## Factsheet: Discrete uniform distribution

Michelle Arnetta and Tom Coleman

## **Summary**

A factsheet for the discrete uniform distribution.

$$DUnif(a = 1, b = 6)$$

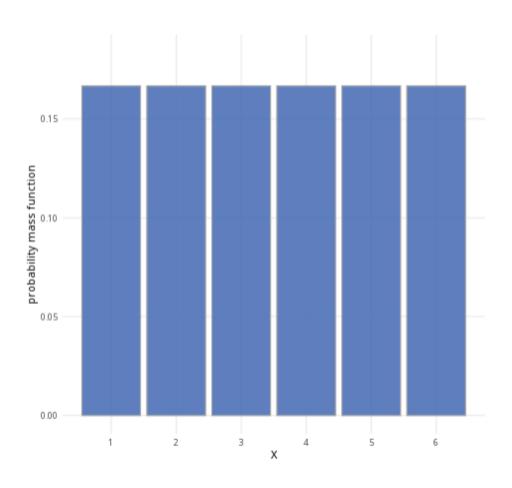


Figure 1: An example of the discrete uniform distribution with a=1 and b=6.

Where to use: The discrete uniform distribution is used when all integer outcomes x in the interval a to b are equally likely. X is a random variable for integer outcomes x where for  $a \le x \le b$ , and the probability of each outcome 1/n, where n = b - a + 1.

**Notation:**  $X \sim \text{Uniform}(a, b)$  or  $X \sim U(a, b)$ 

**Parameters:** The numbers a, b are integers where

- ullet a is the minimum value of an outcome
- b is the maximum value of an outcome

There are n outcomes in total, with n = b - a + 1.

Quantity	Value		Notes
Mean	$\mathbb{E}(X) = \frac{a+b}{2}.$		
Variance	$\mathbb{E}(X) = \frac{a+b}{2}.$ $\mathbb{V}(X) = \frac{n^2-1}{12}.$		
PMF	$\mathbb{P}(X=x) = \frac{1}{n}$		
CDF	$\mathbb{P}(X \leq x) =$		$\lfloor x \rfloor$ is the floor function
	$\int_{0}^{\infty}$	if $x \leq a$	
	$\begin{cases} 0 \\ \lfloor x \rfloor - a + 1 \\ n \end{cases}$	if $a < x < b$	
	(1	$\text{if } x \geq b \\$	

**Example:** You roll a fair six-sided die, where all outcomes (1,2,3,4,5, and 6) are equally likely. This can be expressed as  $X \sim U(1,6)$ . It means 1 is the minimum value and 6 is the maximum value, where all discrete values of X for  $1 \le x \le 6$  are equally likely.

## **Further reading**

This interactive element appears in Overview: Probability distributions.

## Version history

 $v1.0\colon\mbox{initial}$  version created 08/25 by tdhc.

This work is licensed under CC BY-NC-SA 4.0.