

Task 1:**Problem 1**

You survey households in your area to find the average rent they are paying. Find the standard deviation from the following data:

\$1550, \$1700, \$900, \$850, \$1000, \$950.

Solution:

$$\text{Mean} = 1550 + 1700 + 900 + 850 + 1000 + 950 / 6$$

$$\text{Mean} = 1158.33$$

$$\text{S.D} = \sqrt{\text{sum}((xi - \mu)^2)/N}$$

$$= \sqrt{((1550 - 1158.33)^2 + (1700 - 1158.33)^2 + (900 - 1158.33)^2 + (850 - 1158.33)^2 + (1000 - 1158.33)^2 + (950 - 1158.33)^2)/6}$$

$$\text{S.D} = 335.93$$

Problem 2

Find the variance for the following set of data representing trees in California (heights in feet):

3, 21, 98, 203, 17, 9

Solution:

$$\text{Mean} = 3 + 21 + 98 + 203 + 17 + 9$$

$$\text{Mean} = 58.5$$

$$\text{Variance} = (\text{sum}((xi - \mu)^2)/N)$$

$$= ((3 - 58.5)^2 + (21 - 58.5)^2 + (98 - 58.5)^2 + (203 - 58.5)^2 + (17 - 58.5)^2 + (9 - 58.5)^2)/6$$

$$\text{Variance} = 5183.25$$

Problem 3

In a class on 100 students, 80 students passed in all subjects, 10 failed in one subject, 7 failed in two subjects and 3 failed in three subjects. Find the probability distribution of the variable for number of subjects a student from the given class has failed in.

Solution:

In a class on 100 students, 80 students passed in all subjects,

Solution:

Probability of Failing in 0 subjects = $80/100$

Probability of Failing in 1 subjects = $10/100$

Probability of Failing in 2 subjects = $7/100$

Probability of Failing in 3 subjects = $3/100$

Expected number of subjects in which failed = $0 * (80/100) + 1(10/100) + 2(7/100) + 3(3/100)$
 $= (0 + 10 + 14 + 9)/100$
 $= 33/100$

Task 2:

Problem 1

A test is conducted which is consisting of 20 MCQs (multiple choices questions) with every MCQ having its four options out of which only one is correct. Determine the probability that a person undertaking that test has answered exactly 5 questions wrong.

Solution:

Here $N = 20$,

the probability of success = $p = 5/20 = 0.25$,

the probability of failure $q = 1 - p = 1 - 0.25 = 0.75$

test has answered exactly 5 questions wrong, $x = 5$

According to Binomial distribution

$$P(x, N, p) = {}^N C_x p^x q^{N-x}$$

$${}^N C_x = \frac{N!}{x!(N-x)!}$$

$$P(x, N, p) = \frac{20!}{5!(20-5)!} * 0.25^5 0.75^{15}$$

$$P(x = 5 \text{ out of } 20) = 0.0000034$$

Problem 2:

A die marked A to E is rolled 50 times. Find the probability of getting a "D" exactly 5 times.

Solution:

Here, $N = 50$, $x = 5$, $N - x = 45$.

The probability of success = probability of getting a "D" = $s = 1/5$

Hence, the probability of failure = probability of not getting a "D" = $1 - s = 4/5$

According to Binomial distribution

$$P(x, N, p) = C_x^N p^x q^{N-x}$$

$$C_x^N = N! / x!(N-x)!$$

$$P(x, N, p) = 50! / 5! (50 - 5)! * 0.2^5 0.8^{45}$$

$$P(x = 5 \text{ out of } 50) = 0.0295$$

Problem 3:

Two balls are drawn at random in succession without replacement from an urn containing 4 red balls and 6 black balls. Find the probabilities of all the possible outcomes.

Solution:

$$\text{Total Outcomes} = 6 + 4 = 10$$

$$\text{Probability of getting red ball} = 4/10 = 2/5$$

$$\text{Probability of getting black ball} = 6/10 = 3/5$$