Read each question very carefully. You are permitted to use a calculator on all portions of this exam. You are NOT allowed to use any textbook, notes, cellphone, or laptop on either portion of the exam. No part of this exam may be removed from the examination room.

In order to receive full credit for the free response portion of the exam, you must:
1. Show legible and logical (relevant) justification which supports your final answer.
2. Use complete and correct mathematical notation.
3. Include proper units, if necessary.

You have 1 hour 30 minutes to complete the entire exam.

On my honor, I have neither given nor received inappropriate or unauthorized information during this exam.

Student’s Signature: _______________________________________________________________________

Do not write below this line.

<table>
<thead>
<tr>
<th>Free Response Problem</th>
<th>Possible Points</th>
<th>Points Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>8</td>
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<td>Multiple Choice</td>
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<td>Test Total</td>
<td>100</td>
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</table>
1. Classify the following variable as either Quantitative, Qualitative or Neither:

   Price of a textbook

   A) Quantitative  
   B) Qualitative  
   C) Neither

2. If event A and B are mutually exclusive, which of the following must be true?

   A) $P(A \text{ or } B) = 0$  
   B) $P(A \text{ and } B) = 0$  
   C) $P(A \mid B) = 0$  
   D) $P(A \text{ and } B) = P(A) \cdot P(B)$

3. Below is a dataset of speed of tennis serves (in mph) for women’s tennis. If you were to create a boxplot of the data which (if any) of the values would be classified as outliers?

   78  95  110  114  116  117  120  120  121  122  128

   A) 128  
   B) 78  
   C) Both 128 and 78  
   D) There are no outliers for this data

4. Holly is taking a psychology class. On the first test the class average was 85 and the standard deviation was 6. On the second test the class average was 75 and the standard deviation was 4. Holly scored a 79 on the first test and a 73 on the second test. Which test did she perform better on relative to the rest of her class?

   A) Test 1  
   B) Test 2  
   C) She did equally well on both tests  
   D) Cannot determine from the information given

5. Which of the following is the best description of standard deviation?

   A) A measure of the typical deviation between the mean and median  
   B) A measure of the typical deviation between two data points  
   C) A measure of the typical deviation a data point is from the mean  
   D) A measure of the typical squared deviation from the mean
6. Which of the following best describes the shape of the distribution of the following data?

Stem Plot of average number of sit ups for middle schoolers, Key: 1|1 = 1.1

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 1 2 3 3 4 4</td>
</tr>
<tr>
<td>2</td>
<td>5 6 6 8</td>
</tr>
<tr>
<td>3</td>
<td>0 3</td>
</tr>
<tr>
<td>4</td>
<td>7 8</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5 7 8 8</td>
</tr>
<tr>
<td>7</td>
<td>0 0 0 1 2 4 4 4</td>
</tr>
<tr>
<td>8</td>
<td>5 5 6 7 7 8 8 9</td>
</tr>
</tbody>
</table>

A) Skewed left  
B) Skewed right  
C) Symmetric and mound (bell) shaped  
D) Symmetric and non-mound shaped

7. A group of 15 adult females are training to run/walk a 5k as a team. For their first 5k run together the summary statistics were as follows:

Median = 36 minutes  
Mean = 30 minutes  
Standard Deviation = 3 minutes

After a month of training each of their individual times decreased by exactly 2 minutes. What is the groups mean and standard deviation after a month of training?

A) Median = 36 minutes; Mean = 30 minutes; Standard Deviation = 3 minutes  
B) Median = 34 minutes; Mean = 28 minutes; Standard Deviation = 1 minute  
C) Median = 38 minutes; Mean = 32 minutes; Standard Deviation = 5 minutes  
D) Median = 34 minutes; Mean = 28 minutes; Standard Deviation = 3 minutes  
E) Cannot determine from the information given

8. Determine whether the given description corresponds to an observational study or an experiment.

In research sponsored by Coca-Cola, 12,500 people were asked what contributes most to their happiness, and 77% of the respondents said that it was their family or partner.

A) Observational study  
B) Controlled Experiment

9. Determine whether the given value is a statistic or a parameter:

The average (mean) atomic weight of all elements in the periodic table is 134.355 unified atomic mass units.

A) Parameter  
B) Statistic
10. The number of hours per week that the television is turned on is determined for each family in a sample. The mean of the data is 32 hours and the median is 28.2 hours. Twenty-four of the families in the sample turned on the television for 17 hours or less for the week. The 11th percentile of the data is 17 hours. Based on the given information, which of the following do you know is true?

A) The 60th percentile is less than 32 hours
B) The 57th percentile is greater than or equal to 27 hours
C) There are 200 families in the sample
D) 24 families in the sample turned on the television between 17 hours and 28.2 hours

11. If you roll two dice which of the following is true?

A) It is more likely to roll a 4, 3 than to roll a 4, 4
B) It is more likely to roll a 4, 4 than to roll a 4, 3
C) There is an equal chance of rolling a 4, 3 or a 4, 4

12. Below is a boxplot of the weights of 44 high school football players.

![Boxplot of weights](image)

What percentage of the data is between 164 and 191?

A) Approximately 61%
B) Approximately 25%
C) Approximately 28%
D) Approximately 27%
13. The following histograms represent test scores for 4 different tests in Statistics. Which of the tests had the largest variability in scores.

A) Test 1  
B) Test 2  
C) Test 3  
D) Test 4

14. The following statement is an illustration of what type of statistic? 
   “Based on a sample of 500 registered republicans we predict that Donald Trump will win the South Carolina primary by between 35 to 37% of the vote”

A) Descriptive Statistic  
B) Inferential Statistic  
C) Nominal Statistic  
D) Ordinal Statistic
15. Below is a table that summarizes the number of fatal shark attacks per state in the US from 1837 – 2014.

<table>
<thead>
<tr>
<th>State</th>
<th>Number of attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td>11</td>
</tr>
<tr>
<td>California</td>
<td>10</td>
</tr>
<tr>
<td>South Carolina</td>
<td>2</td>
</tr>
<tr>
<td>North Carolina</td>
<td>3</td>
</tr>
<tr>
<td>Texas</td>
<td>2</td>
</tr>
<tr>
<td>New Jersey</td>
<td>5</td>
</tr>
<tr>
<td>Virginia</td>
<td>1</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1</td>
</tr>
</tbody>
</table>

What is the relative frequency for the number of fatal shark attacks in South Carolina?

A) 2
B) 2/35
C) 3/35
D) 1/8

16. A college administrator is interested in the proportion of undergraduate students that wear orange on Fridays at her college. A random sample of 68 undergraduates was taken (on a Friday) and the number of them that were wearing orange was recorded. Which of the following is the population of interest for this study?

A) All undergraduate students at the college
B) The number of undergraduate students that wear orange on Fridays at the college
C) The 68 undergraduates that were polled.
D) The proportion of undergraduates that wear orange on Fridays at the college
17. Below is a stacked bar chart of data on fruit consumption from three different individuals. How many Bananas does Jane consume?

A) 1  
B) 2  
C) 3  
D) 8
1. At Six Flags in Atlanta, GA a college student randomly selected 7 park guests and recorded the number of times the individuals rode the Superman: Ultimate Flight ride. The following were the recorded results:

\[ 3 \ 8 \ 5 \ 9 \ 7 \ 6 \ 4 \]

Calculate the standard deviation of the number of times the individuals rode the Superman ride. Provide the correct notation (symbol) and your value to 3 decimal places in the blanks provided below. You must show ALL work for credit. (Calculator jargon will not be counted as work shown).

\[
\text{________________________} = \text{_______________________} \text{ rides}
\]

2. A histogram of the weights of US quarters is mound (bell) shaped and symmetric with a mean of 5.7 grams and a standard deviation of 0.04 grams. Approximately what percentage of quarters have weights between 5.62 and 5.74 grams? Write answer in blank provided below.
Use the following situation to answer questions 19 and 20.

In the judicial case of United States v. City of Chicago, discrimination was charged in a qualifying exam for the position of Fire Captain. In the table below, Group A is a minority group and Group B is a majority group.

<table>
<thead>
<tr>
<th></th>
<th>Passed</th>
<th>Failed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>10</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>Group B</td>
<td>417</td>
<td>145</td>
<td>562</td>
</tr>
<tr>
<td>Total</td>
<td>427</td>
<td>159</td>
<td>586</td>
</tr>
</tbody>
</table>

3. Find the probability of randomly selecting one of the test subjects who is in Group B or passed. Write the correct probability notation/statement (i.e., P(...)), work shown, and value to 4 decimal places in the blanks provided below.

\[
(\text{Probability Statement}) = \frac{\text{work shown}}{\text{value to 4 decimal places}}
\]

4. Find the probability of randomly selecting one of the test subjects who is in Group A and passed the exam. Write the correct probability notation/statement (i.e., P(...)), work shown, and value to 4 decimal places in the blanks provided below.

\[
(\text{Probability Statement}) = \frac{\text{work shown}}{\text{value to 4 decimal places}}
\]
5. (4 pts) The employees at a large university were classified according to age as well as to whether they belonged to administration, faculty, or staff. **For all probabilities give three decimal places.**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>20-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51 or Over</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>2</td>
<td>24</td>
<td>16</td>
<td>17</td>
<td>59</td>
</tr>
<tr>
<td>Faculty</td>
<td>1</td>
<td>40</td>
<td>36</td>
<td>28</td>
<td>105</td>
</tr>
<tr>
<td>Staff</td>
<td>16</td>
<td>20</td>
<td>14</td>
<td>2</td>
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<tr>
<td>Total</td>
<td>19</td>
<td>84</td>
<td>66</td>
<td>47</td>
<td>216</td>
</tr>
</tbody>
</table>

Let A = the event a randomly selected employee is a faculty member
Let B = the event a randomly selected employee is 41 – 50 years old.

Are the events A and B independent? **Justify your answer using probabilities.**

6. (4 pts) The National Governors Association publishes data on U.S. governors in Governors’ Political Affiliations & Terms of Office. Based on that document, we obtained the following frequency distribution for U.S. governors, as of 2014

<table>
<thead>
<tr>
<th>Party</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democratic</td>
<td>21</td>
</tr>
<tr>
<td>Republican</td>
<td>29</td>
</tr>
</tbody>
</table>

Two U.S. governors are selected at random **without replacement.** What is the probability that the two governors selected have different political-party affiliations? **Provide the appropriate probability notation/statement (i.e., P(...)), work shown, and value to 4 decimal places.**
7. The following is a stem and leaf plot of ages of a random sample of church members.

```
0|8
1|1 7 8
2|0
3|1 2 3 4 4 5 6 7 9 9
4|0 2 3
5|0
6|
7|5
```

Key: 1|1 = 11

a) (4 pts) Find the five number summary for the data above

b) (4 pts) Below is the boxplot of the data. Identify the values at each of the locations indicated below

The value at A = _______________

The value at B = _______________

The value at C = _______________

The value at D = _______________

8. The following histogram represents the number of cars per household for a sample of 40 US households.

A) (4 pts) Find the **mean** number of cars per household based on this data. Show work.

B) (4 pts) Find the **median** number of cars per household based on this data.
9. Some cruise ship passengers wear magnetic bracelets, which they (the passengers) say diminish the effects of motion sickness. The on-ship medical clinic notes the number of passengers wearing bracelets who complain of motion sickness compared to those who complain but are not wearing bracelets.

A) (4 pts) Does the above situation describe an observation or an experiment? Why?

B) (4 pts) Identify the two variables in this situation, determine whether the variable is the explanatory or response; qualitative or quantitative; and discrete, continuous or neither.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Exploratory or Response</th>
<th>Qualitative or Quantitative</th>
<th>Discrete, Continuous, or Neither</th>
</tr>
</thead>
</table>

10. (1 pt) If your scantron is correctly bubbled with a #2 pencil, with your correct XID, your correct test version, AND the front of your test is completed with your signature on the academic integrity statement, you earn 1 point.

END OF TEST