

Indian Institute of Technology Jodhpur

Statistics for Data Science - MAL 7060

First Semester (2024-25)

Assignment - 1

1. The 50 measurements of acid rain in a city are

3.58	3.80	4.01	4.01	4.05	4.05	4.12	4.18	4.20	4.21
4.27	4.28	4.30	4.32	4.33	4.35	4.35	4.41	4.42	4.45
4.45	4.50	4.50	4.50	4.50	4.51	4.52	4.52	4.52	4.57
4.58	4.60	4.61	4.61	4.62	4.62	4.65	4.70	4.70	4.70
4.70	4.72	4.78	4.78	4.80	5.07	5.20	5.26	5.41	5.48

- (a) Determine the Mean and Standard Deviation
 - (b) Calculate the Median and Quartiles
 - (c) Find the 90th percentile
 - (d) Determine the intervals $\bar{x} \pm s, \bar{x} \pm 2s, \bar{x} \pm 3s$
 - (e) What proportions of the measurements lie in those intervals
 - (f) Compare the findings with the empirical guidelines for bell-shaped distributions
2. The hours of sleep data suggest that the population of hours of sleep can be modeled as normal distribution with mean = 7.2 hours and sd = 1.3 hours.
- (a) Determine the probability assigned to sleeping less than 6.5 hours.
 - (b) Find the 70th percentile of the distribution for hours of sleep.
3. From a set of numbers $\{3, 5, 7\}$, a random sample of size 2 is selected with replacement.
- (a) List all possible samples and evaluate \bar{x} and s^2 .
 - (b) Determine the sampling distributions of \bar{X} and S^2
4. From a set of numbers $\{0, 2, 4, 6\}$, a random sample of size 2 is selected with replacement. Define the range $R = \text{Largest Observation} - \text{Smallest Observation}$.
- (a) List all possible samples and evaluate R .
 - (b) Determine the sampling distributions of R
5. Suppose that the load of an airplane wing is a random variable X with $N(1000, 14400)$ distribution. The maximum load that the wing can withstand is a random variable Y which is $N(1260, 2500)$. If X and Y are independent, find the probability that the load encountered by the wing is less than its critical load.
6. If the service life of electron tubes in a particular application is normally distributed, and if 92.5 % of the tubes have lives greater than 2,160 hours, while 3.92 % have lives greater than 17,040 hours, what are the mean and S.D. of the service life?

7. Suppose that 10 percent of the probability for a certain distribution that is $N(\mu, \sigma^2)$ is below 60 and 5 percent is above 90. What are the values of μ and σ ?
8. The lifetime of a color TV picture tube is normally distributed, with the mean of 8 years and a S.D. of 2 years.
 - (a) What is the probability that a picture tube will last more than 10 years?
 - (b) If the firm guarantees the picture tube for 4 years, what percentage of the tubes sold will have to be replaced?
9. Let random variables X_1, X_2, X_3 be independent and distributed according to $N(0; 1)$; $N(1; 1)$, and $N(2; 1)$, respectively. Determine probability $P(X_1 + X_2 + X_3 > 1)$.
10. Extensive data suggest that the number of extracurricular activities per week can be modeled as a distribution with mean 1.9 and standard deviation 1.6.
 - (a) If a random sample of size 41 is selected, what is the probability that the sample mean will lie between 1.7 and 2.1?
 - (b) If a random sample of size 100 is selected, what is the probability that the sample mean will lie between 1.7 and 2.1?