

# Factsheet: Geometric distribution

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## Summary

A factsheet for the geometric distribution.

Geometric( $p = 0.15$ )

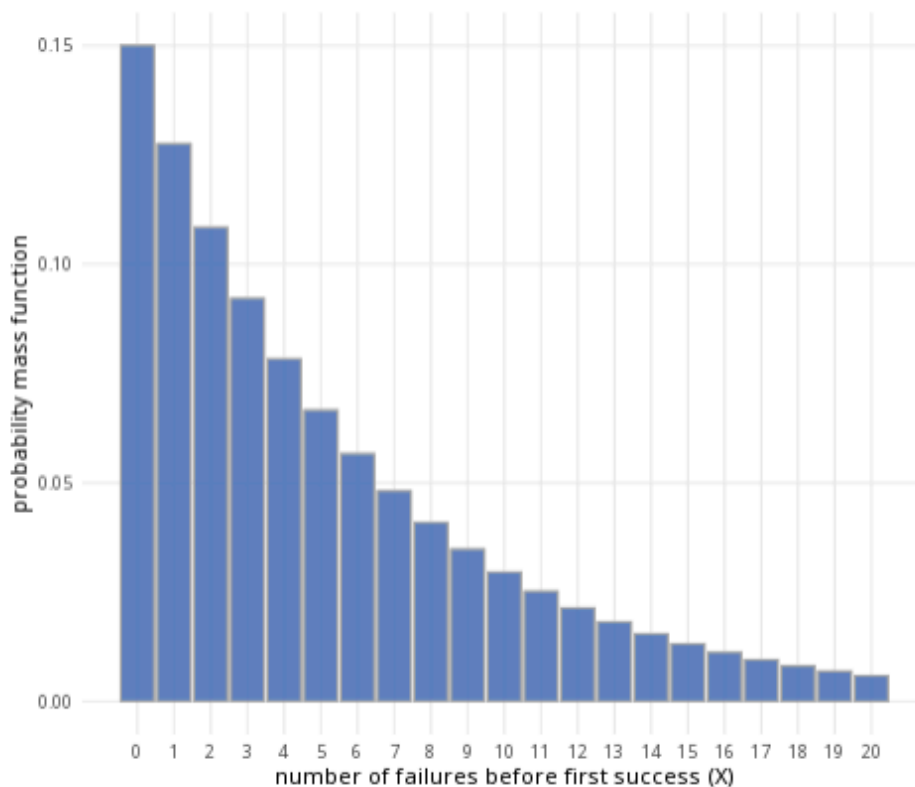


Figure 1: An example of the geometric distribution with  $p = 0.15$ .

**Where to use:** The geometric distribution is used to count  $X$ , the number of Bernoulli trials until a successful outcome is reached.

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

**Parameter:**  $p$  is the real number representing the probability of success in a single trial (where  $0 \leq p \leq 1$ ).

Quantity	Value	Notes
<b>Mean</b>	$\mathbb{E}(X) = \frac{1}{p}$	
<b>Variance</b>	$\mathbb{V}(X) = \frac{1-p}{p^2}$	
<b>PMF</b>	$\mathbb{P}(X = x) = (1-p)^{x-1}p$	
<b>CDF</b>	$\mathbb{P}(X \leq x) = \begin{cases} 1 - (1-p)^x & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$	

**Example:** You flip a coin multiple times, and the probability of getting ‘heads’ is 0.5. You decide to stop flipping the coin once you get a ‘heads’. Taking ‘heads’ as a success, this can be expressed as  $X \sim \text{Geometric}(0.5)$ . It means the probability of success is 0.5, and you will stop conducting trials after you reach a success.

## Further reading

This interactive element appears in [Overview: Probability distributions](#). Please click this link to go to the guide.

## Version history

v1.0: initial version created 04/25 by tdhc and Michelle Arnetta as part of a University of St Andrews VIP project.

- v1.1: moved to factsheet form and populated with material from [Overview: Probability distributions](#) by tdhc.

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