

# Geometric Distribution

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## 1 Geometric Distribution

- Based on
- Examples
- Assumptions

"Probability with R: An Introduction with Computer Science Applications"

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[https://en.wikipedia.org/wiki/Geometric\\_distribution](https://en.wikipedia.org/wiki/Geometric_distribution)

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# Example 1

A newlywed couple plans to have children, and will continue until the first girl. What is the probability that there are zero boys before the first girl, one boy before the first girl, two boys before the first girl, and so on?

## Example 2

A doctor is seeking an anti-depressant for a newly diagnosed patient. Suppose that, of the available anti-depressant drugs, the probability that any particular drug will be effective for a particular patient is  $p=0.6$ . What is the probability that the first drug found to be effective for this patient is the first drug tried, the second drug tried, and so on? What is the expected number of drugs that will be tried to find one that is effective?

## Example 3

A patient is waiting for a suitable matching kidney donor for a transplant. If the probability that a randomly selected donor is a suitable match is  $p=0.1$ , what is the expected number of donors who will be tested before a matching donor is found?

# Assumptions

- The phenomenon being modelled is a sequence of independent trials.
- There are only two possible outcomes for each trial, often designated success or failure.
- The probability of success,  $p$ , is the same for every trial.

# Geometric Random Variables

- If these conditions are true, then the geometric random variable is the count of the number of failures before the first success.
- The possible number of failures before the first success is 0, 1, 2, 3, and so on.
- The geometric random variable  $Y$  is the number of failures before the first success.
- An alternative formulation is that the geometric random variable  $X$  is the total number of trials up to and including the first success,
  - and the number of failures is  $X-1$ .