

3.3-3.4: Summary Statistics – Measures of Center and Spread

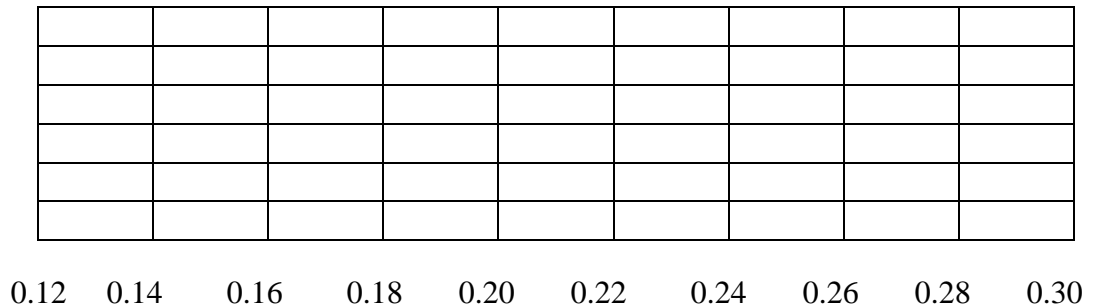
Group Activity

1. The following data are blood alcohol concentrations of 12 drivers involved in fatal crashes (data from the U.S. department of justice). We will analyze the shape, center and spread of this data, and whether there are any outliers.

a. On the grid, make a histogram of the data using a bin-width of 0.02. Label your axes.

Blood alcohol level of drivers in fatal crashes
0.27
0.17
0.17
0.16
0.13
0.24
0.29
0.24
0.14
0.16
0.12
0.16

Histogram of Blood Alcohol Levels



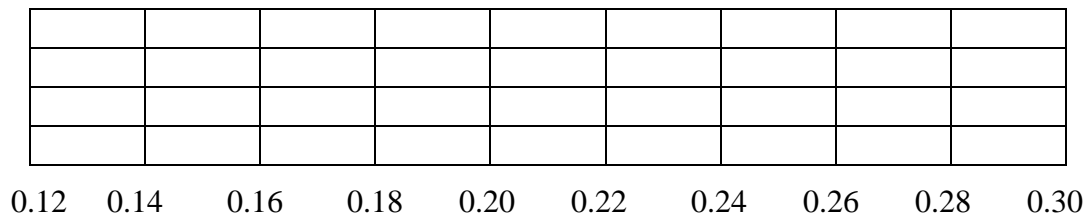
b. What is the shape of the histogram? If you are not sure yet, compute and compare the mean and the median in the next question.

c. Find the mean, median and mode, include units.

d. Find the 5-number summary, IQR and range, including units.

e. Use the 5-number summary to draw a boxplot on the grid below.

Boxplot of Blood Alcohol Levels



f. Do you think there are any outliers? Why or why not?

Calculating Standard Deviation, s

g. Using your mean rounded to two decimal places, find the standard deviation, including units. The variable n refers to the number of data values.

Mean = _____, n = _____

Blood alcohol level of drivers in fatal crashes	Deviation from the mean	Squared deviation
0.27		
0.17		
0.17		
0.16		
0.13		
0.24		
0.29		
0.24		
0.14		
0.16		
0.12		
0.16		
Sum of the squared deviations (numerator)		

$$s = \sqrt{\frac{\sum (x - \text{mean})^2}{n - 1}}$$

$$= \sqrt{\frac{\quad}{-1}}$$

4.1: Contingency Tables and Probability

The survey data below is from four classes of Math 105 students. Their gender identities and modes of transportation to PCC are summarized in a contingency table.

	Bike	Bus	Drive Self	Ride with Another	Walk	Total
Female	0	12	25	5	3	45
Non-binary or Genderqueer	0	3	2	0	0	5
Male	1	4	16	3	1	25
Total	1	19	43	8	4	75

2. Find the following marginal, "and", and "or" probabilities.

If we were to randomly select a student who took the survey, what is the probability they:

- identify as female?
- identify as non-binary or genderqueer?
- walk to PCC?
- bus to PCC?
- walk and identify as male?
- identify as non-binary or genderqueer and drive them self to PCC?
- identify as female or ride with another?
- identify as male or walk to PCC?

3. Calculate these conditional probabilities:

a. Given that a student from the survey identifies as female, what is the probability they take the bus to PCC?

b. If a student drives themselves to campus, what is the probability they identify as non-binary or genderqueer?

c. What is the probability that a student walks, given they identify as male?

d. Of those students who identify as female, what is the probability they ride to campus with another?

More Practice

1. Class Data. Below are the number of credit hours taken by students in two Math 105 courses.

Spring T/Th Class:

15, 4, 12, 12, 12, 12, 12, 16, 11, 12, 18, 13, 12, 8, 15, 11, 13, 12, 14, 14, 11, 11, 15

Fall M/W Class:

4, 12, 12, 11, 12, 8, 15, 12, 12, 12, 12, 11, 12, 12, 11, 8, 11, 13, 12, 13, 12, 16, 12, 12, 8

a. Find the mean, mode, 5-number summary, IQR and range for each class.

T/Th Class:

M/W Class:

b. Draw the boxplot for each class using the same scale.

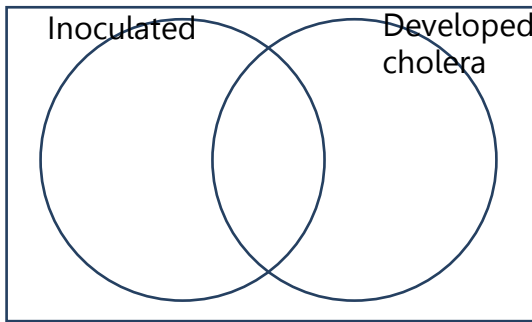
Boxplot for T/Th Class

Boxplot for M/W Class

c. What is the shape of the data for each class? How can you tell from the boxplots?

Cholera Inoculation Study, 1894-96:

2. A group of 818 people who were exposed to cholera in Calcutta, India in 1894-96 were studied. Of this group, 279 were inoculated with Haffkine’s anti-cholera vaccine, while the remaining 539 had not been inoculated. Overall, 69 people developed cholera. Three of those who were inoculated developed cholera. Use this information to complete the Venn diagram and the contingency table. (Source: <https://mysite.du.edu/~jcalvert/econ/twoobytwo.htm>)



	Developed cholera	Did not develop cholera	Total
Inoculated			
Not inoculated			
Total			

Find the marginal, “and,” and “or” probabilities. If a randomly selected person from the study was chosen, what is the probability they

MARGINAL

a. were inoculated?

b. developed cholera?

AND

c. were inoculated and developed cholera?

d. were not inoculated and did not develop cholera?

OR

e. were inoculated or did not develop cholera?

f. were not inoculated or developed cholera?

CONDITIONAL

g. Given that a person was inoculated, what is the probability they developed cholera?

h. If a person was not inoculated, what is the probability they developed cholera?

i. Do you think the inoculation was effective? Why or why not?