

Name: _____ Student ID: _____

1. Suppose the following table shows January rainfall in Los Angeles/

Year	JAN
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) Calculate the mean and the standard deviation of the rainfall.
Round the values to the nearest hundredth if needed. (5 pts)

$$\text{Mean} = \frac{3+1.62+\dots+4.20}{10} = 2.99$$

$$\text{Variance} = \frac{\sum (x_i - \bar{x})^2}{n-1}$$

$$= \frac{(3-2.99)^2 + (1.62-2.99)^2 + \dots + (4.2-2.99)^2}{10-1} = 2.52$$

$$\text{STD} = \sqrt{2.52} = 1.59$$

- b) What is the median of rainfall?
What are lower and upper quartiles?
Round the values to the nearest hundredth if needed. (5 pts)

JAN
1.12
1.25
1.62
2.05
2.84
3.00
3.06
4.20
4.82
5.92

$$Q2_{\text{jan}} = \tilde{x}_{\text{jan}} = \frac{2.84 + 3.00}{2} = 2.92$$

$$Q1_{\text{jan}} = 1.62$$

$$Q3_{\text{jan}} = 4.20$$

- c) Draw the box plot for each month. How many outliers are there? (5 pts)

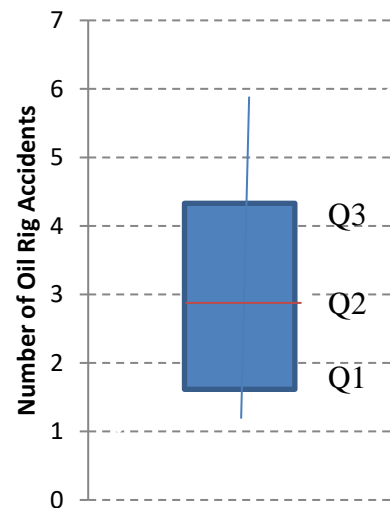
$$\text{IQR} = 4.2 - 1.62 = 2.58$$

$$1.5 * \text{IQR} = 1.5 * 2.58 = 3.87$$

$$Q3_{\text{Jan}} + 1.5 * \text{IQR} = 4.2 + 3.87 = 8.07 \therefore \text{Max} = 5.92$$

$$Q1_{\text{Jan}} - 1.5 * \text{IQR} = 1.62 - 3.87 = -2.25 \therefore \text{Min} = 1.12$$

No outliers



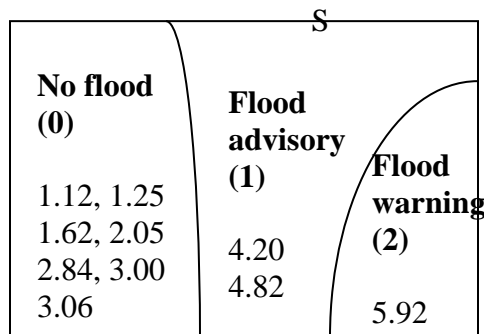
- d) Which measure, the mean or the median, do you think better represents the January rainfall? Why? (5 pts)

Both looks similar because there is no outlier.
(Median is generally better because it is not affected by the outliers)

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2. Use the rainfall data in Problem 1.

- a) Suppose a rainfall of 5 inches and above issues flood warnings (L2), a rainfall of 3.5 inches and above and less than 5 inches issues flood advisory (L1), and a rainfall less than 3.5 inches does not issue flood (L0). Draw the Venn diagram in terms of L0, L1 and L2 with the outcomes. Are they mutually exclusive? Are they collectively exhaustive? (5 pts)



L0, L1 and L2 are mutually exclusive and collectively exhaustive.

- b) Construct the pmf table for flooding (0: no flood, 1: flood advisory, 2: flood warning). (5 pts)

X	0 (No Flood)	1 (Flood Advisory)	2 (Flood Warning)
P(X)	7/10 = 0.7	2/10 = 0.2	1/10 = 0.1

- c) Calculate the probability that issues either flood advisory or warning (5 pts)

$$\begin{aligned}
 P(L1 \cup L2) &= P(L1) + P(L2) - P(L1 \cap L2) \\
 &= 0.2 + 0.1 - 0 \\
 &= 0.3
 \end{aligned}$$

- d) What are the expected levels of flood using the pmf in part b? (5 pts)

$$E(X) = 0 \times 0.7 + 1 \times 0.2 + 2 \times 0.1 = 0 + 0.2 + 0.2 = 0.4 \cong \text{No Flood}$$