

Quiz 3 — Normal Distributions, the Exponential Distribution, and Sampling Distributions

STAT 515 · Ott & Longnecker §4.9–4.13 · Covers Homework 5

Name: _____

Date: Wednesday, Oct 14, 2026

Total Points: 40 · Time: 15 minutes

Show your work. For every probability, write down the z -score (or the exponential formula) you used before giving the final number. You may use the standard normal table.

Useful values: $z_{0.90} = 1.28$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$.

Problem 1: Short Answer (8 points)

(a) State the Central Limit Theorem. Your statement must say what is assumed about the sample and what conclusion follows about the sampling distribution of $\bar{X}$. (4 points)

(b) You make a normal Q–Q plot of a data set and the points lie close to a straight line in the middle but curve sharply away from the line at **both** ends. What does this tell you about the shape of the distribution, and would you treat the data as normal? (4 points)

Problem 2: The Normal Distribution (12 points)

The resting heart rate of healthy adults is approximately normally distributed with mean $\mu = 72$ beats per minute and standard deviation $\sigma = 8$ bpm. Let X be the resting heart rate of a randomly

selected adult.

(a) Find $P(X > 84)$. (4 points)

(b) Find $P(64 < X < 80)$. (4 points)

(c) Find the 90th percentile of resting heart rate. (4 points)

Problem 3: Sampling Distribution of $\bar{X}$ (12 points)

The time students take to complete an online training module is strongly **right-skewed**, with population mean $\mu = 15$ minutes and population standard deviation $\sigma = 6$ minutes. A random sample of $n = 49$ students is selected.

(a) State the mean and the standard error of the sampling distribution of $\bar{X}$, and explain why $\bar{X}$ is approximately normal even though the population is skewed. (4 points)

(b) Find $P(\bar{X} > 16.5)$. (4 points)

(c) Suppose the sample size is increased from $n = 49$ to $n = 196$. Compute the new standard error. By what factor did the sample size change, and by what factor did the standard error change? (4

points)

Problem 4: The Exponential Distribution (8 points)

Calls arrive at a help desk according to a Poisson process at a rate of $\lambda = 4$ calls per hour. Let Y be the waiting time until the next call.

(a) State the distribution of Y and give its mean and standard deviation **in minutes**. (4 points)

(b) Find the probability that the next call arrives more than 20 minutes from now. Use $P(Y \geq a) = e^{-a/\theta}$. (4 points)