**Question1:**

**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:**

Step 1: Calculation Mean

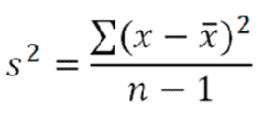
Mean(Xm) = (Sum of Values)/(no. of Values)

= (1550 + 1700 + 900 + 850 + 1000 + 950)/6

= 6950/6

= 1158.33

Step 2: Calculating the Variance (S2)



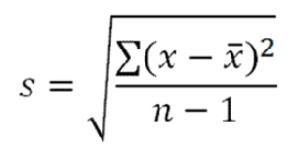
|  |  |  |
| --- | --- | --- |
| X (Avg Rent Being Paid in US$) | X-Xm (Value - Mean) | (X-Xm)2 |
| 1550 | 391.67 | 153402.78 |
| 1700 | 541.67 | 293402.78 |
| 900 | -258.33 | 66736.11 |
| 850 | -308.33 | 95069.44 |
| 1000 | -158.33 | 25069.44 |
| 950 | -208.33 | 43402.78 |
| Sum of (X-Xm)2 | | 677083.33 |

Variance = (Sum of (X-Xm)2)/(n-1) (as shared above)

= 677083.33/5

= 135416.7

Step 3: Calculating the Standard Deviation



Standard Deviation = Sqrt (Variance)

= Sqrt (135416.7)

= 367.99

**Question 2:**

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

**3, 21, 98, 203, 17, 9**

**Solution**

Step 1: Calculation Mean

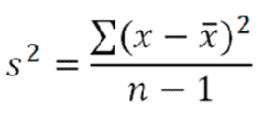
Mean(Xm) = (Sum of Values)/(no. of Values)

= (3 + 21+ 98 + 203 + 17 + 9)/6

= 351/6

= 58.5

Step 2: Calculating the Variance (S2)



|  |  |  |
| --- | --- | --- |
| X (Height of Tree) | X-Xm (Value - Mean) | (X-Xm)2 |
| 3 | -55.50 | 3080.25 |
| 21 | -37.50 | 1406.25 |
| 98 | 39.50 | 1560.25 |
| 203 | 144.50 | 20880.25 |
| 17 | -41.50 | 1722.25 |
| 9 | -49.50 | 2450.25 |
| Sum of (X-Xm)2 | | 31099.50 |

Variance = (Sum of (X-Xm)2)/(n-1) (as shared above)

= 31099.50/5

= 6219.9

**Question3:**

**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:**

The probability of failing in 0 subjects, P(X=0) =80/100 =0.8  
The probability of failing in 1 subjects, P(X=1) =10/100 = 0.1  
The probability of failing in 2 subjects, P(X=2) =7/100 = 0.07  
The probability of failing in 3 subjects, P(X=3) = 3/100 = 0.03

The probability distribution can be shown as:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 |
| P(X) | 0.8 | 0.1 | 0.07 | 0.03 |

**Question 4:**

**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, n - k = 5, Therefore k = 20 - 5 = 15

Here the probability of success = probability of giving a right answer (s) = 1/4

Hence, the probability of failure = probability of giving a wrong answer = 1 - s

= 1 – 1/4

= 3/4

When we substitute these values in the formula for Binomial distribution we get,

So, P (exactly 5 out of 20 answers incorrect) = C (20, 5) \* (1/4) ^ 15 \* (3/4) ^ 5

C (20, 5) \* (1/4) ^ 15 \* (3/4) ^ 5 = (20∗19∗18∗17∗16) / (5∗4∗3∗2∗1) \* (1/4) ^ 15 \* (3/4) ^ 5

= 0.0000034 (approx)

Thus the required probability (**that a person undertaking that test has answered exactly 5 questions wrong**) is **0.0000034** approximately.

**Question 5:**

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

**Solution:**

Here, n = 50, k = 5, Therefore n - k = 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**.

**Question 6:  
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:**

First determine the probabilities of the events.

**Events Probability**

RR = (4/10) (3/9) = 2/15 (Both Balls are Red)

RB = (4/10) (6/9) = 4/15 (First Ball is Red and Second is Black)

BR = (6/10) (4/9) = 4/15 (First Ball is Black and Second is Red)

BB = (6/10) (5/9) = 1/3 (Both Balls are Black)

The probability of 0 black balls (RR) is 2/15

The probability of 1 black ball is (RB or BR) is 4/15+4/15 = 8/15

The probability of 2 black balls (BB) is 1/3

So the probability distribution is as below:

|  |  |
| --- | --- |
| z | p(z) |
| 0 | 2/15 = 0.133 |
| 1 | 8/15 = 0.533 |
| 2 | 1/3 = 0.333 |