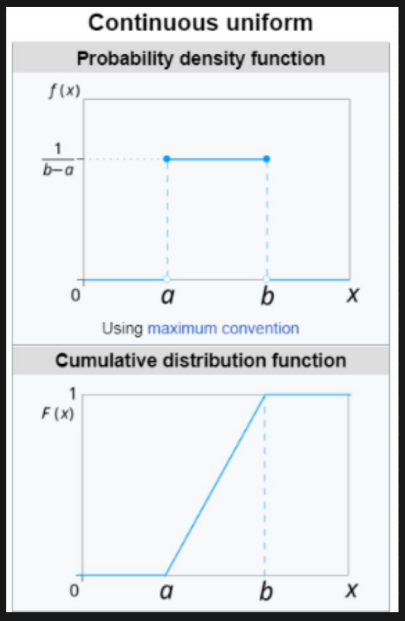
Uniform Distribution

① Continuous Uniform Distribution (pdf) → Here we use the PDF function as we have the continous variable

② Discrete Uniform Distribution (pmf) → uses discrete random variable so PMF

① Continuous Uniform Distribution [Continuous Random Variable]

In probability theory and statistics, the continuous uniform distributions or rectangular distributions are a family of symmetric probability distributions. Such a distribution describes an experiment where there is an arbitrary outcome that lies between certain bounds. The bounds are defined by the parameters, a and b which are the minimum and maximum values.



Notation : $U(a,b)$

Parameters : $-\infty < a < b < \infty$

$$\text{Pdf} = \begin{cases} \frac{1}{b-a} & x \in [a,b] \\ 0 & \text{otherwise} \end{cases}$$

$$\text{Cdf} = \begin{cases} 0 & \text{for } x < a \\ \frac{x-a}{b-a} & \text{for } x \in [a,b] \\ 1 & \text{for } x > b \end{cases}$$

Mean $= \frac{1}{2}(a+b)$ //

Median $= \frac{1}{2}(a+b)$ //

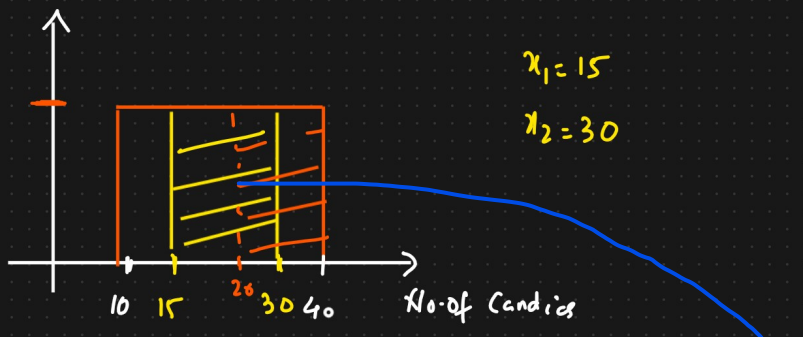
Variance $= \frac{1}{12}(b-a)^2$ //

Eg : The number of candies sold daily at a shop is uniformly distributed with a maximum of 40 candies and a minimum of 10

i) Probability of daily sales to fall between 15 and 30?

Ans)

1 upon b-a = $\frac{1}{30}$



$x_1 = 15$

$x_2 = 30$

$Pr(15 \le X \le 30) = (x_2 - x_1) * \frac{1}{b-a}$ → gives area under curve

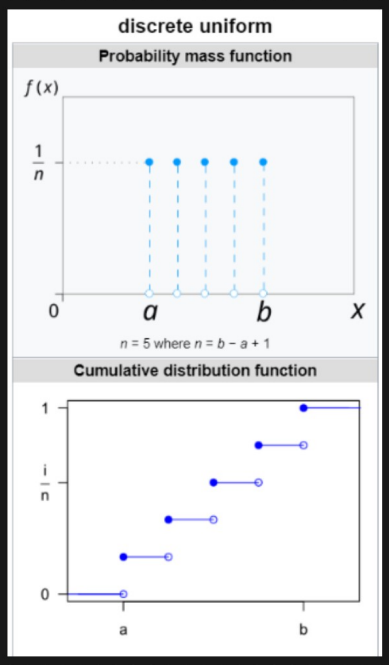
$= (30-15) * \frac{1}{30}$

$= 0.5$ //

$Pr(X \ge 20) = (40-20) * \frac{1}{30} = 0.66 = 66\%$.

② Discrete Uniform Distribution

In probability theory and statistics, the discrete uniform distribution is a symmetric probability distribution wherein a finite number of values are equally likely to be observed; every one of n values has equal probability 1/n. Another way of saying "discrete uniform distribution" would be "a known, finite number of outcomes equally likely to happen".



④ Discrete Random Variable

⑤ pmf

Eg: Rolling a dice ⇒ Fair dice, a ↓ 1, b ↓ 6, {1, 2, 3, 4, 5, 6}

Pr(1) = 1/6
Pr(2) = 1/6
Pr(3) = 1/6
⋮
= 1/6

1/n ⇒ n = b − a + 1 = 6 − 1 + 1 = 6

1/6

Notation $U(a,b)$

Parameters a, b where $b \geq a$

PMF $1/n$

Mean, Median ⌒ $\frac{a+b}{2}$