

Practice Multiple Choice for Chapter 7

1. What is distribution of values taken by a statistic in all possible samples of the same size from the same population called?

- (a) the probability that the statistic is obtained. (b) the population parameter.
(c) the variance of the values. (d) the sampling distribution of the statistic.
(e) the distribution of sample data

2. In order to use the formula to calculate the standard deviation of the sampling distribution of the sample mean, which of the following conditions must be met?

I. $n \geq 30$

II. The population's distribution is approximately Normal.

III. The sample size is less than 10% of the population size.

- (a) I only (b) II only (c) III only (d) III and *either* I or II (e) All three conditions must be met.

3. The *central limit theorem* refers to which of the following characteristic of the sampling distribution of the sample mean?

(a) Regardless of the shape of the population's distribution, the sampling distribution of the sample mean from sufficiently large samples will be approximately Normally distributed.

(b) Regardless of the shape of the population's distribution, the standard deviation of the sampling distribution of the sample mean from sufficiently large samples will be $\frac{\sigma}{\sqrt{n}}$.

(c) Regardless of the shape of the population's distribution, the mean of the sampling distribution of the sample mean from sufficiently large samples will be equal to the mean of the population.

(d) As you take larger and larger samples from a normally distributed population, the standard deviation of the sampling distribution of the sample mean gets smaller and smaller.

(e) As you take larger and larger samples from a normally distributed population, the mean of the sampling distribution of the sample mean gets closer and closer to the population mean.

4. Olive weights are classified according to a unique set of adjectives implying great size. For example, the mean weight of olives classified as "Colossal" is 7.7 gm. Suppose a particular company's crop of "Colossal" olives is approximately normally distributed with a mean of 7.7 gm and a standard deviation of 0.2 gm. Which of the following represents the probability that the mean weight of a random sample of 3 olives from this population is greater than 8gm?

(a) $P\left(z > \frac{8-7.7}{\frac{0.2}{\sqrt{3}}}\right)$

(b) $P\left(z > \frac{7.7-8}{\frac{0.2}{\sqrt{3}}}\right)$

(c) $P\left(z < \frac{8-7.7}{\frac{0.2}{\sqrt{3}}}\right)$

(d) $P\left(z > \frac{8-7.7}{\sqrt{\frac{(0.2)(0.8)}{3}}}\right)$

(e) $P\left(z < \frac{8-7.7}{\sqrt{\frac{(0.2)(0.8)}{3}}}\right)$

5 In a large population, 46% of the households own DVD recorders. A simple random sample of 100 households from this population is to be contacted and the sample proportion computed. Which of the following expressions represents the probability that more than half the households sampled will own a DVD recorder?

(a) $P\left(z > \frac{0.46-0.5}{\sqrt{\frac{(0.5)(0.5)}{100}}}\right)$

(b) $P\left(z < \frac{0.5-0.46}{\sqrt{\frac{(0.5)(0.5)}{100}}}\right)$

(c) $P\left(z > \frac{0.46-0.5}{\sqrt{(0.46)(0.54)(100)}}\right)$

(d) $P\left(z > \frac{0.46-0.5}{\sqrt{\frac{(0.46)(0.54)}{100}}}\right)$

(e) $P\left(z > \frac{0.5-0.46}{\sqrt{\frac{(0.46)(0.54)}{100}}}\right)$

6. You take an SRS of size 500 from the 37,000 students at Purdue University and measure individual's heights. You then take an SRS of size 500 from the 4,400,000 adults in the state of Indiana and measure their heights. Assuming the standard deviation of individual heights in the two populations is the same, the standard deviation of the sampling distribution of mean heights for the Indiana sample is

(a) approximately the same as for the Purdue sample because both are samples of size 500.

(b) smaller than for the Purdue sample because the population of Indiana is much larger.

(c) larger than for the Purdue sample because the population of Indiana is much larger.

(d) larger, because the Indiana sample is smaller relative to the population from which it's been taken.

(e) either larger or smaller than for the Purdue sample because it varies from sample to sample

7. According to the DuPont 2007 Global Automotive Color Popularity Report, 19% of all cars manufactured in 2007 were white. In a random sample of 100 cars parked in long-term parking at Philadelphia International Airport, 22% of the cars were white. Which of the following statements is true?

- (a) 19% and 22% are parameters, 100 is a statistic.
- (b) 19% is a parameter, 22% is a statistic.
- (c) 19% is a statistic, 22% is a parameter.
- (d) 19% and 22% are statistics, 100 is neither a parameter nor a statistic.
- (e) 19%, 22%, and 100 are all statistics.

8. I flip a coin ten times and record the proportion of heads I obtain. I then repeat this process of flipping the coin ten times and record the proportion of heads obtained many, many times. When done, I make a histogram of my results. This histogram approximates

- (a) the bias, if any, that is present.
- (b) the true sample statistic.
- (c) the distribution of sample data.
- (d) the sampling distribution of the proportion of heads in ten flips of the coin.
- (e) the population distribution.

9. If we took a SRS of 1700 people from California (population 34 million) and a SRS of 1000 people from Detroit (population 1 million) which sampling distribution would have the smaller standard deviation?

- (a) Detroit, because $1000/1,000,000$ is more than $1700/32,000,000$.
- (b) Detroit, because it has the smaller population.
- (c) California, because the sample size (1700) is larger than for Detroit (1000).
- (d) California, because it has the larger population.
- (e) Both would be the same, because simple random samples (SRS) are taken in both places.

A 2010 study of 240 randomly-selected residents of a subtropical resort city with 82,000 residents found that 5.4% of them had been exposed to the mosquito-borne virus that causes Dengue fever. Suppose the *actual* percentage of people in the city who have been exposed to the virus is 3%. Let p = the proportion of residents who have been exposed in a random sample of 240,

10. The mean $\mu_{\hat{p}}$ of p is

- (a) 0.03.
- (b) 0.054.
- (c) 7.2.
- (d) 13.
- (e) 240.

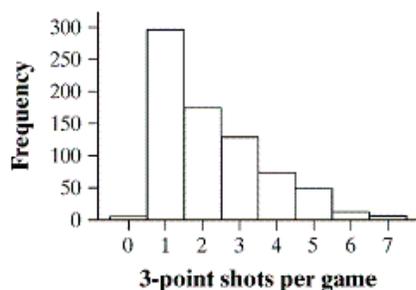
11. The standard deviation $\sigma_{\hat{p}}$ of p is approximately

- (a) 0.000121.
- (b) 0.00187.
- (c) 0.0110.
- (d) 2.643.
- (e) 2.683.

12. Which of the following conditions had to be met in order for us to use the formula for $\sigma_{\hat{p}}$ that we used in the previous question?

- (a) $n \geq 30$
- (b) $\sqrt{np(1-p)} \geq 10$
- (c) $np \geq 10$ and $n(1-p) \geq 10$
- (d) $n < 0.10N$
- (e) The population distribution is approximately normal.

The histogram below was obtained from data on 750 high school basketball games in a regional athletic conference. It represents the number of three-point baskets made in each game.



13. A researcher takes a simple random sample of size $n = 40$ from this population and calculates the mean number of 3-point baskets. Which of the following best describes the shape of the sampling distribution of means?

- (a) Skewed left
- (b) Skewed right
- (c) Approximately uniform
- (d) Approximately normal
- (e) Symmetric, but distinctly non-normal.

14. What is the range of sample sizes the research could take from this population without violating conditions required for the application of the formula $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ and the central limit theorem?
- (a) $n \geq 30$ (b) $30 \leq n \leq 50$ (c) $30 \leq n \leq 75$ (d) $50 \leq n \leq 75$ (e) $n \leq 75$
15. The number of column inches of classified advertisements appearing on Mondays in a certain daily newspaper has mean 320 inches and standard deviation 30 inches. Suppose that the results for 100 consecutive Mondays can be regarded as a simple random sample and let \bar{x} denote the mean number of column inches of classified advertisements in the sample. Assuming a sample of 100 is sufficiently large, the random variable \bar{x} has a
- (a) distribution that is exactly normal by the central limit theorem.
 (b) distribution that is approximately normal by the central limit theorem.
 (c) mean of 3.2 inches by the law of large numbers.
 (d) standard deviation of 3.2 inches by the law of large numbers.
 (e) More than one is true.
16. The Gallup Poll has decided to increase the size of its random sample of voters from about 1500 to about 4000 people right before an election. The poll is designed to estimate the proportion of voters who favor a new law banning smoking in public buildings. The effect of this increase is to
- (a) reduce the bias of the estimate. (b) increase the bias of the estimate.
 (c) reduce the variability of the estimate. (d) increase the variability of the estimate.
 (e) have no effect since the population size is the same.
17. The student newspaper at a large university asks an SRS of 250 undergraduates, "Do you favor eliminating the carnival from the term-end celebration?" All in all, 150 of the 250 are in favor. Suppose that (unknown to you) 55% of all undergraduates favor eliminating the carnival. If you took a very large number of SRSs of size $n = 250$ from this population, the sampling distribution of the sample proportion \hat{p} would be
- (a) exactly normal with mean 0.55 and standard deviation 0.03.
 (b) approximately normal with mean 0.55 and standard deviation 0.03.
 (c) exactly normal with mean 0.60 and standard deviation 0.03.
 (d) approximately normal with mean 0.60 and standard deviation 0.03.
 (e) heavily skewed with mean 0.55 and standard deviation 0.03.
18. Which of the following statements about the sampling distribution of the sample mean is *incorrect*?
- (a) The standard deviation of the sampling distribution will decrease as the sample size increases.
 (b) The standard deviation of the sampling distribution is a measure of the variability of the sample mean among repeated samples.
 (c) The sample mean is an unbiased estimator of the true population mean.
 (d) The sampling distribution shows how the sample mean will vary in repeated samples.
 (e) The sampling distribution shows how the sample was distributed around the sample mean.
19. The Central Limit theorem for a sample mean is a critical result because
- (A) it states that for large sample sizes, the population distribution is approximately normal.
 (B) it states that for large sample sizes, the sample is approximately normal.
 (C) it states that for any population, the sampling distribution is normal regardless of sample size.
 (D) it states that for large sample sizes, the sampling distribution is approximately normal regardless of the population distribution.
 (E) it states that for any sample size, the sampling distribution is normal.
20. The distribution of the population of the millions of household incomes in California is skewed to the right. Which of the following best describes what happens to the sampling distribution of the sample mean when the size of a random sample increases from 10 to 100?
- a) Its mean gets closer to the population mean, its standard deviation gets closer to the population standard deviation, and its shape gets closer to the population's shape.
 b) Its mean gets closer to the population mean, its standard deviation gets smaller, and its shape gets closer to normal.
 c) Its mean stays constant, its standard deviation gets closer to the population standard deviation, and its shape gets closer to the population's shape.
 d) Its mean stays constant, its standard deviation gets smaller, and its shape gets closer to normal.
 e) None of the above.

Answers:

1) d

2) c 10% condition satisfied appropriate for SD

3) a. definition $n \geq 30$

4) a

5) e

6) a depends on sample size not pop. size

7) b

8) d

9) c

10) a

11) c

12) d

13) d

14) c

15) b

16) c

17) b

18) e

19) d

20) b