Other Probability Distributions

Objectives

1. Solve problems involving geometric probability distributions

Binomial vs. Geometric Distributions

With binomial distributions, we had the following conditions:

- There are a fixed number of n repeated independent trials
- Each trial's outcome is either a success or failure
- The probability of success, p, never changes

Binomial vs. Geometric Distributions

With binomial distributions, we had the following conditions:

- There are a fixed number of n repeated independent trials
- Each trial's outcome is either a success or failure
- The probability of success, p, never changes

We could calculate the probability of obtaining 8 heads out of 10 flips of a coin.

Binomial vs. Geometric Distributions

With binomial distributions, we had the following conditions:

- There are a fixed number of n repeated independent trials
- Each trial's outcome is either a success or failure
- The probability of success, p, never changes

We could calculate the probability of obtaining 8 heads out of 10 flips of a coin.

One of these outcomes is TTHTHHHTTH.

Binomial vs. Geometric Distributions

With geometric distributions, we would interested in the probability of obtaining our first success (flipping a tail) after x flips of the coin.

Binomial vs. Geometric Distributions

With geometric distributions, we would interested in the probability of obtaining our first success (flipping a tail) after x flips of the coin.

To put it another way, a geometric distribution has the following property:

Binomial vs. Geometric Distributions

With geometric distributions, we would interested in the probability of obtaining our first success (flipping a tail) after x flips of the coin.

To put it another way, a geometric distribution has the following property:

$$\underbrace{FFF \cdots F}_{x-1 \text{ failures}} S$$

Geometric Distributions

The probability of obtaining our first success after x binomial experiments is given by

$$P(X = x) = (1 - p)^{x-1} \cdot p$$

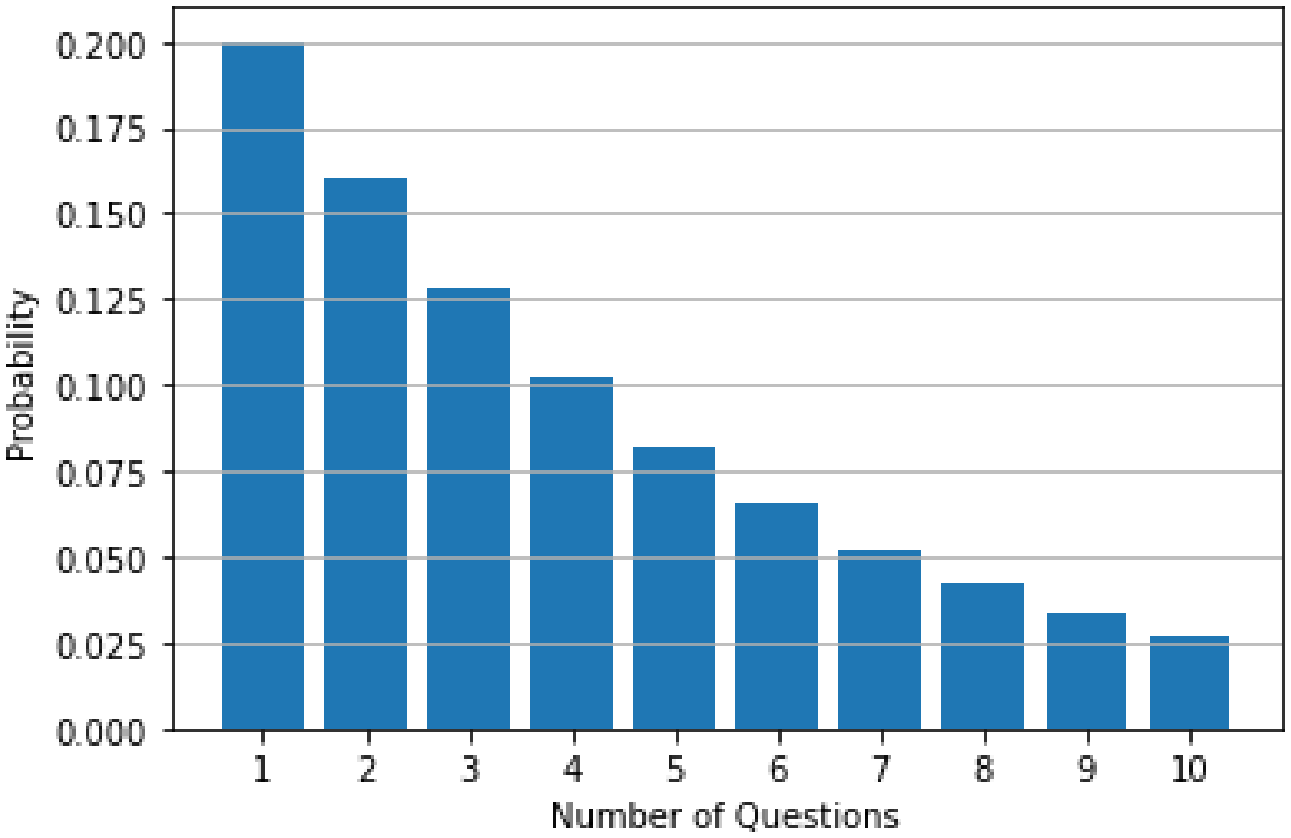
Example 1

A student is given a 10-question multiple choice test in which each question has 5 possible answers. What is the probability that the first question the student guesses correctly on the 4th question?

FFFS

$$\begin{aligned} P(X = 4) &= (1 - 0.2)^4(0.2) \\ &= 0.08192 \end{aligned}$$

Bar Graph of Example 1



Mean and Standard Deviation of Geometric Distributions