Practice For Test 3 (Chapters 6 & 7)
MATH 1530

Instructions. Here are some questions I have asked on previous tests.

1. Let the random variable \( z \) have a Standard Normal Distribution. For each case below, draw a picture and then calculate the given probability or find the value asked for.
   a. \( P(z < 2.35) \)
   b. \( P(z > -1.53) \)
   c. \( P(-2.99 < z < 1.46) \)
   d. \( P(-3.02 < z < -0.06) \)
   e. Find \( P_{75} \) (the 75th percentile)
   f. Find the value that separates the top 70% from the bottom 30% of all \( z \)-scores.

2. Fill in the blank with the appropriate response.
   a. The Standard Normal distribution has a mean of \___________\ and a standard deviation of \___________\.
   b. The Central Limit Theorem can be used if the population sampled from is \___________\ or if the sample size is more than \___________\.

3. Weights of quarters are normally distributed with a mean of 5.67 grams and a standard deviation of 0.07 grams. A soda machine will reject a quarter if its weight is more than 5.75 grams or less than 5.55 grams. What proportion of quarters will the machine reject? Show all work and/or reasoning.

4. The trunk lengths of adult Pink Elephants are normally distributed with a mean of 8.3 feet and a standard deviation of 0.8 feet. Use this information to answer parts (a) through (d) below.
   a. Find the percentage of adult Pink Elephants whose trunk length is between 6 and 7 feet long. Draw a picture.
   b. Find the trunk length that separates the longest 15% from the shortest 85% of all Pink Elephants’ trunk lengths.
   c. If 16 adult Pink Elephants are randomly selected, find the probability that their MEAN trunk length is longer than 9 feet.
   d. If you were to select 16 adult Pink elephants at random and found that their mean trunk length was longer than 9 feet, would you be surprised? Why or why not?

5. The weight of boxes of Smackin’ Good Cereal are normally distributed with a mean of 20 ounces and a standard deviation of 0.21 ounces.
   a. If one box of Smackin’ Good Cereal is randomly selected, what is the probability that the weight of the box is less than 19.5 ounces?
   b. What weight in ounces separates the lightest 20% of all Smackin’ Good Cereal boxes from the heaviest 80%?
   c. If you randomly select 9 boxes of Smackin’ Good Cereal, what is the probability that their MEAN weight is less than 19.5 ounces?

6. The waiting times for customers in the teller line at Lots-O-Money Bank are normally distributed with a mean of 6.3 minutes and a standard deviation of 1.8 minutes. Use this information to answer parts (a) through (d) below. Drawing a picture may help with partial credit.
   a. Find the percentage of customers at Lots-O-Money Bank who wait more than 5 minutes in the teller line.
   b. Find the percentage of customers at Lots-O-Money Bank who wait between 6 and 7
minutes in the teller line.

c. What time (in minutes) separates the shortest 10% of waiting times from the longest 90% of waiting times for customers in the teller line at Lots-O-Money Bank.

d. If 25 customers in the teller line at Lots-O-Money Bank are randomly selected, find the probability that their MEAN wait time is more than 6 minutes.

7. In a recent media poll of 500 dentists, 375 recommended sugarless gum for their patients who chew gum. Construct the 99% confidence interval for the proportion of ALL dentists who recommended sugarless gum for their patients who chew gum.

8. Suppose you want to estimate, with a margin of error of 3 percentage points, the true proportion of all dentists who recommended sugarless gum for their patients who chew gum, with a 99% confidence in your results. What is the minimum amount of dentists you must survey?
   a. Assume you use an estimate of \( \hat{p} \) derived from a prior study which revealed a percentage of 75%.
   b. Assume that you have no prior information suggesting a possible value of \( \hat{p} \).

9. Complete the following statements by filling in the blank with WIDENS or SHRINKS.
   (a) As the level of confidence INCREASES, the confidence interval ___________
   (b) As the sample size INCREASES, the confidence interval ___________

10. A random sample of 45 community college students found that they studied a mean of 10 hours per week with a standard deviation of 3.2 hours. Construct the 95% confidence interval for the mean hours studied per week for all community college students. Write a sentence that interprets the confidence interval you found.

11. The effects of a new drug on the rare disease *Ilovestatistics* were investigated in a recent study. Since the disease was so rare, only 10 patients were able to participate in the study. The study consisted of administering the drug to the 10 patients and observing how long the symptoms took to disappear. The mean length of time for recovery for the 10 subjects was 16 days with a standard deviation of 5.3 days.
   a. ASSUMING RECOVERY TIMES ARE NORMALLY DISTRIBUTED, construct the 95% confidence interval (in days) for the mean recovery time of all diseased people who will use this new drug. Use one decimal places in your final answer.
   b. A doctor claims that the mean recovery time of all diseased people who will use this new drug is 13 days. Is this claim consistent with your confidence interval constructed in part (a) above? Explain.

12. If we want to estimate the mean height of adult males, how many adult males must we randomly select if we want to be 90% confident that the sample mean is within 0.25 inches of the true population mean? Assume a previous study has revealed that \( \sigma = 2.8 \) inches for adult male heights.

13. Bobby constructs the following confidence interval for a population mean from a random sample of size \( n = 40 \).

   \[ 32.5 < \mu < 43.5 \]

   a. What was the sample mean?
   b. What is the margin of error?