Your name: __________________________________________

- Please show all your work clearly for full credit.
- Points are assigned for the answer and the work shown.
- Please box your final answer.

(6 pts) 1. True/False

________ (a) A 90% confidence interval for $\mu$ is wider than a 95% confidence interval for $\mu$.

________ (b) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ if event A and event B are not mutually exclusive.

________ (c) A small p-value indicates that the observed value of the test statistic lies far away from the hypothesized value of $\mu$.

________ (d) The mean ($\mu$) of the standard normal distribution (Z-table) is 0.

________ (e) A binomial distribution is approximately normally distributed if both $np$ and $nq$ are less than 5.

________ (f) In a Permutation, the arrangement XYZ is the same as ZYX.

(12 pts) 2. For the following data: 14 15 8 11 8 8 9 1 12 8 7 15

(a) Find the Mean

(b) Find the Median

(c) Find the Mode

(d) Find the Five-number summary (Low, $Q_1$, $Q_2$, $Q_3$, High)

(e) Construct a boxplot

(f) Is the number 1 an outlier? Justify your answer using IQR.
(6 pts) 3.  (a) If one card is drawn from an ordinary deck, find the probability of getting a heart or a king?

(b) If someone is randomly selected, find the probability that his or her birthday is not October 18. Ignore leap years.

(6 pts) 4. About 10% of the computer chips from a certain manufacturer are defective. If we take a sample of 20 chips, find the
(a) Mean and standard deviation for the number of defective chips in the sample.

(b) Probability of exactly 2 defective chips. (Use the binomial probability formula.)

(6 pts) 5. A company randomly selected nine office employees and secretly monitored their computers for one month. The time (in hours) spent by these employees using their computers for non-job-related activities (playing games, personal communications, etc.) during this month are given below.

6 12 9 8 11 4 14 1 7

(a) Use your calculator to find $\bar{x}$ and $s$.

(b) Assume that such times for all employees are normally distributed, make a 90% confidence interval for the corresponding population mean ($\mu$) for all employees of this company.

(4 pts) 6. Six athletes participate in a 100-meter sprint event. How many possible finishes are there for the first 3 positions?
(6 pts) 7. A random variable $X$ can assume five values: 1, 2, 3, 4, 5. Its probability distribution is:

<table>
<thead>
<tr>
<th>$X$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(X)$</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>?</td>
<td>0.3</td>
</tr>
</tbody>
</table>

(a) Find $P(4)$

(b) What is the probability that $X$ is greater than 3?

(4 pts) 8. Find the $z$ value to the left of the mean so that 60.64% of the area under the distribution curve lies to the right of it.

(6 pts) 9. The average number of calories in a chocolate bar is 225. Suppose that the distribution is approximately normally distributed with $\sigma = 10$. Find the probability that a randomly selected chocolate bar will have:

(a) Less than 235 calories

(b) Between 200 and 220 calories

(6 pts) 10. The average number of pounds of meat that a person consumes a year is 218.4 pounds. Assume that the standard deviation is 25 pounds and the distribution is approximately normal.

(a) Find the probability that a person selected at random consumes less than 224 pounds per year.

(b) If a sample of 40 individuals is selected, find the probability that the mean of the sample will be less than 224 pounds per year.
11. An educator wishes to estimate the mean number of hours \( \mu \) that 12-year-old children in a city watch television per day. How large a sample is needed if the educator wants to estimate \( \mu \) to within 0.5 hour with 90% confidence? Use \( \sigma = 1.75 \).

12. Each of 50 subjects tastes two unmarked cups of coffee and says which he or she prefers. One cup in each pair contains instant coffee; the other, fresh brewed coffee. Thirty-one of the subjects prefer the fresh-brewed coffee. Let \( p \) be the proportion who prefer fresh brewed coffee.
   (a) Calculate the sample proportion.
   (b) Give a 95% confidence interval for the probability \( p \).

13. A researcher claims that the average wind speed in a certain city is 8 miles per hour. A sample of 32 days has an average wind speed of 8.2 miles per hour. The standard deviation of the sample is 0.6 mile per hour. At \( \alpha = 0.05 \), is there enough evidence to reject the claim? Use the traditional method.
   (a) Identify the claim and state the null and alternative hypotheses for the test.
   (b) Find the critical value.
   (c) Compute the test value.
   (d) Make a decision whether to reject or not to reject the null hypothesis.
   (e) Summarize the conclusion.
14. One survey showed that among 785 randomly selected subjects who completed four years of college, 144 smoke. Use $\alpha = 0.05$ to test the claim that the percentage ($p$) of smoking among those with four years of college is less than the 27% rate for the general population. Use the p-value method.

(a) Identify the claim and state the null and alternative hypotheses for the test.

(b) Compute the test value.

(c) Find the P-value.

(d) Make a decision whether to reject or not to reject the null hypothesis.

(e) Summarize the conclusion.

15. (a) What is the range of values for the correlation coefficient?

(b) Given the equation of the regression line $y' = 6.00 + 4.00x$ and the correlation coefficient $r = 0.987$, find the best predicted value of $y$ for $x = 2.00$.

16. State the Central Limit Theorem or four requirements for a Binomial Experiment.