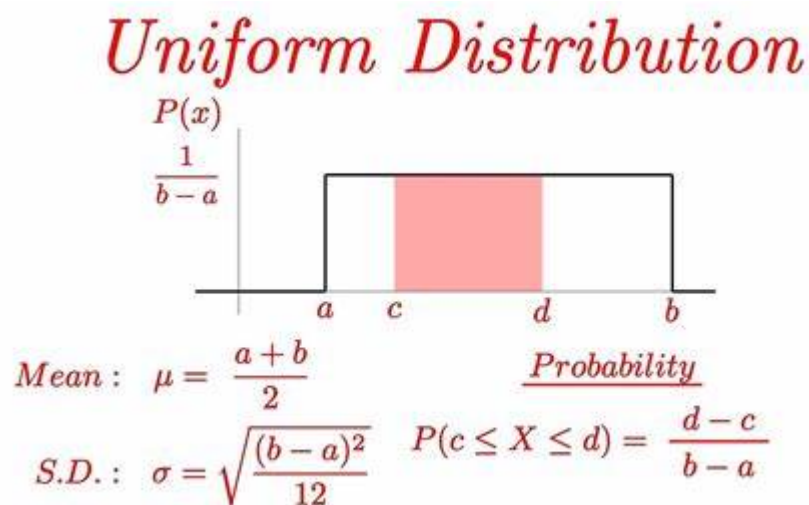# Probability Distribution

1. Uniform Distribution:

Imagine a ruler. The length you measure can be any value between the minimum and maximum markings. A uniform distribution models situations where all values within a specific range are equally likely.

- **Key features:**
  - **Equal probability:** Every value within the specified range (a to b) has an equal chance of occurring.
  - **Applications:** Used in scenarios like random sampling from a defined range (e.g., selecting a random point on a line segment) or modeling random errors within a certain limit.
  - **Probability Density Function (PDF):** A rectangular function with constant height between a and b. The total area under the curve is 1 (representing 100% probability).


2. Exponential Distribution:

Think about the time it takes for light bulbs to burn out. An exponential distribution describes situations where the probability of an event happening

(like a light bulb burning out) decreases as time goes on. There's a higher chance of failure early on, and then the likelihood levels off.

- **Key features:**

  - **Decreasing probability over time:** The probability of the event happening decreases exponentially with time.

  - **Applications:** Used in modeling waiting times (e.g., time between customer arrivals), lifespans of components (e.g., electronic devices), or time gaps between random events.

  - **Probability Density Function (PDF):** A curve that starts high and decreases exponentially as the value increases.
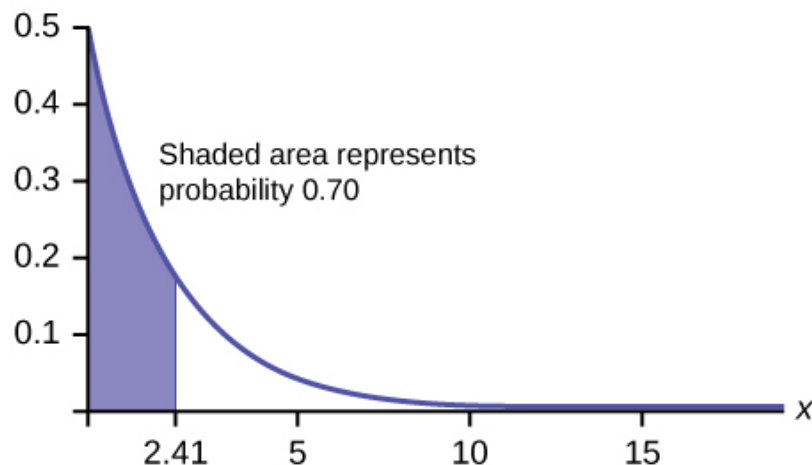
3. Normal Distribution (Bell Curve):

Imagine measuring the heights of people. The normal distribution, also known as the bell curve, is a very common type that describes situations where most values cluster around an average (mean), with fewer values falling further away in either direction.

- **Key features:**

  - **Symmetrical bell shape:** Most values fall around the mean, with fewer occurrences farther out on the tails.

  - **Applications:** Used in modeling a wide variety of natural and human-made phenomena where there's a central tendency with variations

(e.g., heights, weights, test scores, errors in measurements).

- ○ **Probability Density Function (PDF):** A bell-shaped curve that's symmetrical around the mean, with the highest point at the mean and tapering off towards the tails.