

Math 1530 Test 2 100 points

Name:

Chapters 5 –8 Review

Score: **Part**

I: Show work in each problem to earn full credit (4* 10 = 40 Points)

1. The national Science Foundation collects data on Nobel Prize Laureates in the field of science and the data and location of their award-winning research. A frequency distribution for the number of winners, by country, for the years 1901 – 1999 are as follows.

| Country | Winners |
|-----------------|---------|
| United States | 199 |
| United Kingdom | 71 |
| Germany | 61 |
| France | 25 |
| Soviet Union | 10 |
| Japan | 4 |
| Other Countries | 89 |

Suppose that a recipient of a Nobel Prize in science between 1901-1999 is selected at random. Find the probability that the Nobel Laureate is from

- a. Japan

- b. either France or Soviet Union

- c. any country other than the United States.

2. A balanced dime is tossed three times. Find the following.

- a. Sample space (S)

- b. The event that all three tosses come up the same (E)

- c. P(E)

3. In the game of craps, a player rolls two balanced dice. Thirty-six equally likely outcomes are possible. Let

$A = \{\text{event the sum of the dice is 2}\}$

$B = \{\text{event the sum of the dice is 3}\}$.

$C = \{\text{event the sum of the dice is 12}\}$

a. List the members of

$A = \{ \dots \}$

$B = \{ \dots \}$

$C = \{ \dots \}$

b. The player loses on the first roll if the sum of the dice is 2, 3, or 12. Determine the probability of that event by using the special addition rule and your answers from part (a).

4. A factory manager collected data on the number of equipment breakdowns per day. From those data, she derived the probability distribution shown in the following table, where W denotes the number of breakdowns on a given day.

| | | | |
|----------|-----|------|------|
| w | 0 | 1 | 2 |
| $P(W=w)$ | 0.8 | 0.15 | 0.05 |

Use the probability distribution to find

a. the mean of W .

b. standard deviation of W .

Part II: Circle the right answer (2*10 = 20 Points).

5. According to a publication by the U. S. National Center for Health Statistics, the mean stay of female patients in short-stay hospitals is $\mu = 5.8$ days. The standard deviation is

$\sigma = 4.3$ days. Let \bar{x} denote the mean length of stay for a sample of discharged female patients.

- A. For a sample size of 75 the mean of x is 5.0 days.
- B. For a sample size of 75 the mean of x is 4.3 days.
- C. For a sample size of 75 the mean of x is 5.8 days.
- D. For a sample size of 75 the mean of x is $(4.3)(5.8)$ days.

6. Refer to number (5), the standard deviation of x is

- A. 4.3
- B. $\frac{4.3}{\sqrt{75}}$
- C. $\frac{4.3}{75}$
- D. 5.8

7. Refer to Number (5), if the sample size is changed to 500 the standard deviation of \bar{x} will

- A. increase
- B. decrease
- C. not change
- D. none of the above.

8. The z-distribution is a family of curves based on the number of degrees of freedom.

- A. True
- B. False

9. The sample mean \bar{x} is an unbiased estimator of the unknown population mean μ . This means that the mean \bar{x}

- A. is the same as the standard deviation of the population.
- B. could be improved by using the continuity correction.
- C. is the same as the mean of the population.
- D. is within the 95% confidence interval.

10. An example of a set of data for which statistical inference is valid is

- A. A simple random sample
- B. Not an SRS
- C. data with lurking variables.
- D. none of the above.

11. Assume that the population standard deviation is known, the use of the z-interval procedure to obtain a confidence interval for the population mean is reasonable when the variable under consideration is very close to being normally distributed, and the sample size is 75.

A. True

B. False

12. Suppose we are going to test if there is a preference for Coke over Pepsi. We present 25 subjects with a cup of each cola (in a random order) and ask which they prefer. If a sufficient number prefer Coke over Pepsi, then we will conclude that the population in general prefers Coke over Pepsi. In this setting, the number in our sample who prefer Coke over Pepsi is:

A. The null Hypothesis .

B. α

C. the test statistic.

D. None of the above

13. The area under the normal distribution is larger than the are under the standard normal distribution.

A. True

B. false

14. The value of a statistic used to estimate a parameter is called

A. a point estimate.

B. a confidence level.

C. A confidence interval.

D. A margin of error.

Part III: Show all steps in each question to earn full credit (7 * 6 = 42 Points).

15. Taking the family to an amusement park has become increasingly costly according to the industry publication *Amusement Business*, which provides figures on the cost for a family of four to spend the day at one of America's amusement parks. A random sample of 25 families of four that attended amusement parks yielded the following costs, rounded to the nearest dollar

122 166 171 148 135 173 137 163 119 144 92 170
164 153 162 140 142 158 130 167 73 186 126 163 172

The minitab print out of the above data is as follows.

| Variable | N | Mean | StDev | SE Mean | 95% CI |
|------------|----|---------|--------|---------|--------------------|
| Family Fun | 25 | 151.040 | 22.014 | 4.403 | (141.953, 160.127) |

Using the MINITAB print out, the confidence level isand the confidence interval is

16. a. Determined the two z-scores that divide the area under the standard normal curve into a middle 0.90 area and two outside 0.05 areas.

b. Determine the area under the standard normal curve that lies either to the left of -2.33 or to the right of 2.33

17. As reported in *Runner's World* magazine, the times of the finishers in the New York City 10 km run are normally distributed with a mean of 61 minutes and standard deviation of 9 minutes. Determine the percentage of finishers with times less than 75 minutes.

18. Refer to problem (17). Obtain the 40th percentile for the finishing times.

19. Data on salaries in the public school system are published annually in *National Survey of Salaries and Wages in Public Schools*. The mean annual salary for classroom teachers is \$45,871. Assume a standard deviation of \$9200. What is the probability that the sampling error made in estimating the population mean salary of all classroom teachers by the mean salary of a sample of 64 classroom teachers will be at most \$1000? (Show work).

20. Determine the following areas under the standard normal curve. Show work in each case.

a. The area that lies to the left of $z = -4$.

b. The area that lies to the right of $z = 4.2$.

c. The area that lies between $z = 1.1$ and $z = 4.2$.

21. The Rolling Stones, a rock group formed in the 1960s, has toured extensively in support of new albums. *Pollstar* has collected data on the earnings from the Stones's North American tours. For 30 randomly selected Rolling Stones concerts, the mean gross

earnings is \$2.27 million. Assuming a population standard deviation gross earnings of \$0.5 million, do the following.

a. Obtain a 99% confidence interval for the mean gross earnings of all Rolling Stones concerts.

b. Determine the margin of error, E .

c. Explain the meaning of E in this context in terms of the accuracy of the estimate.

d. Find the sample size required to have a margin of error of \$0.1 million and a 95% confidence level. (Recall that $\sigma =$ \$0.5 million.)

e. Obtain a 95% confidence interval for the mean gross earnings if a sample of the size determined in part (d) has a mean of \$2.35 million.