STA2023 R Labs

Lab 3

Basic Concepts of Probability: Apply the classical definition of probability. Compute probabilities using the law of complementation. Addition Rule. Compute probabilities using the laws of addition. The Multiplication Rules: Basics. Compute probabilities using the laws of multiplication. Multiplication Rule: Complements and Conditional Probability. Compute probabilities using the laws of multiplication. Compute conditional probabilities. Compute probabilities using the fundamental counting principle, permutations, and combinations.

```
> RanNum<-runif(10, 1,40)
> RanNum
 [1]  3.923703 15.914572 12.039975  1.973248 14.231712 28.854647 10.614179  4.115
 [9] 23.406436 27.985324
> floor(RanNum)
 [1]  3 15 12  1 14 28 10  4 23 27

> sample(1:40, 5, replace = F)
[1] 34 23 27  8 33


> coins<-c("T", "H")
> s3=sample(coins, 10, replace=T)
> s3
 [1] "H" "T" "H" "H" "T" "H" "T" "H" "T" "H"
> die<-1:6 since this is a sequence of numbers we may omit the c() OR die<-c(1:6)
#same result.
> sample(die, 10, replace=T)
 [1] 6 2 6 2 1 5 5 5 5 3

> coin<-c("Head", "Tail")
> flips<-sample(coin, 100, replace=TRUE)
> table(flips)
flips
Head Tail
  53   47
> #there are 53 HEADS and 47 TAILS.
> flips2<-sample(coin, 1000, replace=TRUE) #tossing a coin 1000 times
> table(flips2)
flips2
Head Tail
 506  494

> #notice that as the number of trails increases the empirical probability
gets closer and closer to the theoretical probability (law of large numbers).
[1] 506

>install.packages("combinat")
> library(combinat)
> x=c("a","b","c")
> permn(x) #the total number of permutaions = factorial(3) Three objects: a, b, c
 [1] "a" "b" "c"
 [1] "a" "c" "b"
```

```
 [1] "c" "a" "b"
 [1] "c" "b" "a"
 [1] "b" "c" "a"
 [1] "b" "a" "c"

> combn(x,2)# combinations: choosing 2 from 3.
     [,1] [,2] [,3]
[1,] "a"  "a"  "b"
[2,] "b"  "c"  "c"

> factorial(3) # factorial(n): in how many ways we can arrange n objects.
[1] 6
> choose(5,3) # choose(n,r)in how many ways we can choose n object taking r
at a time. Combinations.
[1] 10
> #permutations= combinations * factorial (r) # combinations given by
choose(n,r)
> perm<-choose(5,3)*factorial(3)
> perm
[1] 60

Florida Lotto: choose 6 numbers from 1 to 53.
> lotto=1:53 # generals the sequence from  1 to 53
> sample(lotto, 6, replace=F) # choose six numbers, no repetition.
[1] 10  1 39 11 48 16
> choose(53,6) # total number of combinations
[1] 22957480
> 1/choose(53,6) # probability of winning…
[1] 4.355879e-08

> #4.355879e-08 in decimal notation: approx. equal to 0.000000043558…
```