1. The five number summary for total arsenic levels in eighty five 8 oz. boxes of apple juice was Min = 4.2 ppb, \( Q_1 = 6.8 \text{ ppb} \), Med = 8.3 ppb, \( Q_3 = 10.6 \text{ ppb} \), Max = 18.7 ppb. Which of the following is/are true?
   A. 50% of the data are greater than 8.3 ppb.
   B. 50% of the data are between 6.8 ppb and 10.6 ppb.
   C. 50% of the data are less than 6.8 ppb or greater than 10.6 ppb.
   D. All of the above are true.
   E. None of the above are true.

2. Assuming each bin above contains ONLY the value to the left, which of the following describe this histogram?
   A. The 5-Number-Summary is 20, 50, 60, 70, 100
   B. The mean is less than the median since it is skewed to the left.
   C. The mean is less than the median since it is skewed to the right.
   D. The mean is greater than the median since it is skewed to the left.
   E. Two of the above are correct descriptions.

3. In the histogram above, what would happen if the 20-year-olds became 40-year-olds?
   A. Nothing since it would still be the same data.
   B. The mean and standard deviation would increase.
   C. The mean would increase but the standard deviation would decrease.
   D. The mean and the median would increase but the IQR and standard deviation would stay the same.
   E. The mean and the median would increase but the IQR and standard deviation would decrease.

4. A sample is to the population as
   A. a statistic is to a parameter.
   B. \( \bar{x} \) is to \( ε \).
   C. \( \bar{x} \) is to \( \hat{x} \).
   D. All of the above are correct.
   E. Only two of the above are correct.

5. Which of the following is an appropriate graph or summary number for categorical data?
   A. a stem-and-leaf plot
   B. a mean, \( \bar{x} \)
   C. a proportion (or a probability)
   D. a median, \( \hat{x} \)
   E. None of the above are appropriate

6. Which of the following is/are true?
   A. Outliers affect all of the statistics we have talked about.
   B. Shift changes only affect measures of location.
   C. Scales changes only affect measures of spread.
   D. All of the above are true.
   E. Only two of the above are true.

7. An entrepreneurial student makes her large front yard available for parking on game day. She keeps meticulous records of how many trucks and how many cars park there. Over several seasons she has had an average of 10.2 trucks with a standard deviation of 2.1. Which row of the table below is most likely to be the 5 number summary of her truck counts?

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Q1</th>
<th>Med</th>
<th>Q3</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>11</td>
<td>13</td>
</tr>
</tbody>
</table>

8. Which of the following best describes a 95\(^{th}\) percentile for a given distribution?
   A. the value of 95% of the observations
   B. a number that is 2 standard deviations above the mean of the distribution
   C. a number that would be equivalent to 95 on a 100 point scale
   D. a number such that 95% percent of the observations in the distribution have that value or less
   E. Two of the above are true.

9. Explain the boxplot for Truck.
   A. There are only 5 observations.
   B. \( \bar{x} = \hat{x} \)
   C. the data is normal since there is an outlier on both ends
   D. \( Q_3 = \hat{x} = Q_1 \)
   E. \( Q_3 = \hat{x} \) or \( \bar{x} = Q_1 \)
10. For a certain dataset, you are told that the standard deviation, \( s = 0 \). What else can you say about the dataset?
   A. the mean, \( \bar{x} = 0 \)
   B. the median, \( \tilde{x} = 0 \)
   C. the IQR = 0
   D. all of the above
   E. none of the above

11. If the 5-Number-Summaries for a dataset are: 22, 37, 52, 65, 79, which of the following best describes the distribution?
   A. skewed left
   B. skewed right
   C. skewed right with outliers
   D. normal
   E. uniform

12. Which of the following statements is/are true?
   A. The value of the median will change if you add 10 to the maximum in a dataset.
   B. The IQR covers 50% of the range (spread) of the data.
   C. A z-score tells us how many standard deviations an observation is from its mean.
   D. All of the above are true statements.
   E. Exactly two of the above are true statements (excluding D.).

13. If we know that a distribution is skewed to the right, which of the following is true?
   A. The mean is smaller than the median.
   B. Outliers would most likely be to the left.
   C. The histogram would be shorter on the left.
   D. All of the above are true.
   E. None of the above are true.

14. Numbering the boxplots 1 through 4 from left to right, which distribution is approximately uniform?
   A. You can’t tell by looking at a boxplot.
   B. 3 only since it’s the most spread out.
   C. 4 only since it’s the most symmetric.
   D. Both 3 and 4 are uniform.
   E. None of the boxplots are uniform.

15. Which boxplot has an Interquartile Range, IQR, of about 20?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 1, 2 and 4 are all the same.

16. Suppose you get a z-score = 1.2 on this exam. Question #10 is really hard, so I decide to give everyone credit, i.e., I give 5 points to everyone who missed it. What SHOULD you think about this if you got the problem right originally?
   A. It doesn’t matter since your z-score would stay the same.
   B. You get gypped since your z-score would decrease.
   C. You benefit since your z-score would increase.
   D. Your z-score would increase, but so would everyone else’s.
   E. Your z-score would decrease, but so would everyone else’s.

17. Suppose the mean score for the first exam is 70 with a standard deviation of 10. Assuming the data is bell-shaped, which of the following is true for an exam score of 90?
   A. The 90 means that this person did better than 90% of the students who took the same exam.
   B. The 90 did better than almost 98% of the other students since it has a z-score of 2.
   C. The 90 did better than almost 85% of the other students since it has a z-score of 1.
   D. Since the z-score of the 90 is 2, this is the second highest score on the exam.
   E. All we can say is that the 90 made an A on the test.

18. Greg and George both play softball but in different cities. Greg says, “I have 13 home runs this season, you only have 11. I am obviously the better player.” George replies, “The pitchers that I faced were much better, we can’t just compare raw numbers.” Knowing that you are taking statistics, they ask you to solve their problem. In Greg’s city, the average number of home runs 14 with a standard deviation of 1. In George’s city, the mean is 12 with a standard deviation of 2. Who, within their city, is a better home run hitter?
   A. They are equally good (or bad) since they both have hit one under the average number of home runs.
   B. Greg because he has hit more home runs.
   C. Greg because he is relatively better.
   D. George because he is relatively better.
   E. The cities don’t compete, so they won’t ever be compared.

19. Which of the following is TRUE for bell-shaped data?
   A. Approximately 95% of the observations in the dataset fall within 2 standard deviations of the mean.
   B. Approximately 50% of the observations in the dataset fall within the IQR.
   C. The IQR is less than 2 standard deviations (in length).
   D. All of the above are correct statements for bell-shaped data.
   E. Only two of A, B and C are correct statements for bell-shaped data.
20. If a dataset has outliers
   A. the mean is a better measure of center than the median.
   B. the IQR is a better measure of spread than the standard deviation.
   C. the correlation coefficient is closer to zero than it would be without the outliers.
   D. All of the above are correct statements.
   E. Only two of the above are correct statements.

21. Suppose we weigh 50 people. 49 of them are between 180 and 280 lbs. One weighs only 150 lbs. Which of the following is true for this sample?
   A. The sample mean, $\bar{x}$, is NOT the best measure of center for this data.
   B. The sample mean, $\bar{x}$, will be larger than the sample median.
   C. The data cannot be normally distributed since there is an outlier.
   D. All of the above are true for this data.
   E. Only two of the above are true for this data (excluding D.).

<table>
<thead>
<tr>
<th>Hours of Sleep</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5</td>
<td>9</td>
</tr>
<tr>
<td>5-7</td>
<td>90</td>
</tr>
<tr>
<td>8-10</td>
<td>51</td>
</tr>
<tr>
<td>Lots</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>3-5</th>
<th>5-7</th>
<th>8-10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>5</td>
<td>55</td>
<td>32</td>
<td>12</td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
<td>35</td>
<td>19</td>
<td>8</td>
</tr>
</tbody>
</table>

22. This is the data from our survey showing how many hours of sleep you usually get per night vs. gender. Does it appear that there is a relationship between the two?
   A. Yes, there are more females in every category.
   B. Yes, the proportions are about the same for males and females.
   C. No, the proportions are about the same for males and females.
   D. No, the numbers are different for males and females.
   E. There is not enough evidence to tell.

23. Referring to the previous table, how likely is a female to sleep between 8 and 10 hours per night?
   A. $\frac{104}{170}$
   B. $\frac{51}{170}$
   C. $\frac{32}{170}$
   D. $\frac{32}{104}$
   E. $\frac{32}{51}$

24. Which of the following is the best description of the probability $\frac{35}{90}$?
   A. how likely a male is to sleep 5 to 7 hours per night
   B. how likely you get a male if they sleep 5 to 7 hours per night
   C. how likely you sleep 5 to 7 hours per night if you are male
   D. of the males, how likely you get someone who sleeps 5 to 7 hours per night
   E. how likely you get someone who sleeps 5 to 7 hours per night and they are male