

# More Discrete Distributions

Stub: Chapter coming soon!

## Geometric Random Variable

**Notation:**  $X \sim \text{Geo}(p)$

**Description:** Number of experiments until a success. Assumes independent experiments each with probability of success  $p$ .

**Parameters:**  $p \in [0, 1]$ , the probability that a single experiment gives a "success".

**Support:**  $x \in \{1, \dots, \infty\}$

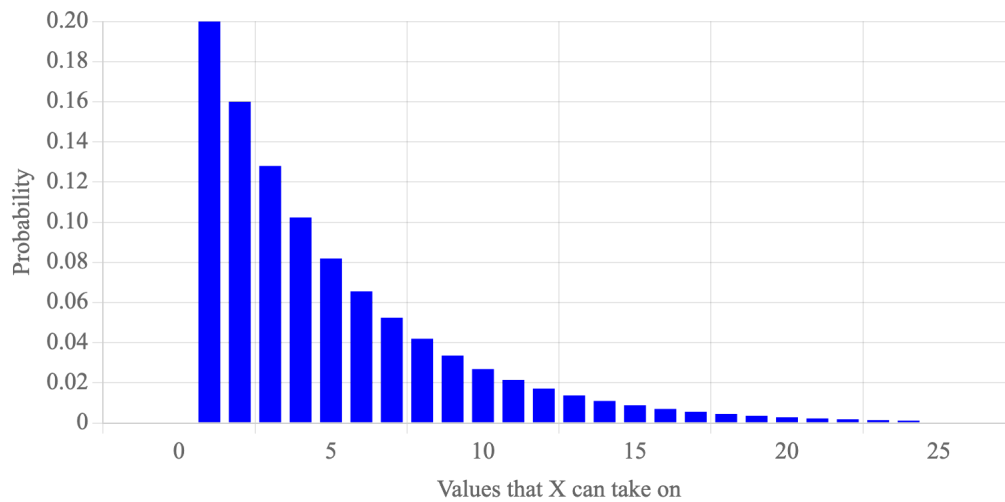
**PMF equation:**  $P(X = x) = (1 - p)^{x-1}p$

**Expectation:**  $E[X] = \frac{1}{p}$

**Variance:**  $\text{Var}(X) = \frac{1-p}{p^2}$

**PMF graph:**

Parameter  $p$ :



## Negative Binomial Random Variable

**Notation:**  $X \sim \text{NegBin}(r, p)$

**Description:** Number of experiments until  $r$  successes. Assumes each experiment is independent with probability of success  $p$ .

**Parameters:**  $r > 0$ , the number of success we are waiting for.  
 $p \in [0, 1]$ , the probability that a single experiment gives a "success".

**Support:**  $x \in \{r, \dots, \infty\}$

**PMF equation:**  $P(X = x) = \binom{x-1}{r-1} p^r (1-p)^{x-r}$

**Expectation:**  $E[X] = \frac{r}{p}$

**Variance:**  $\text{Var}(X) = \frac{r \cdot (1-p)}{p^2}$

**PMF graph:**

Parameter  $r$ : 3

Parameter  $p$ : 0.20

