

Middle East Technical University
Department of Economics
Econ 206: Statistics for Economists-II

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Recitation 2

November 20, 2025

Question 1

A binomial experiment consisting of n trials resulted in observations $y_1, y_2, \dots, y_n$ where $y_i = 1$ if the i -th trial was a success and $y_i = 0$ otherwise. Since each Y_i is a Bernoulli random variable, the probability mass function is given by:

$$P(Y_i = y_i) = p^{y_i}(1 - p)^{1-y_i}, \quad y_i = 0, 1$$

Find the MLE of p , the probability of a success.

Question 2

Let $X_1, X_2, \dots, X_n$ be a random sample from a normal distribution with unknown mean μ and unknown variance σ^2 .

- (a) Find the maximum likelihood estimators for both μ and σ^2 .
- (b) Show that the MLE for σ^2 is biased.
- (c) Suggest an unbiased estimator for σ^2 and verify its unbiasedness.

Question 3

Suppose that a company requests 541 customers to rate their services. The average rating was estimated as 5.68. From earlier years, the standard deviation of the customer population is known to be 1.21. Construct:

- (a) 90% confidence interval,
- (b) 95% confidence interval,
- (c) 99% confidence interval,
- (d) Discuss which one is larger and why.

Question 4

Suppose, for a sample selected from a normally distributed population, $\bar{x} = 65.5$. The population standard deviation is known to be 8.6.

- (a) Construct a 95% confidence interval assuming $n = 16$.
- (b) Construct a 90% confidence interval assuming $n = 16$. Is the width smaller or larger than (a)? Explain.
- (c) Construct a 95% confidence interval assuming $n = 25$. Is it larger or smaller than (b)? Explain.