# STA 2023
# Practice 3
# You may receive assistance from the Math Center.

These problems are intended to provide supplementary problems in preparation for test 3. This packet does not necessarily reflect the number, type, or topics of problems that will appear on the actual test, nor is it guaranteed to cover every topic that may appear on the test. Be sure to study all assigned homework problems.

Part I Multiple Choice

1. Find the area under the standard normal curve between $z = 0$ and $z = 3$.
   (a) 0.9987 (b) 0.0010 (c) 0.4641 (d) 0.4987

2. Find the area under the standard normal curve to the right of $z = 1$.
   (a) 0.8413 (b) 0.1397 (c) 0.1587 (d) 0.5398

3. For a standard normal curve, find the $z$-score that separates the bottom 90% from the top 10%.
   (a) 1.28 (b) 0.28 (c) 1.52 (d) 2.81

4. For a standard normal curve, find the $z$-scores for which 90% of the distribution's area lies between $-z$ and $z$.
   (a) $(-1.28,\ 1.28)$ (b) $(-1.645,\ 1.645)$ (c) $(-1.96,\ 1.96)$ (d) $(-0.90,\ 0.90)$

5. IQ test scores are normally distributed witha mean of 101 and a standard deviation of 20. An individual's IQ score is found to be 111. Find the $z$-score corresponding to this value.
   (a) 105.95 (b) 2.00 (c) 0.5 (d) $-0.5$

6. Suppose that prices of a certain model of new homes are normally distributed with a mean of \$150,000 and a standard deviation of \$1100. Find the percentage of buyers who paid between \$148,900 and \$151,100.
   (a) 68% (b) 34% (c) 32% (d) 47.5%

7. A physical fitness association is including the mile run in its secondary-school fitness test. The time for this event for boys in secondary school is known to possess a normal distribution with a mean of 460 seconds and a standard deviation of 60 seconds. The fitness association wants to recognize the fastest 10% of the boys with certificates of recognition. What time would the boys need to beat in order to earn a certificate of recognition from the fitness association?
   (a) 537 seconds (b) 383 seconds (c) 361 seconds (d) 559 seconds

8. The amount of money collected by the snack bar at a large university has been recorded daily for the past five years. Records indicate that the mean daily amount collected is \$4650 and the standard deviation is \$400. The distribution is skewed to the right due to several high volume days (football game days). Suppose that 100 days were randomly selected from the five years and the average amount collected from those days was recorded. Which of the following describes the sampling distribution of the sample mean?

   (a) normally distributed with a mean of \$4650 and a standard deviation of \$400.

   (b) normally distributed with a mean of \$465 and a standard deviation of \$40.

   (c) skewed to the right with a mean of \$4650 and a standard deviation of \$400.

   (d) normally distributed with a mean of \$4650 and a standard deviation of \$40.

Part II

9. The amount of corn chips dispensed into a 14-ounce bag by the dispensing machine has been identified as possessing a normal distribution with a mean of 14.5 ounces and a standard deviation of 0.3 ounces. Suppose 100 bags of chips were randomly selected from this dispensing machine. Find the probability that the sample mean weight of these 100 bags exceeded 14.6 ounces.

10. A simple random sample of size $n = 25$ is drawn from a population that is normally distributed with population standard deviation $\sigma = 17$, and the sample mean, $\overline{x}$, is 123. Construct a 94% confidence interval to estimate the mean.

11. A Gallup poll conducted December 20-21, 1999 asked Americans how many hours of TV they watch during the week. How many subjects would be needed in order to estimate the number of hours of TV Americans watched within 0.5 hours with 95% confidence? Initial survey results indicate that $\sigma = 1.8$.

12. Compute the mean and standard deviation (to three decimal places) of the random variable $X$ whose probability distribution is

| $x$ | $P(X = x)$ |
|---|---|
| 9 | 0.10 |
| 10 | 0.137 |
| 11 | 0.27 |
| 12 | 0.302 |
| 13 | 0.191 |

13. To play a certain gambling game, a player wagers \$2. The probability of winning is 0.025, with a payoff of \$50, a net gain of \$48. The probability of losing is 0.975, for a loss of \$2. Find and interpret the expected value (to the player) of this game.

14. *Depakote* is a medication whose purpose is to reduce the pain associated with migraine headaches. In clinical trials and extended studies of *Depakote*, 2% of the patients in the study experienced weight gain as a side effect. Let $X$, a binomial random variable, be the number of patients who experience weight gain as a side effect.

    (a) Compute the mean and standard deviation of the random variable $X$, the number of patients experiencing weight gain in 600 trials of the probability experiment.

    (b) Interpret the mean.

(c) Would it be unusual to observe 16 patients who experience weight gain in a random sample of 600 patients who take the medication? Why?

15. Mark Price holds the record for percentage of free throws made in the National Basketball Association, at 90.4%. Assuming that free throws are independent events, compute the probability that in his next 10 free throws

    (a) Mark Price makes exactly 8.

    (b) Mark Price makes 8 or more.

    (c) Mark Price makes fewer than 7.

    (d) Mark Price makes between 6 and 8, inclusive.

16. A standardized test has a mean score of $\mu = 1000$ and a standard deviation of $\sigma = 150$. Find the test score that corresponds to the $80^{\text{th}}$ percentile.

For each of the following, determine whether a binomial random variable is being described. Circle YES if the variable is a binomial random variable, and circle NO if it is not.

17. Hank "The Tank" Wilson claims he can eat more hot dogs than anyone else. To prove his claim, The Tank eats hot dogs until he gets sick. The number of hot dogs he eats is recorded.

    YES NO

18. For a particular airline, the probability that a randomly selected flight will arrive on time is 0.34. A random sample of 100 flights is selected, and the number of on-time flights is recorded. (Assume independence)

    YES NO

19. According to Nielson Media Research, 75% of all United States households have cable television. In a small town of 40 households, a random sample of 10 households is asked whether they have cable television. The number of households with cable television is recorded.

    YES NO

20. A personnel director wishes to estimate the mean scores for a proposed aptitude test that may be used in screening applicants for clerical positions. Using a sample of $n = 100$ applicants, she found $\overline{x} = 75.6$ and $s = 14.7$. Construct a 95% confidence interval estimate for the true mean.

21. A large casualty insurance company is revising its rate schedules. A staff actuary wishes to estimate the average size of claims resulting from fire damage in apartment compleses having between 10 and 20 units. The current year's claim-settlement experience will be used as a sample. There were 19 claim settlements for buildings in this category. The average claim size was $73,249 with a standard deviation of $37,246. Construct a 90% confidence interval estimate of the mean claim size.

22. The highway patrol director in a certain state has ordered a crackdown on drunken drivers. To see if his safety campaign is working, the director has ordered a sampling study to estimate the proportion of all fatal traffic accidents caused by drinking. In a random sample of $n = 100$ accidents, 42 percent were attributable to alcohol. Assuming that the accident ppopulation is large, construct a 95% confidence interval for the population proportion of accidents caused by drunk driving.

# Formula Page

$$\mu = \frac{\sum x}{N} \qquad \overline{x} = \frac{\sum x}{n}$$

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}} \qquad s = \sqrt{\frac{\sum (x_i - \overline{x})^2}{n-1}}$$

$$\mu = \frac{\sum x_i \cdot f_i}{N} \qquad \overline{x} = \frac{\sum x_i \cdot f_i}{n}$$

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2 \cdot f_i}{N}} \qquad s = \sqrt{\frac{\sum (x_i - \overline{x})^2 \cdot f_i}{n-1}}$$

$$z = \frac{x - \mu}{\sigma} \qquad z = \frac{x - \overline{x}}{s}$$

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$$P(A) + P(\overline{A}) = 1 \qquad P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \qquad P(A \text{ and } B) = P(A) \cdot P(B\,|A)$$

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$$E(X) = \mu = \sum x \cdot P(X = x) \qquad E(X) = \mu = np$$

$$\sigma^2 = \sum (x - \mu)^2 \cdot P(X = x) \qquad \sigma^2 = npq$$

$${}_nC_r = \frac{n!}{r!(n-r)!} \qquad P(X = x) = {}_nC_x\, p^x\, q^{(n-x)}$$

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$$\sigma_{\overline{x}} = \frac{\sigma}{\sqrt{n}} \qquad \sigma_{\hat{p}} = \sqrt{\frac{p\,q}{n}}$$

$$z = \frac{\overline{x} - \mu}{\sigma_{\overline{x}}} \qquad t = \frac{\overline{x} - \mu}{s/\sqrt{n}} \qquad z = \frac{\hat{p} - p}{\sqrt{\frac{p\,q}{n}}}$$

$$\overline{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} \qquad \overline{x} \pm t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\,\hat{q}}{n}}$$

$$n = \left(\frac{z_{\alpha/2}\,\sigma}{E}\right)^2 \qquad n = \hat{p}\,\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$