1. Frequency Distribution

<table>
<thead>
<tr>
<th></th>
<th>Heaven</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you believe in heaven?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1: yes, definitely</td>
<td>1,049</td>
<td>51.0</td>
</tr>
<tr>
<td>2: yes, probably</td>
<td>593</td>
<td>28.8</td>
</tr>
<tr>
<td>3: no, probably not</td>
<td>255</td>
<td>12.4</td>
</tr>
<tr>
<td>4: no, definitely not</td>
<td>161</td>
<td>7.8</td>
</tr>
<tr>
<td>Hell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1: yes, definitely</td>
<td>892</td>
<td>51.0</td>
</tr>
<tr>
<td>2: yes, probably</td>
<td>545</td>
<td>31.2</td>
</tr>
<tr>
<td>3: no, probably not</td>
<td>200</td>
<td>11.4</td>
</tr>
<tr>
<td>4: no, definitely not</td>
<td>112</td>
<td>6.4</td>
</tr>
</tbody>
</table>

a. What are the percentages for the four possible outcomes in heaven?

- What percentage of people said "yes, definitely"? 
  □% 
- What percentage of people said "yes, probably"? 
  □% 
- What percentage of people said "no, probably not"? 
  □% 
- What percentage of people said "no, definitely not"? 
  □%

b. Which percentage of "yes, definitely" responses was higher?

- A. Hell
- B. Heaven
- C. Both were the same
2. One year a survey asked the Chinese people the following question, "How many pet do you have in your house?" Of the 870 people who responded, 8% reported having only 1 pet. Identify (a) the sample, (b) the population, and (c) the statistic reported.

(a) What is the sample for this survey?

- O A. The sample is the 8% who reported having only one pet.
- O B. The sample is the Chinese public.
- O C. The sample is the Chinese people who did not respond.
- O D. The sample is the 870 people who responded.

(b) What is the population for this survey?

- O A. The population is the Chinese public.
- O B. The population is all of the people in the world.
- O C. The population is the 870 people who responded.
- O D. The population is the 8% who reported having only 1 pet.

(c) What is the statistic reported for this survey?

- O A. The statistic reported is the percentage of respondents who reported having more than 1 pet.
- O B. The statistic reported is the number of pet.
- O C. The statistic reported is the percentage of respondents who reported having only 1 pet (8%).
- O D. The statistic reported is the number of people who responded 870.
3. A government agency uses a few new luxury cars of each model every year to collect data on pollution emission and gasoline mileage performance. For the model A, identify what is meant by (a) subject, (b) sample, and (c) population.

(a) What is the subject of the study conducted by the government agency?

- [O] A. luxury cars
- [ ] B. the model A luxury cars
- [O] C. new luxury cars
- [O] D. the new model A luxury cars

(b) What is the sample used by the government agency?

- [O] A. model A luxury cars
- [O] B. all new model A luxury cars
- [O] C. luxury cars
- [ ] D. the few new model A luxury cars that were chosen for the study

(c) What is the population for the government?

- [O] A. all new motor vehicles
- [O] B. all new luxury cars
- [O] C. all new model A luxury cars
- [ ] D. the few new model A luxury cars that were chosen for the study

4. The sample of all the residents in a particular country who register their opinion in a poll by sending an e-mail is not a random sample. Why not?

Why is this not a random sample?

- [O] A. Not every person in the population registers their opinion.
- [O] B. Not every person in the population has e-mail.
- [O] C. Not every person in the population has an opinion.
- [O] D. Not every person in the population responds to polls.
5. Identify each of the following variables as categorical or quantitative.
   a. Lucky day of the week
   b. Number of children in family
   c. Number of sick days taken in year
   d. Favorite color

   a. Is the variable categorical or quantitative? Why?
      ○ A. Lucky day of the week is a quantitative variable. Its values are numerical.
      ○ B. Lucky day of the week is a categorical variable. Its values are not numerical.
      ○ C. Lucky day of the week is a categorical variable. Its values are not numerical.
      ○ D. Lucky day of the week is a quantitative variable. Its values are not numerical.

   b. Is the variable categorical or quantitative? Why?
      ○ A. Number of children in family is a quantitative variable. Its values are not numerical.
      ○ B. Number of children in family is a categorical variable. Its values are numerical.
      ○ C. Number of children in family is a categorical variable. Its values are not numerical.
      ○ D. Number of children in family is a quantitative variable. Its values are numerical.

   c. Is the variable categorical or quantitative? Why?
      ○ A. Number of sick days taken in year is a quantitative variable. Its values are numerical.
      ○ B. Number of sick days taken in year is a quantitative variable. Its values are not numerical.
      ○ C. Number of sick days taken in year is a categorical variable. Its values are not numerical.
      ○ D. Number of sick days taken in year is a categorical variable. Its values are numerical.

   d. Is the variable categorical or quantitative? Why?
      ○ A. Favorite color is a categorical variable. Its values are not numerical.
      ○ B. Favorite color is a categorical variable. Its values are numerical.
      ○ C. Favorite color is a quantitative variable. Its values are not numerical.
      ○ D. Favorite color is a quantitative variable. Its values are numerical.
6. In a survey, respondents answered the question, "How many children have you ever had?" The results are below.

<table>
<thead>
<tr>
<th>No. children</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>630</td>
<td>387</td>
<td>504</td>
<td>415</td>
<td>196</td>
<td>58</td>
<td>43</td>
<td>12</td>
<td>27</td>
</tr>
</tbody>
</table>

a. Is the variable, number of children, categorical or quantitative?

- ☐ A. Number of children is a quantitative variable. Its values are numerical.
- ☐ B. Number of children is a categorical variable. Its values are numerical.
- ☐ C. Number of children is a categorical variable. Its values are not numerical.
- ☐ D. Number of children is a quantitative variable. Its values are not numerical.

b. Is the variable, number of children, discrete or continuous?

- ☐ A. Number of children is a continuous variable since it has a finite number of possible values.
- ☐ B. Number of children is a discrete variable since it has a finite number of possible values.
- ☐ C. Number of children is a discrete variable since it has an infinite continuum of possible values.
- ☐ D. Number of children is a continuous variable since it has an infinite continuum of possible values.

c. Add proportions and percentages to this frequency table.

<table>
<thead>
<tr>
<th>No. children</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>630</td>
<td>387</td>
<td>504</td>
<td>415</td>
<td>196</td>
<td>58</td>
<td>43</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Proportion</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Percentage</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

(Round to the nearest thousandth as needed.)

<table>
<thead>
<tr>
<th>No. children</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8+</th>
</tr>
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<tr>
<td>Count</td>
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<td>387</td>
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<td>415</td>
<td>196</td>
<td>58</td>
<td>43</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Percentage</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

(Round to the nearest tenth as needed.)

d. Which response is the mode?

☐
7. For 214 alligators captured in four different lakes, researchers classified the primary food choice (in volume) found in the alligator's stomach in one of the categories - fish, invertebrate, reptile, bird, or other.

Use the bar chart to answer the following questions.

a. Is primary food choice categorical or quantitative?
   - Quantitative
   - Categorical

b. What is the mode for primary food source?
   - A. Fish
   - B. Other
   - C. Invertebrate
   - D. Reptile
   - E. Bird

c. About what percentage of alligators had Fish as the primary food choice?
   - A. 14%
   - B. 20%
   - C. 10%

d. This type of bar chart, with categories listed in order of frequency, has a special name. What is it?
   - A. Stem-and-leaf
   - B. Pareto
   - C. Histogram
   - D. Dot plot
   - E. Pie chart
8. On a class survey students were asked to estimate the number of times a week, on average, that they read a daily newspaper.

Answer the following questions.

a. Is this variable continuous or discrete?

○ A. Continuous, because the newspapers come every day.
○ B. Discrete, because the value for each person would be a whole number.
○ C. Continuous, because the student was asked for the average.
○ D. Discrete, because the newspapers come every day.

b. The histogram shows the results of this variable when this survey was administered to a class of 38 college students. Report the (i) minimum response, (ii) maximum response, (iii) number of students who did not read the newspaper at all, (iv) mode.

(i) What is the minimum response?

(ii) What is the maximum response?

(iii) How many students did not read a newspaper at all?

student(s)

(iv) What is the mode?


c. Describe the shape of the distribution.
8. (cont.)

○ A. The distribution is unimodal and skewed to the left.

○ B. The distribution is bimodal and skewed to the left.

○ C. The distribution is unimodal and skewed to the right.

○ D. The distribution is bimodal and symmetric.

○ E. The distribution is bimodal and skewed to the right.

○ F. The distribution is unimodal and symmetric.

9.

The owner of a company would like to promote the use of public transportation. She decides to investigate how many miles her employees travel on public transportation during a typical day. The values for her ten employees (recorded to the closest mile) are as follows.

0   4   0   0   0   10   0   8   0   0

a. Find the mean, median, and mode.

b. She has just hired an additional employee. He lives in a different city and travels 80 miles a day on public transportation. Recompute the mean and median. Describe the effect of this outlier.

a. The mean is □ mile(s). (Round to two decimal places as needed.)

The median is □ mile(s).

The mode is □ mile(s).

b. Recompute the mean and median with the new employee included. Describe the effect of this outlier.

The mean is □ mile(s).

(Round to two decimal places as needed.)

The median is □ mile(s).

What effect does the outlier have on the mean and median?

○ A. The outlier effects the median but not the mean.

○ B. The outlier does not effect the mean or the median.

○ C. The outlier effects both the mean and the median.

○ D. The outlier effects the mean but not the median.
10. The following table summarizes responses of 4360 subjects in a recent survey to the question, "Within the past month, how many people have you known personally that were victims of homicide?"

<table>
<thead>
<tr>
<th>Number of Victims</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3930</td>
</tr>
<tr>
<td>1</td>
<td>264</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>4 or more</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>4360</td>
</tr>
</tbody>
</table>

a. To find the mean, it is necessary to give a score to the "4 or more" category. Find it, using the score 4.5.

The mean is \( \square \) victim(s)
(Round to two decimal places as needed.)

b. Find the median. Note the "4 or more" category is not problematic.

The median is \( \square \) victim(s).

c. If 1730 observations shift from 0 to 4 or more, how do the mean and median change?

○A. The median increases while the mean remains the same.
○B. The mean increases while the median remains the same.
○C. Both the mean and the median increase.
○D. Both the mean and the median remain the same.
11. Height has an approximately bell-shaped distribution. For the sample heights of college students collected, the males had \( \bar{x} = 70 \) and \( s = 3 \) and the females had \( \bar{x} = 67 \) and \( s = 3 \).

a. Use the empirical rule to describe the distribution of heights for females.

68% of the observations fall within the interval \([\square, \square]\).
(Type a whole number.)

95% of the observations fall within the interval \([\square, \square]\).
(Type a whole number.)

All or nearly all of the observations fall within the interval \([\square, \square]\).
(Type a whole number.)

b. The standard deviation for the overall distribution (combining females and males) was 4. Why would you expect it to be larger than the standard deviations for the separate male and female height distributions?

☐ A. This is expected because the distributions are bell-shaped.

☐ B. This is the case because the standard deviations for the separate distributions are equal.

☐ C. This will always be the case because it increases the sample size.

☐ D. The standard deviation for the overall distribution of a combination will usually be larger than the standard deviation for two distributions with different means because it introduces more spread to the data.
12. Data for 64 male college athletes was collected. The data on weight (in pounds) are roughly bell shaped with $\bar{x} = 156$ and $s = 24$.

a. Give an interval within which about 95% of the weights fall.

(□, □) (Type a whole number.)

b. Identify the weight of an athlete who is three standard deviations above the mean in this sample. Would this be a rather unusual observation? Why?

An athlete who is three standard deviations above the mean would weigh □ pounds.

(Would the weight above be an unusual observation?)

☐A. No, this would not be an unusual observation because typically all or nearly all observations fall within three standard deviations from the mean.

☐B. No, this would not be an unusual observation because approximately 68% of all observations fall within three standard deviations from the mean.

☐C. Yes, this would be an unusual observation because typically all or nearly all observations fall within three standard deviations from the mean.

☐D. Yes, this would be an unusual observation because approximately 95% of all observations fall within three standard deviations from the mean.
13. If the largest observation is less than one standard deviation above the mean, then the distribution tends to be skewed to the left. If the smallest observation is less than one standard deviation below the mean, then the distribution tends to be skewed to the right. A professor examined the results of the first exam given in her statistics class. The scores are listed below.

35 38 40 44 47 51 57 86

The mean and standard deviation are 49.75 and 16.30.

Determine if the distribution is either left or right skewed. Choose the correct answer below.

○ Left skewed
○ Right skewed

Construct a dot plot to check. Choose the correct graph below.

○ A.  
○ B.  
○ C.  
○ D.  

14. A travel magazine recently presented data on the annual number of vacation days averaged by residents of eight different countries. They reported 41 days for Italy, 37 for France, 35 for Germany, 34 for Brazil, 27 for Britain, 26 for Canada, 24 for Japan, and 13 for the United States. Complete parts (a) through (d).

a. Report the median.

□ days

b. By finding the median of the four values below the median, report the first quartile.

□ days

c. Find the third quartile.

□ days

d. Interpret the values found in parts (a)-(c) in the context of these data.

□% of the countries have residents who take fewer than 25.0 vacation days, half of the countries have residents who take fewer than □ vacation days, and 75% of the countries have residents who take \( \square \) 36.0 vacation days per year. The middle 50% of the countries have residents who take an average of between □ and 36.0 vacation days annually.
15. During a recent semester at a large national university, students having accounts on a mainframe computer had hard drive use (in kilobytes) described by the five-number summary, minimum = 337, Q1 = 542, median = 672, Q3 = 1063, and maximum = 430,000.

a. Would you expect this distribution to be symmetric, skewed to the right, or skewed to the left? Explain.

- A. The distribution is skewed to the left, because the median is closer to Q3.
- B. The distribution is skewed to the right, because the median is closer to Q1.
- C. The distribution is symmetric, because the median is exactly between Q1 and Q3.

b. Use the $1.5 \times \text{IQR}$ criterion to determine if any potential outliers are present.

- A. Neither the minimum nor the maximum are potential outliers.
- B. Both the minimum and the maximum are potential outliers.
- C. Only the maximum is a potential outlier.
- D. Only the minimum is a potential outlier.

16. A survey was conducted to determine how many miles per day employees of a company used public transportation. The sample values are below. Identify the five-number summary, and draw a box plot.

0 0 0 0 0 0 0 5 7 10

Identify the five-number summary.

\[
\begin{align*}
\text{minimum} & = \underline{0} \\
\text{Q1} & = \underline{0} \\
\text{median} & = \underline{0} \\
\text{Q3} & = \underline{0} \\
\text{maximum} & = \underline{0}
\end{align*}
\]

Choose the correct box plot below.

A. [Box plot with a single point at 0.]
B. [Box plot with a single point at 0 and a small range of values.]
C. [Box plot with a single point at 0 and a large range of values.]
D. [Box plot with no single point at 0, indicating no outlier.]
17. The carbon dioxide emissions of a group of nations had a mean of 8.2 and standard deviation of 3.1.

a. One country's observation was 15.7. Find and interpret its z-score relative to the distribution of values for the group of nations.

b. Another country's observation was 1.8. Find and interpret its z-score.

a. Find the z-score for the observation of 15.7.

\[ z = \] (Round to two decimal places as needed.)

What does this z-score imply?

☐ A. The observation 15.7 is not an outlier because it is less than 3 standard deviations from the mean.

☐ B. The observation 15.7 is an outlier because it is greater than 3 standard deviations from the mean.

☐ C. The observation 15.7 is not an outlier because its z-score is positive.

☐ D. The observation 15.7 is an outlier because its z-score is negative.

b. Find the z-score for the observation of 1.8.

\[ z = \] (Round to two decimal places as needed.)

What does this z-score imply?

☐ A. The observation 1.8 is not an outlier because its z-score is positive.

☐ B. The observation 1.8 is not an outlier because it is less than 3 standard deviations from the mean.

☐ C. The observation 1.8 is an outlier because it is greater than 3 standard deviations from the mean.

☐ D. The observation 1.8 is an outlier because its z-score is negative.
18. For a sample of 210 female heights, the mean was 64.8 inches and the standard deviation was 2.2 inches. The shortest person in this sample had a height of 58 inches.

a. Find the z-score for the height of 58 inches.

b. What does the negative sign for the z-score represent?

c. Is this observation a potential outlier according to the three standard deviation distance criterion? Explain.

a. Find the z-score.

\[ z = \_ \_ \_ \] (Round to one decimal place as needed.)

b. What does the negative sign for the z-score represent?

- [ ] A. The observation is a potential outlier.
- [ ] B. The observation is above the mean.
- [ ] C. The observation is below the mean.
- [ ] D. The observation is not a potential outlier.

c. Is this observation a potential outlier according to the three standard deviation distance criterion? Explain.

- [ ] A. No, because it is less than three standard deviations from the mean.
- [ ] B. Yes, because the z-score is negative.
- [ ] C. Yes, because it is greater than three standard deviations from the mean.
- [ ] D. No, because the z-score is negative.
19. The six full-time employees of a tanning salon near campus had annual incomes last year of $8300, $8700, $8700, $8800, $9200, $9600. The owner made $240,000.
   a. For the seven annual incomes at the salon, report the mean and the median.
   b. Why is it misleading for the owner to boast to her friends that the average salary at the salon is more than $40,000?

   a. The mean salary is $\boxed{\text{}}$.

   The median salary is $\boxed{\text{}}$.

   b. Why is the boast misleading?

   ○ A. It is misleading because the mean is actually less than $40,000.
   ○ B. It is misleading because no one actually makes $40,000.
   ○ C. It is misleading because the mean is so influenced by the owner's salary that it is not a typical value.
   ○ D. The boast is not misleading.
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>51.0</td>
<td>28.8</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>7.8</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>D</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>D</td>
<td>D</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>B</td>
<td>D</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>6.</td>
<td>A</td>
<td>B</td>
<td>0.277</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>0.170</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.222</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.183</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>0.086</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>0.026</td>
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<td></td>
<td></td>
<td></td>
<td>0.019</td>
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<td></td>
<td></td>
<td>0.005</td>
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<td></td>
<td></td>
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<td>0.012</td>
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<td></td>
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<td>27.7</td>
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<td></td>
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<td>17.0</td>
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<td></td>
<td></td>
<td></td>
<td>22.2</td>
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<td></td>
<td></td>
<td></td>
<td>18.3</td>
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<td></td>
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<td></td>
<td>8.6</td>
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<td></td>
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<td>2.6</td>
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</table>
7. the second choice
   B
   A
   B

8. B
   0
   6
   1
   5
   A

9. 2.2
   0
   0
   9.27
   0
   D

10. 0.16
    0
    B

11. 64
    70
    61
    73
    58
    76
    D

12. 108
    204
    228
    C

13. the second choice
    C
14. 30.5  
25.0  
36.0  
25  
30.5  
fewer than  
25.0  

15. B  
C  

16. 0  
0  
0  
5  
10  
D  

17. 2.42  
A  
-2.06  
B  

18. -3.1  
C  
C  

19. 41,900  
8800  
C