Mini Project #1

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**Section1**

When the sample numbers we get tend to infinite, the average of the sample is closer to the mean of the population. In Exercise we do a theoretical calculation to compute an expected value of the execution time of the whole program consists of three parallel block programs. Here we try to use 10,000 Monte Carlo replications to simulate the solution to the Exercise 4.6. First we do one time, then we use the ‘replicate’ function to do 10,000 times. Then we draw the histogram and the curve of the density function we get from Exercise 4.6 to see the simulation does well. Then we use the data from 10,000-time simulations to get the expected value of execution time of the whole program and the probability that the entire program takes more than 20 minutes to compile. Finally, we repeat the process for five times, then using 1,000 and 100,000 Monte Carlo replications instead of 10,000 to do another 10 times. Trying to find laws behind them.

**Section2**

1.The execution time of the whole program 6.985838.

3. After superimpose the density function on sim.10k, we can see the simulation outcomes fit the density function we get in Exercise 4.6 well.



4. The result we got is 9.078837 which is close to the result 9.17 we calculated.

6.&7. The more Monte Carlo replications are, the closer to the result we calculated in Exercise 4.6. We can forecast this outcome from the LLN.



**Section3**

#1.simulate the three block execution times

x<-rexp(3,0.2)

#get the execution time of the whole program

max(x)

#2.repeat the previous two steps 10,000 times

sim.10k<-replicate(10000,max(rexp(3,0.2)))

#3.make a histogram of the previous 10,000 draws

hist(sim.10k,ylim=c(0,0.1),prob=TRUE)

#superimpose the density function abtained in the exercise 4.6

curve(0.6\*(1-exp(-0.2\*x))^2\*exp(-0.2\*x),0,60,add=TRUE)

#4.estimate the mean

mean(sim.10k)

#5.get the probability that the entire program takes more than 20 mins to compile

sum(sim.10k>20)/10000