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DIS 1C

CEE 110 HW1

1. a)

Gender	Total # of Data	Mean	S.D.	Minimum	Maximum
Female	83	23.72	44.95	0	256
Male	60	12.95	22.20	0	84

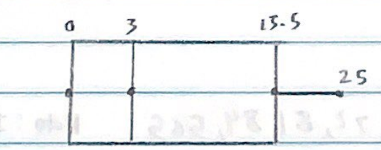
Mean: Add total number of deaths, divide by total # of data
Standard Deviation: Use variance method with mean

b)

Gender	Q1	Q2	Q3	fs(=IQR)	Min. Whisker	Max Whisker
Female	1	5	21.75	20.75	0	51
Male	0	3	13.5	13.5	0	25

Split data into male and female categories
Sort data in ascending order based on # of deaths
Q2 is the median of each respective category
Q1 is the median of the first half of the data of each category
Q3 is the median of the second half of the data of each category
Minimum whisker is the smallest value in each category
Maximum whisker is the largest value no greater than 1.5 IQR + Q3
Female : Q1 → Dolly (2008) Q2 → Kate (1985) Q3 → Gracie (1959)
Male : Q1 → Omar (2020) Q2 → Jerry (1989) Q3 → Juan (1985)

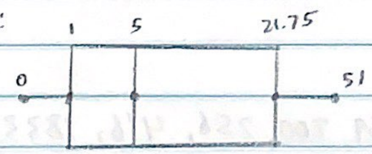
c) Male :



Outliers: 34, 45, 52, 56, 62, 68, 72, 81, 84

Note: I am just listing the outliers because there are so many.

Female :



Outliers: 54, 57, 60, 62, 75, 77, 84, 117, 138, 159, 200, 256.

Female named hurricanes are more severe. They have a higher average and median number of deaths than male named hurricanes. The highest outliers for female hurricanes are also higher than the male hurricanes, which shows that the most dangerous females are more severe than the most dangerous males.

d)

Gender	Total # of Data	Mean	S.D.	Minimum	Maximum
Female	86	84.59	383.10	0	3057
Male	61	22.33	72.48	0	505

I used the same steps/methods as in part a.

e)

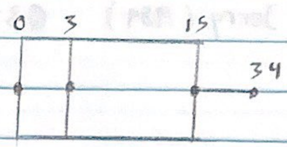
Gender	Q1	Q2	Q3	f_s (=IQR)	Min Whisker	Max Whisker
Female	1	5	26	25	0	62
Male	0	3	15	15	0	34

I used the same steps/methods as in part b.

Female : Q1 → Hermine (2016) Q2 → Wilma (2005) Q3 → Fran (1996)

Male : Q1 → Omar (2020) Q2 → Jerry (1989) Q3 → David (1979)

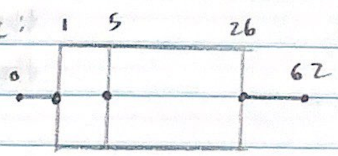
f) Male :



Outliers : 45, 52, 56, 62, 68, 72, 81, 84, 505

Note : I am just listing the outliers because there are so many.

Female :



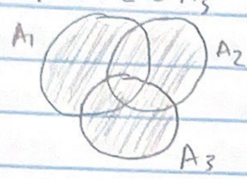
Outliers : 75, 77, 84, 117, 138, 159, 200, 256, 416, 1833, 3057

Again, female hurricanes are more severe than male hurricanes. They have a higher average and median number of deaths than male hurricanes. The newly added extreme female hurricanes were also more devastating than the newly added male hurricane. Overall, the female hurricanes are much more severe.

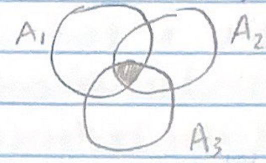
g) Extreme values increase both the mean and median for the female hurricanes. However, these extreme outliers have a much larger effect on the mean.

h) The median represents a better typical number of deaths from a hurricane because it is less severely influenced by outliers. The mean can change dramatically with hurricanes such as Katrina that have enormous death tolls, which makes it misleading for a "typical number". The median works better.

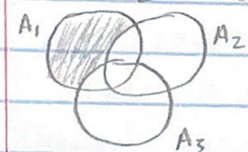
2. a) $A_1 \cup A_2 \cup A_3$



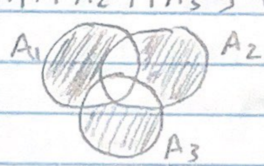
b) $A_1 \cap A_2 \cap A_3$



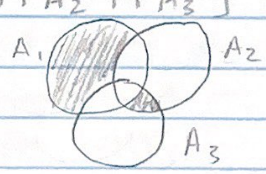
c) $A_1 \cap A_2' \cap A_3'$



d) $[A_1 \cap A_2' \cap A_3'] \cup [A_1' \cap A_2 \cap A_3'] \cup [A_1' \cap A_2' \cup A_3]$



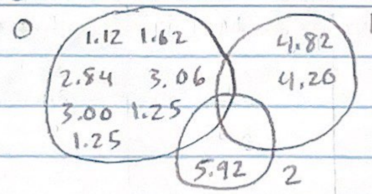
e) $[A_1 \cap A_2' \cap A_3'] \cup [A_1' \cap A_2 \cap A_3]$



3. a) 0 - less than 3.5 inch : no flood

1 - more than 3.5 inch inclusive AND less than 5 inch : flood advisory

2 - more than 5 inch - flood warning



b) 0, 1, and 2 are mutually exclusive because it is impossible for the rainfall to satisfy the requirements of multiple categories. We can see this because :

0 : $0 \le x < 3.5$ inches

1 : $3.5 \le x < 5$ inches

2 : $5 \le x$ inches

Based on these inequalities, it is physically impossible to find a value x that satisfies more than one of the inequalities simultaneously. This means 0, 1, and 2 are mutually exclusive categories. We can also see this because there are no values in the venn diagram's intersections.

c) 0, 1, and 2 are also collectively exhaustive. This is because the union $0 \cup 1 \cup 2$ covers all the events within the sample space. There are 7 events in 0, 2 events in 1, and 1 event in 2. The union of these three categories yields 10 total events, which matches the given number of events in the table. This proves 0, 1, and 2 are collectively exhaustive.

4. a) Inflow: $I = \{6, 7, 8\}$

Outflow: $O = \{5, 6, 7\}$

Possible combinations (I, O) of inflow and outflow:

$\boxed{S = \{(6,5), (6,6), (6,7), (7,5), (7,6), (7,7), (8,5), (8,6), (8,7)\}}$

b) Start of day: 7 ft

Possibilities after inflow: $7+6 \quad 7+7 \quad 7+8$

$\{13, 14, 15\}$

Possibilities after outflow:

$\{13, 8\} \quad \{13, 7\} \quad \{13, 6\}$

$\{14, 9\} \quad \{14, 8\} \quad \{14, 7\}$

$\{15, 10\} \quad \{15, 9\} \quad \{15, 8\}$

Based on these possibilities, the possible water levels at the end of the day are: $\boxed{\{6, 7, 8, 9, 10\} \text{ feet.}}$

c) I will answer this problem assuming it is based off of part b

Based on the possibilites listed above, there are 3 ways to get at least 9 ft (≥ 9 ft) of water in the tank.

1. Inflow brings water level to 14, outflow of 5 $\rightarrow 14 - 5 = 9 \quad 9 \geq 9$ ✓
2. Inflow brings water level to 15, outflow of 5 $\rightarrow 15 - 5 = 10 \quad 10 \geq 9$ ✓
3. Inflow brings water level to 15, outflow of 6 $\rightarrow 15 - 6 = 9 \quad 9 \geq 9$ ✓

Given that there were 9 total possibilities, this means there will be a $\boxed{3/9 \text{ chance, or } 33.\bar{3}\% \text{ chance}}$ to end the day with at least 9 ft of water.

5. $P(A_1) = 0.12$ $P(A_2) = 0.07$ $P(A_3) = 0.05$

$P(A_1 \cup A_2) = 0.13$ $P(A_1 \cup A_3) = 0.14$ $P(A_2 \cup A_3) = 0.10$

$P(A_1 \cap A_2 \cap A_3) = 0.01$

a) $P(A_1') = 1 - P(A_1)$

$P(A_1') = 1 - 0.12 = \boxed{0.88}$

b) $P(A_1 \cap A_2) = P(A_1) + P(A_2) - P(A_1 \cup A_2)$

$P(A_1 \cap A_2) = 0.12 + 0.07 - 0.13$

$P(A_1 \cap A_2) = \boxed{0.06}$

c) $P(A_1 \cap A_2 \cap A_3')$

$P(A_1 \cap A_2) = P(A_1 \cap A_2 \cap A_3) + P(A_1 \cap A_2 \cap A_3')$

$P(A_1 \cap A_2 \cap A_3') = P(A_1 \cap A_2) - P(A_1 \cap A_2 \cap A_3)$

$P(A_1 \cap A_2 \cap A_3') = 0.06 - 0.01$

$P(A_1 \cap A_2 \cap A_3') = \boxed{0.05}$

d) $P(\text{2 or fewer defects}) = 1 - P(\text{all defects})$

$P(\text{2 or fewer defects}) = 1 - P(A_1 \cap A_2 \cap A_3)$

$P(\text{2 or fewer defects}) = 1 - 0.01$

$P(\text{2 or fewer defects}) = \boxed{0.99}$