1. Don’t even open this until you are told to do so.

2. Remember to put your phone on airplane mode NOW. You may listen to tunes as long as it doesn’t bother the people around you.

3. Please turn your hats around backwards or take them off.

4. Please put your backpack and other things along the walls or at the front of the room.

5. You need a gray, 81/2 x 11” scantron, pencil, calculator and you may have 5 sheets of notes.

6. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers clearly. Multiple marks will be counted wrong.

7. You will have 50 minutes to finish this exam.

8. If you have questions, please write out what you are thinking on the back of the page so that we can discuss it after I return it to you.

9. If you are caught cheating or helping someone to cheat on this exam, you both will receive a grade of zero on the exam. You must work alone.

10. When you are finished please make sure you have filled in your name and marked your FORM (A, B, C or D) and 20 answers, then turn in JUST your scantron.

11. Good luck!
1. (2 pts.) If the IQR = 0, the standard deviation, \( s = 0 \).
   A. true
   B. false

2. (2 pts.) The mean = median doesn’t necessarily mean the distribution is normal.
   A. true
   B. false

3. (2 pts.) Boxplots are the easiest way to find the ‘5 Number Summaries’.
   A. true
   B. false

4. (2 pts.) \( z \)-scores are only useful when data is bell-shaped (normal).
   A. true
   B. false

5. (2 pts.) Since the mean is not a good measure of center for skewed distributions, we should always use the median.
   A. true
   B. false

6. The data above shows the size of 100 homes by how many bedrooms they have. Which of the following statements is true?
   A. Most likely there is only one 1 bedroom home and one 5 bedroom home.
   B. Given that there are only two extremely large three bedroom homes, four bedroom homes vary the most in size.
   C. The two bedroom homes are all smaller than the four bedrooms because their box is well below the box for the four bedrooms.
   D. All of the above are true.
   E. Only two of the above are true.

7. In a study concerning Americans’ opinions about other countries, respondents reported whether their feelings toward Canada were positive, neutral, or negative. The responses are reported by gender below.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Negative</th>
<th>Neutral</th>
<th>Positive</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>158</td>
<td>711</td>
<td>7031</td>
<td>7900</td>
</tr>
<tr>
<td>Female</td>
<td>162</td>
<td>729</td>
<td>7209</td>
<td>8100</td>
</tr>
<tr>
<td>Total</td>
<td>320</td>
<td>1440</td>
<td>14,240</td>
<td>16,000</td>
</tr>
</tbody>
</table>

How likely is Female to have Negative feelings toward Canada in this study?
   A. 162
   B. 162/8100
   C. 162/320
   D. 162/16,000
   E. 320/8100

8. Again, in this study, how likely are Americans to feel Positive towards Canada?
   A. \( \frac{7031}{7900}+\frac{7209}{8100} \)
   B. \( \frac{7031}{14240}+\frac{7209}{14240} \)
   C. \( \frac{7031}{16000} \)
   D. \( \frac{7900}{16000}+\frac{8100}{16000} \)
   E. \( \frac{7900 + 8100}{14240} \)

9. If \( X \sim N(25, 3^2) \), what is \( P(22 < X < 24) \)
   A. 0.212
   B. 0.0918
   C. 0.2514
   D. 0.7486
   E. 0.5294
10. Which of the following is most likely the '5 Number Summaries' for the data in the histogram above?
   A. 0, 2, 5, 7.5, 10
   B. 0, 2, 4, 6, 10
   C. 0, 2.3, 4, 10
   D. 0, 2, 3, 4, 11
   E. 0, 3, 4, 5, 11

11. Say there are 100 observations in the graph above, if we took half of the 0's and made them −1, then
   A. the mean and standard deviation would be smaller.
   B. the mean and the median would be smaller.
   C. the standard deviation and the IQR would be larger.
   D. Two of the above are true.
   E. None of the above are true.

12. Which of the following is true about a uniform distribution?
   A. It can never have outliers.
   B. All the values are the same.
   C. The standard deviation is zero.
   D. All of the above are true.
   E. Two of the above are true.

13. Which of the following is true about the circled point in the graph above?
   A. It is an outlier because it’s so far from most of the other points.
   B. It is an influential point because removing it would change the slope of the best fit line and the correlation.
   C. It falls along the best fit line so it has no effect on the slope or correlation.
   D. It must be an invalid point since it’s so far out of range.
   E. None of the above are true.

14. Which of the following is true about z-scores?
   A. They are the number of standard deviation an observation is from the mean.
   B. The mean of the distribution of them will be 0 with standard deviation 1, always.
   C. They are a measure of relative standing.
   D. All of the above are true.
   E. Only two of the above are true.

15. The Pew Research Center asked randomly selected Americans to either agree or disagree with the statement:
   “The best way to ensure peace is through military strength.” 55% of Americans agreed, while 42% disagreed.
   However, when they asked the question in a different way, asking respondents to choose from the following two sentences, Americans chose differently:
   “The best way to ensure peace is through military strength.” (33% chose) OR “Diplomacy is the best way to ensure peace.” (55% chose) What type of bias is most problematic in this example?
   A. Non-response bias
   B. Response bias
   C. Sampling bias due to voluntary response
   D. Sampling bias due to convenience sampling
   E. Sampling bias due to undercoverage
16. The U.S. Census Bureau collected population information by first dividing the households in the country into three groups: metropolitan, urban, and rural; and then randomly selecting some households in each of those groups to visit and ask more detailed information from. Which type of sample was this?

A. Simple random sample
B. Cluster sample
C. Voluntary response sample
D. Stratified sample
E. Multistage sample

17. Supposedly the length of red pandas, without the tail, ranges between 20 and 26 inches. It’s likely the distribution is normal, so what else can we say?

A. The mean length is about 23 inches with a standard deviation of 3 inches.
B. If the standard deviation was 1 inch, then the middle 50% of all red pandas would be more than 22 but less than 24 inches in length.
C. Again, assuming the standard deviation is 1 (it makes the calculations easier), the bottom 5% of red pandas are less than 21.4 inches in length.
D. All of the above are true.
E. Only two of the above are true.

18. Suppose the weight of red pandas is normally distributed with a mean of 16 lbs and standard deviation 1.5 lbs, \( X \sim N(16, 1.5^2) \). How much would a red panda have to weigh to be in the top 10%?

A. 16 + 0.10
B. 16 + 0.10 \times 1.5
C. 16 + 0.10 \times 16
D. 16.128
E. 16 + 1.28 \times 1.5

19. I have data on mother and daughter hair color, how many blonde mothers have blonde, brunette, etc. daughters, and how many brunette mothers, etc. Which of the following would be the best way to display this information?

A. a scatterplot
B. side-by-side boxplots
C. multiple histograms
D. a bell curve
E. stacked bar chart

20. Which of the following is the approximate best fit line in the scatterplot above? Don’t let the line fool you.

A. \( \hat{y} = 20 + 2 \times x \)
B. \( \hat{y} = 20 + 1/2 \times x \)
C. \( \hat{y} = 5 + 2 \times x \)
D. \( \hat{y} = 5 + 1/2 \times x \)
E. \( \hat{y} = 10 + 2 \times x \)