Discrete Probability

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## Monte Carlo simulations

Monte Carlo simulations model the probability of different outcomes by repeating a random process a large enough number of times that the results are similar to what would be observed if the process were repeated forever.

The sample() function draws random outcomes from a set of options.

The replicate() function repeats lines of code a set number of times. It is used with sample() and similar functions to run Monte Carlo simulations.

beads <- rep(c("red", "blue"), times = c(2,3)) # create an urn with 2 red, 3 blue  
beads # view beads object

## [1] "red" "red" "blue" "blue" "blue"

sample(beads, 1) # sample 1 bead at random

## [1] "red"

## Including Plots

Use replicate to do a large number of draws

B <- 1000000 # number of times to draw 1 bead  
events <- replicate(B, sample(beads, 1)) # draw 1 bead, B times  
tab <- table(events) # make a table of outcome counts  
tab # view count table

## events  
## blue red   
## 599794 400206

prop.table(tab) # view table of outcome proportions

## events  
## blue red   
## 0.599794 0.400206

You can use sample funtion to pick more than one element

sample(beads,2)  
sample(beads,2)  
sample(beads,2)  
sample(beads,6)

6 Gives an error because there are only 5 beads. Default is replace=FALSE. Use replace=TRUE to simulate pick with replace. Note : this is much faster than replicate

events <- sample(beads,replace = TRUE,B)   
tab<-table(events)  
tab # view count table

## events  
## blue red   
## 598937 401063

prop.table(tab) # view table of outcome proportions

## events  
## blue red   
## 0.598937 0.401063