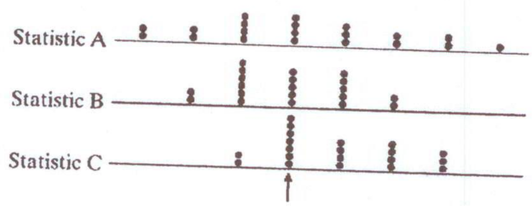
Chapter 7 Multiple Choice Practice

ANSWER KEY

Directions. *Identify the choice that best completes the statement or answers the question. Check your answers and note your performance when you are finished.*

1. The variability of a statistic is described by
   (A) the spread of its sampling distribution.
   (B) the amount of bias present.
   (C) the vagueness in the wording of the question used to collect the sample data.
   (D) probability calculations.
   (E) the stability of the population it describes.

2. Below are dot plots of the values taken by three different statistics in 30 samples from the same population. The true value of the population parameter is marked with an arrow.



   The statistic that has the largest *bias* among these three is
   (A) statistic A.
   (B) statistic B.
   (C) statistic C.
   (D) A and B have similar bias, and it is larger than the bias of C.
   (E) B and C have similar bias, and it is larger than the bias of A.

   ↳ the center of the dotplot is not lined up with the arrow

3. According to a recent poll, 27% of Americans prefer to read their news in a physical newspaper instead of online. Let's assume this is the parameter value for the population. If you take a simple random sample of 25 Americans and let $\hat{p}$ = the proportion in the sample who prefer a newspaper, is the shape of the sampling distribution of $\hat{p}$ approximately Normal?
   (A) No, because $p < 0.50$
   (B) No, because $np = 6.75$
   (C) Yes, because we can reasonably assume there are more than 250 individuals in the population.
   (D) Yes, because we took a simple random sample.
   (E) Yes, because $n(1-p) = 18.25$

   This is a binomial situation, the Normality condition is $np \geq 10$ and $nq \geq 10$

4. The time it takes students to complete a statistics quiz has a mean of 20.5 minutes and a standard deviation of 15.4 minutes. What is the probability that a random sample of 40 students will have a mean completion time greater than 25 minutes?
   (A) 0.9678
   (B) 0.0322
   (C) 0.0344
   (D) 0.3851
   (E) 0.6149

   $\mu = 20.5$
   $\sigma = 15.4$
   for one student

   $\mu = 20.5$
   $\sigma = \frac{15.4}{\sqrt{40}} = 2.43$
   for 40 students

   normalcdf(25, ∞, 20.5, 2.43) = .0322

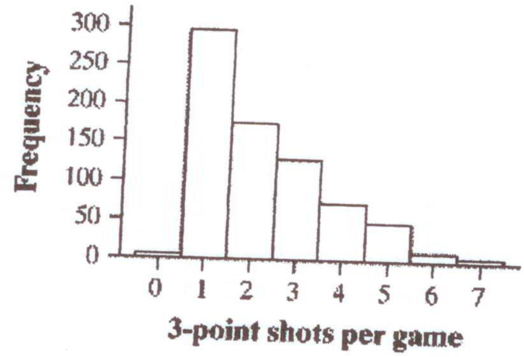
5. A fair coin (one for which both the probability of heads and the probability of tails are 0.5) is tossed 60 times. The probability that more than 1/3 of the tosses are heads is closest to
   (A) 0.9951.
   (B) 0.33.
   (C) 0.109.
   (D) 0.09.
   (E) 0.0049.

   $\mu = np = 60(.5) = 30$

   $\sigma = \sqrt{npq} = \sqrt{60(.5)(.5)} = 3.87$

   normalcdf(20, ∞, 30, 3.87) = .9951

6. 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.



What is the range of sample sizes a researcher could take from this population without violating conditions required for performing Normal calculations with the sampling distribution of $\bar{x}$?

(A) $0 \le n \le 30$
(B) $30 \le n \le 50$
(C) $30 \le n \le 75$
(D) $30 \le n \le 750$
(E) $75 \le n \le 750$

you need to take at least 30 for the normal condition to be met (CLT) but you can't sample more than 10% of the population

7. The incomes in a certain large population of college teachers have a normal distribution with mean \$60,000 and standard deviation \$5000. Four teachers are selected at random from this population to serve on a salary review committee. What is the probability that their average salary exceeds \$65,000?

(A) 0.0228
(B) 0.1587
(C) 0.8413
(D) 0.9772
(E) essentially 0

N(60,000, 5000)

Remember to adjust the std. dev $\frac{\sigma}{\sqrt{n}} = \frac{5000}{\sqrt{4}} = 2500$

normalcdf(65,000, ∞, 60000, 2500) = .0228

8. A random sample of size 25 is to be taken from a population that is Normally distributed with mean 60 and standard deviation 10. The mean $\bar{x}$ of the observations in our sample is to be computed. The sampling distribution of $\bar{x}$

(A) is Normal with mean 60 and standard deviation 10.
(B) is Normal with mean 60 and standard deviation 2.
(C) is approximately Normal with mean 60 and standard deviation 2.
(D) has an unknown shape with mean 60 and standard deviation 10.
(E) has an unknown shape with mean 60 and standard deviation 2.

* pop. is Normal so the samp dist. is as well
* $\mu_x = \mu = 60$
* $\sigma_x = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{25}} = 2$

9. The scores of individual students on a college entrance examination have a left-skewed distribution with mean 18.6 and standard deviation 6.0. At Millard North High School, 36 seniors take the test. The sampling distribution of mean scores for random samples of 36 students is

(A) approximately Normal. because $n \geq 30$ → CLT
(B) symmetric and mound-shaped, but non-Normal.
(C) skewed right.
(D) neither Normal nor non-normal. It depends on the particular 36 students selected.
(E) exactly Normal.

10. The distribution of prices for home sales in Minnesota is skewed to the right with a mean of \$290,000 and a standard deviation of \$145,000. Suppose you take a simple random sample of 100 home sales from this (very large) population. What is the probability that the mean of the sample is above \$325,000?

(A) 0.0015
(B) 0.0027
(C) 0.0079
(D) 0.4046
(E) 0.4921

$\mu_x = 290,000$

$\sigma_x = \frac{145000}{\sqrt{100}} = 14500$

normalcdf(325,000, ∞, 290000, 14500) = .0079

1. A 2. C 3. B 4. B 5. A 6. C 7. A 8. B 9. A 10. C

FRAPPY! Free Response AP® Problem, Yay!

The following problem is modeled after actual Advanced Placement Statistics free response questions. Your task is to generate a complete, concise response in 15 minutes. After you generate your response, view two example solutions and determine whether you feel they are "complete", "substantial", "developing" or "minimal". If they are not "complete", what would you suggest to the student who wrote them to increase their score? Finally, you will be provided with a rubric. Score your response and note what, if anything, you would do differently to increase your own score.

A television producer must schedule a selection of paid advertisements during each hour of programming. The lengths of the advertisements are Normally distributed with a mean of 28 seconds and standard deviation of 5 seconds. During each hour of programming, 45 minutes are devoted to the program and 15 minutes are set aside for advertisements. To fill in the 15 minutes, the producer randomly selects 30 advertisements.

center, spread, shape

a) Describe the sampling distribution of the sample mean length for random samples of 30 advertisements.

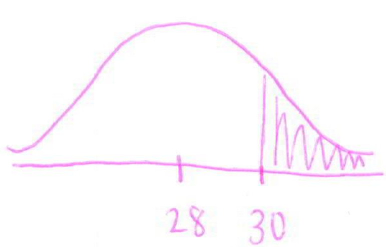
The sampling distribution of the sample mean length has a mean of $\mu_{\bar{x}} = \mu = 28$ and a standard deviation of $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{30}} = .913$ seconds. Since the population shape is Normal, so is the shape of the sampling distribution.

b) If 30 advertisements are randomly selected, what is the probability that the total time needed to air them will exceed the 15 minutes available? Show your work.

$N(28, .913)$

normalcdf$(L{:}30, U{:}\infty, \mu = 28, \sigma = .913)$

$= .0142$



There is a 1.42% chance the total time needed to air the 30 advertisements will exceed the 15 minutes available.

30 comes from 15 min = 900 sec and $\frac{900 \text{ sec}}{30 \text{ advertisements}} = 30$ each