Monte Carlo Simulation Lab
Assignment-6

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Q 1 Generate 50 randam numbers from geometric distribution of the form :

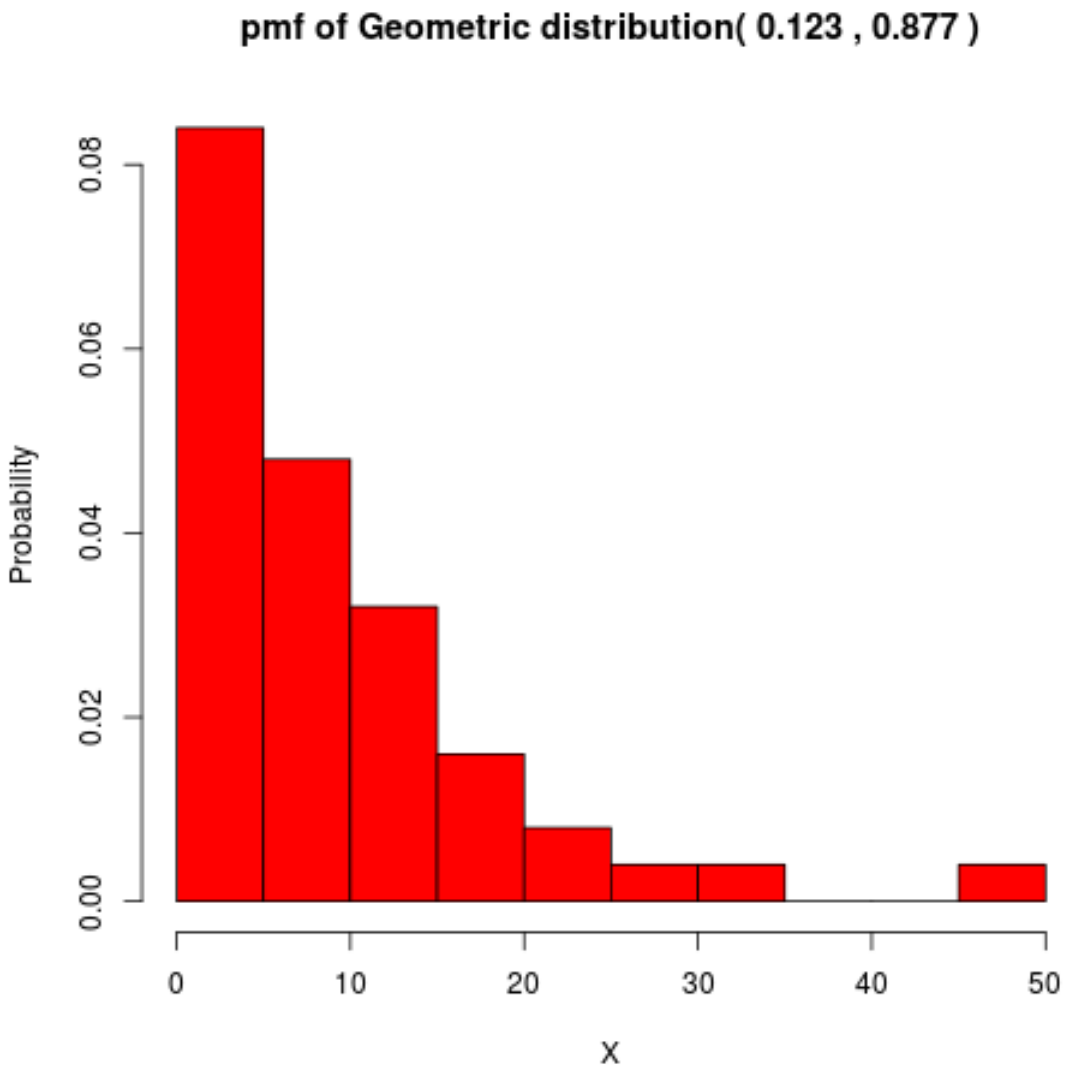
$$f(x;p) = pq^{i-1}, i = 1, 2, ..., 0 < p < 1$$

Draw the probability mass function.

Code for R :

```
U<-runif(50)
X<-vector("numeric")
p=0.123
q=1-p
for(i in 1:50)
{
   X[i]=(floor(log(U[i])/log(q))+1)
}
print(X)
frequency<-array(0,50)
for (i in 1:50)
{
   frequency[X[i]]=frequency[X[i]]+1
}
print(frequency)
probability<-array(0,50)
for (i in 1:50)
{
   probability[i]=frequency[i]/50
}
print(probability)
png("assign6q1.png")
hist(X,col="red",main=paste("pmf of Geometric distribution(",p,",",q,")"
   ),xlab="X",ylab="Probability", freq=FALSE, breaks=15)
```

The probability mass function is as follows for 50 values:



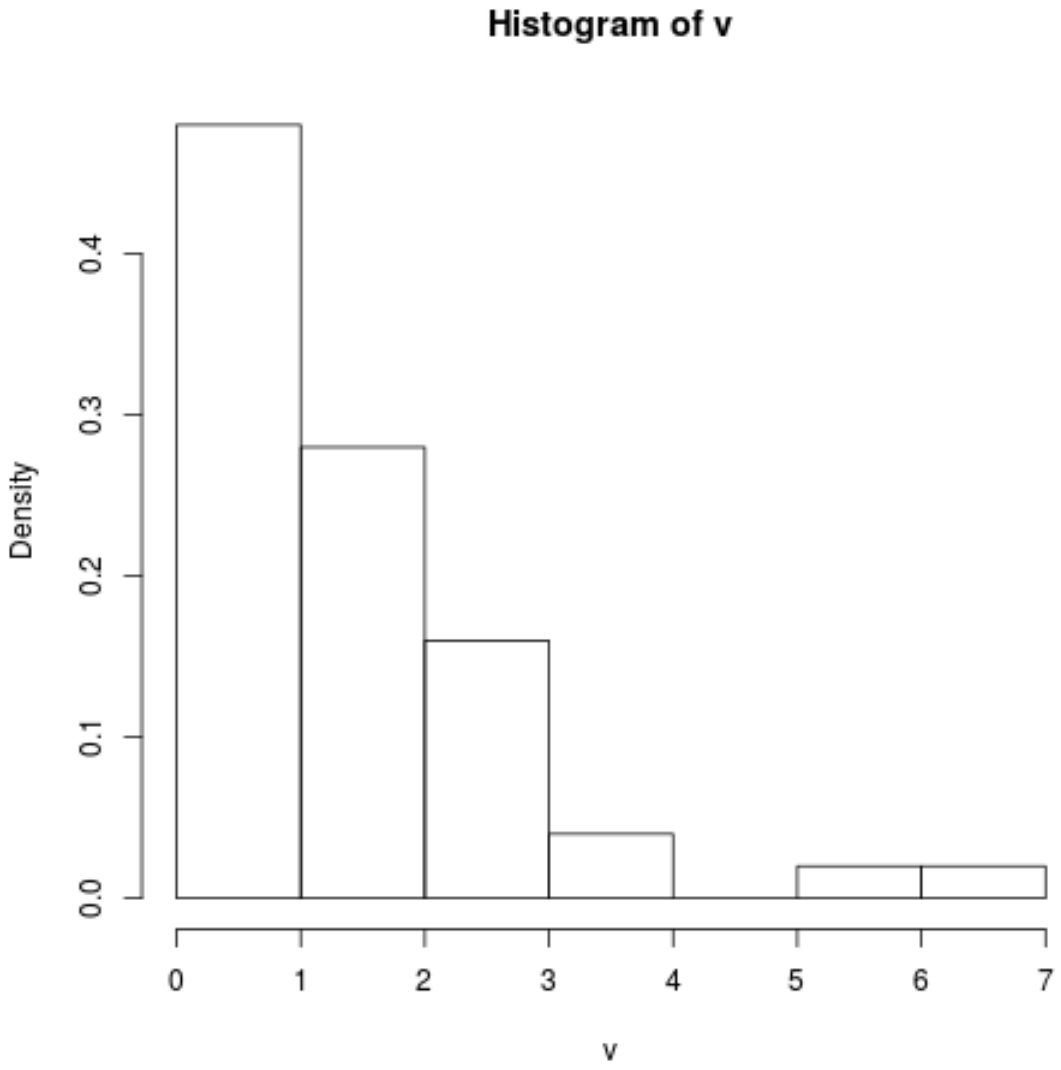
(a) Probability mass function

Q 2 Generate 50 random numbers from poisson distribution with mean 2. Draw the probability mass function and the cumulative distribution function.

Code for R:

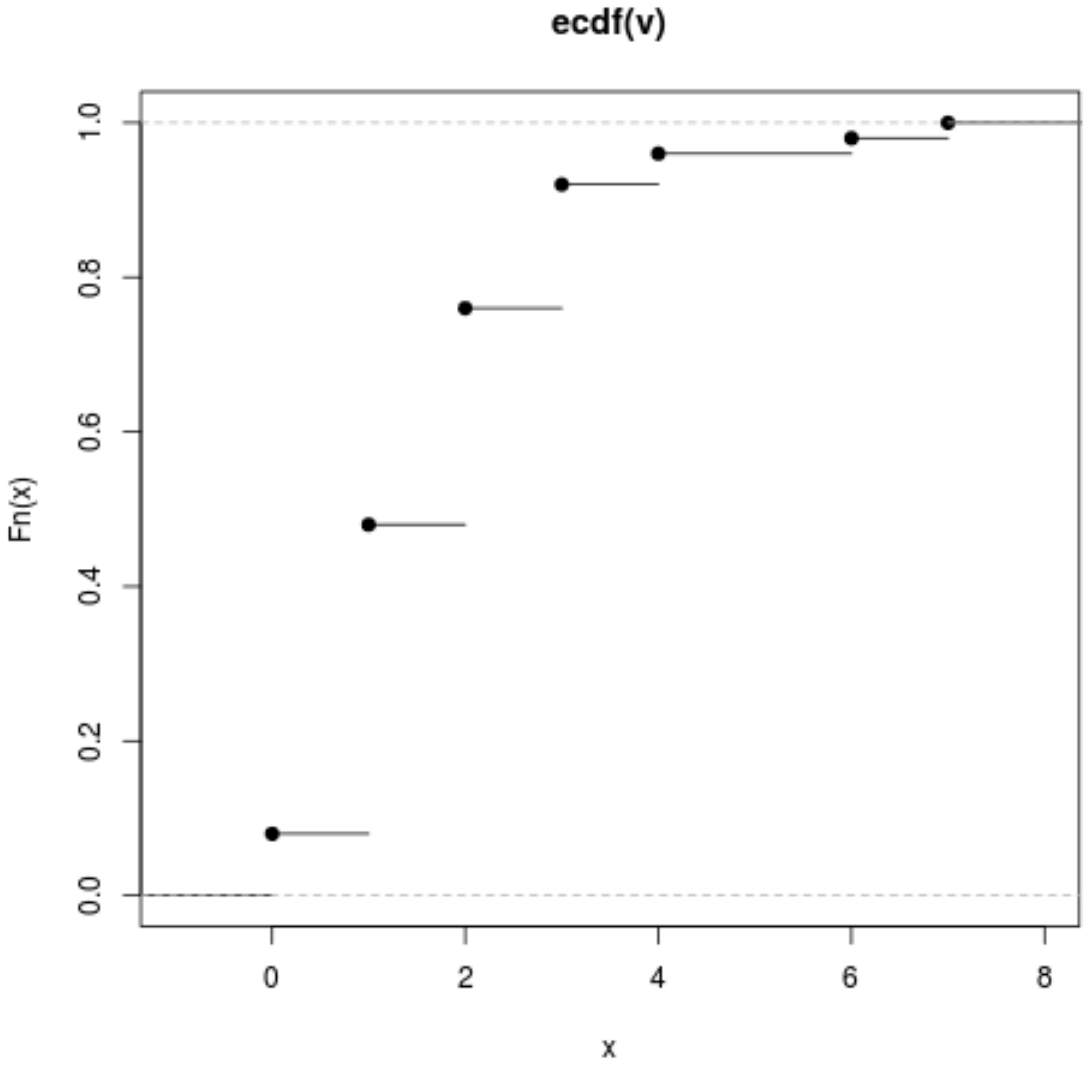
```
f<-function()
{
    u<-runif(50)
    v<-array(50);
    for(j in 1:50)
    {
        i=0;
        p=exp(-2);
        f=p;
        while(u[i]>f)
        {
            p=2*p/(i+1);
            f=f+p;
            i=i+1;
        }
        v[j]=i;
    }
    print(v)
    png("assign6q2.png");
    hist(v,freq=F,col="red");
    dev.off();
    png("assign6q2cdf.png");
    plot(ecdf(v),col="red");
    dev.off();
}
```

The probability mass function is as follows:



(b) Probability mass function

The cumulative density function is as follows:



(c) Cumulative density function

Q 3 Draw the histogram based 50 generated random numbers from the mixture of two Weibull distributions :

$$f(x;\beta_1,\theta_1,\beta_2,\theta_2,p) = p * f_1(x;\beta_1,\theta_1) + (1-p) * f_2(x;\beta_2,\theta_2)$$

where $f_1()$ and $f_2()$ are two Weibull distributions of the form:

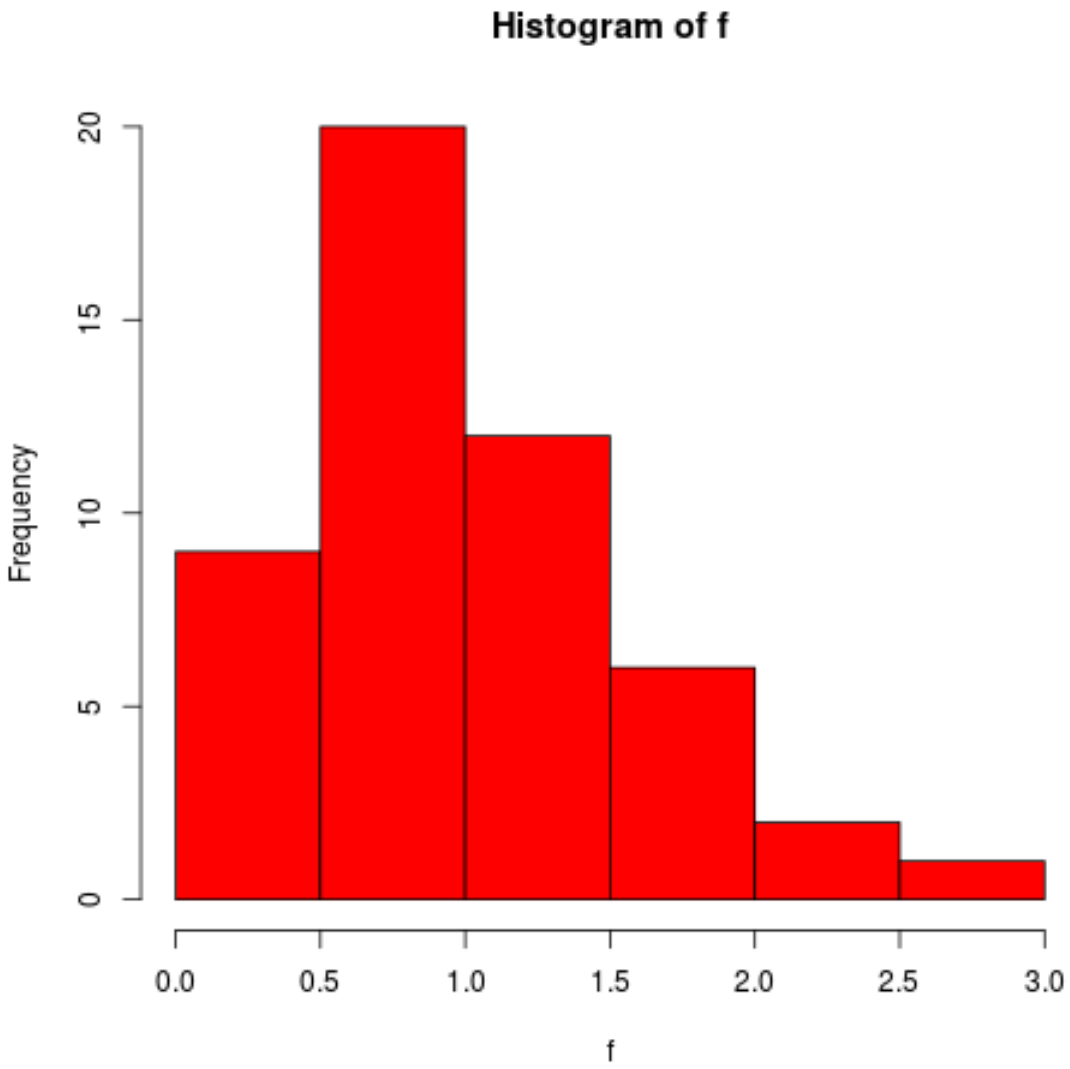
$$f(x;\beta,\theta) = \beta\theta^{\beta}x^{\beta-1}e^{(\theta x)}$$

where, $\beta_1 = 2, \theta_1 = 1, \beta_2 = 1.5, \theta_2 = 1, p = 0.4$.

Code for R :

```
u<-runif(50)
f<-array(0,50)
x1<-array(0,50)
x2<-array(0,50)
for(i in 1:50)
{
    x1[i]=rweibull(1,2,1)
    x2[i]=rweibull(1,1.5,1)
    if(u[i]<=0.4)
        f[i]=x1[i]
    if(u[i]>0.4)
        f[i]=x2[i]
}
print(f)
png("assign6q3.png")
hist(f,col="red")
```

The histogram formed is as follows:



(d) Histogram