

Course: Statistics for Management (8409)
Semester: Autumn, 2021

ASSIGNMENT No. 1

Q.1 The North Carolina Consumers Bureau has conducted a survey of cable television providers in the state. Here are the number of channels they offer in basic services:

32 28 31 15 25 14 12 29 22 28 29 32 33 24 26 8 35

(a) Calculate the median number of channels provided.

Observations in the ascending order are :

8, 12, 14, 15, 22, 24, 25, 26, 28, 28, 29, 29, 31, 32, 32, 33, 35

Here, $n = 17$ is odd.

$$M = \text{value of } \left(\frac{n+1}{2}\right)^{\text{th}} \text{ observation}$$

$$= \text{value of } \left(\frac{17+1}{2}\right)^{\text{th}} \text{ observation}$$

$$= \text{value of } 9^{\text{th}} \text{ observation}$$

$$= 28$$

(b) Calculate the mean number of channels provided.

$$\text{Mean } \bar{x} = \frac{\sum x}{n}$$

$$= \frac{32 + 28 + 31 + 15 + 25 + 14 + 12 + 29 + 22 + 28 + 29 + 32 + 33 + 24 + 26 + 8 + 35}{17}$$

$$= \frac{423}{17}$$

$$= 24.8824$$

(c) Which value is the better measure of the central tendency of these data?

Mean is better measure of central tendency for these data rather than median because mean is easily calculated.

Q.2 A bag contains 32 marbles: 4 are red, 9 are black, 12 are blue, 6 are yellow and 1 is purple. Marbles are drawn one at a time with replacement. What is the probability that:

(a) The second marble is yellow given the first one was yellow?

$$P(B \cap A) = P(B)P(A) \Rightarrow P(B|A) = \frac{P(B)P(A)}{P(A)} = P(B) = \frac{6}{32} = \frac{3}{16}$$

(b) The second marble is yellow given the first one was black?

$$P(B \cap A) = P(B)P(A) \Rightarrow P(B|A) = \frac{P(B)P(A)}{P(A)} = P(B) = \frac{6}{32} = \frac{3}{16}$$

(c) The third marble is purple given both the first and second were purple.

Total number of marbles=4+9+12+6+1=32

The probability of pulling out a purple marble in the 1st case= 1/32

Q. 3 The university has decided to test three new kinds of light bulbs. They have three identical rooms to use in the experiment. Bulb 1 has an average life-time of 1,470 hours and a variance of 156. Bulb 2 has an average lifetime of 1,400 hours and a variance of 81. Bulb 3 has an average lifetime of 1,350 hours and a standard deviation of 6 hours. Rank the bulbs in terms of relative variability. Which was the best bulb?

Bulb 1 = 1470 hours

Bulb 1 Variance = 156

Bulb 2 = 1400 hours

Bulb 2 Variance = 81

Bulb 3 = 1350 hours

Bulb 3 SD = 6 hours

Relative variability:

Bulb 1 is better from bulb 2 and 3. But bulb 3 is better from bulb 2.

Q. 4 Jarrod Medical, Inc., is developing a compact kidney dialysis machine, but its chief engineer, Mike Crowe, is having trouble controlling the variability of the rate at which fluid moves through the device. Medical standards require that the hourly flow be 4 liters, plus or minus 0.1 liter, 80 percent of the time. Mr. Crowe, in testing prototype, has found 68 percent of the time, the hourly flow is within 0.08 liter of 4.02 liters. Does the prototype satisfy the medical standards?

Medical Standard:

Hourly Flow = 4 ± 0.1 Liter

Time = 80%

Mr. Crowe:

Time = 68%

Flow within = 0.08 in 4.02 liter.

$$P(4 < X < 4.02) = (4 - 0.08 < X < 4.02 + 0.08) = P(-0.08 < Z < 0.08) = 0$$

Q. 5 An oil refinery has backup monitors to keep track of the refinery flows continuously and to prevent machine malfunctions from disrupting the process. One particular monitor has an average life of 4,300 hours and a standard deviation of 730 hours. In addition to the primary monitor, the refinery has set up two standby units, which are duplicates of the primary one. In the case of malfunction of one of the monitors, another will automatically take over in its place. The operating life of each monitor is independent of the others.

Average Life = 4300

SD = 730

(a) What is the probability that a given set of monitors will last at least 13,00 hours?

$$P(1300 < X < 4300) = P(1300 - 4300 < X - 4300 < 4300 - 4300) = P(-3000/730 < (X - \text{Mean})/SD < 0)$$

$$P(1300 < X < 4300) = P(-4.11 < Z < 0)$$

$$P(-4.11 < Z < 0) = 0.5$$

(b) At most 12,630 hours?

$$P(12630 < X < 4300) = P(12630 - 4300 < X - 4300 < 4300 - 4300) = P(8330/730 < (X - \text{Mean})/SD < 0)$$

$$P(8330 < X < 4300) =$$

The left side of the interval has to be lesser than the right side. So 12630 hour is not possible.