice is a prime number or an odd number if you roll two dice?

4. Data collected by the Oil Price Information Service from more than 90,000 gasoline and convenience stores throughout the U.S. showed that the average price for a gallon of unleaded gasoline was \$3.28 (MSN Auto website, February 2, 2014). The following data show the price per gallon (\$) for a sample of 20 gasoline and convenience stores located in San Francisco.

3.59	3.59	4.79	3.56	3.55	3.71	3.65	3.60	3.75	3.56
3.57	3.59	3.55	3.99	4.15	3.66	3.63	3.73	3.61	3.57

   (a) (2 points) Use the sample data to estimate the mean price for a gallon of unleaded gasoline in San Francisco.

   (b) (2 points) Compute the sample standard deviation.

   (c) (2 points) What is the median value.

   (d) (2 points) What is IQR?

5. (2 points) Suppose $S = \{1, 2, 3\}$, with $P(\{1\}) = 1/2$ and $P(\{1, 2\}) = 2/3$. What must $P(\{2\})$ and $P(\{3\})$ be?

6. Consider a sample space S and three events A, B, and C. For each of the following events draw a Venn diagram representation as well as a set expression.

   (a) (3 points) Among A, B, and C, only A occurs.

   (b) (3 points) At least one of the events A, B, or C occurs.

   (c) (3 points) A or C occurs, but not B. .

   (d) (3 points) At most two of the events A, B, or C occur.

7. (4 points) Prove that A and B are independent **if and only if** A^C and B are independent. (**Hint**: Prove both directions.)

8. (5 points) Each of 2 cabinets identical in appearance has 2 drawers. Cabinet A contains a silver coin in each drawer, and cabinet$B$ contains a silver coin in one of its drawers and a gold coin in the other. A cabinet is randomly selected , one of its drawers is opened, and a silver coin is found. What is the probability that there is a silver coin in the other drawer?