

QUIZ 1**(LESSONS 1-10: INTRO and DESCRIPTIVE STATISTICS)****MATH 119 – FALL 2023 – KUNIYUKI****100 POINTS TOTAL**

No notes or books allowed. A scientific calculator is allowed. Simplify as appropriate. You do not have to reduce fractions. For example, 10/20 does not have to be rewritten as ½.

FORMULAS

$$\mu = \frac{\sum x}{N}$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N}$$

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

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{N}}$$

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

$$\text{Median Position Number} = \frac{N + 1}{2}, \text{ or } \frac{n + 1}{2}$$

$$\text{Midrange} = \frac{\text{Min} + \text{Max}}{2}$$

$$\text{From a Frequency Table: Estimated Mean} = \frac{\text{Estimated Sum}}{N}, \text{ or } \frac{\sum f \cdot x}{\sum f}$$

$$\text{Weighted Mean} = \frac{\sum w \cdot x}{\sum w}$$

$$\text{Range} = \text{Max} - \text{Min}$$

$$z = \frac{x - \mu}{\sigma}, \text{ or } z = \frac{x - \bar{x}}{s}$$

$$\text{IQR} = Q_3 - Q_1$$

1) (3 points). Fredonia has 25 states with roughly equal populations. A filmmaker randomly selects three adults from each of the 25 states. The filmmaker will talk with these 75 people to see if they will be interesting subjects for a political film. What sampling method is being used here? Box in the best answer:

- simple random sampling
- systematic sampling
- cluster sampling
- stratified sampling

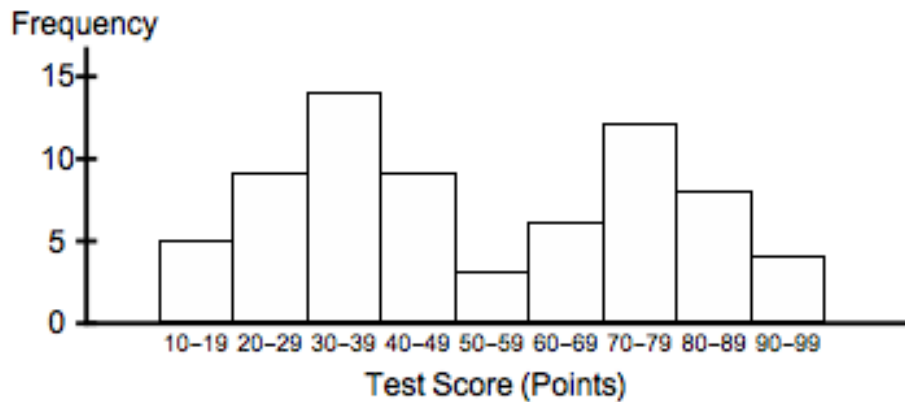
2) (4 points). Twenty years after the 9/11/2001 attacks on the U.S., a 2021 poll used a random sample of 782 American adults. They were asked if the U.S. is safer from terrorism now than before 9/11/2001, if the U.S. is less safe now, or if they didn't know.

Based on the observed frequencies below, find the corresponding relative frequencies. Write the answers in **percent form**. If you round off, round off to three significant digits. It may help to show some work for partial credit.

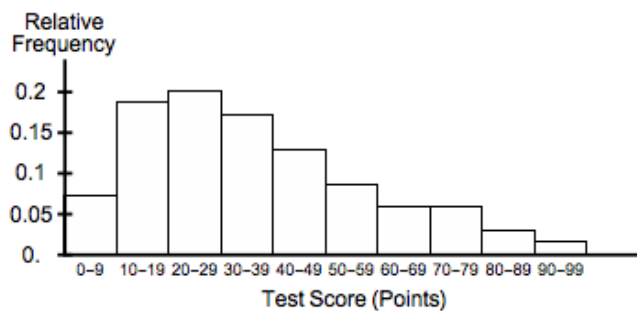
(Note: These figures are based on a 2021 ABC News / Washington Post poll.)

Response	Frequency	Relative Frequency (as a percent)
The U.S. is safer now.	383	
The U.S. is less safe now.	321	
Don't know	78	
	Sum = n = 782	

- 3) (3 points). 70 students take an exam. A frequency histogram for their scores is below. Estimate the number of students who scored in the 20s (between 20 and 29 points).



- 4) (2 points). Describe the skewness of the distribution below.



- 5) (3 points). Which statement below tends to be more true? Box in one:
- The mean is more sensitive to outliers than the median is.
 - The median is more sensitive to outliers than the mean is.
- 6) (3 points). The mean is considered to be a very appropriate measure of center for which of the following types of distributions? Box in one (the best answer):
- a left-skewed distribution
 - a right-skewed distribution
 - a symmetric distribution

7) (18 points). A pharmaceutical company randomly selects seven people with diabetes to participate in a study. Their fasting blood glucose levels are tested and are recorded as follows (in milligrams per deciliter, or mg/dL).

160 209 177 209 179 300 166

(Show work as we have in class.) Based on this data ...

- a) (4 points). Find the **mean** of the fasting blood glucose levels among the seven people.

- b) (2 points). Find the **median position number** of this data set.

- c) (4 points). Find the **median** of the fasting blood glucose levels among the seven people.

- d) (4 points). Find the **mode** of the fasting blood glucose levels among the seven people.

- e) (4 points). Find the **midrange** of the fasting blood glucose levels among the seven people.

8) (11 points). A student's grade report for a term is below. Find the GPA for the term to two decimal places. As stated in class, grades of "A," "B," "C," "D," and "F" are worth 4, 3, 2, 1, and 0 grade points, respectively. A "+" modifier adds 0.3, while a "-" subtracts 0.3. Show work, as in class!

Grade Report		
Course	Number of Units	Grade
English	6	C+
Math	5	B
Music	3	A-

9) (9 points). So far, your grade record in a class looks like this:

Exam	% of overall grade	Your score (out of 100 points)
Quiz 1	10%	50
Quiz 2	10%	75
Midterm 1	25%	70
Midterm 2	25%	80
Final	30%	b

What must you get on the Final to get at least 80% in the class overall?
(What kind of score do you need b to be?) Show work, as in class!
The answer is interesting!

10) (23 points). 1000 students in a large lecture class take a test. Four of the tests are randomly selected and are graded. Their scores in points are as follows:

55 80 95 70

• a) (4 points). Find the **range** of the sample data values.

• b) (4 points). Find the **sample mean**.

• c) (6 points). Fill out the following table:

Data (x) values in points	Deviations $(x - \bar{x})$ values	Squared Deviations $(x - \bar{x})^2$ values
55		
80		
95		
70		

• d) (1 point). What do the deviations from the sample mean add up to?

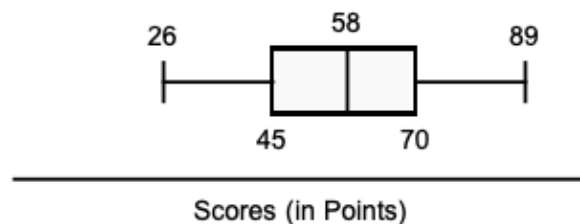
• e) (4 points). Find the **sample variance**. Round it off to one decimal place, but avoid rounding when doing f) below.

• f) (4 points). Find the **sample standard deviation**. Round it off to one decimal place.

11) (12 points). Annual incomes of high-school teachers in Fredonia are approximately normally distributed with mean \$55,000 and standard deviation \$10,000.

- a) (4 points). Use the “Two SD” (2σ) Rule for Usual Values to give an appropriate interval of usual annual incomes for high-school teachers in Fredonia.
- b) (2 points). According to the **Empirical Rule**, about what percent of annual incomes of high-school teachers in Fredonia are within **two** standard deviations of the mean?
- c) (4 points). If a high-school teacher in Fredonia makes an annual income of \$40,000, what would be the z score for that income to two decimal places?
- d) (2 points). **Interpret the z score** from c), as in class.

12) (9 points total). The scores on a test (in points) in a large class are summarized by the boxplot (also known as a “box-and-whisker” plot) below. The minimum score is 26 points. The maximum score is 89 points. There are no extreme outliers.



- a) (2 points). A score of 70 points is at which **quartile**?
- b) (2 points). A score of 70 points is at which **percentile**?
- c) (2 points). What is the **median** of the test scores?
- d) (3 points). What is the **IQR (Interquartile Range)** of the test scores?