Yaşar University

Department of Mathematics

MATH 2240 Probability and Statistics for Engineers

MIDTERM-2 28.12.2023

1. (25) The mean commuting time between a person's home and office is 24 minutes. The standard deviation is 2 minutes. Assume the variable is normally distributed.

a) Find the probability that it takes a person between 24 and 28 minutes to get to work.

b) Find the probability that it takes a person more than 28 minutes to get to work.

2. (15) An electronic firm claims that their new line of Plasma televisions will last for 50000 hours. A consumer research group decides to test this claim. The group randomly selects 50 televisions to test. The data from this sample shows that mean life of 50 television is 47000 hours and population standard deviation is known to be 1100. Determine the 99% confidence interval for the mean life of a television.

3. (30) A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate for the three products are 1%, 3%, and 2% respectively. If a random product was observed and found to be defective, which plan was most likely used and thus responsible?

4. (30) The bivariate data for two variables x (independent variable) and y (dependent variable) are given in the table below.

x	1	2	3	4	5
y	-3	-1	0	1	2

a) Display the scatter plot.

b) If a straight-line relationship exists between x and y, find the equation of the Least Squares Line (Regression Line).

c) Calculate the correlation coefficient r.

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} \qquad \bar{x} = \frac{\sum x_i}{n} \qquad s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$$

$$P(X = x) = \frac{\binom{M}{x}\binom{L}{n-x}}{\binom{N}{n}}$$ (Hypergeometric Dist.)

$$P(X = x) = p(1-p)^{x-1} \ , \ x = 1,2,\ldots$$ (Geometric Dist.)

$$P(X = x) = \binom{x-1}{r-1} p^r (1-p)^{x-r} \ , \ x = r, r+1, \ldots$$ (Negative Binomial Dist.)

$$P(X = x) = \frac{e^{-\lambda}(\lambda)^x}{x!}$$ (Poisson Dist.)

$$\bar{X} - z_c \frac{\sigma}{\sqrt{n}} < \mu < \bar{X} + z_c \frac{\sigma}{\sqrt{n}} \qquad z_c = z_{\alpha/2}$$

$$\bar{X} - t_c \frac{s}{\sqrt{n}} < \mu < \bar{X} + t_c \frac{s}{\sqrt{n}} \qquad t_c = t_{\alpha/2}$$ d.f. = $n - 1$

$$\hat{y} = b_0 + b_1 x \qquad b_1 = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \qquad b_0 = \bar{y} - b_1 \bar{x}$$

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sqrt{(\sum x^2) - \frac{(\sum x)^2}{n}}\sqrt{(\sum y^2) - \frac{(\sum y)^2}{n}}}$$