Session-9 Assignment Solution Task-1

1Q :-> You survey households in your area to find the average rent they are paying. Find the Standard Deviation for the following data.
$1550, $1700, $900, $850, $1000, $950

Soln :->

Average rent pay by household = $1550, $1700, $900, $850, $1000, $950

$$\text{Mean} = \bar{x} = \frac{\$1550 + \$1700 + \$900 + \$850 + \$1000 + \$950}{6}$$

$$= \frac{\$6950}{6} = \$1158.33$$

n = Number of data

Variance of Average rent pay by household = $V = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$

$$V = \frac{(1150 - 1158.33)^2 + (1700 - 1158.33)^2 + (900 - 1158.33)^2 + (850 - 1158.33)^2 + (1000 - 1158.33)^2 + (950 - 1158.33)^2}{6 - 1}$$

$$= \frac{158405.38 + 293406.38 + 66734.38 + 95067.38 + 25068.38 + 43401.38}{5}$$

$$= \frac{677083.28}{5} = 135416.656$$

Standard deviation = $\sqrt{\text{variance}} = \sqrt{135416.656}$

= $367.99

20:→ Find the variance for the following set of data representing height of trees in California

$$x = 3, 21, 98, 203, 17, 9$$

Soln

$$\text{Mean} = \bar{x} = \sum_{i=1}^{n} x_i / n$$

n = number of Data

$$\bar{x} = \frac{3+21+98+203+17+9}{6} = \frac{351}{6} = 58.5$$

$$\text{variance} = V = \sum_{i=1}^{n} (x_i - \bar{x})^2 / n-1$$

$$V = \frac{(3-58.5)^2 + (21-58.5)^2 + (98-58.5)^2 + (203-58.5)^2 + (17-58.5)^2 + (9-58.5)^2}{6-1}$$

$$= \frac{3080.25 + 1406.25 + 1560.25 + 20880.25 + 1722.25 + 2450.5}{5}$$

$$= \frac{31099.5}{5} = 6219.9 \text{ ft}^2$$

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

Soln Probability of failing in 0 subject, $P(x=0) = \frac{80}{100} = 0.8$

Probability of failing in 1 subject, $P(x=1) = \frac{10}{100} = 0.10$

Probability of failing in 2 subject, $P(x=2) = \frac{7}{100} = 0.07$

Probability of failing in 3 subject, $P(x=3) = \frac{3}{100} = 0.03$

Task - 2

1Q:- A Test is conducted which is consisting of 20 MCQs with every MCQs having its 4 options out of which only one is correct Determine the probability that a person undertaking that test has answered exactly 5 question wrong.

Solⁿ:->

Probability of ~~particular~~ getting correct answer for particular question = 1/4

Probability of getting wrong answer for particular question = 3/4

Probability of exactly 5 question answer wrong = $P(x=5)$

$$P(x=5) = \frac{n!}{x!(n-x)!} \times p^x \times (1-p)^{n-x}$$

$$= \frac{20!}{5! \times 15!} \times \left(\frac{3}{4}\right)^5 \times \left(\frac{1}{4}\right)^{15}$$

$$= \frac{\cancel{20} \times 19 \times \cancel{18}^{3} \times 17 \times 16}{\cancel{5 \times 4 \times 3 \times 2 \times 1}} \times \frac{3^5}{4^{20}}$$

$$= \frac{729 \times 17 \times \cancel{18}}{4^{\cancel{18}}} = \frac{235467}{68719476736} = 0.00000342$$

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

Soln

Probability of getting 'D' = $\frac{1}{5}$

Probability of not getting 'D' = $\frac{4}{5}$

Number of occurance of 'D' = 5

Probability of getting 'D' 5 times = $P(x=5)$

$$P(x=5) = \frac{50!}{5! \times 45!} \times \left(\frac{1}{5}\right)^5 \times \left(\frac{4}{5}\right)^{45}$$

$$= \frac{\overset{5}{\cancel{50}} \times 49 \times \overset{4}{\cancel{48}} \times 47 \times 46}{\cancel{5} \times 4 \times \cancel{3} \times \cancel{2} \times 1} \times \frac{(4)^{45}}{5^{50}}$$

$$= \frac{20 \times 49 \times 47 \times 46 \times (4)^{45}}{(5)^{50}} = \frac{211876 \times (4)^{45}}{(5)^{50}}$$

$$= 0.0295$$

30:→ 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.

Soln:→ Possible outcome :→

RR	RB	BR	BB
↓	↓	↓	↓
x_1	x_2	x_3	x_4

Now the probability of first ball being red = $\frac{4}{10}$

Probability of 2nd ball being red = $\frac{3}{9}$

$$P(x_1) = \frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$$

Likewise For 1st Red and 2nd Black ball

Probability of first ball being red = $\frac{4}{10}$

Probability of 2nd ball being black = $\frac{6}{9}$

$$P(x_2) = \frac{\cancel{4}^{2}}{\cancel{10}_{5}} \times \frac{\cancel{6}^{2}}{\cancel{9}_{3}} = \frac{4}{15}$$

Similarly For 1st black and 2nd Red ball

Probability of first ball being black = $\frac{6}{10}$

Probability of 2nd ball being red = $4/9$

$$P(x_3) = \frac{\cancel{6}^{2}}{\cancel{10}_{5}} \times \frac{\cancel{4}^{2}}{\cancel{9}_{3}} = \frac{4}{15}$$

Similarly For 2 Black ball

Probability of first ball being black = $\frac{6}{10}$

Probability of 2nd ball being black = $\frac{5}{9}$

$$P(x_4) = \frac{\cancel{6}^{2}}{\cancel{10}_{2}} \times \frac{\cancel{5}}{\cancel{9}_{3}} = \frac{1}{3}$$