Binomial Distribution

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Outline

Based on

"Probability with R: An Introduction with Computer Science Applications"
Jane Horgan
https://en.wikipedia.org/wiki/Bernoulli_trial

Bernoulli Trial Example 1

Flipping a coin. In this context, obverse ("heads") conventionally denotes success and reverse ("tails") denotes failure. A fair coin has the probability of success 0.5 by definition. In this case there are exactly two possible outcomes.

Bernoulli Trial Example 2

Rolling a die, where a six is "success" and everything else a "failure". In this case there are six possible outcomes, and the event is a six; the complementary event "not a six" corresponds to the other five possible outcomes.

Bernoulli Trial Example 3

In conducting a political opinion poll, choosing a voter at random to ascertain whether that voter will vote "yes" in an upcoming referendum.

Assumptions of Bernoulli Trials

-In the theory of probability and statistics, a Bernoulli trial (or binomial trial) is a random experiment with exactly two possible outcomes, "success" and "failure", in which the probability of success is the same every time the experiment is conducted.

- Since a Bernoulli trial has only two possible outcomes, it can be

framed as some "yes or no" question. For example:

- Is the top card of a shuffled deck an ace?
- Was the newborn child a girl?

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x <- 0:6

round( ppois(x, 2), 4 )
```

Assumptions in Binomial Distribution (1)

- the binomial distribution with parameters n and p is the discrete

probability distribution of the number of successes in a sequence of n independent experiments, each asking a yes–no question, and each with its own boolean-valued outcome:

- a random variable containing single bit of information:

success/yes/true/one (with probability p) or failure/no/false/zero (with probability q = 1 p).

Assumptions in Binomial Distribution (2)

- A single success/failure experiment is also called a Bernoulli trial or Bernoulli experiment and a sequence of outcomes is called a Bernoulli process;
- for a single trial, i.e., n = 1, the binomial distribution is a Bernoulli distribution.
- The binomial distribution is the basis for the popular binomial test of statistical significance.

Assumptions in Binomial Distribution (3)

- The binomial distribution is frequently used to model the number of successes in a sample of size n drawn with replacement from a population of size N.
- If the sampling is carried out without replacement, the draws are not independent and so the resulting distribution is a hypergeometric distribution, not a binomial one.
- However, for N much larger than n, the binomial distribution remains a good approximation, and is widely used.