2026 MA 116 Exam 1

NAME:

Part I: True / False

1. True or False: The sampling distribution of $\bar{x}$ is normal for **any** sample size if the population itself is normally distributed.

A) True B) False

2. True or False: If the population distribution is strongly skewed to the right, the distribution of $\bar{x}$ has to be skewed to the right.

A) True B) False

3. True or False: Suppose a normal variable x has mean 3 and standard deviation 1, then the probability density function of x has the same shape as the standard normal distribution, but the probability density function of x is horizontally shifted to the right, compared to the standard normal distribution.

A) True B) False

4. True or False: A 95% confidence interval means there is a 95% probability that the true population mean lies inside the interval obtained from a particular sample.

A) True B) False

5. True or False: The mean of the sampling distribution of $\hat{p}$ is p, and the standard deviation of $\hat{p}$ is $\sqrt{\dfrac{p(1-p)}{n}}$. This holds even if $np(1-p) < 10$.

A) True B) False

6. True or False: $z_{0.1}$ is the area under the standard normal curve to the right of $z = 0.1$.

A) True B) False

7. True or False: $P(z \geq 1) = P(z \leq -1)$ if z is the standard normal variable.

A) True B) False

8. True or False: For a normal variable x, there exists some number a such that $f(a) = 0$, where $f(x)$ is the probability density function of x.

A) True B) False

9. True or False: It is appropriate to use the normal distribution to approximate a binomial distribution with $n = 11$ and $p = 0.4$.

A) True B) False

10. True or False: For a normal random variable x with mean μ and standard deviation σ, the total area under the curve of $f(x)$ and the x-axis is always equal to 1.

A) True B) False

Part II: Multiple Choice

11. A population has mean $\mu = 80$ and standard deviation $\sigma = 24$. Consider random samples of size $n = 64$. What is the standard deviation of the sampling distribution of $\bar{x}$?

A) 24 B) 8 C) 3 D) 0.375

12. Suppose a population has mean $\mu = 120$ and standard deviation $\sigma = 30$. If a random sample of size $n = 100$ is selected, what is the probability that the sample mean $\bar{x}$ is greater than 126?

A) 0.0228 B) 0.9772 C) 0.1587 D) 0.8413

13. Find the value of $z_{0.15}$.

A) 1.04 B) 1.645 C) 0.52 D) -1.645

14. The tread life of a particular brand of tire follows a normal distribution with mean 60,000 miles and standard deviation 1,100 miles. What is the probability that a randomly selected tire of this brand will last longer than 58,900 miles?

A) 0.1587 B) 0.8413 C) 0.5000 D) 0.3413

15. Suppose X is normally distributed with mean $\mu = 80$ and standard deviation $\sigma = 16$. Compute $P(36 < X < 100)$.

A) 0.8944 B) 0.7888 C) 0.8914 D) 0.8819

16. Assuming all conditions are met, to compute $P(12 \leq x \leq 15)$ from a binomial distribution using the normal approximation, we compute:

A) $P(12.5 < x < 14.5)$

B) $P(11.5 < x < 15.5)$

C) $P(x > 15.5)$ and $P(x < 11.5)$

D) $P(x > 12.5)$ and $P(x < 14.5)$

17. Assuming all conditions are met, to compute $P(x \geq 19)$ from a binomial distribution using the normal approximation, we compute:

A) $P(x \geq 19.1)$ B) $P(x \leq 18.9)$ C) $P(x \geq 18.5)$ D) $P(x \leq 18.5)$

18. Find the probability that in 200 tosses of a fair six-sided die, a **four** will be obtained at most 40 times. Use normal distribution to approximate a binomial distribution.

A) 56.36% B) 10.2% C) 91.31% D) 89.8%

19. A population proportion is believed to be $p = 0.38$. What is the **minimum** sample size needed so that the sampling distribution of $\hat{p}$ is approximately normal (i.e. $np(1 - p) \geq 10$)?

A) 10 B) 25 C) 42 D) 43

20. A random sample of 400 adults is selected. Suppose $p = 32\%$ of adults prefer online shopping. Find the mean and standard deviation of the sampling distribution of $\hat{p}$.

A) $\mu_{\hat{p}} = 0.32,\ \sigma_{\hat{p}} = 0.023$

B) $\mu_{\hat{p}} = 128,\ \sigma_{\hat{p}} = 9.32$

C) $\mu_{\hat{p}} = 0.50,\ \sigma_{\hat{p}} = 0.023$

D) $\mu_{\hat{p}} = 0.32,\ \sigma_{\hat{p}} = 0.32$

21. The probability that a football game goes into overtime is 19%. What is the probability that, among 150 randomly selected football games, at most 20 games went overtime? Use sampling distribution of $\hat{p}$ to calculate this probability.

A) 5% B) 3.84% C) 16.2% D) 96.16%

22. Adult height in a country is approximately normally distributed with mean 170 cm and standard deviation 9 cm. What is the probability that a group of 9 randomly chosen adults from this country has a group average height of at least 174.5 cm?

A) 0.3085 B) 0.1915 C) 0.0668 D) 0.8085

23. Family income in the US is not normally distributed because a small number of families earn extremely high amounts, creating a right-skewed distribution. The mean family income is about 110 thousand dollars and standard deviation 100 thousand dollars. Find the probability that a random sample of 100 US families has a sample mean in between 85 and 95 thousand dollars.

A) 3.09% B) 93.94% C) 99.38% D) 6.06%