

Show all work neatly and systematically for full credit. Time: 75 minutes. Total points: 104

(4) Classify the variable as qualitative or quantitative.

1) (a). the numbers on the shirts of a boy's football team
quantitative

(b). The weights of a textbook.
quantitative

(4) Determine whether the quantitative variable is discrete or continuous.

2) (a). the speed of a car on a Boston tollway during rush hour traffic
continuous

(b). The number of pills in an aspirin bottle.
discrete

(6) Determine the level of measurement (Nominal, Ordinal, Interval, or Ratio) of the variable.

3) (a). the musical instrument played by a music student
nominal

(b). Height of a tree.
ratio

(c). The day of the month
ordinal

(4) Determine whether the study depicts an observational study or an experiment.

4) (a). A poll is conducted in which professional musicians are asked their ages.
observational

(b). The personnel director at a large company would like to determine whether the company cafeteria is widely used by employees. She calls each employee and asks them whether they usually bring their own lunch, eat at the company cafeteria, or go out for lunch.

observational

(6) Identify the type of sampling used (Stratified, Random, Cluster, Convenience, or Systematic).

5) (a). Every fifth adult entering an airport is checked for extra security screening. What sampling technique is used?

systematic

(b). A travel industry researcher interviews all of the passengers on five randomly selected cruises. What sampling technique is used?

cluster

(c). A lobbyist for the oil industry assigns a number to each senator and then uses a computer to randomly generate ten numbers. The lobbyist contacts the senators corresponding to these numbers. What sampling technique was used?

random

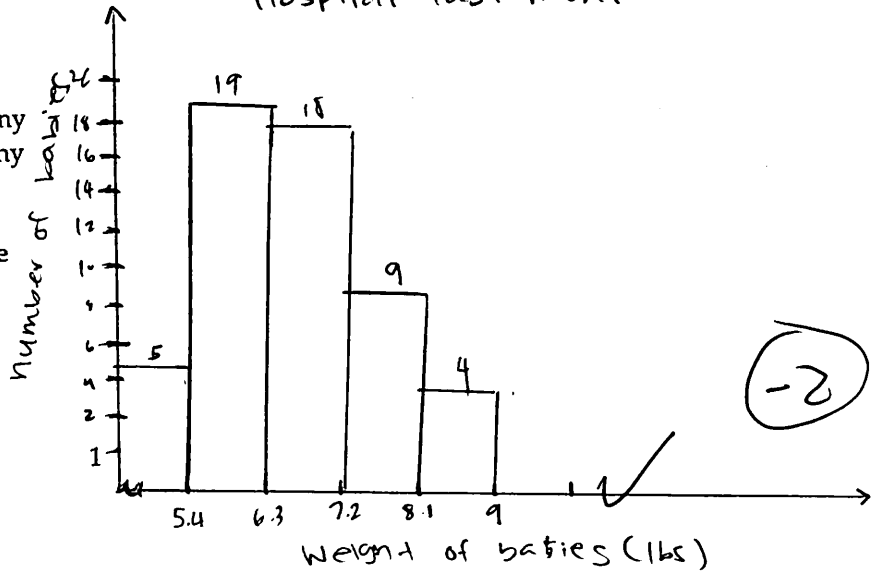
Provide an appropriate response.

6) (5) The weights (in pounds) of babies born at St Mary's hospital last month are summarized in the table.

Weight (lb)	Number of Babies	midpoints
5.0 - 5.8	5	5.4
5.9 - 6.7	19	6.3
6.8 - 7.6	18	7.2
7.7 - 8.5	9	8.1
8.6 - 9.4	4	9

Construct a frequency histogram.

Weight of babies born at St Mary's hospital last month



7) (10) Given the frequency table below.

	f	x
Class	Frequency	midpoint
1 35-36	3	35.5
2 37-38	1	37.5
3 39-40	3	39.5
4 41-42	6	41.5
5 43-44	2	43.5
total	15	

a. Find the class width for the frequency table.

$$\text{class width} = 37 - 35 = 2$$

b. Determine the class limits of the second class.

$$2 \quad 36.5 \text{ to } 38.5$$

c. Find the relative frequency of the fourth class.

$$\frac{6}{15} = 0.4 \rightarrow 40\%$$

c. Find the midpoint of the first class.

$$35.5 \quad \checkmark$$

d. Find the mean.

$$\frac{\sum fx}{\sum f} = \frac{598.5}{15}$$

$$\bar{x} = 39.9$$

(4) Determine the original set of data.

8)

Stem	Leaves
7	5
8	3
9	0 2
10	6
11	6 7
12	6 9
13	6 7 9
14	2 3 8 9
15	8 9

Legend: 5|5 represents 55

75, 83, 90, 92, 106, 116, 117,
126, 129, 136, 137, 139, 142, 143,
148, 149, 158, 159

(6) Construct the requested frequency distribution.

9) The March utility bills (in dollars) of 30 homeowners are listed below.

44 38 41 50 36 36 43 42 49 48
35 40 37 41 43 50 45 45 39 38
50 41 47 36 35 40 42 43 48 35

Construct a frequency distribution using five classes and using 33 as the lower class limit of the first class.

March utility bill	frequency
① 33 - 36	6
② 37 - 40	6
③ 41 - 44	9
④ 45 - 48	5
⑤ 49 - 52	4

Provide an appropriate response.

10) (7) The costs (in dollars) of 10 college math textbooks are listed below.

~~70 72 74 76 78 80 82 84 86 88~~

a. Find the sample mean.

$$\bar{x} = 70.3$$

b. Find the sample standard deviation.

$$s = 1.494$$

c. Find the median.

$$\tilde{x} = 70$$

d. Find the mode.

$$70$$

e. Find the range.

$$73 - 68 = 5$$

f. Find the sample variance.

$$\sigma^2 = 2.232$$

g. Find the midrange.

$$\frac{73 + 68}{2} = 70.5$$

11) (6) At a tennis tournament a statistician keeps track of every serve. The statistician reported that the mean serve speed of a particular player was 97 miles per hour (mph) and the standard deviation of the serve speeds was 11 mph.

(a). Assume that the statistician also gave us the information that the distribution of the serve speeds was bell shaped. What proportion of the player's serves are expected to be between 64 mph and 130 mph?

$\bar{x} = 97 \text{ MPH}, s = 11 \text{ mph}$

$z = \frac{64 - 97}{11} = -3 \quad z = \frac{130 - 97}{11} = 3$

99.7% of the player's serves are expected to be between 64 mph & 130 mph.

(b). If the distribution of the data is unknown, what proportion of the player's serves are expected to be between 64 mph and 130 mph?

$K = \frac{64 - 97}{11} = -3 \quad K = \frac{130 - 97}{11} = 3$

$1 - \frac{1}{32} \cdot 100\% = 88.89\%$

At least, 88.89% of the player's serves are expected to be between 64 mph & 130 mph

12) (5) A student receives test scores of 62, 83, and 91. The student's term project score is 88. Each test is worth 20% of the final grade, the term project is 25% of the final grade. What is the student's mean score in the class before the final? (Note that the total weight is not 100%)

$\bar{w} = \frac{(62 \cdot 0.2) + (83 \cdot 0.2) + (91 \cdot 0.2) + (88 \cdot 0.25)}{0.2 + 0.2 + 0.2 + 0.25}$

$\bar{w} = 81.411\% \checkmark$

13) (3) Find the z-score for the value 84, when the mean is 74 and the standard deviation is 4.

$z = \frac{84 - 74}{4}$

$z = 2.5 \checkmark$

14) (4) Test scores for a statistics class had a mean of 79 with a standard deviation of 4.5. Suppose a student gets a 94 on the statistics test, calculate the z-score for the test. Then determine whether it is unusual to have a score (-2 of 94, explain

$\bar{x} = 79 \quad s = 4.5$

$z = \frac{94 - 79}{4.5}$

$z = 3.3 \checkmark$

It is unusual to have a score of 94 because the z-score is 3.3 which is greater than 2.

15) (6) The commute times (in minutes) of 30 employees are listed below.

- 13 34 45 48 52 55 56 56 63 65
- 67 67 69 70 70 74 75 78 79 79
- 80 81 83 85 85 87 90 92 95 109

(a). Find Q_1 , Q_2 , and Q_3 , and the interquartile range.

$Q_1 = 56$

$Q_2 = 72 \checkmark$

$Q_3 = 83$

$IQR = 83 - 56 = 27$

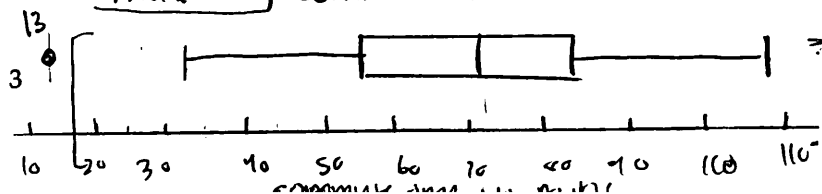
(b). Determine whether there is any outlier. You need to show work (Show fences and make decision).

upper fence $83 + 1.5(27) = 123.5$

lower fence $56 - 1.5(27) = 15.5$

outlier 13

min: 13 < outlier → becomes 34
max: 109



16) (5) Notations. Write the symbol for the following:

a. Sample mean: \bar{x} ✓

b. Sample Size. n ✓

c. Sample standard deviation. s ✓

d. Population mean. μ ✓

e. Population standard deviation. σ^2 ✓

(4) Determine whether the underlined value is a parameter or a statistic.

18) (a) A study of 2700 college students in the city of Pemblington found that 14% had been victims of violent crimes.

statistic ✓

(b). 51.6% of the residents of Garden City are female.

parameter ✓

(6) Use the given data to construct a frequency distribution.

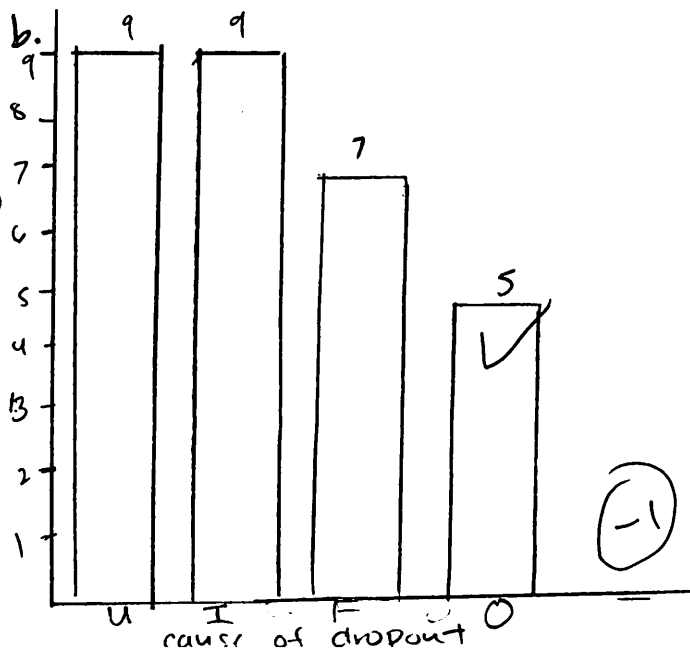
19) A school district performed a study to find the main causes leading to its students dropping out of school. Thirty cases were analyzed, and a primary cause was assigned to each case. The causes included unexcused absences (U), illness (I), family problems (F), and other causes (O). The results for the thirty cases are listed below:

~~(I)~~ ~~(I)~~ ~~(U)~~ ~~(F)~~ ~~(O)~~ ~~(O)~~ ~~(U)~~ ~~(F)~~
~~(F)~~ ~~(O)~~ ~~(U)~~ ~~(X)~~ ~~(X)~~ ~~(F)~~ ~~(X)~~ ~~(X)~~ ~~(O)~~ ~~(U)~~
~~(X)~~ ~~(F)~~ ~~(F)~~ ~~(U)~~ ~~(U)~~ ~~(X)~~ ~~(X)~~ ~~(O)~~ ~~(F)~~ ~~(U)~~

a. Construct a frequency distribution of the primary causes leading to student dropout.

b. Construct a pareto chart.

cause of dropout	frequency
U	9
I	9
F	7
O	5



Provide an appropriate response.

17) (2, 2, 5) The following is a sample of 19 November utility bills (in dollars) from a neighborhood.

52, 62, 66, 68, 72, 74, 76, 76, 76, 78, 78, 82, 84, 84, 86, 88, 92, 96, 110

a. Find the percentile for 72.

$$L = \frac{4}{19} \times 100 = 21.05\% \quad \checkmark$$

b. Find the 85th percentile, that is find P_{85}

$$L = \frac{85}{100} \cdot 19 = 16.15 \approx 17 = \boxed{92} \quad \checkmark$$

b. Construct a modified box plot (Note: you need to find the upper fence, lower fence, then determine whether there is an outlier).

min = 52 IQR = 86 - 72 = 14
 Q1 = 72 upper fence: 86 + 1.5(14) = 107
 Q2 = 78 lower fence: 72 - 1.5(14) = 51
 Q3 = 86
 max = ~~96~~ outlier = 110

utility bills from a neighborhood Nov. ✓

