

Solve the problem.

- 1) Consider the population described by the probability distribution below.

$x$	3	5	7
$p(x)$	.1	.7	.2

- Find  $\mu$ .
  - Find the sampling distribution of the sample mean  $\bar{x}$  for a random sample of  $n = 2$  measurements from the distribution.
  - Show that  $\bar{x}$  is an unbiased estimator of  $\mu$ .
- 2) Consider the population described by the probability distribution below.
- |        |    |    |    |
|--------|----|----|----|
| $x$    | 3  | 5  | 7  |
| $p(x)$ | .1 | .7 | .2 |
- Find  $\sigma^2$ .
  - Find the sampling distribution of the sample variance  $s^2$  for a random sample of  $n = 2$  measurements from the distribution.
  - Show that  $s^2$  is an unbiased estimator of  $\sigma^2$ .
- 3) The amount of time it takes a student to walk from her home to class has a skewed right distribution with a mean of 10 minutes and a standard deviation of 1.6 minutes. If times were collected from 40 randomly selected walks, describe the sampling distribution of  $\bar{x}$ , the sample mean time.
- 4) One year, the distribution of salaries for professional sports players had mean \$1.6 million and standard deviation \$0.7 million. Suppose a sample of 100 major league players was taken. Find the approximate probability that the average salary of the 100 players that year exceeded \$1.1 million.
- 5) Suppose a random sample of  $n$  measurements is selected from a binomial population with probability of success  $p = .32$ . Given  $n = 400$ , describe the shape, and find the mean and the standard deviation of the sampling distribution of the sample proportion,  $\hat{p}$ .
- 6) Suppose a random sample of  $n = 64$  measurements is selected from a population with mean  $\mu = 65$  and standard deviation  $\sigma = 12$ . Find the probability that  $\bar{x}$  falls between 65.75 and 68.75.
- 7) The average score of all golfers for a particular course has a mean of 66 and a standard deviation of 3.5. Suppose 49 golfers played the course today. Find the probability that the average score of the 49 golfers exceeded 67.
- 8) A random sample of  $n = 300$  measurements is drawn from a binomial population with probability of success .43. Give the mean and the standard deviation of the sampling distribution of the sample proportion,  $\hat{p}$ .
- 9) Suppose a random sample of  $n$  measurements is selected from a binomial population with probability of success  $p = .32$ . Given  $n = 400$ , describe the shape, and find the mean and the standard deviation of the sampling distribution of the sample proportion,  $\hat{p}$ .

At a large university, students have an average credit card debt of \$2500, with a standard deviation of \$1200. A random sample of students is selected and interviewed about their credit card debt. Use the 68-95-99.7 Rule to answer the question about the mean credit card debt for the students in this sample.

- 10) If we imagine all the possible random samples of 100 students at this university, 68% of the samples should have means between what two numbers?

# Answer Key

## Testname: STT315 PRACTICE CH 5

1) a.  $\mu = E(x) = .1(3) + .7(5) + .2(7) = 5.2$

b.

$\bar{x}$	3	4	5	6	7
$p(\bar{x})$	.01	.14	.53	.28	.04

c.  $E(\bar{x}) = .01(3) + .14(4) + .53(5) + .28(6) + .04(7) = 5.2$ ; Since  $E(\bar{x}) = \mu$ ,  $\bar{x}$  is an unbiased estimator of  $\mu$ .

2) a.  $\sigma^2 = .1(3 - 5.2)^2 + .7(5 - 5.2)^2 + .2(7 - 5.2)^2 = 1.16$

b.

$s^2$	0	2	8
$p(s^2)$	.54	.42	.04

c.  $E(s^2) = .54(0) + .42(2) + .04(8) = 1.16$ ; Since  $E(s^2) = \sigma^2$ ,  $s^2$  is an unbiased estimator of  $\sigma^2$ .

3) By the Central Limit Theorem, the sampling distribution of  $\bar{x}$  is approximately normal with  $\mu_{\bar{x}} = \mu = 10$  minutes and

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{1.6}{\sqrt{40}} = 0.2530 \text{ minutes.}$$

4) approximately 1

5) approximately normal; 0.32, 0.023

6)  $P(65.75 \leq \bar{x} \leq 68.75) = P(.5 \leq z \leq 2.5) \approx .3023$

7) .0228

8) .43; .029

9) approximately normal; 0.32, 0.023

10) \$2380.00 and \$2620.00