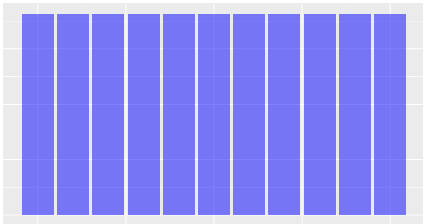
Probability Distributions

(Discrete) Uniform

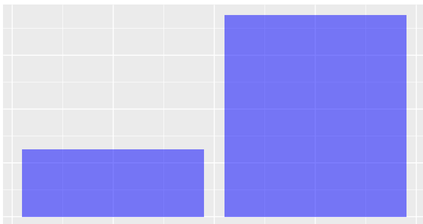
Each integer value in a specified range
is assigned the same value.



Possible values	$\{a, a+1, \ldots, b-1, b\}$
Parameters	lower bound $a \in \mathbb{Z}$, upper bound $b \in \mathbb{Z}$ s.t. $a < b$
Notation	$U(a, b)$
Probability function	$p(x) = \frac{1}{b-a+1}$
Expectation	$\frac{a+b}{2}$
Variance	$\frac{(b-a)(b-a+2)}{12}$
MGF	$M(t) = \frac{1}{b-a+1} \sum_{k=a}^{b} e^{kt}$

Bernoulli

Represents the success of a single experiment as a binary outcome.

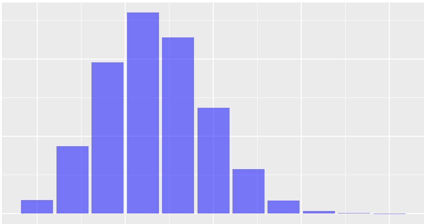


Possible values	$\{0, 1\}$
Parameters	probability of success $0 \leq p \leq 1$
Notation	$\text{Bern}\,(p)$
Probability function	$p(x) = p^x (1-p)^{1-x}$
Expectation	p
Variance	$p(1-p)$
MGF	$M(t) = 1 + p\left(e^t - 1\right)$

Binomial

Represents the number of successes in a fixed number of independent and repeated trials of the same Bernoulli experiment.

Represents the success of a single experiment as a binary outcome.



Possible values	$\{0, 1, 2, \ldots, n\}$
Parameters	number of trials $n \in \mathbb{N}$, probability of success on a single trial $0 \leq p \leq 1$
Notation	$\mathrm{Bin}\,(n, p)$
Probability function	$p(x) = \binom{n}{x} p^x (n-p)^{1-x}$
Expectation	np
Variance	$np(1-p)$
MGF	$M(t) = \Big[1 + p\left(e^t - 1\right)\Big]^n$

Related Distributions

- If $X \sim \mathrm{Bin}\,(n, p)$, then

$$X = \sum_{i=1}^{n} X_i,$$

where the X_i are independent and identically distributed random variables with probability p of success.

Continuous

Multivariate

Discrete

Continuous