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## Fair coin toss

Imagine you have a stick and break it in two points, what is the probability that you can build a triangle out of resulting three pieces? In R write a function that draws two independent numbers from uniform distribution and rerurns TRUE if they correspond to a division of  $[0,1]$  interval that enables to build a triangle and FALSE otherwise. Using this function simulate a vector of 10000 observations and calculate what is the the percentage of TRUE observations. Does it match your probability estimation?

# Binomial

What is the probability that while drawing 2 out of  $n$  numbers we will get the first and the last number?

In R write a function that takes an integer argument  $n$  and returns an integer between 1 and  $n$  with equal probability. Using this function build a matrix with 2 columns and 10000 rows, where each row stores 2 different numbers drawn from  $n$ .

Calculate the percentage of rows that store 1 and  $n$ . Does it match with your probability calculation?

## Geometric

A discrete random variable  $X$  is defined as number of unsuccessful Bernoulli trials before the first two successful trials in a row. Write a function in R that takes as argument  $p$ -probability of success in single Bernoulli trial and returns a value of  $X$ .

# Borel Cantelli

We have a box with certain amount of black and white marbles (at least one each). We draw one marble, write down the result and put it back to the box. After each draw we put one extra black marble to the box. What is the probability we will be drawing white marble forever? Instead of adding one black marble let's add number of black marbles corresponding to the draw number i.e. after the first draw we add one black marble, after the second draw we add two, after the third we add three and so on. What is now the probability we will be drawing the white marble forever?