

## Homework 2

Yuan-Ling Chen

**1a. Generate 10000 random numbers from Gaussian distribution with mean=20 and variance =10, and plot the distribution.**

### ➤ Numbers from Gaussian distribution

`set.seed(123)` *#not necessary here#ensure that the sequence of random numbers generated is always the same*

```
gaussian_numbers <- rnorm(10000, mean = 20, sd = sqrt(10))
gaussian_numbers
```

```
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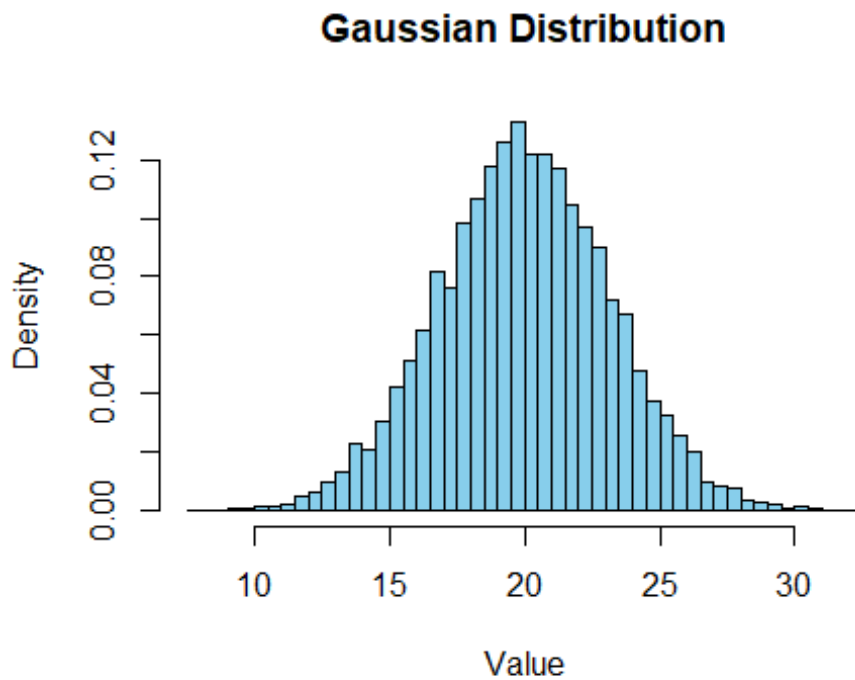
```

#### ➤ Plot for Gaussian Distribution

```

hist(gaussian_numbers, breaks = 50, col = "skyblue", main = "Gaussian D
istribution", xlab = "Value", probability = TRUE)

```



*#probability: Transform the Y-axis into probability density, ensuring that the total area of the histogram equals 1.  
#probability=TRUE: Density; probability=FALSE: frequency*

**1b. Generate 10000 random numbers from Binomial distribution with  $p=0.5$  and  $n=40$ , and plot the distribution.**

**Compare the distribution of 1a and 1b, what do you find?**

Ans: The Gaussian distribution is continuous and has a smoother shape. The binomial distribution is discrete and may exhibit more obvious peaks.

➤ **Numbers from Binomial Distribution**

```
binomial_numbers <- rbinom(10000, size = 40, prob = 0.5)#prob= 0.5: probability of success per trial is 0.5(like tossing coins)
binomial_numbers
```

```
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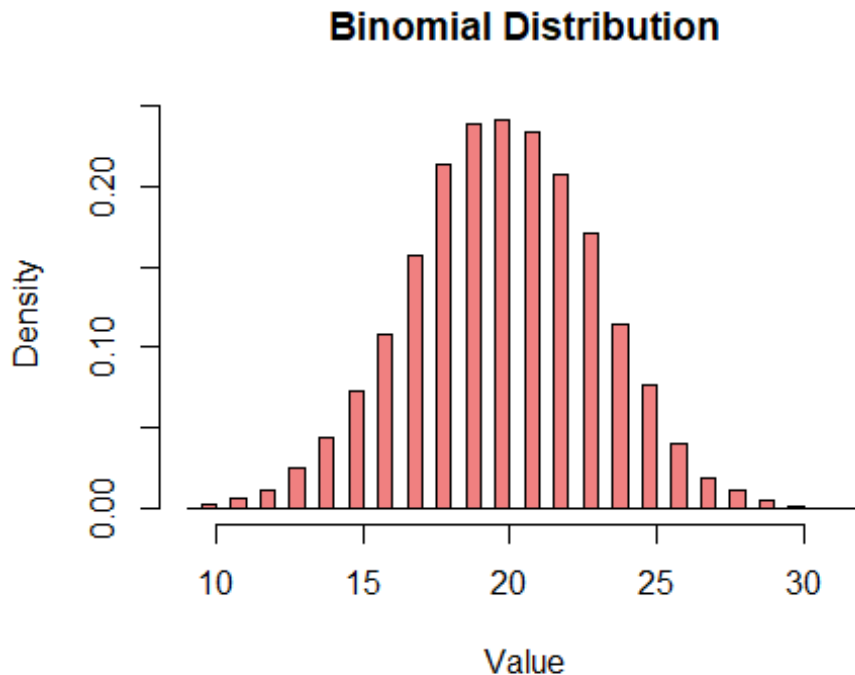
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➤ Plot for Binomial Distribution

```
hist(binomial_numbers, breaks = 50, col = "lightcoral", main = "Binomial Distribution", xlab = "Value", probability = TRUE)
```



**Make a program that can select our candidates for presentation next week. This program should select randomly but avoid selecting the numbers that had been selected before.**

```
students <- 1:34

students_per_class <- 2

num_classes <- length(students) / students_per_class #how many classes do we have

for (i in 1:num_classes) {

  selected <- sample(students, students_per_class)
  #select 2 students

  students <- students[!students %in% selected]
  #delete students that were selected
  #!students %in% selected: this will return TRUE/FALSE, indicating which numbers in "students" haven't appeared in "selected"
}
```

```
#students[...]: keep TRUE(haven't been selected) only, delete FALSE

cat("第", i, "堂課報告的同學: ", selected, "\n")
#`cat()`: used to output text and variable values. It does not automatically add a newline, so you need to manually include ` "\n"`. 

}

## 第 1 堂課報告的同學: 1 21
## 第 2 堂課報告的同學: 29 28
## 第 3 堂課報告的同學: 19 7
## 第 4 堂課報告的同學: 14 34
## 第 5 堂課報告的同學: 13 12
## 第 6 堂課報告的同學: 5 10
## 第 7 堂課報告的同學: 9 11
## 第 8 堂課報告的同學: 8 33
## 第 9 堂課報告的同學: 2 25
## 第 10 堂課報告的同學: 4 15
## 第 11 堂課報告的同學: 22 26
## 第 12 堂課報告的同學: 6 17
## 第 13 堂課報告的同學: 18 31
## 第 14 堂課報告的同學: 20 27
## 第 15 堂課報告的同學: 3 30
## 第 16 堂課報告的同學: 16 32
## 第 17 堂課報告的同學: 23 24
```