

## Sampling Distributions for Sample Means Quiz

1. For which of the following conditions is it not appropriate to assume that the sampling distribution of the sample mean is approximately normal?
- (A) A random sample of 8 taken from a normally distributed population
  - (B) A random sample of 50 taken from a normally distributed population
  - (C) A random sample of 10 taken from a population distribution that is skewed to the right ✓
  - (D) A random sample of 75 taken from a population distribution that is skewed to the left
  - (E) A random sample of 100 taken from a population that is uniform

### Answer C

Correct. It is not appropriate to assume the sampling distribution of the sample mean is approximately normal for this sample. Because the distribution is skewed, the sample size needs to be at least 30 to assume normality for the sampling distribution.

2. At a certain high school, the distribution of backpack weight is approximately normal with mean 19.7 pounds and standard deviation 3.1 pounds. A random sample of 5 backpacks will be selected, and the weight, in pounds, of each backpack will be recorded.

For samples of size 5, which of the following is the best interpretation of  $P(\bar{x} > 22) \approx 0.05$ ?

- (A) The probability that each of the 5 backpacks selected will have a weight above 22 pounds is approximately 0.05.
- (B) The probability that each of the 5 backpacks selected will have a weight above 19.7 pounds is approximately 0.05.
- (C) The probability that the population mean is greater than 22 pounds is approximately 0.05.
- (D) For all samples of size 5, approximately 5% of the sample will have a probability greater than 22 pounds.
- (E) For all samples of size 5, the probability that the sample mean will be greater than 22 pounds is approximately 0.05. ✓


### Answer E

Correct. The statement gives a probability of 0.05 that the sample mean is greater than 22 pounds.

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3. The distribution of prices for a certain car model is approximately normal with mean \$21,800 and standard deviation \$400. A random sample of 4 cars of the model will be selected.

What is the correct unit of measure for the mean of the sampling distribution of  $\bar{x}$  ?


- (A) Dollars 
- (B) Models
- (C) Cars
- (D) Samples
- (E) There are no units associated with the mean of the sampling distribution.

### Answer A

Correct. The unit for the mean of the sampling distribution of  $\bar{x}$  is the same as the unit for the individual sample means, which is dollars.

4. A fair die has its faces numbered from 1 to 6. Let random variable  $F$  represent the number landing face up when the die is tossed. The probability distribution for the random variable has mean 3.5 and standard deviation 1.7078. Consider a simulation with 400 trials designed to estimate the sampling distribution of the sample mean for 5 tosses of the die. For each trial, the die is tossed 5 times, and the mean of the 5 values landing face up is recorded.

The mean and standard deviation of the results of the simulation should be close to which of the following?

- (A) Mean 3.5 and standard deviation 1.7078
- (B) Mean 3.5 and standard deviation 0.7638 
- (C) Mean 3.5 and standard deviation 0.0854
- (D) Mean 17.5 and standard deviation 1.7078
- (E) Mean 17.5 and standard deviation 0.7638

### Answer B

Correct. Since 400 is large, the mean of the 400  $\bar{x}$  values will be close to the mean of the sampling distribution, which equals the population mean of 3.5. The standard deviation will also be close to the standard deviation of the sampling distribution of sample means, which equals the population standard deviation divided by the square root of 5, or  $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{1.7078}{\sqrt{5}} \approx 0.7638$ .

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5. The mean number of pets owned by the population of students at a large high school is 3.2 pets per student with a standard deviation of 1.7 pets. A random sample of 16 students will be selected and the mean number of pets for the sample will be calculated.

What is the mean of the sampling distribution of the sample mean for samples of size 16 ?

(A) 1.7

(B) 3.2

(C)  $\frac{3.2}{\sqrt{16}}$

(D)  $\frac{1.7}{\sqrt{16}}$

(E)  $\sqrt{\frac{1.7}{16}}$

**Answer B**

Correct. The mean of the sampling distribution of the sample mean is equal to the population mean.

6. For which of the following is the shape of the sampling distribution of the sample mean approximately normal?

I. A random sample of size 5 from a population that is approximately normal

II. A random sample of size 10 from a population that is strongly skewed to the right

III. A random sample of size 60 from a population that is strongly skewed to the left

(A) I only

(B) III only

(C) I and II only

(D) I and III only

(E) I, II, and III

**Answer D**

Correct. If the population is normal, the sampling distribution is assumed normal for any size sample, as is described in choice I. If the population is not normal, the sampling distribution is assumed normal if the size of the sample is at least 30, as is described in choice III. In choice II, the sample size is not large enough to assume a normal sampling distribution from a skewed population.

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7. The distribution of age for players of a certain professional sport is strongly skewed to the right with mean 26.8 years and standard deviation 4.2 years. Consider a random sample of 4 players and a different random sample of 50 players from the population.

Which of the following statements is true about the sampling distributions of the sample mean ages for samples of size 4 and samples of size 50 ?

- (A) Both will be skewed to the right, and the mean for size 50 will be closer to 26.8 than the mean for size 4.
- (B) Both will be skewed to the right, and the standard deviation for size 50 will be closer to 4.2 than the standard deviation for size 4.
- (C) Both will be approximately normal, and the mean for size 50 will be closer to 26.8 than the mean for size 4.
- (D) Only the sampling distribution for size 4 will be approximately normal, and the standard deviation for both will be 4.2.
- (E) Only the sampling distribution for size 50 will be approximately normal, and the mean for both will be 26.8. ✓

### Answer E

Correct. The sampling distribution of the sample mean will be approximately normal for populations that are not normal if the sample size is at least 30. The sample of size 4 is not large enough to assume normality for a skewed distribution. Both sampling distributions will have a mean equal to the population mean of 26.8.

8. A reading specialist wanted to estimate the mean word length, in number of letters, for an elementary school history textbook. The specialist took repeated random samples of size 100 words and estimated the mean and standard deviation of the sampling distribution to be 4.9 letters and 0.15 letter, respectively.

Based on the estimates for the sampling distribution, which of the following provides the best estimates of the population parameters?

- (A) Mean 4.9 letters and standard deviation 0.015 letter
- (B) Mean 4.9 letters and standard deviation 0.15 letter
- (C) Mean 4.9 letters and standard deviation 1.5 letters ✓
- (D) Mean 0.49 letter and standard deviation 0.15 letter
- (E) Mean 49 letters and standard deviation 15 letters

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### Answer C

Correct. The mean of the sampling distribution is equal to the population mean. The standard deviation of the sampling distribution is the population standard deviation divided by the square root of the sample size. In this case,  $\frac{\sigma}{\sqrt{100}} = 0.15$ . So the population standard deviation  $\sigma$  must equal  $0.15(10) = 1.5$ .

9. At a large corporation, the distribution of years of employment for the employees has mean 20.6 years and standard deviation 5.3 years. A random sample of 100 employees was selected and surveyed about employee satisfaction. The sample of employees had a mean 20.3 years and standard deviation 6.1 years.

Remy claims that the mean of the sampling distribution of the sample mean for samples of size 100 is 20.6 years. Is Remy's claim correct?

- (A) No. The mean of the sampling distribution is 20.3 years.
- (B) No. The mean of the sampling distribution is 20.3 employees.
- (C) No. The mean of the sampling distribution is 5.3 years.
- (D) No. The mean of the sampling distribution is 20.6 employees.

(E) Yes. The mean of the sampling distribution is 20.6 years.



### Answer E

Correct. Remy's claim is correct. The mean of the sampling distribution for the sample mean is equal to the population mean, which is 20.6 years.