title: “Statistical Computing HW1” author: “106033233 資工21 周聖諺” date: “3/21/2021” output: pdf\_document: latex\_engine: xelatex html\_document: df\_print: paged

## Problem 1:

### (a) Generate standard normal distribution by using Box-Muller approach with 10000 samples. Display the result by the histogram and the boxplot.

**Pseudo Code:**

Step 1. Generate , from uniform independently

Step 2. Let variable

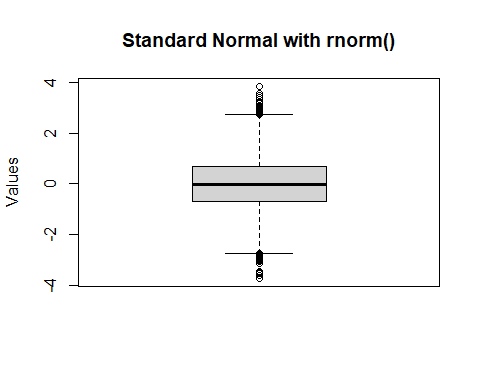
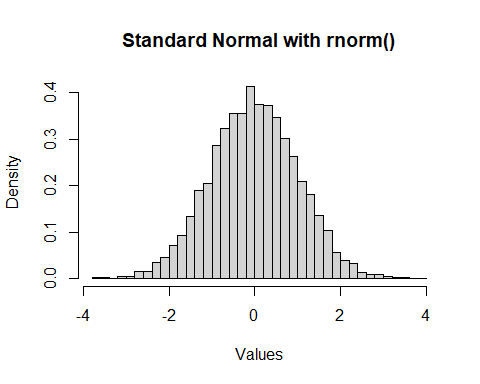
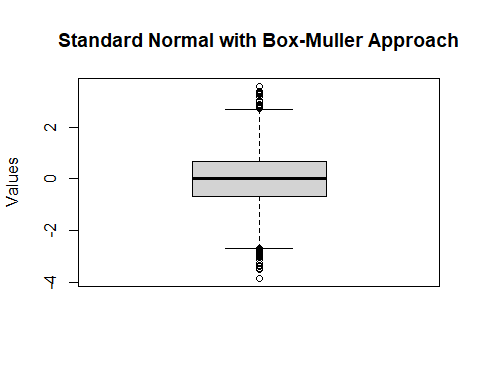
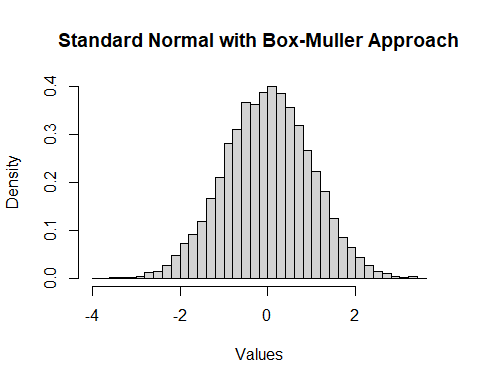
Step 3. Return or , since

## Welcome to compositions, a package for compositional data analysis.  
## Find an intro with "? compositions"

##   
## Attaching package: 'compositions'

## The following objects are masked from 'package:stats':  
##   
## cor, cov, dist, var

## The following objects are masked from 'package:base':  
##   
## %\*%, norm, scale, scale.default



### (b) Generate standard normal distribution by using Acceptance and Rejection approach with 10000 samples. Display the result by the histogram and the boxplot.

**Pseudo Code:**

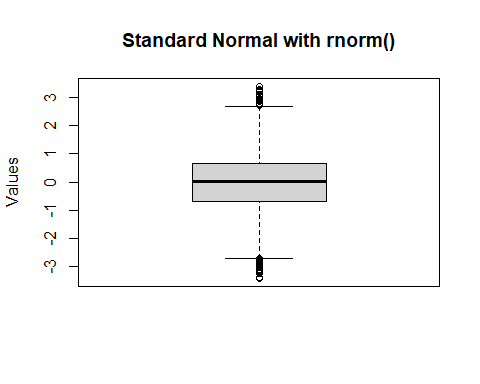
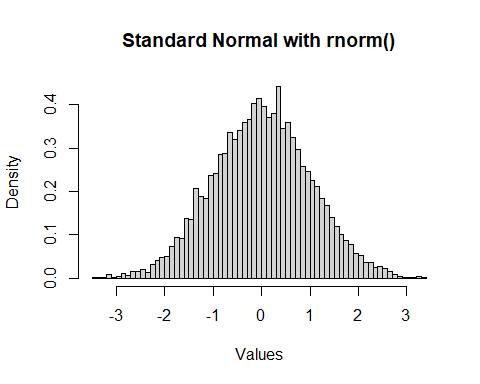
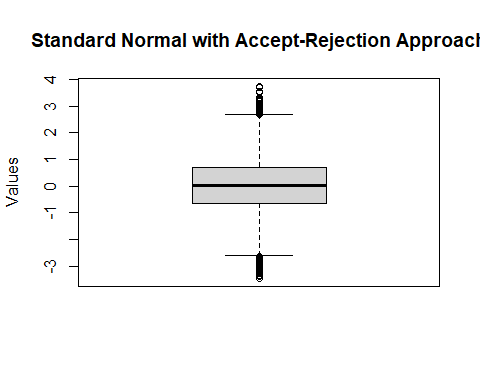
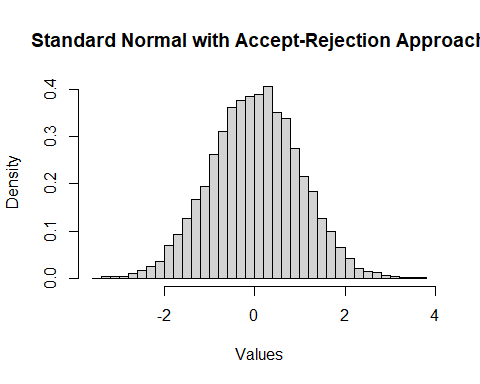
Step 1. Generate ,

Step 2. If , set . Otherwise, go back to Step 1.

Step 3. Generate . If , set . Otherwise, .

Step 4. Return X

## [1] "Acceptance Rate(%)"  
## [1] 76.08613



## Problem 2:

### (a) Generate Poisson distribution with 10000 samples. Display the result by the histogram and the boxplot.

where the happening rate of the event during time and the means the average occurrence of the event during time.

**Pseudo Code**

For

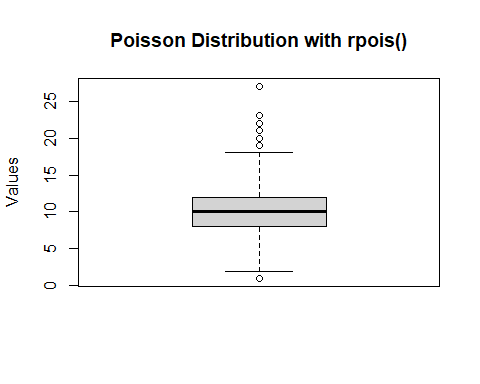
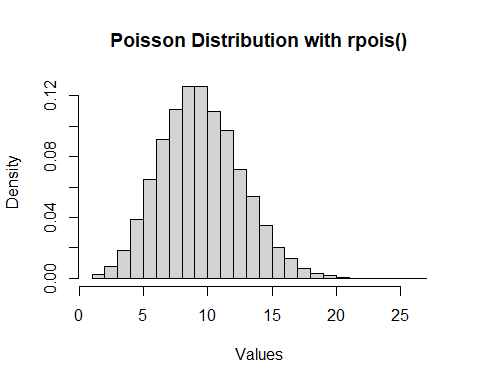
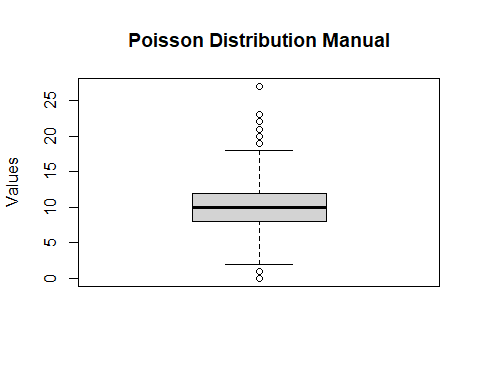
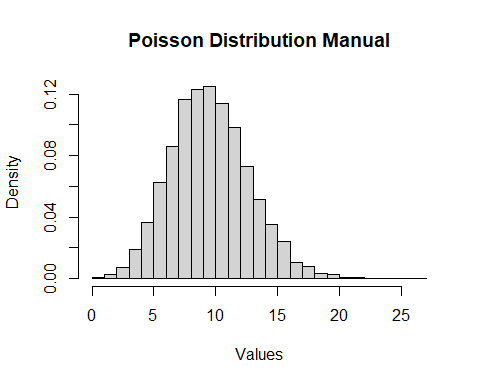
Step 1. Let

Step 2. If , generate . Otherwise, go to Step 5.

Step 3.

Step 4. if , . Otherwise, go back to Step 2.

Step 5. Return



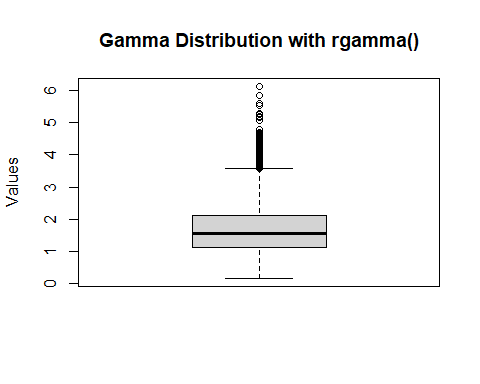
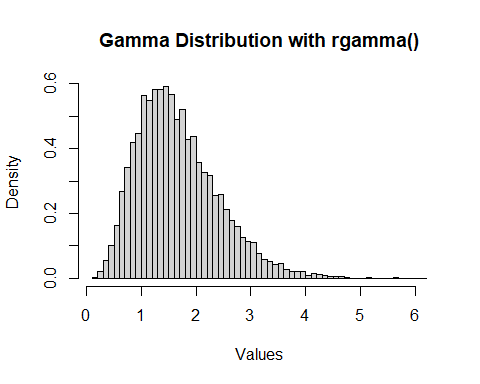
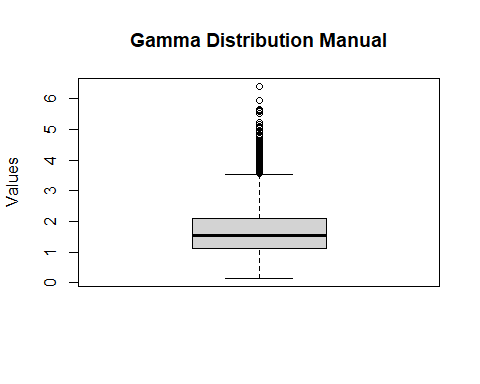
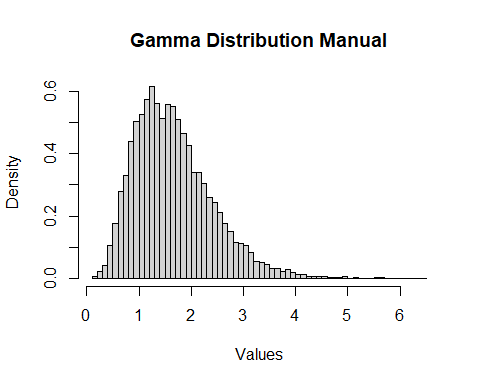
### (b) Generate Gamma distribution with 10000 samples. Display the result by the histogram and the boxplot.

**Pseudo Code**

For

Step 1. Generate

Step 2. Return



## Problem 3

### (a)

Suppose

The marginal distribution of is

Let

It is a Negative Binomial distribution

**Pseudo Code Of Geometric**

For

Step 1. Generate

Step Return

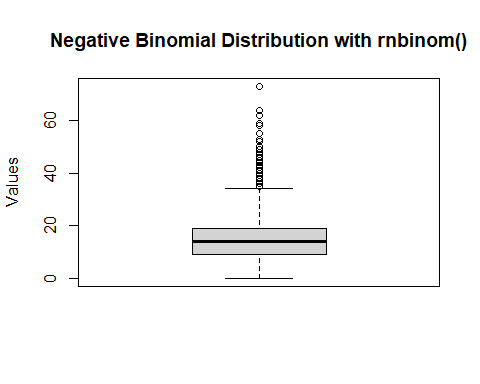
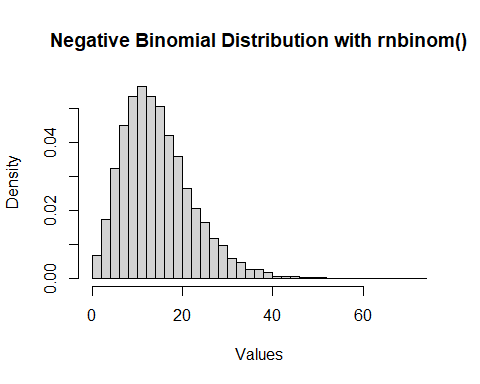
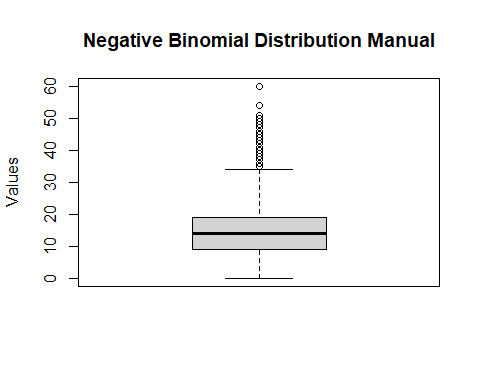
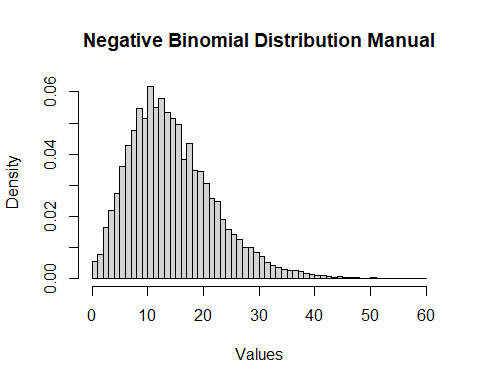
**Pseudo Code Of Negative Binomial**

For

Step 1. Generate

Step 2. Return

### (b)



### (c) What are the mean and variance of ?

Mean

Variance

# Problem 4

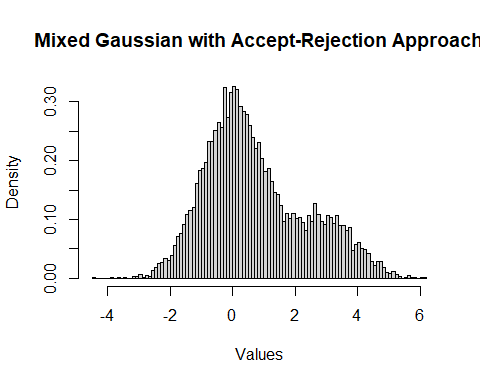
### (a)

A mixture model of

Let and

### (b)

Let and generate 10000 samples from the mixture model.



The distribution seems bimodal.