MULTIPLE CHOICE

1. A sample of a population taken at one particular point in time is categorized as:
   a. categorical
   b. discrete
   c. cross-sectional
   d. time-series

   ANS: C PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

2. If data is stored in a database package, which of the following terms are typically used?
   a. Fields and records
   b. Cases and columns
   c. Variables and samples
   d. Variables and observations

   ANS: A PTS: 1 MSC: AACSB: Analytic

3. Researchers may gain insight into the characteristics of a population by examining a
   a. mathematical model describing the population
   b. sample of the population
   c. description of the population
   d. replica

   ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

4. Numerical variables can be subdivided into which two types?
   a. Diverse and categorical
   b. Discrete and continuous
   c. Nominal and progressive
   d. Cross-sectional and discrete

   ANS: B PTS: 1 MSC: AACSB: Analytic

5. *Gender* and *State* are examples of which type of data?
   a. Discrete data
   b. Continuous data
   c. Categorical data
   d. Ordinal data

   ANS: C PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

6. Which of the following indicates how many observations fall into various categories?
   a. The Likert scale
   b. The frequency table
   c. The sample table
   d. The tabulation scale

   ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

7. Data that arise from counts are called:
   a. continuous data
   b. nominal data
   c. counted data
   d. discrete data

   ANS: D PTS: 1 MSC: AACSB: Analytic

8. A histogram that is positively skewed is also called
   a. skewed to the right
   b. skewed to the left
   c. balanced
   d. symmetric

   ANS: A PTS: 1 MSC: AACSB: Analytic

9. A histogram that has exactly two peaks is called a

a. unimodal distribution
b. bimodal distribution
c. skewed distribution
d. scatterplot

ANS: B PTS: 1 MSC: AACSB: Analytic

10. A histogram that has a single peak and looks approximately the same to the left and right of the peak is called:
a. bimodal
b. symmetric
c. balanced
d. proportional

ANS: B PTS: 1 MSC: AACSB: Analytic

11. A variable is classified as ordinal if:
a. there is a natural ordering of categories
b. there is no natural ordering of categories
c. the data arise from continuous measurements
d. we track the variable through a period of time

ANS: A PTS: 1 MSC: AACSB: Analytic

12. In order for the characteristics of a sample to be generalized to the entire population, it should be:
a. symbolic of the population
b. typical of the population
c. representative of the population
d. illustrative of the population

ANS: C PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

13. When we look at a time series plot, we usually look for which two things?
a. "Is there an observable trend?" and "Is there a seasonal pattern?"
b. "Is there an observable trend" and "Can we make predictions?"
c. "Is the sample representative?" and "Is there a seasonal pattern?"
d. "Is there an observable trend?" and "Is the trend symmetric?"

ANS: A PTS: 1 MSC: AACSB: Analytic

14. Which of the following are possible categorizations of data type?
a. Numerical versus categorical (with subcategories nominal, ordinal)
b. Discrete versus continuous
c. Cross-sectional versus time series
d. All of these options
e. Two of these options

ANS: D PTS: 1 MSC: AACSB: Analytic

15. Which of the following are the two most commonly used measures of variability?
a. Variance and median
b. Variance and standard deviation
c. Mean and variance
d. Mean and range
e. First quartile and third quartile

ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

16. The median can also be described as:
a. the middle observation when the data values are arranged in ascending order
b. the second quartile
c. the 50^{th} percentile

d. All of these options

ANS: D PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

17. The difference between the first and third quartile is called the
    a. interquartile range
    b. interdependent range
    c. unimodal range
    d. bimodal range
    e. mid range

ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

18. If a value represents the 95^{th} percentile, this means that
    a. 95% of all values are below this value
    b. 95% of all values are above this value
    c. 95% of the time you will observe this value
    d. there is a 5% chance that this value is incorrect
    e. there is a 95% chance that this value is correct

ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

19. For a boxplot, the point inside the box indicates the location of the
    a. mean
    b. median
    c. minimum value
    d. maximum value

ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

20. For a boxplot, the vertical line inside the box indicates the location of the
    a. mean
    b. median
    c. mode
    d. minimum value
    e. maximum value

ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

21. Which of the following are the three most common measures of central location?
    a. Mean, median, and mode
    b. Mean, variance, and standard deviation
    c. Mean, median, and variance
    d. Mean, median, and standard deviation
    e. First quartile, second quartile, and third quartile

ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

22. The length of the box in the boxplot portrays the
    a. mean
    b. median
    c. range
    d. interquartile range
    e. third quartile

ANS: D PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

23. Suppose that a histogram of a data set is approximately symmetric and "bell shaped". Approximately what percent of the observations are within two standard deviations of the mean?
    a. 50%
    b. 68%
    c. 95%
    d. 99.7%
    e. 100%

    ANS: C PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

24. The mode is best described as the
    a. middle observation
    b. same as the average
    c. 50^{th} percentile
    d. most frequently occurring value
    e. third quartile

    ANS: D PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

25. For a boxplot, the box itself represents what percent of the observations?
    a. lower 25%
    b. middle 50%
    c. upper 75%
    d. upper 90%
    e. 100%

    ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

26. Which of the following statements is true for the following data values: 7, 5, 6, 4, 7, 8, and 12?
    a. The mean, median and mode are all equal
    b. Only the mean and median are equal
    c. Only the mean and mode are equal
    d. Only the median and mode are equal

    ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

27. In a histogram, the percentage of the total area which must be to the left of the median is:
    a. exactly 50%
    b. less than 50% if the distribution is skewed to the left
    c. more than 50% if the distribution is skewed to the right
    d. between 25% and 50% if the distribution is symmetric and unimodal

    ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

28. The average score for a class of 30 students was 75. The 20 male students in the class averaged 70. The 10 female students in the class averaged:
    a. 75
    b. 85
    c. 60
    d. 70
    e. 80

    ANS: B PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

29. Which of the following statements is true?
    a. The sum of the deviations from the mean is always zero

b. The sum of the squared deviations from the mean is always zero
c. The range is always smaller than the variance
d. The standard deviation is always smaller than the variance

ANS: A PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

30. Expressed in percentiles, the interquartile range is the difference between the
a. 10^{th} and 60^{th} percentiles
b. 15^{th} and 65^{th} percentiles
c. 20^{th} and 70^{th} percentiles
d. 25^{th} and 75^{th} percentiles
e. 35^{th} and 85^{th} percentiles

ANS: D PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

31. A sample of 20 observations has a standard deviation of 4. The sum of the squared deviations from the sample mean is:
a. 400
b. 320
c. 304
d. 288
e. 180

ANS: C PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

TRUE/FALSE

1. Age, height, and weight are examples of numerical data.

ANS: T PTS: 1 MSC: AACSB: Analytic

2. Data can be categorized as cross-sectional or time series.

ANS: T PTS: 1 MSC: AACSB: Analytic

3. All nominal data may be treated as ordinal data.

ANS: F PTS: 1 MSC: AACSB: Analytic

4. Four different shapes of histograms are commonly observed: symmetric, positively skewed, negatively skewed, and bimodal.

ANS: T PTS: 1 MSC: AACSB: Analytic

5. Categorical variables can be classified as either discrete or continuous.

ANS: F PTS: 1 MSC: AACSB: Analytic

6. A skewed histogram is one with a long tail extending either to the right or left. The former is called negatively skewed, and the later is called positively skewed.

ANS: F PTS: 1 MSC: AACSB: Analytic

7. Some histograms have two or more peaks. This is often an indication that the data come from two or more distinct populations.

   ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

8. A population includes all elements or objects of interest in a study, whereas a sample is a subset of the population used to gain insights into the characteristics of the population.

   ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

9. A frequency table indicates how many observations fall within each category, and a histogram is its graphical analog.

   ANS: T PTS: 1 MSC: AACSB: Analytic

10. In the term "frequency table," frequency refers to the number of data values falling within each category.

    ANS: T PTS: 1 MSC: AACSB: Analytic

11. Time series data are often graphically depicted on a line chart, which is a plot of the variable of interest over time.

    ANS: T PTS: 1 MSC: AACSB: Analytic

12. The number of car insurance policy holders is an example of a discrete random variable

    ANS: T PTS: 1 MSC: AACSB: Analytic

13. A variable (or field) is an attribute, or measurement, on members of a population, whereas an observation (or case or record) is a list of all variable values for a single member of a population.

    ANS: T PTS: 1 MSC: AACSB: Analytic

14. Phone numbers, Social Security numbers, and zip codes are examples of numerical variables.

    ANS: F PTS: 1 MSC: AACSB: Analytic

15. *Cross-sectional* data are data on a population at a distinct point in time, whereas *time series* data are data collected across time.

    ANS: T PTS: 1 MSC: AACSB: Analytic

16. Distribution is a general term used to describe the way data are distributed, as indicated by a frequency table or histogram.

    ANS: T PTS: 1 MSC: AACSB: Analytic

17. Both ordinal and nominal variables are categorical.

    ANS: T PTS: 1 MSC: AACSB: Analytic

18. A histogram is said to be symmetric if it has a single peak and looks approximately the same to the left and right of the peak.

ANS: T PTS: 1 MSC: AACSB: Analytic

19. Suppose that a sample of 10 observations has a standard deviation of 3, then the sum of the squared deviations from the sample mean is 30.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

20. If a histogram has a single peak and looks approximately the same to the left and right of the peak, we should expect no difference in the values of the mean, median, and mode.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

21. The mean is a measure of central location.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

22. The length of the box in the boxplot portrays the interquartile range.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

23. In a positively skewed distribution, the mean is smaller than the median and the median is smaller than the mode.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

24. The value of the standard deviation always exceeds that of the variance.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

25. The difference between the first and third quartiles is called the interquartile range.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

26. The standard deviation is measured in original units, such as dollars and pounds.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

27. The median is one of the most frequently used measures of variability.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

28. Assume that the histogram of a data set is symmetric and bell shaped, with a mean of 75 and standard deviation of 10. Then, approximately 95% of the data values were between 55 and 95.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

29. Abby has been keeping track of what she spends to rent movies. The last seven week's expenditures, in dollars, were 6, 4, 8, 9, 6, 12, and 4. The mean amount Abby spends on renting movies is $7.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

30. Expressed in percentiles, the interquartile range is the difference between the 25^{th} and 75^{th} percentiles.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

31. The value of the mean times the number of observations equals the sum of all of the data values.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

32. The difference between the largest and smallest values in a data set is called the range.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

33. There are four quartiles that divide the values in a data set into four equal parts.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

34. Suppose that a sample of 8 observations has a standard deviation of 2.50, then the sum of the squared deviations from the sample mean is 17.50.

ANS: F PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

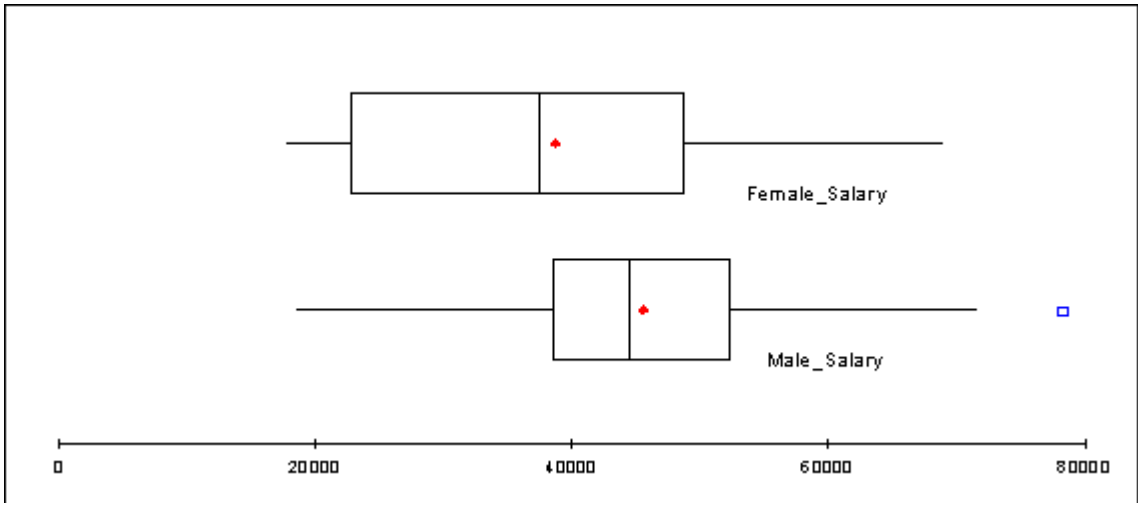
35. The median of a data set with 30 values would be the average of the 15^{th} and the 16^{th} values when the data values are arranged in ascending order.

ANS: T PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

SHORT ANSWER

NARRBEGIN: SA_71_73

A manager for Marko Manufacturing, Inc. has recently been hearing some complaints that women are being paid less than men for the same type of work in one of their manufacturing plants. The boxplots shown below represent the annual salaries for all salaried workers in that facility (40 men and 34 women).



NARREND

1. Would you conclude that there is a difference between the salaries of women and men in this plant? Justify your answer.

ANS:
Yes. The men seem to have higher salaries than the women do in many cases. We can see from the boxplots that the mean and median values for the men are both higher than for the women. You can also see from the boxplots that the middle 50% of salaries for men is above the median for women. This means that if you were in the 25^{th} percentile for men, you would be above the 50^{th} percentile for women. You can also see that the mean and median salaries for the men are about $10,000 above those for the women.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

2. How large must a person's salary should be to qualify as an outlier on the high side? How many outliers are there in these data?

ANS:
A person's salary should be somewhere above $70,000. There is one male salary that would be considered an outlier (at approximately $80,000)

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

3. What can you say about the shape of the distributions given the boxplots above?

ANS:

They both appear to be slightly skewed to the right (both have a mean > median). The total variation seems to be close for both distributions (with one outlier for the male salaries), but there seems to be more variation in the middle 50% for the women than for the men. There seem to be more men's salaries clustered more closely around the mean than for the women.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_74_75
Statistics professor has just given a final examination in his statistical inference course. He is particularly interested in learning how his class of 40 students performed on this exam. The scores are shown below.

77	81	74	77	79	73	80	85	86	73
83	84	81	73	75	91	76	77	95	76
90	85	92	84	81	64	75	90	78	78
82	78	86	86	82	70	76	78	72	93

NARREND

4. What are the mean and median scores on this exam?

ANS:

Mean = 80.40, Median = 79.50

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

5. Explain why the mean and median are different.

ANS:

There are few higher exam scores that tend to pull the mean away from the middle of the distribution. While there is a slight amount of positive skewness in the distribution (skewness = 0.182), the mean and the median are essentially equivalent in this case.

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

NARRBEGIN: SA_76_78
The data shown below contains family incomes (in thousands of dollars) for a set of 50 families; sampled in 1980 and 1990. Assume that these families are good representatives of the entire United States.

1980	1990	1980	1990	1980	1990
58	54	33	29	73	69
6	2	14	10	26	22
59	55	48	44	64	70
71	57	20	16	59	55
30	26	24	20	11	7
38	34	82	78	70	66
36	32	95	97	31	27
33	29	12	8	92	88
72	68	93	89	115	111
100	96	100	102	62	58
1	0	51	47	23	19
27	23	22	18	34	30
22	47	50	75	36	61
141	166	124	149	125	150
72	97	113	138	121	146
165	190	118	143	88	113
79	104	96	121		

NARREND

6. Find the mean, median, standard deviation, first and third quartiles, and the 95th percentile for family incomes in both years.

ANS:

	Income 1980	Income 1990
Mean	62.820	67.120
Median	59.000	57.500
Standard deviation	39.786	48.087
First quartile	30.250	27.500
Third quartile	92.750	97.000
95th percentile	124.550	149.55

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

7. The Republicans claim that the country was better off in 1990 than in 1980, because the average income increased. Do you agree?

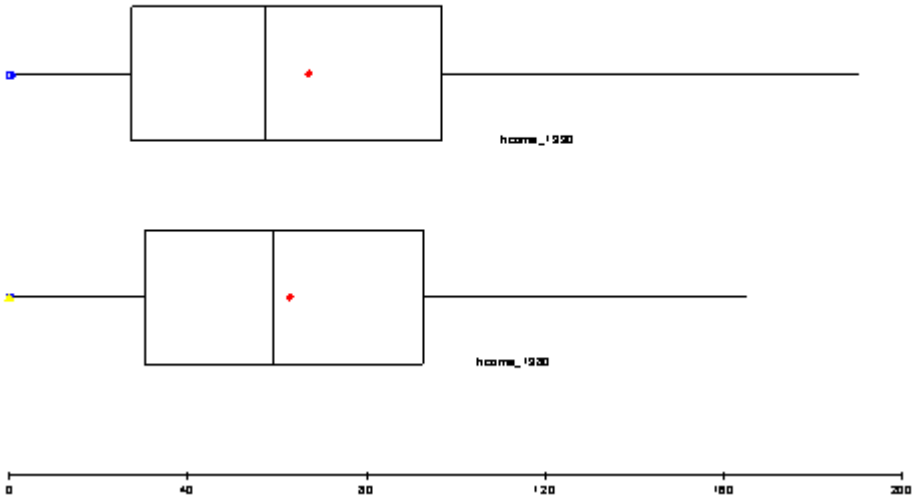
ANS:

It is true that the mean increased slightly, but the median decreased and the standard deviation increased. The 95th percentile shows that the mean increase might be because the rich got richer.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

8. Generate a boxplot to summarize the data. What does the boxplot indicate?

ANS:



The boxplot shows that there is not much difference between the two populations.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_79_81
In an effort to provide more consistent customer service, the manager of a local fast-food restaurant would like to know the dispersion of customer service times about their average value for the facility's drive-up window. The table below provides summary measures for the customer service times (in minutes) for a sample of 50 customers collected over the past week.

Count	50.000
Mean	0.873
Median	0.885
Standard deviation	0.432
Minimum	0.077
Maximum	1.608
Variance	0.187
Skewness	-0.003

NARREND

9. Interpret the variance and standard deviation of this sample.

ANS:

The variance = 0.187 (minutes squared) and this represents the average of the squared deviations from the mean. The standard deviation = 0.432 (minutes) and is the square root of the variance. Both the variance and standard deviation measure the variation around the mean of the data. However, it is easier to interpret the standard deviation because it is expressed in the same units (minutes) as the values of the random variable (customer service time).

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

10. Are the empirical rule applicable in this case? If so, apply it and interpret your results. If not, explain why the empirical rule is not applicable here.

ANS:

Considering that this distribution is only very slightly skewed to the left, it is acceptable to apply the empirical rule as follows:
Approximately 68% of the customer service times will fall between 0.873 ± 0.432, that is between 0.441 and 1.305 minutes.
Approximately 95% of the customer service times will fall between $0.873 \pm 2(0.432)$, that is between 0.009 and 1.737 minutes.
Approximately 99.7% of the customer service times will fall between $0.873 \pm 3(0.432)$, that is between 0 and 2.169 (we set the lower end to zero since service times cannot assume negative values).

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

11. Explain what would cause the mean to be slightly lower than the median in this case.

ANS:

The data is slightly skewed to the left. This is causing the mean to be slightly lower than the median. It is important to understand that service times are bounded on the lower end by zero (or it is impossible for the service time to be negative). However, there is no bound on the maximum service time. Therefore, the smaller service times are causing the mean to be somewhat lower than the median.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_82_85
Below you will find summary measures on salaries for classroom teachers across the United States. You will also find a list of selected states and their average teacher salary. All values are in thousands of dollars.

Salaries for classroom teachers across the United States

	Salary
Count	51.000
Mean	35.890
Median	35.000
Standard deviation	6.226
Minimum	26.300
Maximum	50.300
Variance	38.763
First quartile	31.550
Third quartile	40.050

Selected states and their average teacher salary

State	Salary
Alabama	31.3
Colorado	35.4
Connecticut	50.3
Delaware	40.5
Nebraska	31.5
Nevada	36.2
New Hampshire	35.8
New Jersey	47.9
New Mexico	29.6
South Carolina	31.6
South Dakota	26.3
Tennessee	33.1
Texas	32.0
Utah	30.6
Vermont	36.3
Virginia	35.0
Wyoming	31.6

NARREND

12. Which of the states listed paid their teachers average salaries that exceed at least 75% of all average salaries?

    ANS:

    Connecticut at 50.3; Delaware at 40.5; and New Jersey at 47.9 (all those > 40.05).

    PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

13. Which of the states listed paid their teachers average salaries that are below 75% of all average salaries?

    ANS:

    Alabama at 31.3; Nebraska at 31.5; New Mexico at 29.6; South Dakota at 26.3; and Utah at 30.6 (all those < 31.55).

    PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

14. What salary amount represents the second quartile?

    ANS:

    $35,000 (median)

    PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

15. How would you describe the salary of Virginia's teachers compared to those across the entire United States? Justify your answer.

    ANS:

Virginia = $35,000 which is also the median. Virginia is at the 50th percentile or 50% of the teachers' salaries across the U.S. are below Virginia and 50% of the salaries are above theirs.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_86_88

Suppose that an analysis of a set of test scores reveals that: $Q_1 = 45, Q_2 = 85, Q_3 = 105.$
NARREND

16. What do these statistics tell you about the shape of the distribution?

ANS:

The fact that $Q_2 - Q_1 =$ 40 is greater that $Q_3 - Q_2 =$ 20 indicates that the distribution is skewed to the left.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

17. What can you say about the relative position of each of the observations 34, 84, and 104?

ANS:

Since 34 is less than Q_1, the observation 34 is among the lowest 25% of the values. The value 84 is a bit smaller than the middle value, which is $Q_2 =$ 85. Since $Q_3 =$ 105, the value 104 is larger than about 75% of the values.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

18. Calculate the interquartile range. What does this tell you about the data?

ANS:

IQR = $Q_3 - Q_1 =$ 60. This means that the middle 50% of the test scores are between 45 and 105.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_89_91
The following data represent the number of children in a sample of 10 families from Chicago: 4, 2, 1, 1, 5, 3, 0, 1, 0, and 2.
NARREND

19. Compute the mean number of children.

ANS:

Mean = 1.90

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

20. Compute the median number of children.

ANS:

Median = 1.5

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

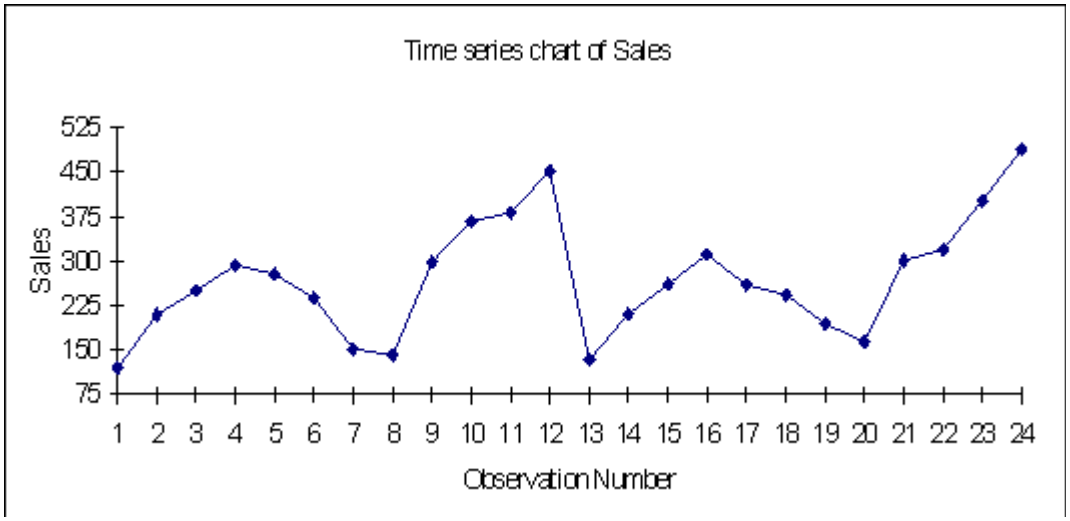
21. Is the distribution of the number of children symmetrical or skewed? Why?

ANS:

The distribution is positively skewed because the mean is larger than the median.

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

22. The data below represents monthly sales for two years of beanbag animals at a local retail store (Month 1 represents January and Month 12 represents December). Given the time series plot below, do you see any obvious patterns in the data? Explain.

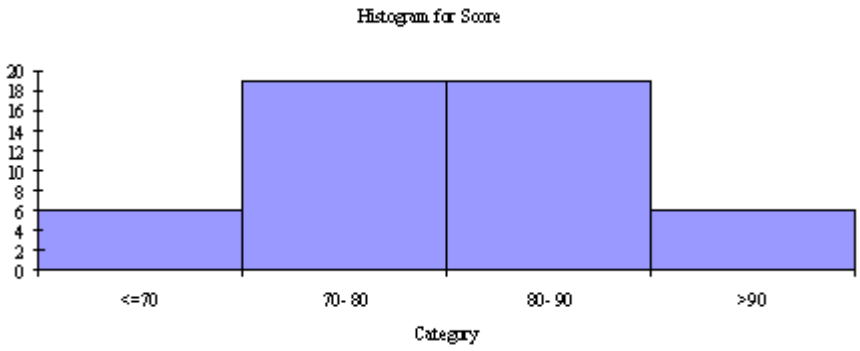


ANS:

This is a representation of seasonal data. There seems to be a small increase in months 3, 4, and 5 and a large increase at the end of the year. The sales of this item seem to peak in December and have a significant drop off in January.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

23. An operations management professor is interested in how her students performed on her midterm exam. The histogram shown below represents the distribution of exam scores (where the maximum score is 100) for 50 students.



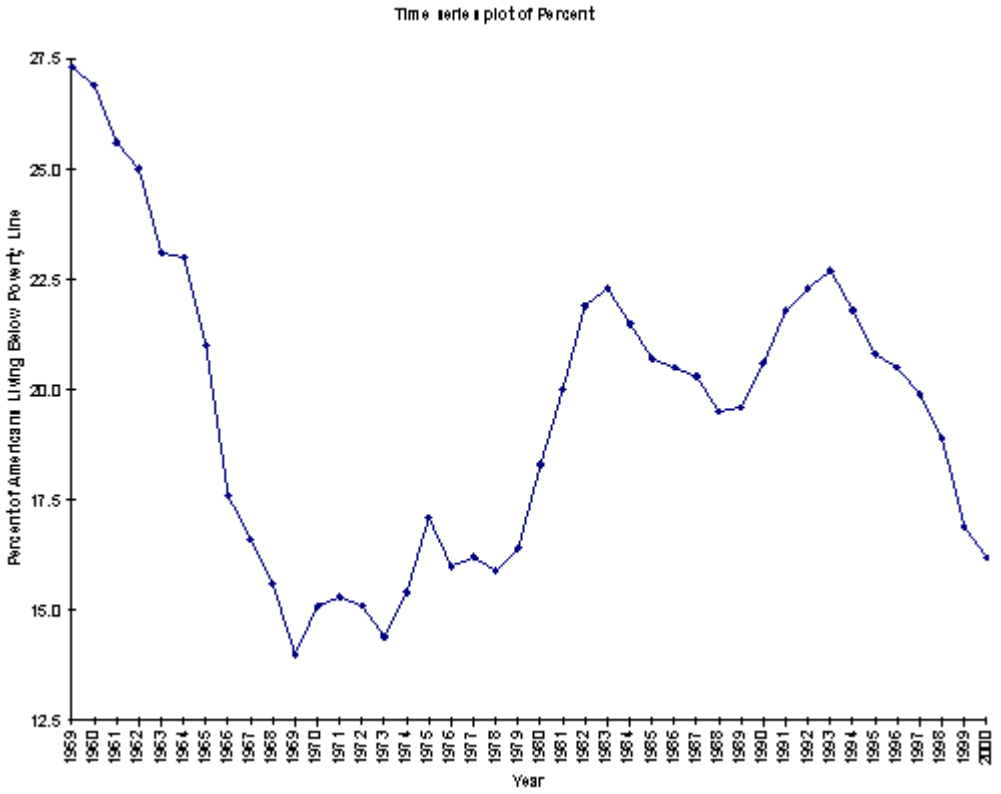
Based on this histogram, how would you characterize the students' performance on this exam?

ANS:

Exam scores are fairly normally distributed. Majority of scores (76%) are between 70 and 90 points, while 12% of scores are above 90 and 12% of scores are 70 or below.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

24. The proportion of Americans under the age of 18 who are living below the poverty line for each of the years 1959 through 2000 is used to generate the following time series plot.



How successful have Americans been recently in their efforts to win "the war against poverty" for the nation's children?

ANS:

Americans have been relatively unsuccessful in winning the war on poverty in the 1990s. This is especially true when you compare recent poverty rates with those of the years from 1969 through 1979. However, at least the curve is trending downwards in the most recent years.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_95_97
A financial analyst collected useful information for 30 employees at Gamma Technologies, Inc. These data include each selected employees gender, age, number of years of relevant work experience prior to employment at Gamma, number of years of employment at Gamma, the number of years of post-secondary education, and annual salary.
NARREND

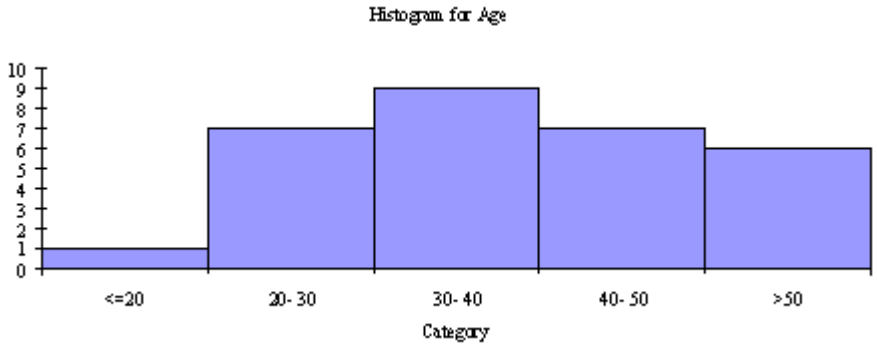
25. Indicate the type of data for each of the six variables included in this set.

ANS:

Gender – categorical, nominal
Age – numerical, continuous
Prior experience – numerical, discrete
Gamma experience – numerical, discrete
Education – numerical, discrete
Annual salary – numerical, continuous

PTS: 1 MSC: AACSB: Analytic

26. Based on the histogram shown below, how would you describe the age distribution for these data?

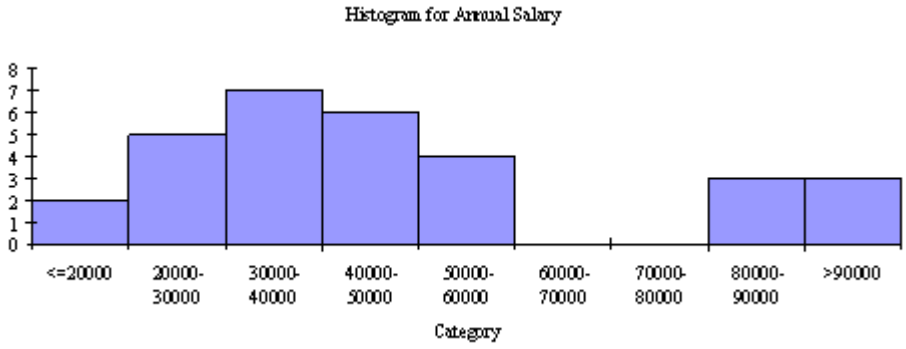


ANS:

The age distribution is skewed slightly to the right. Largest grouping is in the 30-40 range. This means that most workers are above the age of 30 years and only one worker is 20 years old or younger.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

27. Based on the histogram shown below, how would you describe the salary distribution for these data?

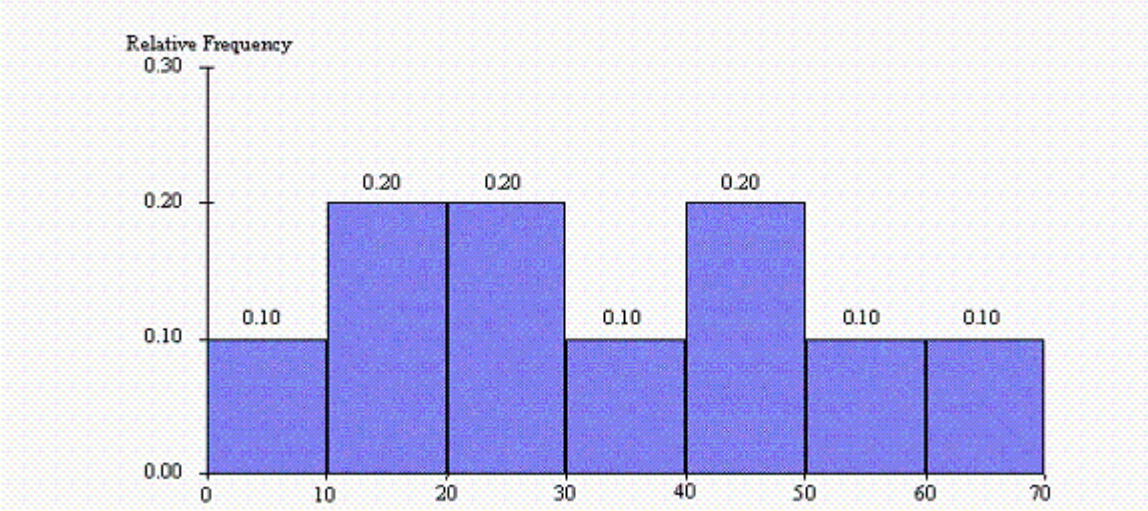


ANS:

The salary distribution is skewed to the right. There appears to be several workers who are being paid substantially more than the others. If you eliminate those above $80,000, the salaries are fairly normally distributed around $35,000.

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference

NARRBEGIN: SA_98_103
The histogram below represents scores achieved by 250 job applicants on a personality profile.



NARREND

28. What percentage of the job applicants scored between 30 and 40?

ANS:

10%

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

29. What percentage of the job applicants scored below 60?

ANS:

90%

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

30. How many job applicants scored between 10 and 30?

ANS:

100

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

31. How many job applicants scored above 50?

ANS:

50

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

32. Seventy percent of the job applicants scored above what value?

ANS:

20

PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

33. Half of the job applicants scored below what value?

ANS:

30

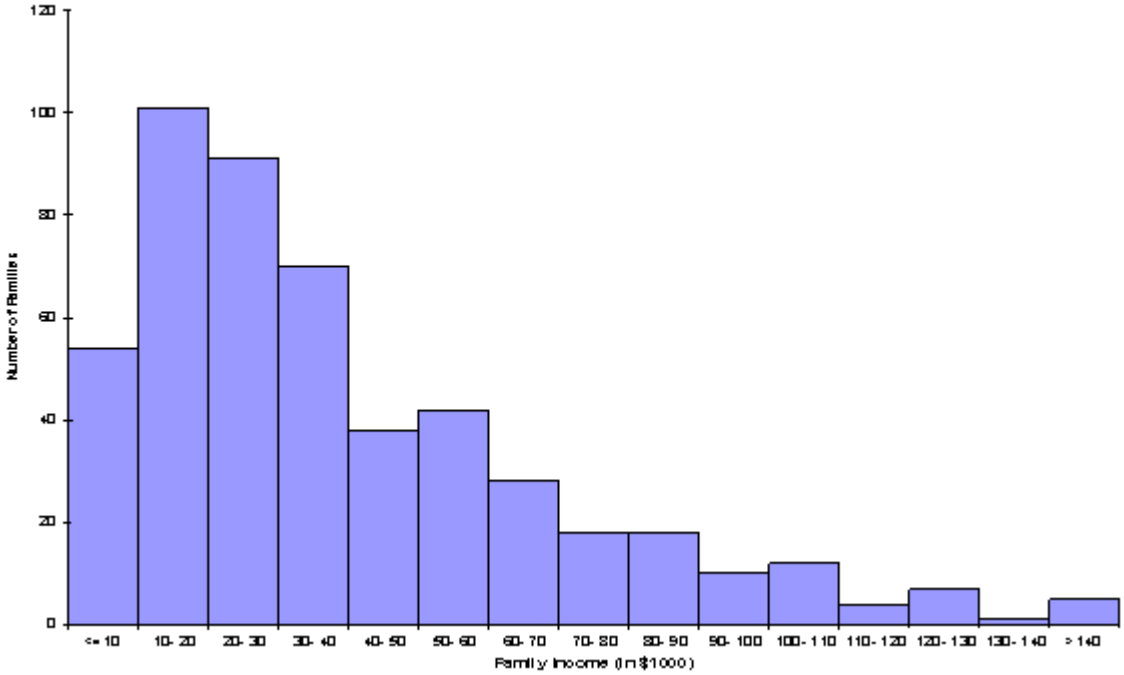
PTS: 1 MSC: AACSB: Analytic | AACSB: Descriptive Statistics

34. A question of great interest to economists is how the distribution of family income has changed in the United States during the last 20 years. The summary measures and histograms shown below are generated for a sample of 500 family incomes, using the 1985 and 2005 income for each family in the sample.

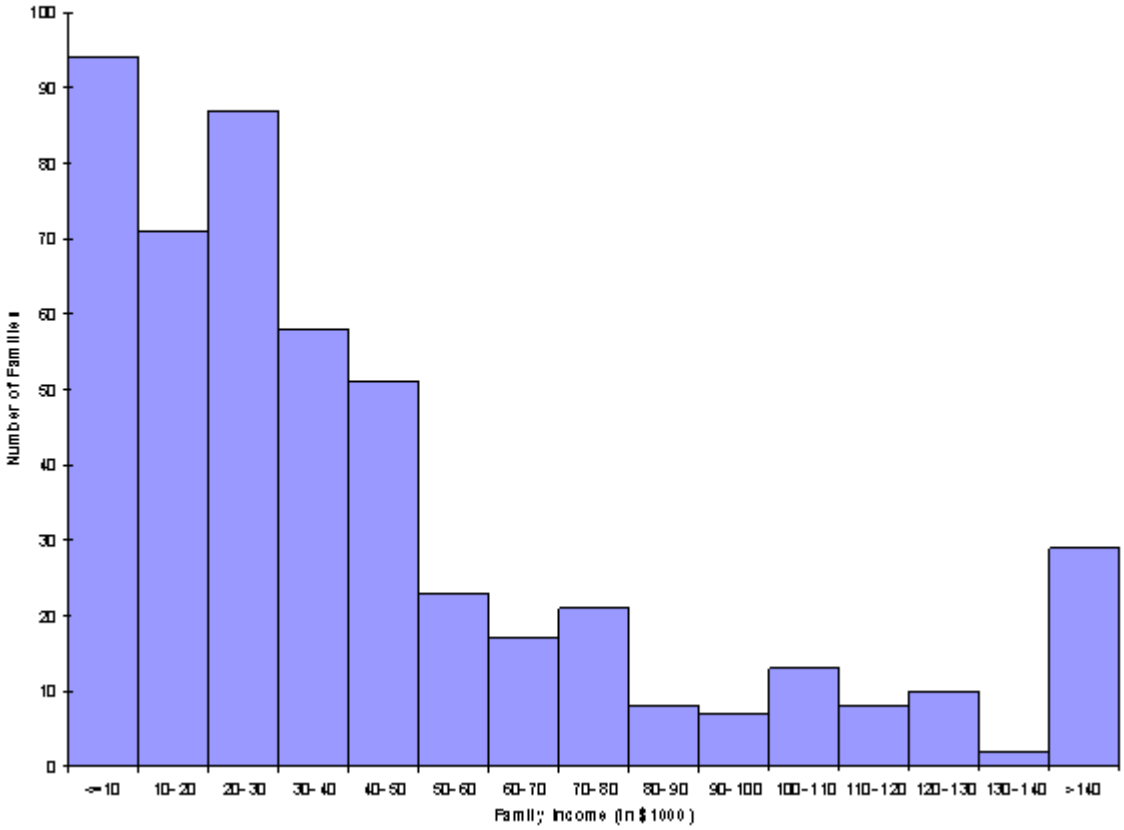
Summary Measures:

	Year 1985	Year 2005
Mean	40.216	45.916
Median	32.000	30.000
Standard deviation	31.530	46.992
First quartile	17.000	16.000
Third quartile	54.000	56.000
5th percentile	9.000	6.000
95th percentile	102.100	151.100

Histogram for Year 1985



Histogram for Year 2005



Based on these results, discuss as completely as possible how the distribution of family income in the United States changed from 1985 to 2005.

ANS:

These summary measures say quite a lot. The mean has increased, although the median has decreased. There is also more variation. In fact, the 5th percentile has decreased slightly, whereas the 95th percentile is much larger -- the rich people are getting richer. This behavior is also evident in the two histograms (which use the same categories for ease of comparison).

PTS: 1 MSC: AACSB: Analytic | AACSB: Statistical Inference