**Discrete Random Variable:**

**Is one in which we can produce a countable number of outcomes.** (A random variable represents in number form the possible outcomes which could occur for some random experiment.)

** or; (the probability that the random variable X=x is P)**

**Ex) Consider the experiment of tossing a coin three times in succession. If the random variable x denotes the number of heads observed, list the values that x can have and find the corresponding probability values.**

**Probability Distribution**

* **Tabular Form:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | **0** | **1** | **2** | **3** |
| **P(X=x)** | **1/8** | **3/8** | **3/8** | **1/8** |

* **Function Form:**  **where x= 0, 1, 2, 3**
* **Graphical Representation:**

**Prosperities of the Probability Function:**

1. ****
2. ****

**Ex) The probability distribution of the random variable x is represented by the function P(X=x) = k/x, where x = 1, 2, 3, 4, 5, 6.**

1. **Find the value of k.**
2. **Find **

**Ex) A discrete random variable x has a probability distribution defined by the  where x =0, 1, 2, 3, and 4.**

1. **Display this distribution using a table form.**
2. **Find .**

**Ex) A bag contains 5 white cube and 4 red cubes. Two cubes are selected in such a way that the first cube drawn is not replaced before the next cube is drawn. Find the probability distribution of x, where x denotes the number of white cubes selected from the bag.**

**Exit Slip:**  Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Two friends, Andra and Diana, independently applied for different jobs. The chances that Andra is successful is 0.8 and the chances that Diana is successful is 0.75.
2. If X is denotes that number of successful applications between the two friends, find the probability distribution of x.
3. Find the probability that if one is successful, it is Andra.
4. **A dart board** consisting of concentric circle of radius 1, 2, and 3 units is placed against a wall. Upon throwing a dart, which lands at some random location on the board, a player will receive $8.00 if the smaller circle is hit, $6.00 if the middle annular region is hit, and $4.00 if the outer annular region is hit. However, should the player miss the dart board altogether, they would lose $7.00. The probability that the player missed the dart board is 0.5. In a long run, would it be a fair game for a player?

**Expectation of the random variable x:** 

**Expected value of x, E(x): mean value of x: The expected value is a measure of a probability weighted average or a long-run average.**

**Properties of E(x)**

1. ****
2. ****
3. ****
4. 

**Ex) For the random variable X with probability distribution defined by**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | **1** | **2** | **3** | **4** |
| **P(X=x)** | **1/10** | **2/10** | **3/10** | **4/10** |

**Find the mode, median, and mean values of x.**

**Ex) For the Probability distribution shown below**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | **0** | **1** | **2** | **3** |
| **P(X=x)** | **1/6** | **1/2** | **1/5** | **2/15** |

**Find**

1. **E(x)**
2. **E(x2)**
3. **E(x2+3x - 1)**

**Variance (): The Average of the squared deviations about the mean .**

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**Notes: ; Var(x)=**

**Proof:**

**Standard Deviation: **

* **Variance and Standard deviation provide a measure of the variability of the random variable.**

**Properties of the Variance**

1. ****
2. ****
3. ****

**Ex) A random variable x has a probability distribution defined by**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **0** | **1** | **2** | **3** | **4** |
| **P(X=x)** | **1/16** | **3/16** | **7/16** | **3/16** | **2/16** |

1. **Find .**
2. **Find **
3. **Find **

**The Binomial Distribution**

**Bernoulli Trials: Trials of only two mutually exclusive possible outcomes.**

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*Where n is the number of trials, p is the probability of a success, and 1-p is the probability of a failure***.**

* : X is distributed binomially with parameters n and p.

**Expected Value and Variance of Binomial Distribution**

* 
* 

**Ex) If , find .**

**Ex) A manufacture finds that 30% of the items produced from one of the assembly lines are defective. During a floor inspection, the manufacturer selects 10 items from this assembly line. Find the probability that the manufacturer finds.**

1. **Two defectives**
2. **At least two defectives.**
3. **Find E(x).**
4. **Find the standard Deviation.**

**Ex) The random variable X is such that  and . Find .**