**Discrete Uniform Distribution**

**Discrete Uniform (PMF) and (CDF):**

* discrete\_uniform\_pmf:

Function Purpose:

* + Calculates the Probability Mass Function (PMF) for a discrete uniform distribution.

Parameters:

k: The specific value for which to calculate the PMF.

a: The lower limit of the distribution.

b: The upper limit of the distribution.

Explanation:

* + Returns 1 / (b - a + 1) if k is within the range [a, b]. Otherwise, returns 0.
* discrete\_uniform\_cdf:

Function Purpose:

* + Calculates the Cumulative Distribution Function (CDF) for a discrete uniform distribution.

Parameters:

x: The specific value for which to calculate the CDF.

a: The lower limit of the distribution.

b: The upper limit of the distribution.

Explanation:

* Returns 0 if x is less than a.
* Returns (x - a + 1) / (b - a + 1) if x is within the range [a, b].
* Returns 1 if x is greater than b.

**Discrete Uniform Variance and Expectation:**

Variance Function:

* Calculates the variance of the discrete uniform distribution.

Expectation Function:

* Calculates the expectation (mean) of the discrete uniform distribution.

Parameters:

a: The lower limit of the distribution.

b: The upper limit of the distribution.

Explanation:

* Variance formula: ((b - a + 1)^2 - 1) / 12
* Expectation formula: (a + b) / 2

**Plotting Probability Mass Function (PMF) Function:**

Function Purpose:

* Generates a random sample (X) from the discrete uniform distribution and plots the PMF.

Parameters:

* a: The lower limit of the distribution.
* b: The upper limit of the distribution.
* size: Number of samples in the random sample.

Explanation:

* Generates a random sample of integers between a and b.
* Computes unique values and their counts.
* Calculates the PMF for each unique value and plots the bar chart.

**Plotting Cumulative Distribution Function (CDF) Function:**

Function Purpose:

* Generates a random sample (X) from the discrete uniform distribution and plots the CDF.

Parameters:

* a: The lower limit of the distribution.
* b: The upper limit of the distribution.
* size: Number of samples in the random sample.

Explanation:

* Generates a random sample of integers between a and b.
* Sorts the sample and calculates the CDF for each value, then plots the step chart.