STA2023 R labs

Lab 5

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> # Normal probability distributions: The Standard Normal Distribution.
Applications of the Normal Distribution. The Central Limit Theorem.

> # Uniform distribution. It is not part of a normal distribution; it is a
continuous distribution.
># probability of values if the random var are equally distributed from [a,b]
> runif(5,0,1) # generates 5 uniform random numbers between 0 and 1, which
are default values of [a,b]
[1] 0.2796386 0.2887013 0.5745078 0.4460276 0.4455596
> runif(5,1,29) # generates 5 uniform random numbers between 1 and 29
[1] 10.486425 11.489333 15.753965 26.248012  3.167962

 > punif(11,6,12) # prob of a random var x<11, for a=6, b=12
[1] 0.8333333

> library("MASS", lib.loc="C:/Program Files/R/R-3.5.1/library")
> fractions(0.8333333)
[1] 5/6
 > # Given a random variable x uniformly distributed between 5 and 20.
  What is p(x<7)?  p(8<x<13)?

 > punif(7,5,20)
 [1] 0.1333333
 > fractions(0.1333333)
 [1] 2/15
 > punif(13,5,20)-punif(8,5,20)
 [1] 0.3333333
 > fractions(0.3333333)
 [1] 1/3

 > # Normal distribution
 > rnorm(5, 10,1.1) # generates five random numbers, normally dist with mean  =10, sd=1.1
 [1]  9.357693 10.206649  9.849423  9.648391 11.420522
 > x<-rnorm(10000, 10,1.1) # generates five random numbers, normally dist with mean=10,
  sd=1.1
 > hist(x, prob=T)
 > lines(density(x), col="red")
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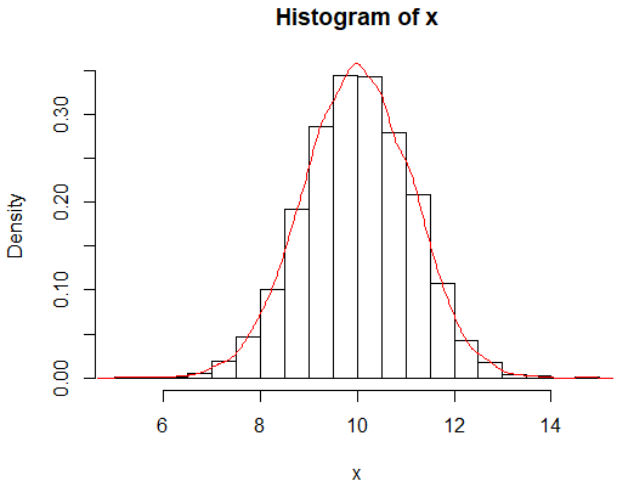

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> mean(x); sd(x) # How the following result relates to the Law of Large numbe
rs? Comment of the shape of the histogram.
[1] 10.00387
[1] 1.111514


> # pnorm(q, mean = 0, sd = 1, lower.tail = TRUE)
> pnorm(1)
[1] 0.8413447
> pnorm(1, lower.tail = F)
[1] 0.1586553
> 1-pnorm(1)
[1] 0.1586553

> # prob of a norm dist variable in between two values:
> # prob of a norm dist variable in between two values. example. Find prob a
randomly selected ind IQ is between 95 and 105. mu=100, sigma=15.
> pnorm(105,100,15)-pnorm(95,100,15)
[1] 0.2611173
> # prob of randomly selected individual IQ greater than 105?
> 1-pnorm(105,100,15)
[1] 0.3694413
> pnorm(105,100,15, lower.tail = F)
[1] 0.3694413

> # Find the 99 percentile of the random var IQ score with mean = 100, sigma=
15.
> qnorm(.99,100,15)
[1] 134.8952
> qnorm(.99,100,15)# qnorm(p, mean = 0, sd = 1, lower.tail = TRUE)
[1] 134.8952
> # qnorm finding critical values:
> qnorm(0.01)
[1] -2.326348

> qnorm(1-0.05/2) #critical value for 95%. What is the meaning of (1-alpha/2)
used in this entry?
[1] 1.959964

> # Central Limit Theorem:
> #Find prob that a sample of 35 randomly selected individuals have a mean IQ
score greater than 105. mu=100, sigma=15.
> pnorm(105, 100, 15/sqrt(35), lower.tail = F)
[1] 0.02430329

> pnorm(105, 100, 15, lower.tail = F) # for just one individual.
[1] 0.3694413
```