

Show all work to receive full credit. Supply explanations where necessary.

1. (12 points) In a study of dogs' reaction times to a specific stimulus, an animal trainer obtained the following data.

| Reaction time (seconds) | Frequency |
|-------------------------|-----------|
| 2.3-2.9 | 10 |
| 3.0-3.6 | 12 |
| 3.7-4.3 | 6 |
| 4.4-5.0 | 8 |
| 5.1-5.7 | 4 |
| 5.8-6.4 | 2 |

- (a) What is the class width?

$$3.0 - 2.3 = 0.7$$

- (b) What are the class boundaries?

$$2.25, 2.95, 3.65, 4.35, 5.05, 5.75, 6.45$$

- (c) What is the relative frequency of the second class listed above?

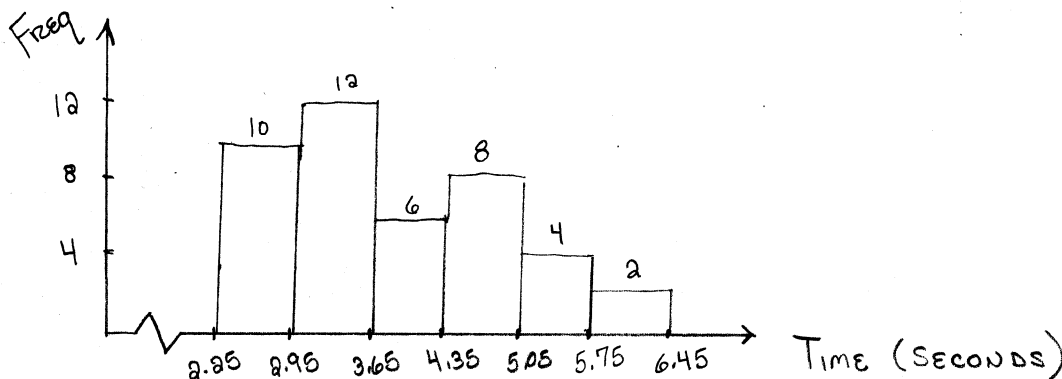
$$10 + 12 + 6 + 8 + 4 + 2 = 42$$

$$\frac{12}{42} \approx 28.6\%$$

- (d) If the frequency distribution was changed to a cumulative frequency distribution, what number would be associated with the class " ≤ 5.0 "?

$$10 + 12 + 6 + 8 = 36$$

- (e) Using **class boundaries** along the horizontal axis, construct the corresponding frequency histogram. Be sure to label your axes.



2. (15 points) The frequency distribution shown below is from Problem #1.

| Reaction time (seconds) | Frequency |
|-------------------------|-----------|
| 2.3-2.9 | 10 |
| 3.0-3.6 | 12 |
| 3.7-4.3 | 6 |
| 4.4-5.0 | 8 |
| 5.1-5.7 | 4 |
| 5.8-6.4 | 2 |

(a) What are the class midpoints?

$$\frac{2.3 + 2.9}{2} = 2.6, 3.3, 4.0, 4.7, 5.4, 6.1$$

(b) Use class midpoints to compute the weighted mean.

$$\bar{X} \approx \frac{2.6(10) + 3.3(12) + 4.0(6) + 4.7(8) + 5.4(4) + 6.1(2)}{42}$$

$$= \frac{161}{42} \approx 3.83$$

(c) Use class midpoints to compute the weighted median.

$$\frac{21^{\text{st}} + 22^{\text{nd}}}{2} = \frac{3.3 + 3.3}{2} = 3.3$$

(d) Looking at the frequency distribution, do the data appear to be normally distributed? Briefly explain your reasoning.

No, THE DATA ARE HIGHLY SKEWED RIGHT

(e) Use class midpoints to compute the weighted (sample) standard deviation.

$$\text{CALCULATOR: } S_x \approx 1.046$$

(f) What number of seconds is the cutoff for unusually small reaction times?

$$\bar{X} - 2(s) \approx 3.83 - 2(1.046)$$

$$\approx 1.74$$

3. (3 points) In a recent study, a large number of heterosexual couples in committed relationships were asked whether the man or woman said "I love you" first. In this context, would the collected data be qualitative (categorical) or quantitative?

DATA ARE THE WORDS MAN OR WOMAN

QUALITATIVE

4. (6 points) The mean price of a family-size bag of Doritos at four local stores is \$4.21. The mean price at two other stores is \$4.74. What is the mean price of the Doritos at all six of the stores?

$$\frac{4(4.21) + 2(4.74)}{6} \approx 4.39$$

5. (6 points) The following are the numbers of thousands of Ford Pintos produced annually from 1971 to 1980. Based on these numbers, was the 1974 production level of 544 thousand unusually large?

352, 480, 485, 544, 224, 290, 225, 189, 199, 185

CALCULATOR:

$$\bar{X} = 317.3$$

$$S \approx 138.6923$$

$$\bar{X} + 2s \approx 594.7$$

→ No, 544 WAS NOT UNUSUAL

6. (3 points) Suppose a researcher has recorded the eye colors of her subjects using the following scheme: she recorded a 1 for a subject with blue eyes, a 2 for brown eyes, and a 3 for green eyes. After a large number of observations, the researcher found that the mean eye color was 1.74. What is wrong with the researcher's use of the mean?

THE DATA ARE NOMINAL (JUST LABELS).

A MEAN VALUE OF NOMINAL DATA DOES NOT MAKE SENSE.

7. (6 points) Determine the most appropriate level of measurement. Choose from *nominal*, *ordinal*, *interval*, or *ratio*.

(a) Depths of earthquakes measured in kilometers

RATIO

(b) Colors of Skittles candies

NOMINAL

(c) Body temperatures measured in °F

INTERVAL

(d) Years in which U.S. presidents were inaugurated

INTERVAL

8. (3 points) Determine whether each value comes from a discrete collection or a continuous collection of data.

(a) A fully loaded Abrams M1 tank weighs 14,125 lbs.

CONTINUOUS

(b) Jessica spoke 14,125 words in one day.

DISCRETE

9. (5 points) Determine whether the given value is a statistic or a parameter.

(a) Among the students who were selected to participate in a survey, 83% were full-time students.

STATISTIC

(b) There are 10 Canadian provinces.

PARAMETER

(c) The mean atomic weight of all elements in the periodic table is 134.355 atomic mass units.

PARAMETER

10. (10 points) For each of the following situations, tell which type of graph would best display the data. Choose from *dot plot*, *bar graph*, *time-series graph*, *scatterplot*, *pie chart*, *ogive*, *histogram*, or *stem-and-leaf plot*. You may get partial credit if you offer brief explanations.

(a) What type of graph would be best to show how gas prices have changed over the last decade?

Time-series graph

(b) What type of graph typically uses class boundaries along the horizontal axis and cumulative frequencies along the vertical axis?

Ogive

(c) A researcher collected data consisting of 50 whole numbers between 70 and 110 (with most lying between 85 and 100). He would like to construct a visual display showing all of his data values. What two types of graphs would be equally appropriate in this context?

STEM-AND-LEAF PLOT OR DOT PLOT

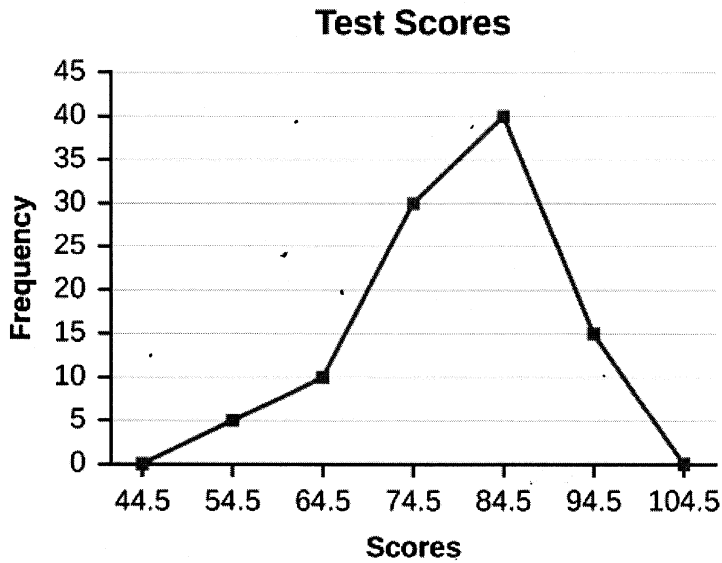
(d) If your data were qualitative (categorical) and you wanted to show how many in each category, what type of graph would you use?

BAR GRAPH

(e) If your data consisted of numerical measurements and you wanted to show the number of measurements in the separate classes, what type of graph would you use?

HISTOGRAM

11. (10 points) The following graph summarizes the scores on a widely administered test.



(a) What is the name of this type of graph?

Frequency polygon

(b) About how many test scores are in the sample?

$$5 + 10 + 30 + 40 + 15 = 100$$

(c) Which interval along the horizontal axis contains the most test scores? Explain how you know.

THE INTERVAL CENTERED AT 84.5 HAS THE GREATEST FREQUENCY (ABOUT 40).

(d) If the vertical axis was changed to relative frequency, what would be the height of the highest peak?

$$\frac{40}{100} = 40\%$$

(e) Steve estimated the mean test score by using the following calculation:

$$\frac{44.5 + 54.5 + 64.5 + 74.5 + 84.5 + 94.5 + 104.5}{7} = 74.5$$

What is wrong with Steve's estimation of the mean?

HE DID NOT GIVE THE SCORES THEIR APPROPRIATE WEIGHTS. THERE ARE 100 SCORES, NOT 7.

12. (10 points) What type of sampling is described in each situation. Choose from random, systematic, convenience, stratified, or cluster.

(a) The first ten people to enter a store are asked about their shopping preferences.

CONVENIENCE

(b) One hundred business cards are placed into a box. The cards are mixed up and five are selected.

RANDOM

(c) PSC students are divided into groups according to age, and ten people are selected at random from each group.

STRATIFIED

(d) Every third problem in a textbook's exercise set is selected for homework.

SYSTEMATIC

(e) Ten Illinois community colleges are selected at random to take part in a survey. All students at those colleges are asked to participate.

CLUSTER

13. (3 points) A survey in New Zealand asked the following question: "Should spanking, as part of good parental correction, be a criminal offense?" What is wrong with this survey question?

IT IS A LOADED QUESTION. IT CREATES BIAS
 BY HAVING THE SUBJECTIVE
 PHRASE "GOOD PARENTAL CORRECTION."

14. (5 points) Joanna sells childrens' t-shirts. One morning she sold 14 shirts—their sizes are shown below.

6, 6, 6, 8, 8, 10, 10, 12, 12, 12, 12, 12, 12, 12
~~6, 10, 8, 12, 12, 8, 12, 6, 10, 12, 12, 12, 6, 12~~

- (a) Compute the mean, median, and mode of these shirt sizes. Label which is which.

$$\bar{x} = \frac{\text{MEAN}}{14} = \frac{138}{14} \approx 9.86$$

$$\frac{\text{MED}}{2} = \frac{10 + 12}{2} = 11$$

$$\text{MODE} = 12$$

- (b) Someone asked Joanna the size of her average customer. Should she report the mean, median, or mode? Briefly explain.

IN THIS CONTEXT, USING THE MEAN OR MED DOES NOT MAKE SENSE. AVERAGE HERE PROBABLY IS BEST INTERPRETTED AS "MOST COMMON" --- MODE = 12

15. (3 points) Construct a stem-and-leaf plot for the following collection of numbers. Be sure to include a key.

~~1.1, 4.7, 1.8, 1.4, 3.2, 1.1, 4.0, 2.7, 2.5, 1.6, 2.6, 1.7~~

| | |
|---|-------------|
| 1 | 1 1 4 6 7 8 |
| 2 | 5 6 7 |
| 3 | 2 |
| 4 | 0 7 |

WHERE

2 | 5 MEANS

2.5