CEE110
Homework #1

You must show all work for full credit. Submit your homework through CCLE.

**Problem 1.**
This homework is modified the dataset discussed in the article *Female Hurricanes are Deadlier than Male Hurricanes* written by Kiju Junga et al. The dataset contains actual fatalities caused by hurricanes in the United States between 1950 and 2020. You are asked to analyze and explore this hurricane data in order to determine if the data supports the claim that "Female named hurricanes are more deadly than Male named hurricanes". The data is given as Hurricane.csv file.

a. Using the dataset excluding hurricanes Katrina in 2005 (1833 deaths), Audrey in 1957 (416 deaths), Maria (3057 deaths) and Matthew (585 deaths), calculate the descriptive statistics of the death totals for Female and Male named hurricanes as shown below. You should show the process.

| Gender | Total number of data | Mean | S.D. | Minimum | Maximum |
|---|---|---|---|---|---|
| Female | | | | | |
| Male | | | | | |

b. Calculate the following statistics for each of Female and Male named hurricanes using the same data. You should show the process (and the name and the year of hurricane that were used for calculating Q1, Q2, Q3).

| Gender | Q1 | Q2 | Q3 | $f_s$(=IQR) | Minimum whisker | Maximum whisker |
|---|---|---|---|---|---|---|
| Female | | | | | | |
| Male | | | | | | |

c. Construct comparative boxplots that display the distributions of the number of deaths for Female and Male named hurricanes. Enumerate the outlier values for each case. Compare the two distributions and state your opinion on whether or not it seems that the Female named hurricanes are more severe.

d. Now, consider the data including extreme values (Audrey, Katrina, Maria and Mathew) for the analysis. Calculate the descriptive statistics of the death totals for Female and Male named hurricanes as shown a. You should show the process.

e. Calculate the statistics as shown b for each of Female and Male named hurricanes with extreme values. You should show the process (and the name and the year of hurricane that were used for calculating Q1, Q2, Q3).

f. Construct and compare comparative boxplots that display the distributions of the number of deaths for Female and Male named hurricanes with extreme values. Enumerate the outlier values for each case. Compare the two distributions and state your opinion on whether or not it seems that the Female named hurricanes are more severe.

g. Comparing the descriptive statistics of Female named hurricanes with or without extreme values. How do the extreme values affect the mean and median?

h. Which measure, the mean or the median, do you think better represents a typical number of deaths from a hurricane? Why?

**Problem 2.**

An engineering construction firm is currently working on power plants at three different sites. Let Ai denote the event that the plant at site i is completed by the contract date. Use the operations to describe the following events in terms of A1, A2, and A3 and draw a Venn diagram

a. At least one plant is completed by the contract date

b. All plants are completed by the contract date

c. Only the plant at site 1 is complete by the contract date

d. Exactly one plant is completed by the contract date

e. Either the plant at site 1 or both of the other two plants are completed by the contract date

**Problem 3.**

The following table shows monthly rainfall in Los Angeles in January.

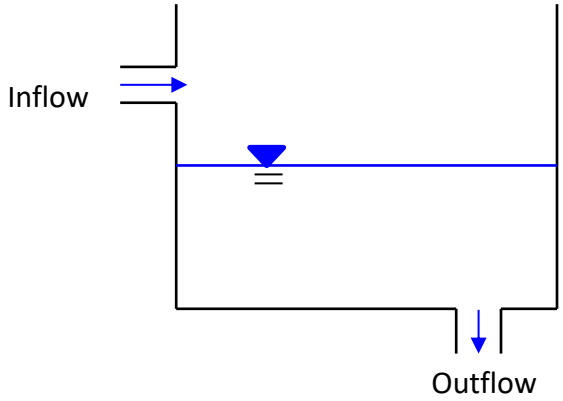
| Year | January Rainfall (inch) |
|---|---|
| 2011 | 3.00 |
| 2012 | 1.62 |
| 2013 | 1.12 |
| 2014 | 2.05 |
| 2015 | 1.25 |
| 2016 | 2.84 |
| 2017 | 5.92 |
| 2018 | 4.82 |
| 2019 | 3.06 |
| 2020 | 4.20 |

a. Suppose a rainfall of 5 inches and above issues flood warnings (2), a rainfall of 3.5 inches and above and less than 5 inches issues flood advisory (1), and a rainfall less than 3.5 inches does not issue flood (0). Draw the Venn diagram in terms of no flood (0), flood advisory (1) and flood warnings (2) with the outcomes.

b. Are 0, 1, 2 mutually exclusive? Why?

c. Are 0, 1, 2 collectively exhaustive? Why?

**Problem 4.**
A cylindrical tank is used to store water for a town as shown in the figure below. On any given day, the water supply inflow per day may fill the tank with an additional 6, 7, or 8 ft of water. The daily demand of the water for the town will draw down the water level in the tank by an amount equivalent to 5, 6, or 7 ft of the water in the tank.




a. What are the possible combinations of inflow and outflow of water in the tank in a given day?

b. If the water level in the tank is 7 ft from the bottom at the start of a day, what are the possible water levels in the tank at the end of the day?

c. If the amounts of inflow and outflow of water for the tank are both equally likely, what would be the probability that there would be at least 9 ft of water remaining in the tank at the end of the day?

**Problem 5.**
A certain system can experience three different types of defects. Let $A_i$ ($i$ = 1,2,3) denote the event that the system has a defect of type i. Suppose that

$P(A_1)=0.12$, $P(A_2)=0.07$, $P(A_3) = 0.05$,
$P(A_1 \cup A_2) = 0.13$, $P(A_1 \cup A_3)= 0.14$, $P(A_2 \cup A_3) = 0.10$,
$P(A_1 \cap A_2 \cap A_3) = 0.01$

a. What is the probability that the system does not have a type 1 defect?

b. What is the probability that the system has both type 1 and type 2 defects?

c. What is the probability that the system has both type 1 and type 2 defects but not a type 3 defect?

d. What is the probability that the system has at most two of these defects?