Factsheet: Geometric distribution

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Summary

A factsheet for the geometric distribution.



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:** $X∼Geometric\left(p\right)$

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

| Quantity | Value | Notes |
| --- | --- | --- |
| **Mean** | $E\left(X\right)=\frac{1}{p}$ |  |
| **Variance** | $V\left(X\right)=\frac{1−p}{p^{2}}$ |  |
| **PMF** | $P\left(X=x\right)=\left(1−p\right)^{k−1}p$ |  |
| **CDF** | $P\left(X\leq x\right)=\left\{\begin{matrix}1−\left(1−p\right)^{x}&if x\geq 0\\0&if x<0\end{matrix}\right.$ |  |

**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 $X∼Geometric\left(0.5\right)$. 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.](../overviews/o-distributions.qmd)

## 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](../overviews/o-distributions.qmd) by tdhc.

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