DEPARTMENT OF STATISTICS
FACULTY OF MATHEMATICAL SCIENCES
UNIVERSITY OF DELHI

PROJECT REPORT

ADVANCE STATISTICAL COMPUTING USING R

RANDOM NUMBER GENERATION FROM VARIOUS DISTRIBUTIONS

(AS PART OF THE COURSE PAPER 404: ADVANCED STATISTICAL COMPUTING AND DATA MINING)

UNDER THE GUIDANCE AND SUPERVISION OF

MR. ABHISHEK K. UMRAWAL
(ASSISTANT PROFESSOR)

SUBMITTED BY:

VISHAL KUMAR
M. SC. STATISTICS, SEMESTER – IV

DATE: FEB 28, 2016
PLACE: NEW DELHI

ABSTRACT

To understand the computational aspect of Data Mining, a practical approach using statistical software R was introduced in Statistics Department of University of Delhi. The main purpose of this approach is to understand how random numbers are generated, to validate that the numbers generated mimic the actual population under consideration. Then using that generated sample to estimate population parameters using method of Maximum Likelihood estimation and using some iterative techniques for those distribution involving two parameters.

This study has been divided into 4 parts:

1. In this part random numbers were generated using Linear Congruential Generator (LCG) for the choice of a priori integers due to Lehmer (1951). Then validity tests like histogram, Q-Q plot, Chi-square test for goodness of fit and Kolmogorov-Smirnov test were performed on the random numbers.

2. In this part random numbers were generated from Normal and Gamma distribution using Acceptance/Rejection method. Then MLE's were computed and validity tests like histogram, Q-Q plot, Chi-square test for goodness of fit and Kolmogorov-Smirnov test were performed on the random numbers.

3. In this part random numbers were generated from Bivariate Normal distribution and 3-D histogram was made. Then random numbers were generated from Marshall-Olkin Bivariate Exponential(MOBE) distribution and from Block & Basu Bivariate Exponential Distribution(BBBE).

4. In this part random numbers were generated from Weibull distribution, then MLE's were computed using Newton-Raphson method. Expectation-Maximization Algorithm was used to find MLE's from a mixture of two normal distribution.

ACKNOWLEDGEMENTS

I have given my best efforts to make this a good report. However, it would not have been possible without the kind support, guidance and constant supervision of our professor **MR. ABHISHEK K. UMRAWAL** and I would like to express my gratitude towards him for providing necessary help regarding the concepts and techniques used in this case study.

Lecture notes released by **MR. ABHISHEK K. UMRAWAL,** provided the necessary knowledge to tackle the given problem at hand and to understand the basic "why" concept behind any technique and algorithm used in this report.

Question 1. Construct a Uniform Random Number Generator between 0 and 1 using the Linear Congruential Generator (LCG) for the choice of a priori integers due to Lehmer (1951), viz. Multiplier = 23, Shift = 0 and Modulus = $10^8 + 1$.

Generate random samples each of size 1000 from a $U(0,1)$ distribution using your own generator. Check **validity** of the generated random samples.

Solution:

Linear Congruential Generator (LCG):

$$X_i = (aX_{i-1} + c)\ mod\ M$$

Where a = multiplier

c = shift

M = modulus, and the first element is denoted as X_0 and is called seed value (priori).

Some restrictions are imposed on the parameters of the generator:

$$M > 0, 0 \leq a < M, 0 \leq c < M, 0 \leq X_0 < M$$

R Code:

```
rm(list=ls())
LGC <- function(a, c, M, n, y){
  x <- c()
  x[1] <- y
  for(i in 1:n)
    x[i+1] <- (a*x[i]+c) %% (M)
  return(x[-1]/M)
}

uni_01 <- LGC(a= 23, c= 0, M= 10^8, n= 1000, y= 123)
```

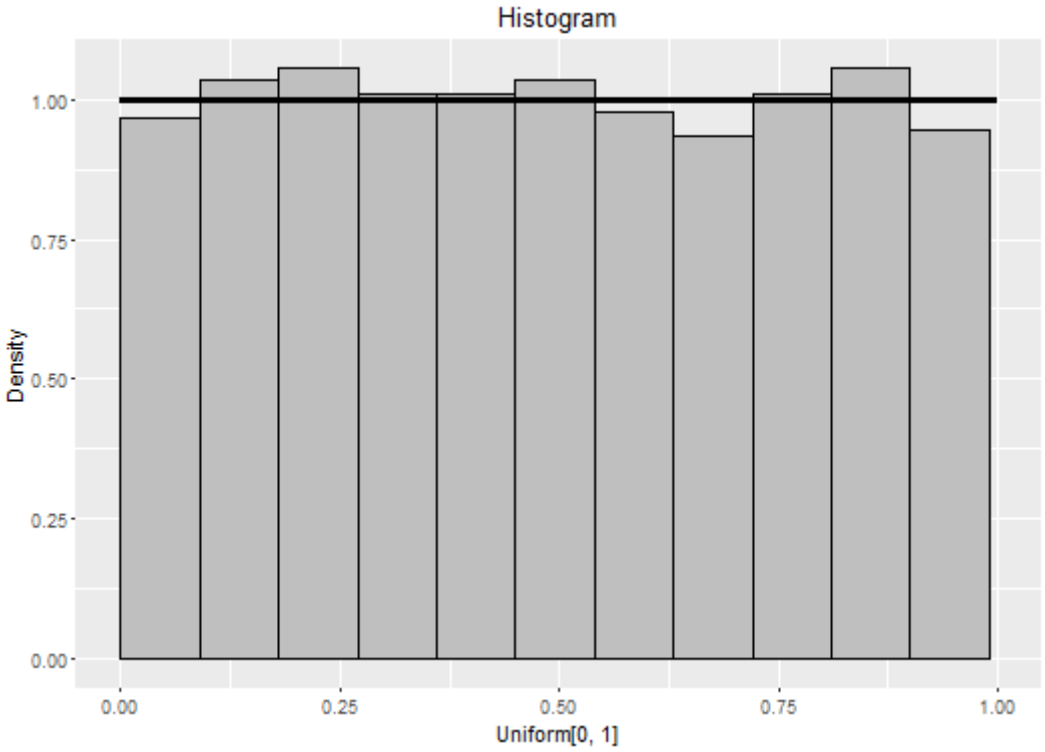
Conclusion: "**LCG**" function can be called to generate random numbers from U[0, 1] distribution using linear Congruential Generator (LCG). For given set of parameters 1000 random numbers are generated and are given in the appendix.

We will check **validity** of our random sample:

1. Histogram overlaid with a theoretical frequency curve:

R code:

```
library(ggplot2)
p <- ggplot(mapping = aes(x = uni_01))
p <- p + geom_histogram(aes(y=..density..), binwidth = .09,
                        colour="black", fill="gray75")
p <- p + stat_function(fun=dunif, args = list(min=0, max=1),
                           col = 'black', lwd=1.2) + xlim(0,1)
p + xlab("Uniform[0, 1]") + ylab("Density") + ggtitle("Histogram")
```

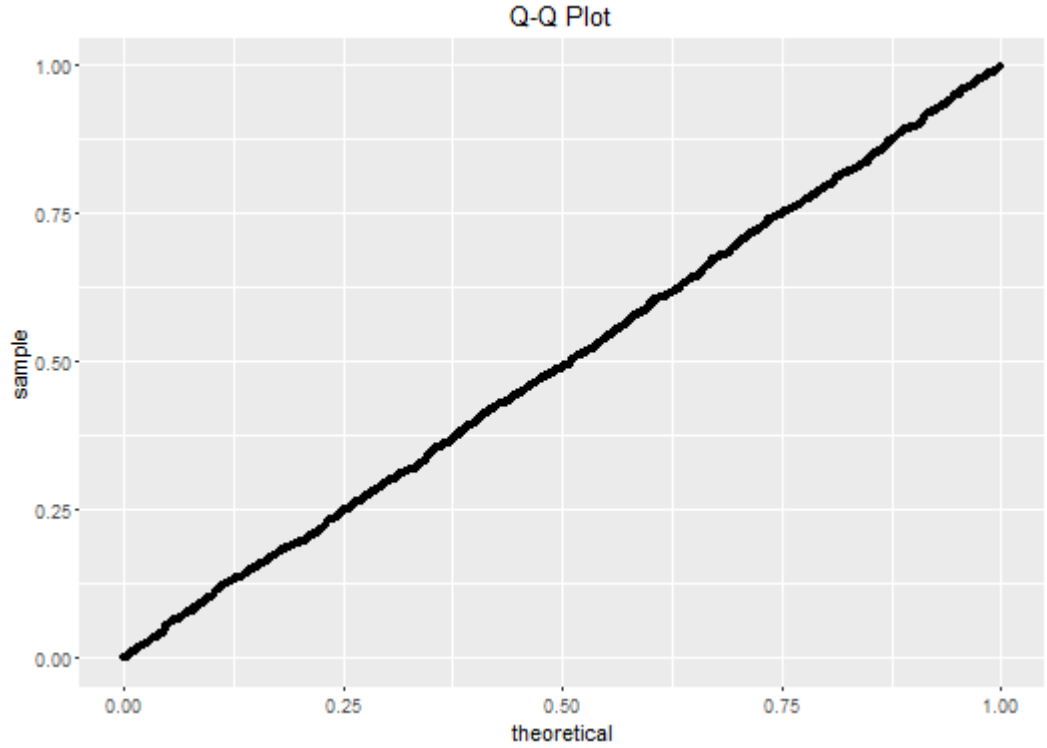


Conclusion: We see that observed sample density is close to expected density. No skewness is observed.

2. Q-Q Plot:

R Code:

```
q <- ggplot(mapping = aes(sample = uni_01)) + ggtitle("Q-Q Plot")
q + stat_qq(distribution = stats::qunif)
```



Conclusion: We observe that sample and theoretical quantiles lies along a straight line. No skewness is observed.

3. Chi - Square Test:

H_0: The data are consistent with the uniform distribution.
H_1: The data are not consistent with the uniform distribution.

R Code:

```
breaks <- seq(0, 1, length = 6)
intervals <- cut(uni_01, breaks, right=FALSE)
observed <- table(intervals)
prob <- c()
for(i in 1:5)
  prob[i] <- punif(breaks[i+1], 0, 1) - punif(breaks[i], 0, 1)
expected <- prob*1000
chisq.test(cbind(observed, expected))
```

Output:

```
        Pearson's Chi-squared test

data:  cbind(observed, expected)
X-squared = 0.40835, df = 4, p-value = 0.9818
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data fits well to Uniform[0, 1].

4. Kolmogorov-Smirnov Test:

H_0: Samples are from same distribution.
H_1: Samples are not from same distribution.

R Code:

```
ks.test(uni_01, "punif", 0, 1)
```

Output:

```
        One-sample Kolmogorov-Smirnov test

data:  uni_01
D = 0.015665, p-value = 0.9668
alternative hypothesis: two-sided
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data is coming from Uniform[0, 1].

All the validity test holds true, hence we conclude that Lehmer Linear Congruential Generator is a valid generator in generating random sample from Uniform[0, 1].

Question 2:

(i) Generate a random sample of size 1000 from a $N(7,3)$ distribution using a suitable algorithm. Check **validity** of the generated random sample. Now assuming that the generated random sample is a random sample from some $N(\mu, \sigma^2)$ distribution, find MLEs of the parameters and comment on your results.

Solution:

We will generate the required sample by generating 1000 random numbers from N(0, 1) and then transforming into N(7, 3). We will generate random sample from N(0, 1) by Acceptance/Rejection method. Algorithm is described as follows:

1. Generate X_1 from h(.) and U_1 from U(0, 1), independently. h(.) will be pdf of double exponential distribution. To generate data from double exponential, we generate "n" numbers from Exponential(1) distribution and take negative for half of them. To generate data from exponential distribution we use simple inversion method:

$$x = F^{-1}(u) = -\ln(1-u)$$

2. We will check if the following condition is satisfied:

$$cU_1 h(X_1) \leq f_y(X_1)$$

Where $c = \sqrt{\frac{2}{\pi}} e^{\frac{1}{2}}$ and $f_y(X_1)$ is the pdf from which we want to generate our random sample.

If satisfied then that X_1 will be our first data point from $f_y(.)$. If not, then go back to step 1.

3. Repeat step 1 and step 2as many times as the data points are required.
4. After generating sample from N(0, 1), we will transform them into N(7, 3) by following transformation:

$$Y = 7 + \sqrt{3} * Z$$

Where Z ~ N(0, 1) and Y ~ N(7, 3).

R Code:

```
set.seed(122)
rand_snormal <- function(n){
  uni_01 <- runif(2*n)
  y1 <- uni_01[1:n]
  y2 <- uni_01[n+1:1000]
  y <- c(y1, y2)
  x <- c()
  for(i in 1:n){                    # Random number from double
exponential(1)
    x[i] <- -log(1-y1[i])
    x[n +i] <- log(1-y2[i])
  }
  p <- c()
  i<-1
  while(length(p) < 1000){          # Acceptance/Rejection condition
    U = sample(uni_01, 1)
    z = sample(x, 1)
    if(exp(-abs(z))*1.315*U/2 <= dnorm(z, 0, 1)){
      p[i] <- z
      i <- i+1
    }
```

```
    else i <- i-1
  }
  return(p)
}

norm_01 <- rand_snormal(1000)                    # Generating from N(0, 1)
norm <- norm_01*sqrt(3) + 7                  # Transforming into N(7, 3)

mean(norm)
[1] 7.011245
> var(norm)
[1] 2.893641
```

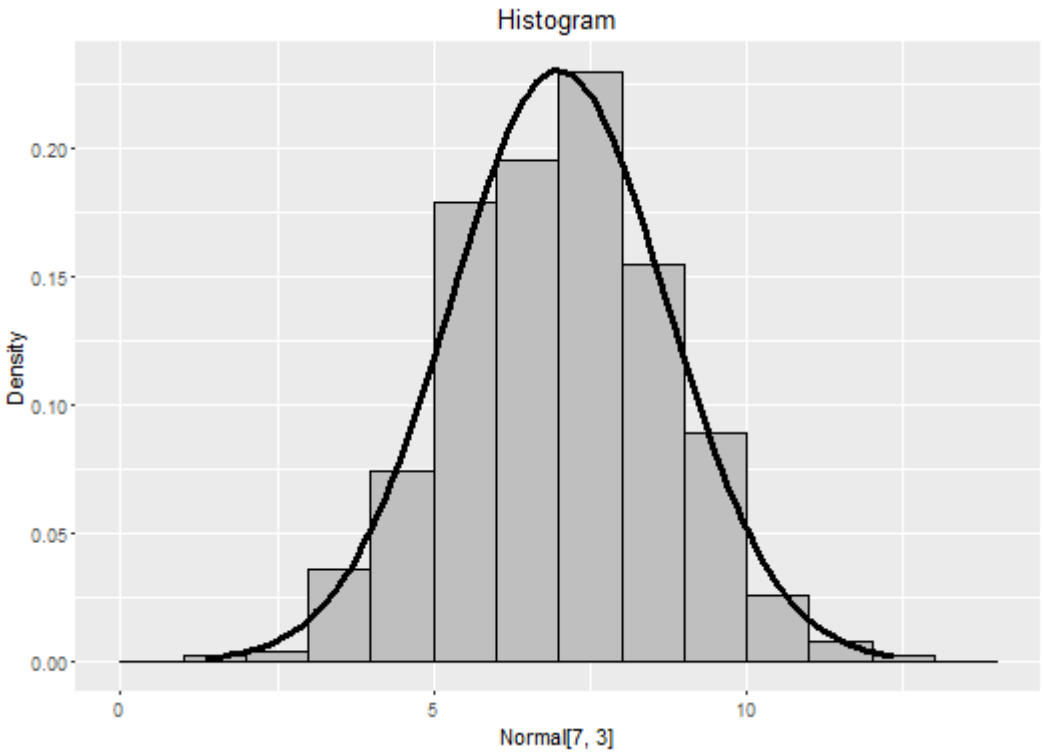
Conclusion: "**norm_01**" function can be called to generate random numbers from N[0, 1] distribution using Acceptance/Rejection Method. 1000 random numbers are generated and are given in the appendix.
MLE of population mean is given by the **sample mean** = 7.011
MLE of population variance is given by the **sample variance** = 2.893

We will check validity of our random sample:

1. Histogram overlaid with a theoretical frequency curve:

R Code:

```
library(ggplot2)
p <- ggplot(mapping = aes(x = norm))
p <- p + geom_histogram(aes(y=..density..), binwidth = 1, colour="black",
                        fill="gray75")
p <- p + stat_function(fun=dnorm, args = list(mean=7, sd=sqrt(3)),
                       col = 'black', lwd=1.2)
p + xlab("Normal[7, 3]") + ylab("Density") + ggtitle("Histogram")
```

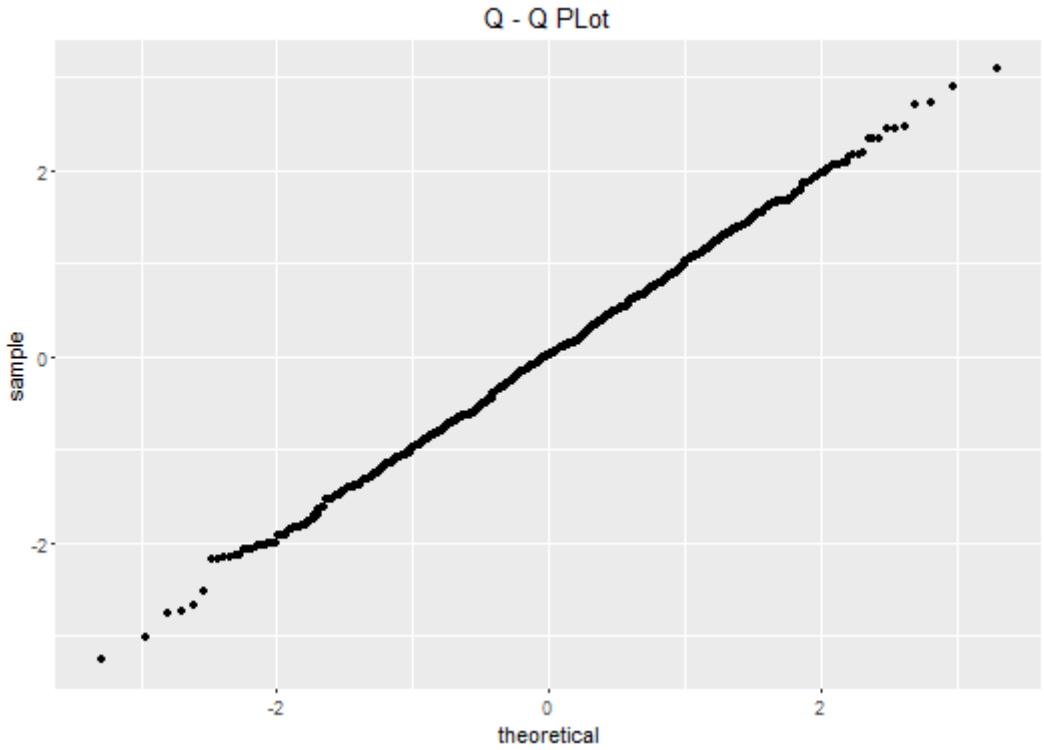


Conclusion: We see that observed sample density is close to expected density. No skewness is observed.

2. Q-Q Plot:

R Code:

```
q <- ggplot(mapping = aes(sample = norm_01))
q + stat_qq(distribution = stats::qnorm) + ggtitle("Q - Q PLot")
```



Conclusion: We observe that sample and theoretical quantiles lies along a straight line, i.e. they coincides.

3. Chi - Square Test:

H_0: The data are consistent with the normal distribution.
H_1: The data are not consistent with the normal distribution.

R Code:

```
breaks <- seq(min(norm), max(norm), length = 6)
intervals <- cut(norm, breaks, right=FALSE)
observed <- table(intervals)
prob <- c()
for(i in 1:5)
  prob[i] <- pnorm(breaks[i+1], 7, sqrt(3)) - pnorm(breaks[i], 7,
sqrt(3))
expected <- prob*1000
chisq.test(cbind(observed, expected))
```

Output:

```
        Pearson's Chi-squared test

data:  cbind(observed, expected)
X-squared = 0.20693, df = 4, p-value = 0.995
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data fits well to N[7, 3].

4. Kolmogorov-Smirnov Test:

H_0: The samples are from the same population.
H_1: The samples are not from the same population.

R Code:

```
ks.test(norm, "pnorm", mean=7, sd=sqrt(3))
```

Output:

```
        One-sample Kolmogorov-Smirnov test

data:  norm
D = 0.021345, p-value = 0.7524
alternative hypothesis: two-sided
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data is coming from N[7, 3].

All the validity test holds true, hence we conclude that our random number generator is a valid generator in generating random sample from N[0, 1], which can be transformed into N[7,3].

Question 2

(ii) Generate a random sample of size 1000 from a Gamma(5.8) distribution using a suitable algorithm. Check **validity** of the generated random sample. Now assuming that the generated random sample is a random sample from some Gamma(α) distribution, find MLE of the parameter and comment on your results.

Solution:
Here we will use the fact that, sum of "n" independent exponential distribution follows Gamma distribution and sum of Gamma distribution is also a Gamma distribution. So we will generate Gamma(5) from exponential distribution and Gamma(0.8) from Acceptance/Rejection method and then we will add them up.

Let X_1, X_2, X_3, X_4, X_5 be 5 independent observation from Exponential(1) distribution, then:

$$\sum_{i=1}^{5} X_i \sim Gamma(5)$$

Acceptance/Rejection Method:

1. Generate X_1 from h(.) and U_1 from U(0, 1) independently such that h(.) is generated from:

$$F_X^{-1}(u) = \begin{cases} \left(uc\Gamma(\alpha+1)\right)^{\frac{1}{\alpha}}, & 0 < u < \dfrac{1}{\Gamma(\alpha+1)} \\ -\ln\left\{\left(\dfrac{1}{c\Gamma(\alpha+1)} - u\right)c\Gamma(\alpha) + \dfrac{1}{e}\right\}, & u > \dfrac{1}{\Gamma(\alpha+1)} \end{cases}$$

2. Check, if $cU1h(X_1) \leq f_y(X_1)$ is true then $Y = X_1$ and if false then go back to step 1, where:

$$f_y(x) = \frac{1}{\Gamma(\alpha)} e^{-x} x^{\alpha-1}, \quad x > 0, 0 < \alpha < 1$$

$$h(x) = \begin{cases} \dfrac{1}{c\Gamma(\alpha)} x^{\alpha-1} & 0 < x < 1 \\ \dfrac{1}{c\Gamma(\alpha)} e^{-x} & x \geq 1 \end{cases} \qquad and \qquad c = \frac{1}{\Gamma(\alpha)}\left(\frac{1}{\alpha} + \frac{1}{e}\right)$$

3. Repeat step 1 and step 2as many times as the data points are required.

R code:

```
set.seed(1234)

uni_01 <- runif(2000, 0, 1)            # Random number from U[0, 1]
y <- -log(uni_01)                      # Random number from exp(1)

z <- c()
for(i in 1:2000)
  z[i] <- sum(sample(y, 5))      # Random number from gamma(5)

rand_gamma <- function(n, alpha){ # Random number from gamma(alpha)
  c <- (1/alpha + 1/exp(1))/gamma(alpha)
  x <- c()
  for(i in 1:(2*n)){
    if(uni_01[i] < 1/(c*gamma(1 + alpha)))
      x[i] <- (uni_01[i]*c*gamma(1 + alpha))^(1/alpha)
    else if(uni_01[i] > 1/(c*gamma(1 + alpha)))
      x[i] <- -log((1/(c*gamma(1 + alpha))-uni_01[i])*c*gamma(alpha) +
                  1/exp(1))
  }
  x <- na.omit(x)

  i <- 1
  p<-c()
  while(length(p) < n){
    u <- sample(uni_01, 1)
    if(x[i] < 1){
      if(u*(x[i]^-0.2)/gamma(alpha) < dgamma(x[i], shape=alpha)){
        p[i] <- x[i]
        i <- i + 1
      }
      else i <- i - 1
    }
    else if(x[i] > 1){
      if(u*(exp(-x[i]))/gamma(alpha) < dgamma(x[i], shape=alpha)){
        p[i] <- x[i]
        i <- i + 1
      }
      else i <- i - 1
    }
  }
  return(p)
}
gam <- rand_gamma(1000, 0.8)
gam <- gam + z

> mean(gam)
[1] 5.889198
> var(gam)
[1] 5.967602
```

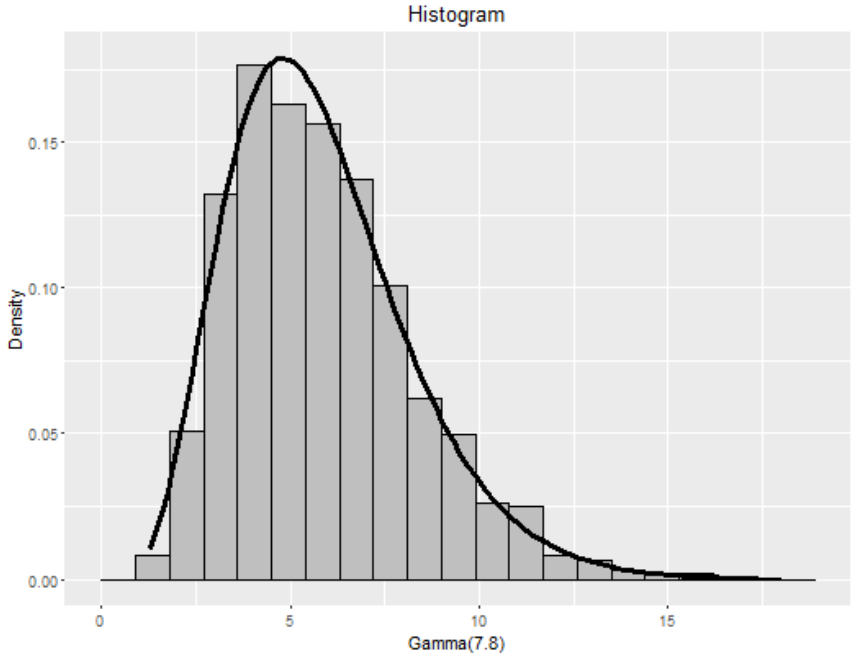
Conclusion: "**rand_gamma**" function can be called to generate 1000 random numbers from gamma(0.8) distribution, the numbers generate here are given in the appendix, then these numbers can be added to gamma(5) random number so as to obtain a random sample from gamma(5.8) distribution.

We will check validity of our random sample:

1. Histogram overlaid with a theoretical frequency curve:

R code:

```
library(ggplot2)
p <- ggplot(mapping = aes(x = gam))
p <- p + geom_histogram(aes(y=..density..), binwidth = 0.9, colour="black",
fill="gray75")
p <- p + stat_function(fun=dgamma, args = list(shape=5.8), col = 'black',
lwd=1.2)
p + xlab("Gamma(7.8)") + ylab("Density") + ggtitle("Histogram")
```

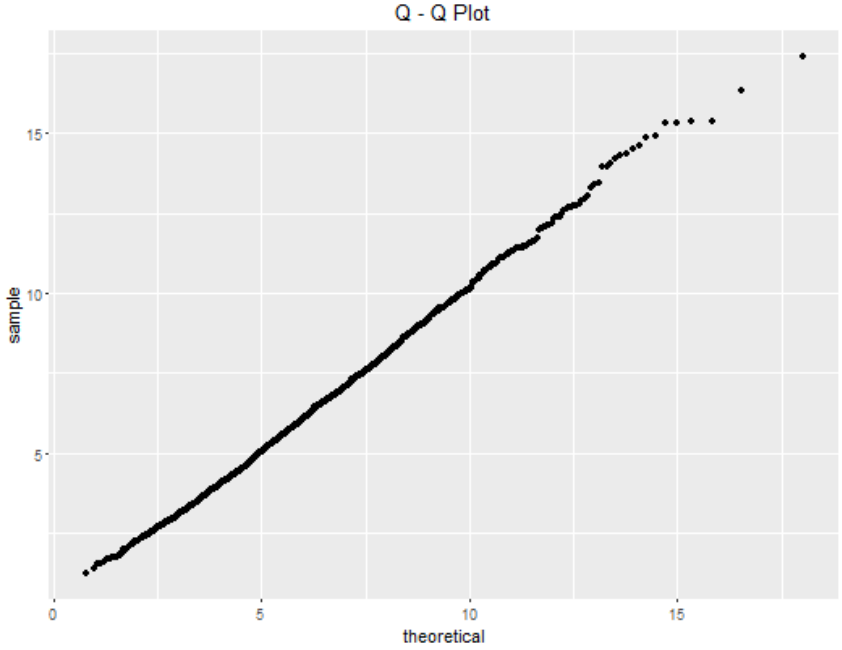


Conclusion: We see that observed sample density is close to expected density. Data is skewed to the right.

2. Q-Q Plot:

R code:

```
q <- ggplot(mapping = aes(sample = gam))+ ggtitle("Q-Q Plot")
q + stat_qq(distribution = stats::qgamma, dparams = list(shape=5.8))
```



Conclusion: We observe that sample and theoretical quantiles lies along a straight line, i.e. they coincides.

3. Chi-Square Test:

H_0: The data are consistent with the gamma distribution.
H_1: The data are not consistent with the gamma distribution.

R code:

```
breaks <- seq(0, max(gam), length = 6)
intervals <- cut(gam, breaks, right=FALSE)
observed <- table(intervals)
prob <- c()
for(i in 1:5)
  prob[i] <- pgamma(breaks[i+1], 5.8) - pgamma(breaks[i], 5.8)
expected <- prob*1000
chisq.test(cbind(observed, expected))
```

Output:

```
        Pearson's Chi-squared test

data:  cbind(observed, expected)
X-squared = 1.0292, df = 4, p-value = 0.9053
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data fits well to Gamma(5.8).

4. Kolmogorov-Smirnov Test:

H_0: The samples are coming from the same population.
H_1: The samples are not coming from the same population.

R Code:

```
ks.test(gam, "pgamma", shape=5.8)
```

Output:

```
        One-sample Kolmogorov-Smirnov test

data:  gam
D = 0.021098, p-value = 0.3355
alternative hypothesis: two-sided
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data is coming from Gamma(5.8).

All the validity test holds true, hence we conclude that our random number generator is a valid generator in generating random sample from Gamma(0.8), which can be transformed into Gamma(5.8).

Question 3

(i) Generate a random sample of size 1000 from a $N_2\left[\begin{pmatrix}9\\2\end{pmatrix}, \begin{pmatrix}8 & 2.3\\2.3 & 5\end{pmatrix}\right]$ distribution using a suitable algorithm. Check validity of the generated random sample using 3-D Histogram overlaid with the Theoretical Bivariate Normal Frequency Curve. Now assuming that the generated random sample is a random sample from some $N_2\left[\begin{pmatrix}\mu_1\\\mu_2\end{pmatrix}, \begin{pmatrix}\sigma_1^2 & \sigma_{12}\\\sigma_{21} & \sigma_2^2\end{pmatrix}\right]$ distribution, find MLEs of the parameters and comment on your results.

Solution: A p-dimension random vector is said to follow a multivariate normal distribution, if pdf is given as:

$$f_y(x;\mu,\Sigma) = \frac{1}{(2\pi)^{\frac{p}{2}}|\Sigma|^{\frac{1}{2}}}\exp\left(-\frac{1}{2}(x-\mu)^T\Sigma^{-1}(x-\mu)\right); x \in R^p, \mu \in R^p$$

Here we will generate samples from N[0, 1] and then transform them into bivariate normal sample.

We will follow the following steps:

1. Using Spectral decomposition of Σ we can write: $\Sigma = U\Lambda U^T$, where U is the matrix of p orthonormalized eigenvectors of Σ and $\Lambda = \text{diag}(\lambda_1, \lambda_2, \ldots, \lambda_p)$ is the matrix of corresponding eigenvalues of Σ.
2. Define $A = U\Lambda^{1/2}U^T$, which is completely specified in terms of eigenvalues and eigenvectors of Σ.
3. If $Z \sim N(0, I_P)$ then $AZ + \mu \sim N_P(\mu, AIA^T)$. Then we can define:

$$Y = AZ + \mu$$

Hence we have started with p univariate N(0, 1) random variables as $Z_1, Z_2, \ldots, Z_P$ and then stacking them in a column vector and then multiplying with any non-singular matrix A and adding p-dimensional vector μ.

R code:

```
set.seed(1)
mu <- matrix(c(9, 2), nrow=2, ncol=1)
sigma <- matrix(c(8, 2.3, 2.3, 5), nrow=2, ncol=2)

u <- svd(sigma)$u
eig <- diag(eigen(sigma)$values, 2)

z <- matrix(c(rnorm(1000, 0, 1), rnorm(1000, 0, 1)), nrow=2)
a <- u %*% t(eig^0.5) %*% u
b <- a %*% z

b[1,] <- b[1,] + 9
b[2,] <- b[2,] + 2
> mean(b[1, ])
[1] 8.880603
> mean(b[2, ])
[1] 2.017876
> var(b[1, ])
[1] 9.072315
> var(b[2, ])
[1] 5.089713
> cov(b[1, ], b[2, ])
[1] 2.485204
```

MLE's are:

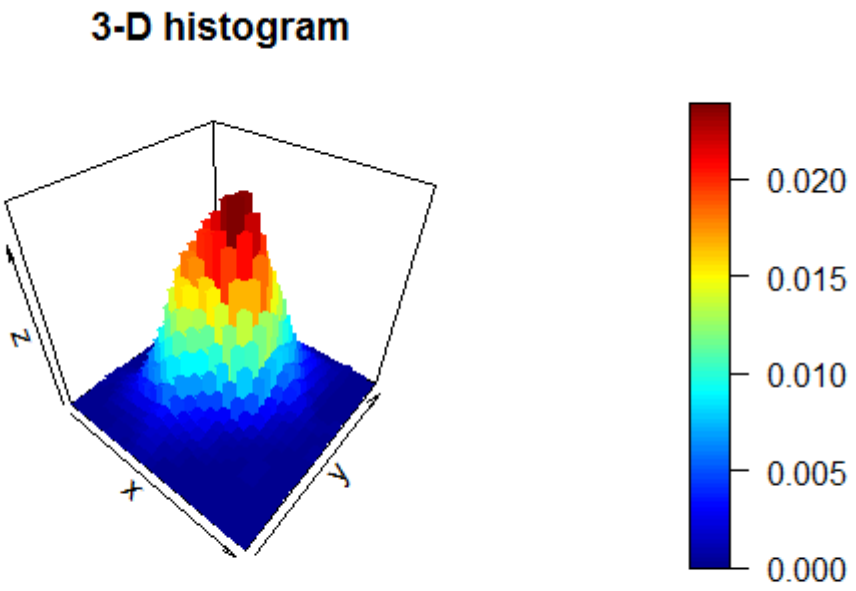
$$\hat{\mu} = \begin{pmatrix}8.88060\\2.01787\end{pmatrix} \text{ and } \hat{\Sigma} = \begin{pmatrix}9.07231 & 2.48520\\2.48520 & 5.08971\end{pmatrix}$$

We will check validity of our random sample:

1. 3-D Histogram:

R code:

```
library(plot3D)
library(MASS)
a <- kde2d(b[1,],b[2,])
hist3D(z=a$z, main="3-D histogram")
```



Question 3

(ii) Generate a random sample of size 1000 from a MOBE (5,5,2) distribution using a suitable algorithm. Suppose $\{Y_{1i}, Y_{2i}: i = 1, \dots, 1000\}$ is the generated sample then observe that the proportions of sample values in each of the three classes viz. $I_1 = \{Y_1 < Y_2\}, I_2 = \{Y_2 < Y_1\}$ and $I_3 = \{Y_1 = Y_2\}$ are in accordance with the model parameters.

Solution: Pdf of Marshall-Olkin Bivariate Exponential Distribution is given by:

$$f_{Y_1Y_2}(y_1, y_2) = \begin{cases} \lambda_1 e^{-\lambda_1 y_1}\,(\lambda_2 + \lambda_3) e^{-(\lambda_2+\lambda_3)y_2}, & y_1 < y_2 \\ \lambda_2 e^{-\lambda_2 y_2}\,(\lambda_1 + \lambda_3) e^{-(\lambda_1+\lambda_3)y_1}, & y_1 > y_2 \\ \dfrac{\lambda_3}{\lambda_1 + \lambda_2 + \lambda_3} e^{-(\lambda_1+\lambda_2+\lambda_3)y} & y_1 = y_2 = y_3 \end{cases}$$

To generate random sample from this distribution:

1. First generate independent samples from $X_1 \sim exp(\lambda_1)$, $X_2 \sim exp(\lambda_2)$ and $X_3 \sim exp(\lambda_3)$.
2. F(x) = 1- $e^{-\lambda x}$, we have used the formula:

$$x = -\frac{log(1-u)}{\lambda}$$

3. Define: $Y_1 = \min(X_1, X_2)$ and $Y_2 = \min(X_1, X_3)$

R Code:

```
set.seed(123)

MOBE <- function(n, l1, l2, l3){
  uni_01 <- runif(n)
  uni_02 <- runif(n)
  uni_03 <- runif(n)

  x1 <- -log(uni_01)/l1
  x2 <- -log(uni_02)/l2
  x3 <- -log(uni_03)/l3

  y1 <- c()
  y2 <- c()
  for(i in 1:1000){
    y1[i] <- min(x1[i], x3[i])
    y2[i] <- min(x2[i], x3[i])
  }
  y <- rbind(y1, y2)
  return(y)
}
y <- MOBE(1000, 5, 5, 2)


> sum(y[1, ] < y[2,])
[1] 415
> sum(y[1, ] > y[2,])
[1] 424
> sum(y[1, ] == y[2, ])
[1] 161
```

Conclusion: The sample is generated and stored in "y". The number of sample points falling in each class is:

$$\mathrm{I}_1 = \{\mathrm{Y}_1 < \mathrm{Y}_2\} = 415;\ \mathrm{I}_2 = \{\mathrm{Y}_2 < \mathrm{Y}_1\} = 424;\ \mathrm{I}_3 = \{\mathrm{Y}_1 = \mathrm{Y}_2\} = 161$$

Further expected number of observation in 3 classes are: 416, 416 and 166 respectively.

Question 3

(iii) Generate a random sample of size 1000 from a BBBE (5,5,2) distribution using a suitable algorithm.

Solution: The pdf of Block and Basu Bivariate Exponential Distribution is given by:

$$f_{Y_1Y_2}(y_1,y_2) = \begin{cases} \left(\frac{\lambda_2+\lambda_3}{\lambda_1+\lambda_2+\lambda_3}\right)^{-1} \lambda_1 e^{-\lambda_1 y_1}(\lambda_2+\lambda_3)\, e^{-(\lambda_2+\lambda_3)y_2}, & y_1 < y_2 \\ \left(\frac{\lambda_2+\lambda_3}{\lambda_1+\lambda_2+\lambda_3}\right)^{-1} \lambda_2 e^{-\lambda_2 y_2}\,(\lambda_1+\lambda_3) e^{-(\lambda_1+\lambda_3)y_1}, & y_1 > y_2 \end{cases}$$

To generate random sample from this distribution:

1. First generate independent samples from $X_1 \sim exp(\lambda_1)$, $X_2 \sim exp(\lambda_2)$ and $X_3 \sim exp(\lambda_3)$.
2. F(x) = 1- $e^{-\lambda x}$, we have used the formula:

$$x = -\frac{log(1-u)}{\lambda}$$

3. Define: $Y_1 = \min(X_1, X_2)$ and $Y_2 = \min(X_1, X_3)$. Accept if $Y_1 \neq Y_2$ otherwise go back to step 1.

R Code:

```
set.seed(123)

BBBE <- function(n, l1, l2, l3){
  uni_01 <- runif(n)
  uni_02 <- runif(n)
  uni_03 <- runif(n)
  x1 <- -log(uni_01)/l1
  x2 <- -log(uni_02)/l2
  x3 <- -log(uni_03)/l3
  y1 <- c()
  y2 <- c()
  i <- 1
  while(length(y1) < n){
    y1[i] <- min(sample(x1, 1), sample(x3, 1))
    y2[i] <- min(sample(x2, 1), sample(x3, 1))
    if(y1[i] == y2[i])
      i <- i - 1
    else i <- i + 1
  }
  y <- rbind(y1, y2)
  return(y)
}
y <- BBBE(1000, 5, 5, 2)

> sum(y[1, ] < y[2,])
[1] 496
> sum(y[1, ] > y[2,])
[1] 504
> sum(y[1, ] == y[2, ])
[1] 0
```

Conclusion: The sample is generated and stored in "y". The number of sample points falling in each class is:

$$I_1 = \{Y_1 < Y_2\} = 496;\ I_2 = \{Y_2 < Y_1\} = 504; I_3 = \{Y_1 = Y_2\} = 0$$

Further expected number of observation in 3 classes are: 500, 500 and 0 respectively.

Question 4.

(i) Generate a random sample of size 1000 from a Weibull (7,3) distribution using a suitable algorithm. Check **validity** of the generated random sample. Now assuming that the generated random sample is a random sample from some Weibull (α, λ) distribution, find MLEs of the parameters using the method of Profile Log Likelihood function before using the Newton-Raphson Algorithm and comment on your results.

Solution: Pdf of Weibull distribution is given by:

$$f_Y(x) = \alpha\lambda x^{\alpha-1}e^{-\lambda x^{\alpha}}; \quad x > 0, \alpha > 0, \lambda > 0$$

$$F_Y^{-1}(u) = 1 - e^{-\lambda x^{\alpha}}$$

From the CDF we can generate random sample from Weibull(7, 3), in order to find MLE, we will use Profile Log Likelihood method, which involves Newton-Raphson method.

1. Log likelihood function is given by l(α , λ) as a function of λ in terms of α:

$$l(\alpha, \lambda) = n \ln \lambda - \lambda \sum_i^n x_i^{\alpha} + c(constant)$$

2. We will differentiate log-likelihood and equate it to zero, then we get:

$$\hat{\lambda} = \frac{n}{\sum_i^n x_i^{\alpha}}$$

3. Substituting the value of λ in l(α , λ) equation and call it h(α). We differentiate h(α) and get:

$$h'(\alpha) = \frac{n}{\alpha} - \frac{n}{\sum_i^n x_i^{\alpha}} \sum_i^n x_i^{\alpha} \ln x_i + \sum_i^n \ln x_i$$

$$h''(\alpha) = -\frac{n}{\alpha^2} - \frac{n}{\sum_i^n x_i^{\alpha}} \sum_i^n x_i^{\alpha} (\ln x_i)^2 + \frac{n}{(\sum_i^n x_i^{\alpha})^2} \left(\sum_i^n x_i^{\alpha} \ln x_i \right)^2$$

4. We use the Newton Raphson Method to maximize h(α)(single parameter) where we iterate:

$$\alpha^{(1)} = \alpha^{(0)} - \frac{h'(\alpha)}{h''(\alpha)}; \quad where\ \alpha = \alpha^{(0)}$$

R code:

```
set.seed(123)

rand_web <- function(n, alpha, lambda){
  webu <- (-log(runif(n))/lambda)^(1/alpha)
}

webu <- rand_web(1000, 7, 3)
```

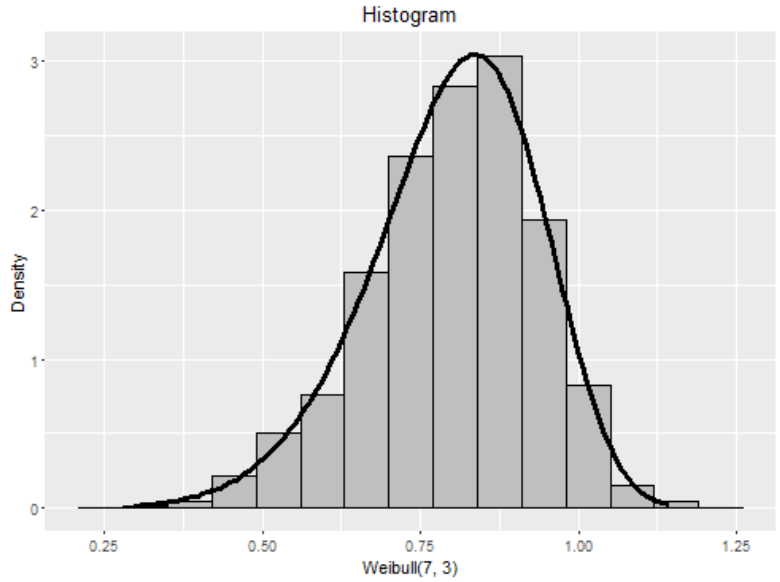
Conclusion: "**rand_web**" function can be called to generate 1000 random numbers from Weibull(7, 3) distribution, the numbers generate here are given in the appendix.

We will check validity of our random sample:

1. Histogram overlaid with a theoretical frequency curve:

R code:

```
library(ggplot2)
p <- ggplot(mapping = aes(x = webu))
p <- p + geom_histogram(aes(y=..density..), binwidth = .07, colour="black",
                        fill="gray75")
p <- p + stat_function(fun=dweibull, args = list(shape=7, scale=1/3^(1/7)),
                       col = 'black', lwd=1.2)
p + xlab("Weibull(7, 3)") + ylab("Density") + ggtitle("Histogram")
```

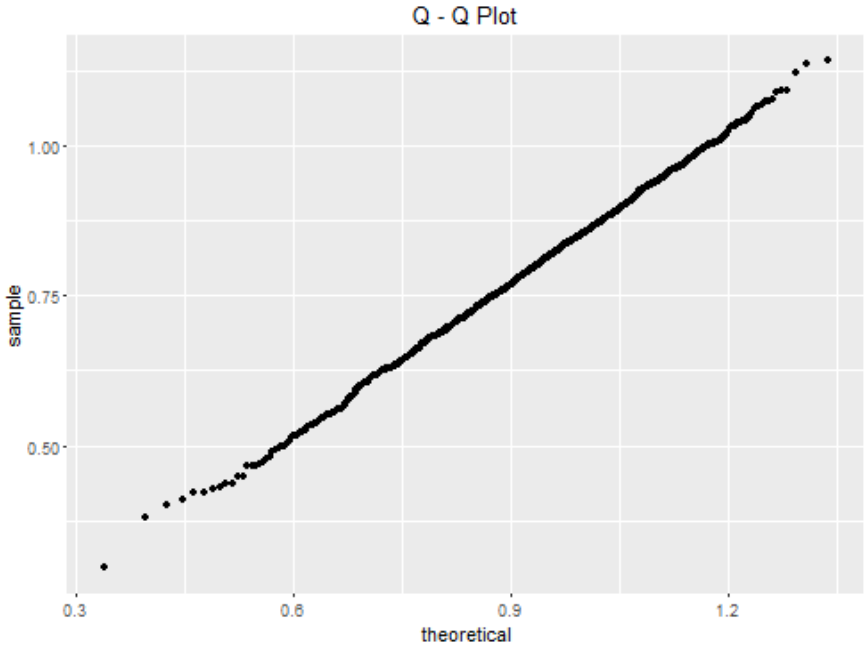


Conclusion: We see that observed sample density is close to expected density.

2. Q-Q Plot:

R code:

```
q <- ggplot(mapping = aes(sample = webu)) + ggtitle("Q - Q Plot")
q + stat_qq(distribution = stats::qweibull, dparams = list(shape=7))
```



Conclusion: We observe that sample and theoretical quantiles lies along a straight line, i.e. they coincides.

3. Chi-Square Test:

H_0: The data are consistent with the Weibull distribution.
H_1: The data are not consistent with the Weibull distribution.

R code:

```
breaks <- seq(min(webu), max(webu), length = 6)
intervals <- cut(webu, breaks, right=FALSE)
observed <- table(intervals)
prob <- c()
for(i in 1:5)
  prob[i] <- pweibull(breaks[i+1], 7, 1/3^(1/7)) - pweibull(breaks[i],
7, 1/3^(1/7))
expected <- prob*1000
chisq.test(cbind(observed, expected))
```

Output:

```
        Pearson's Chi-squared test

data:  cbind(observed, expected)
X-squared = 0.17233, df = 4, p-value = 0.9965
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data fits well to Weibull(7, 3).

4. Kolmogorov-Smirnov Test:

H_0: The samples are coming from the same population.
H_1: The samples are not coming from the same population.

R Code:

```
ks.test(webu, "pweibull", 7, 1/3^(1/7))
```

Output:

```
        One-sample Kolmogorov-Smirnov test

data:  webu
D = 0.014051, p-value = 0.9891
alternative hypothesis: two-sided
```

Conclusion: We observe that p-value is insignificant, hence we conclude that data is coming from Weibull(7, 3).

To find MLE using Profile Log Likelihood:

R Code:

```
al <- 8                          # Initial guess for the parameter
d <- 1
n <- 1000
while(d > 0.00001){
  ao <- al
  h1 <- n/al-(n/sum(webu^al))*sum(webu^al*log(webu)) + sum(log(webu))
  h2 <- -(n/al^2) - n*(sum((webu^al)*log(webu)^2)/sum(webu^al))+
          n*sum((webu^al)*log(webu))^2/(sum(webu^al))^2
  al <- ao - h1/h2
  d <- abs(al - ao)
}

> alpha_hat <- al
> alpha_hat
[1] 7.054301
> lambda_hat <- n/sum(webu^alpha_hat)
> lambda_hat
[1] 2.996589
```

Conclusion: The MLE of the parameters is given by: $\widehat{\boldsymbol{\alpha}}$ = 7.0543 and $\hat{\boldsymbol{\lambda}} = 2.99658$.

All the validity test holds true, hence we conclude that our random number generator is a valid generator in generating random sample from Weibull(7, 3).

Question 4

(ii) Generate a random sample of size 1000 from the following mixture of two distributions:

$$f_X(x\,;\boldsymbol{\theta}) = \pi f_0(x\,;\boldsymbol{\theta_0}) + (1-\pi) f_1(x\,;\boldsymbol{\theta_1})$$

where $\pi = \frac{2}{5}$ and, f_0 and f_1 are defined the density functions of $N(3,2)$ and $N(10,3)$ distributions respectively. Clearly $\boldsymbol{\theta_0} = (3,2)^T$, $\boldsymbol{\theta_1} = (10,3)^T$ and $\boldsymbol{\theta} = \left[\frac{2}{5}, (3,2)^T (10,3)^T\right]^T$. Now assuming that the generated random sample is a random sample from some mixture of two normal distributions with unknown parameters, find the MLEs of the parameters viz., $\pi, \boldsymbol{\theta_0} = (\mu_0, \sigma_0^2)$ and $\boldsymbol{\theta_1} = (\mu_1, \sigma_1^2)$ using the Expectation-Maximization (EM) Algorithm.

Solution:

To generate the sample from the mixture of 2 distributions, we first generate the required number of samples from the two univariate normal distributions independently. Then we generate the mixture by taking proportion of data coming from $f_0(x\,;\theta_0)$ to be equal to π and that from $f_1(x\,;\theta_1)$ to be equal to (1 – π).

R Code:

```
set.seed(123)

rand_snormal <- function(n){
  uni_01 <- runif(2*n)
  y1 <- uni_01[1:n]
  y2 <- uni_01[n+1:1000]
  y <- c(y1, y2)
  x <- c()
  for(i in 1:n){        # Random number from double exponential(1)
    x[i] <- -log(1-y1[i])
    x[n +i] <- log(1-y2[i])
  }

  p <- c()
  i<-1
  while(length(p) < 1000){       # Acceptance/Rejection condition
    U = sample(uni_01, 1)
    z = sample(x, 1)
    if(exp(-abs(z))*1.315*U/2 <= dnorm(z, 0, 1)){
      p[i] <- z
      i <- i+1
    }
    else i <- i-1
  }
  return(p)
}

> rn1 <- rand_snormal(1000)*sqrt(2) + 3
> c(mean(rn1), var(rn1))
[1] 3.009182 1.929094
> rn2 <- rand_snormal(1000)*sqrt(3) + 10
> c(mean(rn2), var(rn2))
[1] 10.083094  2.975097
```

Conclusion: We have generated 2 samples from $N(3,2)$ and $N(10,3)$ distribution in "rn1" and "rn2" respectively.

Then from the mixture we try to find MLE of parameters by using Expectation-Maximization (EM) Algorithm:

1. A initial guess is made about the parameters:

$$\theta^t = (\pi^t, {\mu_0}^t, {\mu_1}^t, {\Sigma_0}^t, {\Sigma_1}^t)^T$$

2. Next we calculate $\delta_i{}^t = \dfrac{f_1(x_i;{\theta_1}^t)\,x\,(1-\pi^t)}{f_1(x_i;{\theta_1}^t)\,x\,(1-\pi^t)+ f_0(x_i;{\theta_0}^t)\,x\,(\pi^t)}$
3. The next iterate of the parameter vector is obtained as:

$$\hat{\pi}^{(t+1)} = \frac{1}{n}\sum_{i=1}^{n}(1-{\delta_i}^t)$$

$$\widehat{\mu_0}^{(t+1)} = \frac{1}{\sum_{i=1}^{n}(1-{\delta_i}^t)}\sum_{i=1}^{n}(1-{\delta_i}^t)\,x_i$$

$$\widehat{\mu_1}^{(t+1)} = \frac{1}{\sum_{i=1}^{n} \delta_i{}^t} \sum_{i=1}^{n} \delta_i{}^t \; x_i$$

$$\widehat{\Sigma_0}^{(t+1)} = \frac{1}{\sum_{i=1}^{n} (1 - \delta_i{}^t)} \sum_{i=1}^{n} (1 - \delta_i{}^t)(x_i - \widehat{\mu_0}^{(t+1)})(x_i - \widehat{\mu_0}^{(t+1)})^T$$

$$\widehat{\Sigma_1}^{(t+1)} = \frac{1}{\sum_{i=1}^{n} \delta_i{}^t} \sum_{i=1}^{n} \delta_i{}^t \; (x_i - \widehat{\mu_1}^{(t+1)})(x_i - \widehat{\mu_1}^{(t+1)})^T$$

After this we will get new parameters:

$$\hat{\theta}^{(t+1)} = (\hat{\pi}^{(t+1)}, \widehat{\mu_0}^{(t+1)}, \widehat{\mu_1}^{(t+1)}, \widehat{\Sigma_0}^{(t+1)}, \widehat{\Sigma_1}^{(t+1)})$$

4. We will repeat this procedure till convergence criteria is satisfied i.e.

$$| \hat{\theta}^{(t+1)} - \hat{\theta}^{t}) < \varepsilon |$$, for some pre-specified threshold ε.

R Code:

```
x <- c(sample(rn1, 400), sample(rn2, 600))
p <- 0.4
m1 <- 6
m2 <- 18
v1 <- 4
v2 <- 8
d <- rep(1, 5)
a <- 0.00001
i <- 0
while(sum(d > a) > 0){
  d1 <- c(p, m1, m2, v1, v2)
  delta <- (dnorm(x, m2, sqrt(v2))*(1-p))/(dnorm(x, m1, sqrt(v2))*p +
                                           dnorm(x, m2, sqrt(v2))*(1-p))
  p <- sum(1 - delta)/1000
  m1 <- sum((1-delta)*x)/sum(1-delta)
  m2 <- sum((delta)*x)/sum(delta)
  v1 <- sum((1-delta)*(x-m1)^2)/sum(1-delta)
  v2 <- sum((delta)*(x-m2)^2)/sum(delta)
  d2 <- c(p, m1, m2, v1, v2)
  d <- abs(d2 - d1)
  d1 <- d2
  i <- i+1
}
> # Number of iterations performed:
> i
[1] 13
> # Parameter estimates are:
> d1
[1]  0.4109478  3.0905900 10.1426955  2.3751448  2.8903687
```

Conclusion: MLE'S of the parameters obtained by EM algorithm are very close to the actual parameters, hence EM algorithm is a valid technique to obtain MLE of parameters from a mixture of 2 distributions.

Appendix

Random Numbers from U[0, 1]

```
  [1] 0.000028 0.000651 0.014965 0.344204 0.916702 0.084143 0.935300 0.511896 0.773599
 [10] 0.792788 0.234130 0.384995 0.854881 0.662265 0.232097 0.338222 0.779107 0.919454
 [19] 0.147439 0.391097 0.995236 0.890435 0.479997 0.039940 0.918630 0.128487 0.955212
 [28] 0.969872 0.307047 0.062092 0.428122 0.846811 0.476649 0.962929 0.147369 0.389478
 [37] 0.957995 0.033878 0.779191 0.921393 0.192044 0.417019 0.591429 0.602876 0.866158
 [46] 0.921631 0.197524 0.543048 0.490095 0.272196 0.260514 0.991827 0.812017 0.676393
 [55] 0.557041 0.811934 0.674483 0.513102 0.801343 0.430889 0.910452 0.940403 0.629261
 [64] 0.473012 0.879286 0.223575 0.142236 0.271424 0.242743 0.583100 0.411306 0.460043
 [73] 0.580985 0.362657 0.341113 0.845590 0.448571 0.317126 0.293895 0.759585 0.470460
 [82] 0.820587 0.873493 0.090348 0.078014 0.794319 0.269348 0.195000 0.484991 0.154804
 [91] 0.560498 0.891459 0.503553 0.581721 0.379585 0.730446 0.800259 0.405950 0.336847
[100] 0.747481 0.192068 0.417571 0.604125 0.894884 0.582342 0.393863 0.058860 0.353776
[109] 0.136839 0.147308 0.388090 0.926075 0.299721 0.893585 0.552457 0.706502 0.249547
[118] 0.739574 0.010199 0.234577 0.395276 0.091355 0.101157 0.326620 0.512270 0.782207
[127] 0.990772 0.787752 0.118287 0.720612 0.574082 0.203891 0.689489 0.858249 0.739729
[136] 0.013758 0.316435 0.277998 0.393951 0.060873 0.400084 0.201939 0.644589 0.825556
[145] 0.987798 0.719351 0.545084 0.536928 0.349335 0.034716 0.798474 0.364907 0.392857
[154] 0.035713 0.821401 0.892214 0.520923 0.981222 0.568103 0.066369 0.526492 0.109323
[163] 0.514421 0.831692 0.128926 0.965295 0.201796 0.641304 0.749983 0.249620 0.741266
[172] 0.049123 0.129825 0.985977 0.677473 0.581870 0.383011 0.809246 0.612655 0.091065
[181] 0.094500 0.173507 0.990653 0.785028 0.055654 0.280039 0.440908 0.140880 0.240231
[190] 0.525324 0.082458 0.896539 0.620393 0.269041 0.187945 0.322726 0.422699 0.722070
[199] 0.607607 0.974961 0.424108 0.754491 0.353285 0.125564 0.887982 0.423583 0.742420
[208] 0.075656 0.740079 0.021828 0.502050 0.547155 0.584561 0.444905 0.232817 0.354782
[217] 0.159987 0.679694 0.632959 0.558057 0.835316 0.212275 0.882317 0.293300 0.745910
[226] 0.155927 0.586332 0.485632 0.169527 0.899132 0.680042 0.640971 0.742329 0.073569
[235] 0.692089 0.918038 0.114875 0.642118 0.768711 0.680353 0.648124 0.906859 0.857749
[244] 0.728236 0.749438 0.237071 0.452644 0.410808 0.448575 0.317236 0.296434 0.817987
[253] 0.813697 0.715033 0.445761 0.252494 0.807363 0.569342 0.094863 0.181849 0.182532
[262] 0.198243 0.559581 0.870372 0.018566 0.427015 0.821356 0.891184 0.497223 0.436140
[271] 0.031226 0.718203 0.518665 0.929297 0.373833 0.598150 0.757451 0.421366 0.691415
[280] 0.902545 0.758540 0.446427 0.267813 0.159708 0.673294 0.485759 0.172468 0.966760
[289] 0.235471 0.415844 0.564418 0.981619 0.577233 0.276361 0.356305 0.195006 0.485139
[298] 0.158190 0.638367 0.682441 0.696148 0.011411 0.262445 0.036244 0.833622 0.173303
[307] 0.985980 0.677536 0.583319 0.416348 0.576010 0.248235 0.709401 0.316225 0.273177
[316] 0.283062 0.510427 0.739814 0.015719 0.361537 0.315356 0.253195 0.823477 0.939980
[325] 0.619550 0.249647 0.741892 0.063512 0.460767 0.597652 0.746002 0.158051 0.635169
[334] 0.608889 0.004449 0.102318 0.353315 0.126238 0.903471 0.779833 0.936164 0.531779
[343] 0.230909 0.310916 0.151078 0.474791 0.920204 0.164688 0.787815 0.119756 0.754394
[352] 0.351067 0.074537 0.714353 0.430121 0.892774 0.533803 0.277462 0.381623 0.777329
[361] 0.878572 0.207163 0.764741 0.589052 0.548206 0.608735 0.000916 0.021064 0.484463
[370] 0.142660 0.281186 0.467283 0.747505 0.192617 0.430193 0.894430 0.571891 0.153486
[379] 0.530175 0.194025 0.462580 0.639347 0.704973 0.214388 0.930934 0.411479 0.464028
[388] 0.672640 0.470711 0.826364 0.006378 0.146699 0.374073 0.603681 0.884665 0.347286
[397] 0.987579 0.714310 0.429127 0.869921 0.008188 0.188331 0.331605 0.626924 0.419262
[406] 0.643023 0.789540 0.159416 0.666559 0.330868 0.609970 0.029315 0.674241 0.507545
[415] 0.673537 0.491342 0.300867 0.919934 0.158479 0.645017 0.835396 0.214115 0.924637
[424] 0.266660 0.133190 0.063367 0.457452 0.521392 0.992007 0.816172 0.771962 0.755131
[433] 0.368009 0.464209 0.676809 0.566598 0.031755 0.730358 0.798231 0.359313 0.264204
[442] 0.076699 0.764069 0.573596 0.192718 0.432511 0.947764 0.798568 0.367055 0.442276
[451] 0.172354 0.964147 0.175377 0.033673 0.774481 0.813054 0.700243 0.105582 0.428383
[460] 0.852809 0.614612 0.136083 0.129901 0.987732 0.717846 0.510455 0.740476 0.030944
[469] 0.711703 0.369180 0.491146 0.296363 0.816345 0.775937 0.846553 0.470710 0.826331
[478] 0.005606 0.128935 0.965505 0.206620 0.752267 0.302133 0.949068 0.828574 0.057199
[487] 0.315588 0.258520 0.945951 0.756884 0.408338 0.391779 0.010913 0.251001 0.773025
[496] 0.779566 0.930019 0.390430 0.979887 0.537401 0.360228 0.285251 0.560765 0.897604
[505] 0.644902 0.832743 0.153100 0.521296 0.989799 0.765388 0.603930 0.890395 0.479081
[514] 0.018865 0.433897 0.979622 0.531307 0.220054 0.061239 0.408497 0.395436 0.095035
[523] 0.185797 0.273340 0.286830 0.597087 0.733012 0.859272 0.763247 0.554692 0.757922
[532] 0.432211 0.940849 0.639529 0.709169 0.310878 0.150195 0.454478 0.452991 0.418793
[541] 0.632244 0.541619 0.457229 0.516276 0.874358 0.110231 0.535324 0.312448 0.186295
[550] 0.284796 0.550314 0.657227 0.116217 0.672993 0.478841 0.013334 0.306683 0.053702
[559] 0.235143 0.408289 0.390652 0.985003 0.655061 0.066412 0.527486 0.132175 0.040036
[568] 0.920824 0.178943 0.115700 0.661106 0.205443 0.725185 0.679257 0.622913 0.326990
[577] 0.520771 0.977726 0.487695 0.216985 0.990660 0.785187 0.059293 0.363748 0.366214
[586] 0.422919 0.727148 0.724400 0.661191 0.207404 0.770298 0.716859 0.487753 0.218321
[595] 0.021385 0.491846 0.312459 0.186550 0.290647 0.684881 0.752268 0.302171 0.949925
[604] 0.848284 0.510542 0.742463 0.076660 0.763176 0.553039 0.719908 0.557890 0.831475
```

```
 [613] 0.123921 0.850185 0.554257 0.747902 0.201747 0.640174 0.723999 0.651977 0.995476
 [622] 0.895955 0.606957 0.960020 0.080470 0.850807 0.568572 0.077152 0.774487 0.813212
 [631] 0.703882 0.189291 0.353689 0.134849 0.101529 0.335158 0.708635 0.298598 0.867751
 [640] 0.958273 0.040284 0.926539 0.310389 0.138956 0.195998 0.507951 0.682884 0.706328
 [649] 0.245535 0.647316 0.888274 0.430307 0.897057 0.632313 0.543201 0.493614 0.353123
 [658] 0.121822 0.801903 0.443769 0.206692 0.753923 0.340221 0.825092 0.977126 0.473895
 [667] 0.899596 0.690704 0.886183 0.382220 0.791066 0.194523 0.474025 0.902577 0.759273
 [676] 0.463270 0.655211 0.069846 0.606455 0.948465 0.814700 0.738107 0.976453 0.458428
 [685] 0.543854 0.508639 0.698708 0.070280 0.616431 0.177924 0.092258 0.121939 0.804593
 [694] 0.505641 0.629745 0.484126 0.134899 0.102670 0.361407 0.312361 0.184308 0.239091
 [703] 0.499085 0.478964 0.016182 0.372183 0.560220 0.885056 0.356279 0.194428 0.471850
 [712] 0.852555 0.608761 0.001505 0.034617 0.796182 0.312187 0.180294 0.146759 0.375457
 [721] 0.635516 0.616875 0.188117 0.326700 0.514110 0.824527 0.964132 0.175032 0.025727
 [730] 0.591732 0.609842 0.026371 0.606529 0.950169 0.853889 0.639438 0.707075 0.262718
 [739] 0.042511 0.977753 0.488324 0.231459 0.323549 0.441636 0.157638 0.625671 0.390444
 [748] 0.980208 0.544775 0.529836 0.186234 0.283387 0.517897 0.911633 0.967561 0.253894
 [757] 0.839563 0.309942 0.128663 0.959249 0.062732 0.442843 0.185381 0.263772 0.066766
 [766] 0.535615 0.319156 0.340584 0.833423 0.168740 0.881026 0.263603 0.062865 0.445897
 [775] 0.255633 0.879550 0.229651 0.281966 0.485215 0.159945 0.678740 0.611027 0.053613
 [784] 0.233108 0.361494 0.314359 0.230268 0.296160 0.811671 0.668444 0.374218 0.607019
 [793] 0.961433 0.112961 0.598105 0.756406 0.397339 0.138790 0.192167 0.419841 0.656348
 [802] 0.096011 0.208245 0.789644 0.161822 0.721903 0.603780 0.886936 0.399519 0.188948
 [811] 0.345810 0.953635 0.933601 0.472825 0.874977 0.124462 0.862627 0.840414 0.329519
 [820] 0.578937 0.315556 0.257795 0.929277 0.373380 0.587750 0.518247 0.919692 0.152912
 [829] 0.516967 0.890252 0.475802 0.943451 0.699369 0.085489 0.966249 0.223718 0.145515
 [838] 0.346838 0.977271 0.477233 0.976364 0.456379 0.496709 0.424316 0.759278 0.463391
 [847] 0.658004 0.134088 0.084015 0.932356 0.444194 0.216467 0.978737 0.510953 0.751921
 [856] 0.294174 0.766003 0.618062 0.215423 0.954729 0.958772 0.051763 0.190541 0.382452
 [865] 0.796406 0.317335 0.298716 0.870464 0.020663 0.475260 0.930986 0.412683 0.491705
 [874] 0.309217 0.111993 0.575830 0.244091 0.614086 0.123975 0.851425 0.582780 0.403947
 [883] 0.290773 0.687788 0.819134 0.840079 0.321828 0.402040 0.246911 0.678964 0.616178
 [892] 0.172099 0.958273 0.040281 0.926465 0.308686 0.099779 0.294910 0.782927 0.007321
 [901] 0.168388 0.872931 0.077405 0.780324 0.947462 0.791623 0.207340 0.768816 0.682759
 [910] 0.703468 0.179770 0.134715 0.098441 0.264145 0.075337 0.732742 0.853067 0.620534
 [919] 0.272279 0.262417 0.035596 0.818715 0.830437 0.100060 0.301390 0.931967 0.435252
 [928] 0.010792 0.248207 0.708772 0.301762 0.940531 0.632209 0.540809 0.438609 0.087998
 [937] 0.023955 0.550958 0.672031 0.456713 0.504404 0.601299 0.829869 0.086996 0.000918
 [946] 0.021111 0.485564 0.167968 0.863255 0.854876 0.662154 0.229547 0.279577 0.430273
 [955] 0.896281 0.614454 0.132443 0.046182 0.062183 0.430209 0.894812 0.580683 0.355701
 [964] 0.181132 0.166046 0.819055 0.838276 0.280344 0.447903 0.301780 0.940946 0.641763
 [973] 0.760545 0.492537 0.328353 0.552110 0.698531 0.066206 0.522735 0.022905 0.526820
 [982] 0.116867 0.687933 0.822468 0.916774 0.085799 0.973388 0.387920 0.922151 0.209484
 [991] 0.818138 0.817179 0.795113 0.287601 0.614825 0.140966 0.242219 0.571030 0.133687
[1000] 0.074801
```

Random Numbers from N[7, 3]

[1]	8.921741	6.457742	6.318709	7.069802	7.790513	5.696806	3.847144	6.194282
[9]	9.135566	3.923386	8.691001	4.724195	7.109499	8.675874	7.059426	9.664716
[17]	5.928883	7.555913	8.101871	7.170207	6.179516	7.751178	5.568084	4.596065
[25]	9.559993	8.867730	8.369355	6.866307	5.203706	7.149139	5.149206	9.540181
[33]	7.367788	7.304394	10.378739	6.742006	6.895115	8.240888	7.286279	7.237360
[41]	6.650050	5.700314	6.705106	4.596065	8.298164	7.830509	9.174996	8.587014
[49]	6.323495	8.154123	5.518526	4.057397	5.031723	7.318690	4.207943	9.460756
[57]	6.798544	6.650050	7.910789	7.784101	6.137606	7.176023	6.882552	8.161563
[65]	7.903957	5.755009	4.449945	6.915985	6.384655	4.057397	8.448694	4.342476
[73]	4.724195	7.965821	9.292042	6.585829	6.851162	8.557208	7.456358	6.938021
[81]	9.491803	8.587014	3.866625	4.426417	7.927844	7.575079	5.866945	5.080405
[89]	7.221274	8.708787	5.040168	5.301590	5.135528	5.116266	7.992347	8.570958
[97]	4.207943	7.473289	6.492943	6.068424	7.473289	7.934306	9.661814	3.403727
[105]	6.780871	8.936073	8.968226	6.978643	6.869395	8.165714	8.812506	6.019520
[113]	8.167029	5.919361	7.074513	6.802805	8.846814	11.742340	6.183591	9.292042
[121]	6.039222	5.192162	12.024784	7.217313	7.668938	7.851380	4.794847	7.983324
[129]	5.796861	4.652843	8.513891	7.441454	8.401171	6.952087	8.018335	7.940261
[137]	6.176880	7.856131	5.670838	6.409982	6.446288	7.533314	5.795710	5.080405
[145]	7.014288	6.631968	5.331317	7.854974	7.136639	2.366601	8.336263	7.210142
[153]	7.856131	4.724433	8.088347	7.116276	5.559043	6.799055	8.989929	5.443568
[161]	7.588921	6.323495	6.142911	7.221881	6.858414	5.234772	7.528087	4.516254
[169]	5.188784	5.116266	6.432880	7.584172	8.571384	7.904613	6.991948	7.783151
[177]	5.403795	8.684597	6.397307	7.785680	8.771992	6.857515	4.433274	4.532950
[185]	8.311687	7.584172	10.435351	5.518526	6.327837	9.415307	8.902016	9.141554
[193]	8.279721	5.547247	7.327270	3.549551	5.734250	7.653455	7.381620	8.292965
[201]	6.170766	3.794143	9.653899	7.275619	5.176068	8.253429	6.516815	7.381620
[209]	7.923618	7.563628	7.136639	9.444653	8.161165	6.628090	8.672519	5.886852
[217]	6.745797	5.354128	6.384390	7.138203	6.488569	5.008311	7.327382	9.160182
[225]	6.501685	3.234094	8.180906	4.818588	9.936556	5.466902	4.818588	5.569952
[233]	7.220243	9.863864	6.210748	7.756574	7.176023	5.507391	6.152561	7.965821
[241]	8.562739	5.403795	8.440145	8.805266	7.272769	5.668665	8.292965	6.858414
[249]	5.795710	8.208550	8.321668	7.170207	7.065967	9.905085	7.856131	10.313430
[257]	7.103414	7.812582	9.384010	9.477792	5.814632	11.048124	7.871129	9.548071
[265]	8.275375	5.187176	4.341273	5.547336	5.624459	7.438762	5.220460	5.336157
[273]	7.242595	9.263927	4.571636	10.235340	6.561177	5.445686	6.445490	7.221274
[281]	8.790074	8.444382	9.335429	8.125472	5.741935	8.154123	8.625305	6.309151
[289]	6.152561	4.342476	7.441454	9.877058	6.655275	6.136147	7.547031	5.901773
[297]	8.210670	5.591192	9.897610	7.519763	7.637987	5.688811	11.258275	7.539224
[305]	6.832591	4.581850	9.172695	4.406079	6.564642	7.015974	5.733639	5.187176
[313]	7.692478	5.943866	7.134952	7.078204	7.881718	6.536404	6.697630	5.149206
[321]	9.015982	9.301413	8.440145	6.956473	11.275250	9.893210	5.012448	8.643264
[329]	3.403727	9.032493	4.818588	9.586763	6.049478	5.547336	6.997997	5.180719
[337]	6.869395	8.515098	6.199986	5.928828	4.955095	6.731141	4.787041	6.281798
[345]	5.426709	3.217585	6.345555	8.056441	8.125394	7.035035	7.755774	6.234821
[353]	9.172695	7.696229	9.897610	5.159836	7.467652	8.473386	7.620608	6.742006
[361]	6.219346	7.144370	8.275375	5.966369	5.942691	7.575079	4.750758	8.557208
[369]	6.543040	5.903480	7.081613	6.923661	4.740714	5.686048	8.076835	6.851162
[377]	8.785121	8.401171	6.756045	5.597148	5.845747	5.334291	3.279428	4.975436
[385]	6.857515	6.882427	8.642821	9.015982	7.275559	8.666478	7.923618	7.874944
[393]	6.591721	5.613389	6.979928	7.027018	6.432736	8.066577	8.208550	10.600069
[401]	4.581850	7.061483	5.761891	7.371011	4.975436	9.369157	7.584172	8.354546
[409]	5.879499	6.504659	7.934306	7.259630	5.315839	8.867730	7.645894	7.064770
[417]	6.099670	8.360365	5.361304	8.380305	9.905085	8.088151	6.310900	7.262535
[425]	9.661814	8.370883	6.543196	7.196586	5.159836	6.937711	5.900350	6.198372
[433]	6.686614	4.944608	7.555009	8.336263	7.648858	5.734250	5.349209	5.543956
[441]	5.535326	7.913728	3.665706	2.647794	9.880103	7.220243	6.719706	4.764858
[449]	5.474333	10.576271	7.860407	3.995620	7.094035	7.221274	5.466902	7.275559
[457]	6.415497	9.615207	6.419877	5.874391	4.427649	6.733452	9.846596	7.944794
[465]	6.055997	8.076835	5.547336	7.872960	5.218614	8.487371	7.767741	8.136935
[473]	3.530851	7.921967	7.103414	9.108545	7.860407	8.026178	5.235611	6.188748
[481]	7.287384	3.679914	6.069231	7.225156	7.784971	7.936209	8.388588	8.089147
[489]	4.601588	7.241298	7.745610	4.433274	8.066577	10.254343	4.694309	3.516278
[497]	6.743538	5.474339	7.255337	5.547247	9.009049	8.907918	3.306774	7.198301
[505]	8.910084	7.871032	9.257563	6.501685	6.759953	6.865629	8.951454	5.723505
[513]	4.724433	3.292265	7.663360	5.535326	7.587311	6.415497	8.807952	7.718528
[521]	5.762987	5.192162	7.842496	6.736016	7.203978	9.846596	7.790513	5.358506
[529]	5.901773	5.358506	6.228033	8.902016	8.307341	7.489268	6.696032	6.136147
[537]	6.073620	8.779752	4.940507	6.066785	4.892849	6.869699	7.176023	4.620980

```
[545]  9.163757  6.597483  8.487371  9.807121  8.998014  6.432736 10.508724  6.736016
[553]  3.767601  6.502448  7.001082  5.036170  7.647401  4.584350  7.761559  5.915167
[561]  5.903480  8.034225  5.795482  9.689198  6.700656  7.476548  9.430812  8.561880
[569]  6.488569  5.585694  7.287384  7.284220  8.127500  8.776602  4.516254  6.447587
[577]  8.411922  7.812582  4.433274  3.674023  4.675117  5.149206 12.351115  6.236979
[585]  5.925989  6.925451 10.487332  9.263737  8.666478  8.543878  9.540181  3.510254
[593]  6.071145  8.298164  7.001082  8.560585  6.004633 10.597302  7.450999  9.056830
[601]  5.935168  7.519763  8.805733  5.116266  6.771078  9.661814  6.733452  2.257593
[609]  8.229060  7.265860  7.123709  9.281584  5.875181  5.418117  8.522882  9.044283
[617]  5.905475  5.942691  5.969051  5.569952  4.712556  7.559509  8.088347  6.918735
[625]  5.346944  7.088001  7.221881  5.096446  6.829016  7.905889  7.934306  7.272769
[633]  5.051731  9.465609  8.532833  5.763452  5.835019  3.858286  6.769068  7.065967
[641]  6.047438  6.115043  7.040045  8.161165  5.036170  5.585694  5.919361  8.154123
[649]  6.947351  5.913370  6.887119  9.435173  5.627295  7.663360  8.104800  4.207943
[657]  8.691001  9.172695  6.742006  3.469951  5.443568  6.540000 10.065291  7.591631
[665]  8.285121  5.861874  7.065967  5.544883  5.943866  8.846814 10.085175 10.367297
[673]  5.688811  4.750758 10.769870 10.769870  3.836915  7.031048  7.897522  6.631968
[681]  7.098536  6.719315  7.758931  8.086497  5.597148  5.805037  5.994977  7.189431
[689]  7.683937  3.675278  8.306684  8.125472  9.748429  5.983833  6.219346 11.233155
[697]  5.361304  7.409351  8.117104  6.590569  9.313841  7.794494  3.847144  6.545919
[705]  7.507126  6.808901  4.343843  6.384390  7.697651  4.740714  7.949013  6.848680
[713]  6.906745  8.082297  4.762513  4.897370  7.422051  7.189831  6.376681  9.936556
[721]  6.483967  4.838193  8.279721  6.331116  7.255690  5.928932  5.983833 10.716514
[729]  8.130209  8.300770  7.619060  8.140171  5.605837  9.912707  6.564642  4.614135
[737]  5.886852  5.875181  8.487139  3.279428  5.358506  5.303217  5.762987 10.576271
[745]  5.868884  6.126929  8.911280  3.847951  4.057397  3.923386  8.998014  9.491803
[753]  8.050545  6.419877  5.624647  7.210142  7.233428  8.370883  7.397222  9.460756
[761]  9.889865  7.327270  8.143217  6.743896  6.514815 11.045127  6.702824  5.952804
[769]  3.964026  7.381620  5.846836  9.889865  5.658701  7.663360  5.176068  9.094518
[777] 10.587209  6.905205  8.561880 11.047432  9.306096  9.210047  6.863354  6.758217
[785]  6.860011  7.794494  9.636959  5.688811  7.751178  7.360049  7.674074  6.733452
[793]  9.210047  6.345555  7.853792  7.528087  6.995701  4.837021  5.477911  9.664716
[801] 10.792757  8.470172  3.510254  9.960095  6.989450  6.863675  5.012448  7.672929
[809]  1.774282  3.861659  9.377516  4.532950  7.561437  5.585694  3.864559  6.707805
[817] 10.291315  4.556096  6.879927  8.840261  9.306096  4.556096  7.103843  5.799716
[825]  6.944694  8.523034  3.418809  5.925989  6.131136  9.057310  6.516815  8.718453
[833]  3.516278  8.918180  9.021418  7.077877  6.659783  7.001082  5.164971 10.061503
[841]  7.241298  4.334824  6.351251  7.912346  5.928883  7.697651  7.288136  5.130875
[849]  8.295217  5.915167  6.839822  8.880748  7.324190  9.421566  8.002518  4.862762
[857]  8.161563  5.838232  7.199556  9.748429  7.723165  7.041524  7.049176  8.963971
[865]  5.627295  8.894809  4.883613  6.563493  7.619060  2.211081  6.769068  5.813804
[873]  8.369724  5.275223  9.422815  5.646753  7.940261  8.575640  8.127211  7.913728
[881] 10.128283  9.145151  7.441650  7.818078  8.866625  7.275487  7.372219  9.242253
[889] 10.235340  7.369311  7.261188  4.160293  7.818078  9.310831  5.942691  6.393565
[897] 11.699942 10.406730  8.235003  7.302969  7.189831  4.406079  5.944499  6.865629
[905]  5.435192  7.430612  8.450235  5.457709  6.131136  6.073620  6.075645  9.265471
[913]  5.903306  6.397307  8.384053  9.369157  6.758217  8.448694  5.135528  6.483967
[921]  5.309773  8.056441  6.840652  5.354128  5.947143  9.797605  7.394621  5.650218
[929]  6.882526  7.278137  5.051731  6.419197  8.216015  7.035123  4.975436  4.581850
[937]  7.035035  4.747918  7.177185  6.159844  6.015312  4.955095  6.606910  6.990683
[945]  7.092856  6.004488  4.614135  6.591721  9.073527  5.361304  5.813804  6.130288
[953]  1.378181  3.782971  5.921233  5.040168  8.164325  5.763452  7.296421  7.779504
[961]  5.925989  7.806211  7.591162  6.486348  6.794053  9.432418  8.911484 10.090729
[969]  5.868884  7.668938 10.367297  6.743896  5.031723  7.035123  9.242253  7.756574
[977]  6.219346  4.334824  4.486606  9.877058  5.755009  8.459194  7.851056  6.140361
[985]  3.499233  7.199556  6.393565  4.160293  6.740962  8.330192  7.259630  7.312383
[993]  8.894809  6.351251  8.161563  6.975683  4.657782  6.510705  8.375499  8.805266
```

Random Numbers from Gamma(5.8)

[1]	4.114101	3.589421	4.260729	7.490542	6.863032	7.334752	5.084039	3.558057
[9]	2.239906	9.301268	6.901516	5.863973	3.293069	4.129076	9.191731	2.900571
[17]	5.141268	3.422547	6.444308	6.663006	5.816847	3.797126	2.545334	4.135330
[25]	2.985504	11.224773	3.914457	10.075771	6.850553	7.616406	5.726462	4.016976
[33]	3.478861	8.380475	4.330243	4.557448	4.558217	8.225295	8.120647	5.722012
[41]	3.836903	3.370864	6.314801	3.513647	7.512845	3.448328	3.348552	5.921171
[49]	6.196747	5.424827	5.802159	5.067929	3.862796	3.112345	8.164984	2.296285
[57]	2.849171	5.360144	3.368985	6.780357	6.877277	4.171921	8.814615	4.966065
[65]	3.248227	5.166506	5.475803	5.649211	4.070493	6.049134	7.870737	3.947587
[73]	3.602831	5.256552	3.555785	6.318355	6.456204	3.218159	6.005542	4.415590
[81]	4.750376	7.141149	6.953747	7.959500	2.887874	10.097913	3.211016	4.199889
[89]	2.721816	7.446488	4.127450	6.523089	2.959904	2.045402	7.576649	3.673372
[97]	4.441362	2.924649	5.519954	3.772282	8.742867	9.559849	4.060528	4.927040
[105]	9.046656	5.025976	6.827875	4.817571	6.467587	4.569861	2.717042	3.002202
[113]	11.583449	2.438692	2.848211	7.832202	6.969476	7.336214	3.117910	3.262057
[121]	5.747777	4.132338	7.678364	7.352346	4.152787	4.185495	2.456536	4.134875
[129]	5.070847	6.061824	17.411806	6.124377	6.341114	3.966924	4.986214	4.221941
[137]	5.122961	3.315429	3.766358	6.535421	10.389417	8.910884	2.763190	7.004251
[145]	5.590558	2.500210	7.914404	6.757889	7.400287	8.220641	8.693581	3.480132
[153]	3.890797	4.424721	7.376037	11.489426	5.148305	9.250025	2.570658	4.444224
[161]	4.770840	6.911873	3.629934	6.575779	6.813063	7.945910	7.109461	3.302516
[169]	4.829045	4.187793	2.191746	5.339380	5.990386	6.695001	6.854701	2.917142
[177]	2.627620	3.506239	7.522912	2.776831	9.099297	4.367582	9.861639	3.110946
[185]	7.177293	4.267815	4.242965	3.514854	5.729906	5.378311	4.185037	8.193410
[193]	4.795412	8.298005	5.114943	8.972026	5.771960	4.192927	6.905311	5.860331
[201]	5.447838	3.870312	3.895203	7.508136	8.642211	9.326255	3.743066	4.852647
[209]	4.104670	9.775914	5.576361	4.226326	5.495027	5.451262	4.176183	6.066368
[217]	3.427740	6.175500	3.456317	7.170355	3.071526	5.297274	6.197749	4.038573
[225]	5.225079	3.313963	10.609312	3.358237	3.556926	6.853985	8.337397	15.320409
[233]	5.067448	7.459106	3.003432	6.760066	12.135478	2.709354	7.680008	8.349796
[241]	5.731884	7.405414	3.224877	3.125404	11.339207	3.217206	2.588758	4.973213
[249]	9.018893	4.768758	5.278942	4.555193	3.861513	6.259660	4.415585	5.680787
[257]	3.627375	6.503544	8.684344	4.312246	11.390281	7.312309	4.760470	3.357873
[265]	3.430954	2.877219	4.115015	5.859632	3.703742	8.840638	7.693280	5.904917
[273]	4.953786	4.761049	3.848733	4.188683	7.030727	4.934565	4.103537	4.377564
[281]	4.998732	6.045008	8.370502	3.788668	7.563123	3.486021	3.832405	4.459450
[289]	5.225224	7.646951	3.388145	4.911971	10.634680	7.071929	11.132878	5.170279
[297]	7.241228	3.878468	9.130000	3.544221	3.179880	6.518510	6.504963	5.508779
[305]	10.924592	7.753421	3.923926	10.092197	14.294159	7.142988	6.839165	7.737199
[313]	4.865334	7.692916	8.275020	5.772957	3.212468	2.000590	2.950340	7.502413
[321]	3.378160	5.835810	3.329573	6.840182	5.917476	6.114745	6.964731	11.415461
[329]	4.169690	5.439573	6.974168	7.761916	7.714227	6.928548	6.328524	4.025428
[337]	3.702940	6.766889	7.490606	4.071286	7.641151	5.348149	6.701919	8.658587
[345]	4.113304	4.500579	2.543494	4.449038	8.650914	2.803188	4.994475	7.381432
[353]	8.759929	5.998316	11.167013	11.417312	7.111905	2.562152	5.884095	4.204113
[361]	3.456865	4.257082	3.310738	3.674570	9.055222	6.596080	11.403760	4.597786
[369]	5.400870	6.276299	8.267191	4.518316	6.444973	2.607245	4.062782	7.120637
[377]	3.180658	3.344094	5.619144	5.425075	9.791584	12.067360	6.042865	5.590329
[385]	2.492976	6.448199	10.011747	3.485703	5.291795	5.108625	9.091438	4.859345
[393]	4.491982	3.462769	2.798808	6.829846	6.014536	7.585943	3.916998	4.176081
[401]	3.757138	7.380680	2.961160	3.136361	3.021298	3.657604	5.381421	6.072267
[409]	3.698458	4.140854	4.814162	8.128466	5.167454	2.890991	6.674494	1.773518
[417]	4.904279	4.648526	2.084365	5.639366	4.338673	5.480536	6.071118	3.026018
[425]	5.601101	2.893315	4.913150	9.419662	3.278556	7.900518	5.248926	2.601090
[433]	3.199965	9.936017	10.729930	7.765513	4.023244	4.362330	6.967929	6.556508
[441]	6.364214	11.072919	7.605649	6.830831	7.449249	9.532131	3.539519	6.973892
[449]	3.730499	10.575155	4.094992	4.739111	9.731377	4.989912	6.471830	6.887087
[457]	5.358973	4.871667	3.434972	4.370036	4.002853	7.357207	7.450563	5.940655
[465]	7.754127	5.693518	9.526476	4.803273	3.925418	8.878963	7.718227	2.504372
[473]	4.528307	11.127824	4.107028	8.424178	3.555617	2.679109	7.225268	8.604863
[481]	4.314093	4.360143	6.857137	5.448308	3.509965	2.850060	8.217993	4.274123
[489]	10.962756	7.792151	3.830846	5.340090	8.351519	4.622947	4.270567	4.316115
[497]	2.998436	10.536915	6.012851	4.071680	2.464741	10.053633	3.654627	4.700640
[505]	5.064513	5.276762	2.466824	5.425302	3.799331	11.112933	5.713482	6.339282
[513]	7.454543	4.533069	7.060549	9.008338	5.764670	4.520250	6.329444	3.825351
[521]	4.184473	2.889080	4.676832	5.728373	5.851682	2.722899	5.117763	4.084874
[529]	6.836935	2.934165	8.112202	1.891019	4.119618	5.469822	3.638544	11.290161
[537]	4.625390	7.765413	3.969205	4.800648	2.737899	8.942978	8.240318	4.733065

```
[545]  3.863386  6.672256 10.178837  5.427602 10.107779  9.693437  6.967316  4.170561
[553]  8.421531  1.577176  6.949076  9.901635  5.002002  5.658180  7.998119  4.158165
[561]  7.073185 12.192023  5.141772  6.436290  4.342010  4.393429  5.280323  8.776737
[569]  2.466129  3.939166  3.540429  7.814377  6.680701  5.885330  2.744504  5.099331
[577]  4.116469  6.918474  3.422609  5.753862  3.215160  5.281819  5.689609  7.867597
[585]  4.221057  4.479740  3.458509  4.932414  7.015371  7.313228  7.351258  9.981084
[593]  4.599316  6.621610  2.893956  6.771273  6.334074  8.932164  3.983328  5.326360
[601]  7.019737  3.272902  9.680120  6.942494  3.695062  7.420899 10.289788  4.188170
[609]  5.826434  8.826755  1.556011  2.293952  4.450578  2.142262  6.886189  2.808469
[617]  3.237078  6.948616  7.725002  9.872440 14.353869  4.321360 11.579683  6.770131
[625]  3.879439  7.775820  6.714220  7.864594  3.549466  3.439742  5.511462  6.662329
[633]  3.288558  5.371108  4.306994  3.849712  6.549528  9.363357  8.072052  4.613765
[641]  2.160937  2.560151  4.093666  6.794823  2.672794  3.852990  4.632621 16.333046
[649]  4.623126  6.579313  5.379743  5.061064  3.074982  3.027678  4.748946  7.024715
[657]  4.721675  5.037087  5.727724  6.905701  6.733519 10.833789  5.975617  6.243200
[665] 11.670543  5.083350  3.039388  5.883263  5.343241 10.430572  6.261650  9.759460
[673]  5.965150  4.246202  6.056658  5.492763  3.041089  6.101642  2.484978  9.978017
[681] 10.607480  6.125758  4.136746  7.575568  8.559072  3.761772  7.076688  1.723947
[689]  4.841458  5.578209  6.312236  8.103210 10.820831  2.771230  3.784175  8.531814
[697]  4.102894  5.874414  3.610139  5.023148  5.157808  4.380995  7.727302  6.573462
[705]  3.349354  3.791816  3.395115  4.243826  5.484458 10.706040  7.506632  6.782092
[713]  8.734789  3.762194  3.178101  5.740011  5.511800  2.762677  4.899946  5.103303
[721]  3.414242  2.080391 14.930074 11.429829  2.998052  5.257389  4.524972  4.405984
[729]  3.378760  6.949897  4.332648  2.932333  3.302648  6.316016  3.350867  7.411807
[737]  7.820342  5.817290 10.022110  5.415749  3.657040  9.366818  6.465186  6.038285
[745]  3.353953  7.972224  5.047975  6.470624  2.960797  3.878516  4.946073  5.026455
[753]  3.228761  3.179437  5.729224  5.919060  9.522819  9.214934  1.801917  3.429272
[761]  4.541611  3.326119  1.744827  5.896106  7.312488  4.207283  8.295853  7.098351
[769]  7.209009  8.266411  5.158963  5.042191  9.694219  4.390254  5.193834  1.725560
[777]  6.432091  2.166454  5.573079  2.630096  7.945512  6.887994  5.228083  9.640275
[785]  2.827563  2.870979  6.340286  4.563566  3.734391  2.701224  5.273447  7.486288
[793]  3.997992  1.904645  5.183695  4.702167  3.222618  8.759579  5.611233  3.850896
[801]  9.307948  7.132754  4.497523  7.003469  3.730519  3.584269  6.223623  5.576758
[809]  8.383027  4.315271  4.280836  6.251373  7.262165  5.362508  4.310813  5.289777
[817]  5.400643  8.808501  7.717138  4.612207  2.071182  3.242889  1.748681  5.939652
[825]  6.711630  4.281185  6.446987  5.797065 12.467708  2.836356  6.131170  9.029825
[833]  7.445853  6.327057  8.802439  4.209161  5.263860  6.513768  2.995136  5.406530
[841]  6.504268  6.138230  6.573219  6.369548  5.293915  6.730548  4.889710  8.855504
[849]  4.276206  4.785482  4.953319  8.335988  7.493650  3.667724  3.413202  7.053360
[857]  3.558083  6.703524  5.263819  6.145859  4.337605  9.724672  6.407494  4.649828
[865]  6.150990  6.550435  4.324571  7.124721  5.419137  5.562131  7.864989  8.975182
[873]  5.242778  3.691360  2.998516  6.451616  3.077569  2.359501  4.939087  7.820125
[881]  7.670055  4.864059  4.948577  6.180057  4.818230  8.704711  6.643024  9.531810
[889]  2.852113  9.452276  8.089577  4.522634  3.179539  8.462489  7.182224  5.717365
[897]  6.494561  9.134823 10.031409  7.481479  6.502142  3.029473  7.546649  3.861520
[905]  6.799742  9.510503  5.685002  3.858292  8.035716  6.924057  8.362286  4.206649
[913]  9.974993  2.571366  8.458902  3.731244  3.634680 11.332673 11.150498  6.104146
[921]  3.455970  3.175909  6.650393  3.874621  4.906001  7.437459  3.270605  8.876915
[929]  8.206277  3.294510  6.989796  6.916989  5.554550  5.783695  7.373811  8.057679
[937]  8.136840  6.142465  3.963561  3.633806  6.823268  5.475537  7.504807  6.796525
[945]  1.892772  2.959239  4.469655  8.738142  4.471375  3.676002  6.537328  7.492558
[953]  6.162106  6.044674  5.621893  4.620110  8.440969  4.621132  5.183568  5.035316
[961] 11.608906  7.722281  7.351256  4.595398  6.607715  3.668035 10.375375  6.625892
[969]  8.089628  2.492074 14.854960  6.281142  5.822109  8.294080  5.902063  4.306562
[977]  6.026681 10.338557  6.728121  3.771761  5.298291  7.024658  1.789111  4.212292
[985]  8.963060  7.610372  5.267247  8.263478  1.387701  5.537536  8.791436  1.559632
[993]  6.858899  4.178721  6.118921  4.011925  4.623853  2.941241  6.942424  6.507982
```

Random Numbers from Multivariate Normal

```
        [,1]    [,2]    [,3]     [,4]     [,5]     [,6]     [,7]     [,8]    [,9]    [,10]
[1,] 7.33676 7.40526 9.54041 10.70125 10.46559 13.39864  6.24325 12.11829 9.39088 11.56596
[2,] 2.11235 5.10412 0.35720  3.84052  1.59788  3.55136 -3.13238  2.42142 4.05746  3.67876
       [,11]    [,12]    [,13]    [,14]   [,15]    [,16]    [,17]   [,18]   [,19]    [,20]
[1,] 11.92570  8.28897 10.70365  7.88576 7.85884 12.74382 10.05692 4.96567 7.87235 12.42215
[2,]  4.13575 -2.31789  2.16357 -1.28972 2.69347  2.40284  2.06139 0.45585 1.68807  4.17791
       [,21]    [,22]   [,23]    [,24]   [,25]   [,26]    [,27]    [,28]    [,29]    [,30]
[1,] 8.42385 11.20202 6.75120 10.37241 9.09358 9.82813  9.43010 13.91373  7.49289 10.52737
[2,] 1.36968  3.53988 0.13392  3.84985 3.87580 0.84493 -0.31324  6.99482 -0.45404  1.96774
       [,31]    [,32]   [,33]   [,34]    [,35]   [,36]    [,37]   [,38]   [,39]   [,40]
[1,] 15.68344 10.93761 7.01317 4.64047 10.43141 9.99888 10.27263 5.63646 7.76353 8.93508
[2,]  3.02372  2.37993 2.06964 4.37246  6.82408 0.66646  0.23853 2.05844 1.79761 0.74458
       [,41]    [,42]    [,43]    [,44]    [,45]   [,46]    [,47]    [,48]   [,49]   [,50]
[1,] 7.35071 11.58348 10.81120 11.82598 10.15592 8.04418 12.56154 13.68599 5.17289 5.36408
[2,] 1.44152 -0.78900  3.00284  1.82566  2.75532 4.39195  4.06806  3.95500 0.15600 0.39850
       [,51]   [,52]   [,53]    [,54]    [,55]   [,56]    [,57]   [,58]   [,59]    [,60]
[1,] 7.28836 6.53114 7.98992 11.42044 10.84923 7.01273 12.69607 8.23984 7.97813 10.29707
[2,] 1.80553 1.92488 5.56408  4.32242  5.85779 0.69629  1.23812 1.04480 1.24151  1.84035
       [,61]   [,62]   [,63]   [,64]   [,65]  [,66]    [,67]    [,68]   [,69]   [,70]
[1,] 8.20865 8.31827 9.04968 8.77734 6.94805 8.8958  9.78160  9.14558 7.91607 7.15408
[2,] 4.70457 1.50803 3.51290 1.88368 0.97562 0.7394 -1.07641 -1.21984 0.70517 1.57425
       [,71]   [,72]    [,73]    [,74]    [,75]    [,76]    [,77]    [,78]    [,79]   [,80]
[1,] 4.20169 4.13984  5.53921 14.83215  4.65268 10.24764  7.68308  4.35258 11.50349 6.00047
[2,] 3.68970 0.21665 -0.15822  3.00235 -2.18363  2.16739 -0.18023 -1.03955  1.10280 5.45005
       [,81]    [,82]   [,83]    [,84]   [,85]    [,86]    [,87]   [,88]    [,89]    [,90]
[1,] 10.07596 12.36317 8.29128  7.63023 8.69295 15.48915 10.23958 8.05195 12.15664 12.42494
[2,]  1.67428  4.42836 6.54045 -1.23436 2.38734  3.29778  2.04234 1.76971  6.90416  5.11735
       [,91]    [,92]    [,93]   [,94]    [,95]   [,96]   [,97]    [,98]    [,99]  [,100]
[1,] 6.01864  8.93580 10.38054 12.7329  7.37165 8.69154 7.34174  5.14474 12.55213 9.97353
[2,] 3.58370 -1.10847  1.89339  1.0006 -0.22492 2.79770 3.47863 -0.85094  0.44334 1.35661
       [,101]   [,102]  [,103]   [,104]  [,105]  [,106]   [,107]   [,108]   [,109]   [,110]
[1,] 10.92269 13.27440 3.77713 11.11151 9.19828 8.73568  7.25009 12.45864  7.55945 10.77148
[2,]  5.88409  2.00905 6.40863  3.49252 3.10983 2.84446 -1.18268  5.78132 -0.88461  2.19891
       [,111]  [,112]  [,113]   [,114]  [,115]   [,116]  [,117]  [,118]   [,119]   [,120]
[1,] 4.16455 7.08366 6.60572  7.33423 9.67185  4.91440 7.47635 8.78799 10.01678 12.05802
[2,] 1.20390 0.96282 5.41060 -1.66556 2.66689 -4.77589 2.95226 1.75761 -0.33665  2.49503
       [,121]  [,122]   [,123]  [,124]  [,125]  [,126]  [,127]   [,128]  [,129]  [,130]
[1,] 11.45147 9.21764 11.32109 7.36167 9.00791 9.56823 8.69121 11.47046 2.55892 9.84917
[2,]  4.58922 0.18080 -1.83870 1.18894 4.15584 2.95374 1.42597  4.82909 2.14280 1.24272
       [,131]  [,132]   [,133]   [,134]   [,135]  [,136]  [,137]  [,138]  [,139]  [,140]
[1,] 11.47391 8.60272 13.92328  7.27254  7.64206 8.45967 7.84688 9.95751 2.95469 5.75206
[2,]  1.58780 3.74449  3.38531 -0.79662 -0.20912 2.74320 7.40233 4.54477 2.56358 3.40425
       [,141]   [,142]   [,143]  [,144]   [,145]  [,146]   [,147]   [,148]   [,149]  [,150]
[1,] 9.92268 12.37129  6.91733 7.57217 10.67461 8.08528  9.02238 14.02471 11.57764 8.71761
[2,] 1.29234  1.07765 -0.45841 3.75919  4.39948 2.64319 -1.00759  3.11580  4.44338 1.30757
       [,151]   [,152]   [,153]  [,154]  [,155]   [,156]  [,157]  [,158]  [,159]  [,160]
[1,] 11.00988 14.32365 14.31445 9.49357 6.29029 11.95791 7.42978 9.39372 7.59359 5.61716
[2,]  0.12159  2.07146  6.07268 3.27931 2.23333  2.69892 0.35545 4.32253 1.51165 2.48356
       [,161]   [,162]   [,163]  [,164]  [,165]   [,166]  [,167]  [,168]   [,169]  [,170]
[1,] 13.34127 10.40952 10.55581 8.09263 6.90277  7.36231 8.60503 8.40575 11.64342 7.77214
[2,]  5.87952 -1.71436  3.22064 2.20973 3.08684 -1.58399 4.81537 3.44868  2.44695 0.67835
       [,171]  [,172]   [,173]   [,174]   [,175]   [,176]  [,177]   [,178]  [,179]  [,180]
[1,] 10.57245 9.55328  2.02906 11.46772 12.11354 13.42568 9.97119 13.67848 5.65330 3.55519
[2,]  0.01505 1.48038 -2.12871  2.00473  6.50057  4.16269 1.75374  4.03345 1.11728 0.68626
       [,181]  [,182]  [,183]   [,184]   [,185]  [,186]  [,187]  [,188]  [,189]  [,190]
[1,] 2.37335 7.02790 8.81038 11.15527  6.77250 8.04369 6.67144 5.73787 9.29217 9.35739
[2,] 3.67712 0.76566 3.26120  3.55597 -1.24715 2.42843 1.46912 1.44235 1.74038 5.78260
       [,191]  [,192]   [,193]  [,194]   [,195]   [,196]   [,197]   [,198]   [,199]  [,200]
[1,] 11.64144 6.49978 12.19636 3.21747  3.30957 12.97898 12.18789  8.26557 13.46572 7.40422
[2,]  4.78393 1.93302  2.40988 1.77068 -0.65480  3.95860  3.17516 -0.07312  2.83442 3.56255
       [,201]  [,202]  [,203]  [,204]   [,205]  [,206]   [,207]  [,208]   [,209]  [,210]
[1,] 12.87397 7.13679 7.66500 7.84033 12.70104 8.21832 11.78189 7.82413 11.72394 5.79932
[2,]  6.64375 0.86626 0.98583 1.18372  1.14005 3.24829  0.83042 2.91085  1.92071 5.07858
       [,211]   [,212]   [,213]   [,214]  [,215]  [,216]  [,217]   [,218]   [,219]  [,220]
[1,] 12.67628  8.00554 11.33470  4.07110 6.89615 3.55769 4.71406 10.56312 11.47721 7.49137
[2,]  1.10885 -1.87946  5.79074 -0.46199 0.21358 2.15662 1.23760  1.84035  2.35586 3.11489
       [,221]  [,222]   [,223]  [,224]   [,225]   [,226]   [,227]  [,228]   [,229]  [,230]
[1,] 8.60838 9.34306  8.18275 4.99201  8.57843 11.40431  6.18044 4.96902  9.45212 6.44492
```

```
[2,] 5.67772 3.85737 -4.48628 0.44099 -3.01605  1.12194 -1.75123 1.45153 -2.35445 2.70815
      [,231]   [,232]  [,233]  [,234]   [,235]   [,236]  [,237]   [,238]   [,239]   [,240]
[1,] 8.73625 12.75131 9.14270 7.32036 13.63100  5.98276 8.89771 12.16066 10.12467 12.31876
[2,] 6.52812  3.87839 2.61345 3.04785  5.05422 -1.91753 2.91392 -0.26071  2.67920  2.49056
       [,241]  [,242]   [,243]   [,244]  [,245]  [,246]  [,247]   [,248]   [,249]  [,250]
[1,]  7.47314 7.38887 16.68940  8.05264 3.73243 7.01235 6.58007 19.12002  9.34685 9.56665
[2,] -0.67410 0.96869  8.43854 -0.36037 2.21449 6.49456 1.83392  1.33429 -0.27959 0.25008
      [,251]  [,252]   [,253]  [,254]   [,255]   [,256]  [,257]  [,258]  [,259]  [,260]
[1,] 9.07855 5.70345 12.50343 5.05421 11.72052  1.51198 6.32292 7.98035 7.99424 8.52852
[2,] 1.38622 1.47804  5.94544 0.81969  0.09795 -1.21577 1.65702 2.31994 2.62336 4.43463
      [,261]  [,262]   [,263]  [,264]   [,265]  [,266]  [,267]   [,268]   [,269]   [,270]
[1,] 7.07682 6.62698  8.08855 9.14281 10.96759 6.21311 9.01228 13.22642 10.43868 10.53862
[2,] 2.29527 2.04627 -1.70748 4.51546  2.62821 4.00720 1.04819  1.07490  4.94436  1.60652
      [,271]   [,272]   [,273]  [,274]  [,275]   [,276]  [,277]   [,278]  [,279]  [,280]
[1,] 7.99651 10.44143 12.64864 7.29412 3.03716 10.28284 5.70019 12.98120 2.86877 7.36509
[2,] 2.58366  2.27794  2.46511 2.85203 1.84032  1.73762 0.61969  1.08936 2.69977 0.65066
      [,281]   [,282]  [,283]  [,284]  [,285]  [,286]   [,287]   [,288]   [,289]   [,290]
[1,] 5.59818 10.68534 7.81362 8.23546 7.66981 6.61813 11.03223 11.82336 11.54173  2.98597
[2,] 1.38914  1.03868 4.11894 1.53581 3.68087 3.39868  1.34922  4.55085  6.69593 -1.45526
      [,291]   [,292]   [,293]  [,294]  [,295]  [,296]   [,297]  [,298]  [,299]   [,300]
[1,] 5.23638 14.19701 10.76852 8.81240 9.69825 8.11928 12.41034 3.45503 6.52107 11.17197
[2,] 1.73089  6.40303  4.14797 2.95909 0.50881 1.56949  0.37523 2.70401 0.66880  0.74849
      [,301]   [,302]   [,303]  [,304]   [,305]  [,306]   [,307]   [,308]   [,309]  [,310]
[1,] 8.74241 10.72471  8.09344 4.72055 14.68810 9.61235  7.27886 16.27074  7.33869 8.19369
[2,] 5.12946  3.43030 -0.55011 0.81982  3.40986 2.80366 -1.23819  2.30927 -2.05927 1.34436
       [,311]   [,312]   [,313]   [,314]  [,315]  [,316]  [,317]   [,318]   [,319]  [,320]
[1,]  7.46143 14.79479 10.41573 10.87992 8.73721 5.33748 6.96877  4.28607 11.21270 6.54075
[2,] -2.02754  6.68294 -0.08962  1.79088 4.83347 0.31425 1.70540 -0.26544  3.34857 2.77351
      [,321]   [,322]   [,323]   [,324]  [,325]  [,326]   [,327]   [,328]  [,329]  [,330]
[1,] 2.05456 10.68519  8.16231 10.51082 7.97895 8.78954 13.44512  8.35095 9.24221 6.29879
[2,] 0.13118  0.88757 -1.50264 -1.65663 1.29203 0.22650 -0.28304 -4.31428 3.11617 3.04090
       [,331]   [,332]  [,333]  [,334]   [,335]  [,336]   [,337]   [,338]   [,339]   [,340]
[1,] 10.37464  6.19830 3.90767 5.58209 10.21059 6.31544  6.85544  9.93660  5.71687  9.12701
[2,]  4.28894 -0.51308 0.47603 2.88702  6.82371 4.05045 -1.43049 -0.87125 -0.09142 -0.08802
       [,341]  [,342]  [,343]  [,344]   [,345]   [,346]   [,347]   [,348]  [,349]   [,350]
[1,] 11.45374 9.67062 5.82806 7.61222 12.86121 11.56185  3.16143 10.35385 2.45299 10.68720
[2,] -0.12516 2.41314 0.56986 3.79582  0.44184  2.26487 -0.56264  2.53052 2.14126  1.63643
      [,351]  [,352]   [,353]  [,354]   [,355]   [,356]   [,357]   [,358]  [,359]  [,360]
[1,] 7.93646 8.74239  5.24406 4.55477 13.60785 13.97554  7.77143  6.97068 8.89126 9.87173
[2,] 5.98654 1.92775 -1.45976 0.37310  6.46574  5.56166 -0.78799 -3.42945 5.48654 4.45811
       [,361]   [,362]  [,363]  [,364]   [,365]  [,366]   [,367]  [,368]   [,369]   [,370]
[1,] 10.00561 13.82908 6.31042 5.16152 10.23568 8.06965  5.58088 9.97533 11.48963 12.56310
[2,]  0.52197  2.63404 1.70388 3.18818  1.45553 3.82278 -0.64326 1.20861  1.99285  3.63619
       [,371]   [,372]   [,373]   [,374]   [,375]   [,376]  [,377]   [,378]   [,379]
[1,]  2.11809 12.89866  5.67970 11.50933 14.84607  4.55007 5.81891  4.45800 15.10521
[2,] -1.95883  4.10399 -1.39114  0.70154  6.70822 -0.52222 2.88217 -3.04856  5.13477
       [,380]  [,381]  [,382]   [,383]   [,384]   [,385]   [,386]   [,387]   [,388]  [,389]
[1,] 10.97336 9.25482 5.36737 10.27247 11.38424  8.87820  7.28302 12.24649  8.37180 12.0980
[2,]  0.92483 3.35053 1.13619  5.78468  5.10196 -0.36902 -1.79914  5.52890 -0.17501  2.8071
      [,390]  [,391]  [,392]   [,393]   [,394]   [,395] [,396]  [,397]   [,398]   [,399]
[1,] 8.44124 7.41053 6.82996 10.87043 10.05938 10.52128 9.3959 9.85048  7.90802  8.40356
[2,] 4.27974 4.16266 2.46711 -0.50948  1.93981  0.58689 4.9840 3.87884 -0.35418 -0.68511
      [,400]   [,401]   [,402]  [,403]  [,404]   [,405]   [,406]   [,407]  [,408]   [,409]
[1,] 2.29586  5.12338 11.77179 7.24456 8.27179 10.23277 10.32193  9.74468 9.25786 10.43371
[2,] 3.35840 -2.49730  2.43388 1.33365 3.98370 -1.44137  3.75341 -2.99522 6.22234 -1.37146
      [,410]  [,411]  [,412]  [,413]  [,414]  [,415]  [,416]   [,417]   [,418]   [,419]
[1,] 4.58453 8.95843 9.85733 9.58931 6.54275 5.05205 8.31278 11.56192 10.11167 15.37997
[2,] 2.30583 4.02271 2.31296 2.44859 6.55370 1.31053 5.68684  1.23399  4.64472  3.69450
       [,420]   [,421]   [,422]  [,423]   [,424]  [,425]   [,426]   [,427]   [,428]
[1,]  5.63654 13.64021 17.40612 7.80484 11.74447 3.70482 10.56160  5.02645  7.65802
[2,] -0.63346 -1.60337  2.83999 2.13478  3.09377 1.86971  3.65108 -3.66389 -0.21591
       [,429]  [,430]   [,431]  [,432]   [,433]   [,434]  [,435]   [,436]  [,437]  [,438]
[1,]  6.42218 7.74561 11.67719 6.64023 10.65484  8.05864 9.59195 14.10470 7.05835 7.67595
[2,] -0.44054 1.13523  4.52593 0.95728  5.22729 -1.74273 1.84657  3.57025 0.75055 2.17356
      [,439]  [,440]  [,441]  [,442]   [,443]  [,444]  [,445]  [,446]   [,447]   [,448]
[1,] 9.91541 9.72402 6.66852 8.91010 12.88910 7.09801 6.70449 9.49258 12.58615 10.83705
[2,] 4.08522 1.34568 2.95404 2.37115  6.34303 5.15628 2.18229 1.49691  1.20258  2.27617
      [,449]   [,450]  [,451]   [,452]   [,453]   [,454]   [,455]  [,456]  [,457]   [,458]
[1,] 6.96196  2.92953 4.78859  9.22099 10.33923 10.94934 10.56235 9.05225 4.97172 13.65016
[2,] 4.22717 -0.11596 1.71300 -0.32542  0.04095  2.82488  0.27723 1.03149 1.65541  1.40163
```

```
      [,459]  [,460]   [,461]   [,462]  [,463]  [,464]   [,465]   [,466]   [,467]   [,468]
[1,] 8.76086 9.99879 12.12963  9.44973 9.74856 6.10232 11.76493 11.69437  7.41060 12.22308
[2,] 3.41562 6.26880  7.41926 -0.31960 0.17190 1.12019  3.18389  4.37868 -3.33504  7.11335
      [,469]   [,470]  [,471]   [,472]  [,473]   [,474]  [,475]   [,476]   [,477]  [,478]
[1,]  8.53693  7.54262 9.19618 11.52639 6.76954 13.80279 7.84153 12.27715 10.56365 8.70268
[2,] -0.93733 -0.21437 3.45997  2.91482 3.34774  7.54965 2.80916  2.29684  2.71160 2.30655
      [,479]   [,480]  [,481]  [,482]   [,483]   [,484]   [,485]   [,486]  [,487]   [,488]
[1,] 11.88089  6.66363 6.77221 3.00513  4.30942 12.05599 10.90337 10.67779 5.99936  0.19318
[2,]  3.34005 -3.11574 1.58902 5.67547 -1.22734 -2.11756  1.58883  4.13176 0.01292 -1.48723
      [,489]   [,490]   [,491]  [,492]   [,493]  [,494]   [,495]  [,496]   [,497]  [,498]
[1,] 10.29424 14.68623 10.32836 7.98752 10.35521 6.70596 11.49302 7.34405 10.91555 9.19306
[2,]  3.28065  3.07791  2.37782 3.41356  2.49763 1.53541  3.84098 0.31311  4.53174 1.37050
      [,499]   [,500]   [,501]  [,502]   [,503]   [,504]  [,505]  [,506]   [,507]  [,508]
[1,] 6.34883  4.54031 12.68077 6.66751  8.42549 10.37908 5.98217 7.39076  3.80372 9.89855
[2,] 0.67580 -0.21065  4.95707 2.05874 -1.60551 -1.80925 3.60777 1.27672 -1.92379 1.78025
      [,509]  [,510]  [,511]   [,512]   [,513]  [,514]  [,515]  [,516]  [,517]   [,518]
[1,]  6.73332 6.87875 8.44655 11.54314  9.24405 6.53019 5.59285 7.32714 6.69043 11.65736
[2,] -1.19185 5.94766 3.54254  4.03252 -0.60372 3.17751 2.54969 0.88193 1.13170  3.39795
      [,519]   [,520]   [,521]   [,522]   [,523]   [,524]   [,525]  [,526]  [,527]   [,528]
[1,] 8.75327 13.61803 10.44141  5.84313 14.76416 11.13891 10.42461 9.22042 7.28975 11.12176
[2,] 3.79601  2.75115  2.82606 -0.47900  4.81503  2.66571  2.55649 2.50821 6.78659  1.82092
      [,529]   [,530]  [,531]   [,532]   [,533]   [,534]  [,535]   [,536]  [,537]   [,538]
[1,] 12.09469 13.59268 3.15226 11.80167  4.21687  7.40204 6.80285 11.00844 8.77288 13.35370
[2,]  1.18804  1.92775 3.91189  0.82904 -2.66522 -2.13659 1.98157  0.60133 2.50067  0.69704
      [,539]   [,540]   [,541]   [,542]  [,543]   [,544]   [,545]   [,546]  [,547]
[1,]  3.67058 10.52297 11.08939 10.20050 8.77788 12.33409 10.93663 14.29982 8.05347
[2,] -2.77906  2.12523  2.04858  2.67216 0.64795  1.69530  2.66825  4.37909 1.82397
      [,548]   [,549]  [,550]   [,551]   [,552]  [,553]   [,554]  [,555]  [,556]   [,557]
[1,]  7.68434 14.22800 7.03729  9.15165 13.04280 9.69933  5.72448 9.13070 9.53217 10.18672
[2,] -2.63228  5.11179 2.48158 -0.36651  2.14523 2.97060 -0.83402 3.23794 3.57859  3.34797
      [,558]  [,559]   [,560]  [,561]  [,562]   [,563]   [,564]  [,565]   [,566]   [,567]
[1,] 5.39808 6.58094  7.94609 8.51903 6.73881 11.89383  7.25691 6.88717 12.85930  5.92052
[2,] 2.83312 0.61617 -1.65364 0.99168 0.45468 -0.17886 -3.50771 0.59178  0.60785 -1.46071
      [,568]  [,569]   [,570]   [,571]  [,572]   [,573]  [,574]   [,575]  [,576]   [,577]
[1,] 10.03494 5.45888 12.49645 11.09283 5.91959 10.99333 6.29708 11.01091 3.70412 10.61843
[2,]  4.60801 0.51486  1.13413  3.16888 4.05922  1.29928 0.72818  1.14163 0.82145 -0.17931
      [,578]  [,579]  [,580]  [,581]  [,582]   [,583]   [,584]  [,585]  [,586]   [,587]
[1,]  7.77145 9.26472 8.61848 7.42318 9.20702 -0.55555 10.94089 5.42529 7.72029 11.08843
[2,] -0.78386 1.76408 0.62290 3.57883 1.63959 -2.27534  1.46243 0.48059 0.72941  5.55685
      [,588]  [,589]  [,590]   [,591]  [,592]   [,593]   [,594]   [,595]   [,596]  [,597]
[1,] 12.33293 8.46962 6.19805 15.09240 7.87814 12.12526 10.02939 14.42694 11.96281 6.71174
[2,]  5.18280 3.69487 1.24214  2.98163 0.58079  6.96429  1.61882  1.25417  1.60095 4.19337
      [,598]  [,599]   [,600]  [,601]   [,602]   [,603]  [,604]   [,605]  [,606]  [,607]
[1,] 3.83546 8.83894  4.13291 5.54371  2.84558 11.36599 8.35755 11.66941 5.16434 9.39018
[2,] 0.49410 1.03946 -0.16004 5.48817 -3.46568  4.30764 1.45697  5.39512 4.11915 1.34814
      [,608]   [,609]   [,610]  [,611]  [,612]   [,613]  [,614]   [,615]  [,616]  [,617]
[1,] 12.96449 12.43153 11.30249 8.36864 9.42602 10.65612 7.00602 16.23958 8.51254 9.87161
[2,]  4.64056  1.95342  3.00559 5.60556 1.95508  3.09706 1.55758  3.04538 3.46970 1.00778
      [,618]  [,619]   [,620]   [,621]   [,622]  [,623]   [,624]   [,625]  [,626]   [,627]
[1,] 6.37042 9.55443  7.42379 10.29727  4.46603 5.10313 12.78403  7.69149 9.66045 15.91440
[2,] 3.35461 3.10998 -1.74911  7.26207 -0.82993 0.58389  2.30281 -0.93736 4.29526  5.92056
      [,628]   [,629]   [,630]   [,631]   [,632]  [,633]   [,634]  [,635]   [,636]   [,637]
[1,] 6.33980 10.69043  9.16200  7.38179  6.07678 7.83993 10.53235 7.35525 12.09527 13.29194
[2,] 0.49728  2.25868 -0.74387 -0.22386 -0.00183 1.79596  1.17866 5.13993  3.98375  0.64628
      [,638]   [,639]  [,640]  [,641]   [,642]  [,643]   [,644]   [,645]   [,646]   [,647]
[1,] 15.28373 10.14518 9.11997 4.94470 15.94352 9.42396 10.03727 13.31079 12.09682 10.93664
[2,]  5.62982  3.50777 1.78587 2.89642  7.56182 1.84243  4.59117  3.57503  2.45557  4.82392
      [,648]  [,649]  [,650]   [,651]   [,652]   [,653]   [,654]  [,655]  [,656]  [,657]
[1,] 19.13106 7.34154 8.16108 10.56031  5.76482 13.47830  5.92998 7.73148 8.14862 9.77093
[2,]  3.56337 2.66666 3.20239  5.03719 -1.08100  3.21712 -0.77538 3.03663 4.69211 2.54121
      [,658]  [,659]  [,660]  [,661]   [,662]  [,663]   [,664]   [,665]   [,666]  [,667]
[1,] 8.81921 9.06641 5.76636 8.36089  8.21522 9.67307 11.75513  3.61675  7.02222 8.06199
[2,] 1.34178 4.45270 3.75913 3.44542 -0.97138 0.76356  0.70855 -0.69439 -0.07127 0.58777
      [,668]  [,669]  [,670]  [,671]  [,672]   [,673]   [,674]   [,675]  [,676]  [,677]
[1,] 8.00538 6.10412 8.97521 3.17883 7.84096 13.44985  5.52552  8.26063 4.88888 9.47404
[2,] 2.52782 3.12552 1.91518 0.40021 3.59701  5.33631 -0.25599 -0.35970 2.99012 3.37568
      [,678]   [,679]  [,680]   [,681]   [,682]   [,683]   [,684]  [,685]  [,686]   [,687]
[1,] 5.48562  5.34851 9.26307  5.62439  4.59925 13.45144  5.24441 8.39760 9.57277 11.75386
[2,] 0.69932 -0.35574 0.32284 -1.31664 -0.55038  1.35277 -1.58928 1.06839 1.49795  3.97630
      [,688]   [,689]   [,690]   [,691]  [,692]   [,693]   [,694]   [,695]  [,696]  [,697]
```

```
[1,] 12.05940 12.07419 11.53028  6.53459 6.67593 10.58344  6.82604 13.11168 5.31662 9.64522
[2,]  3.02065  2.34736  2.08538 -0.98422 0.03450  2.15217 -0.25662  2.18091 0.48226 3.86565
      [,698]  [,699]  [,700]   [,701]  [,702]   [,703]   [,704]   [,705]   [,706]  [,707]
[1,] 8.81468 6.46747 9.61926 13.39914 7.85707  6.96891  9.35413  3.82134 12.08236 7.93018
[2,] 2.20547 3.26220 3.65849  3.10612 0.19075 -0.26784 -1.04012 -0.26648  2.76968 3.23659
      [,708]  [,709]   [,710]   [,711]   [,712]   [,713]  [,714]  [,715]  [,716]   [,717]
[1,] 7.96610 9.70669 13.19937 11.88421 15.18885 12.60582 6.18696 7.57770 7.88946 15.55492
[2,] 1.58606 4.41576  5.40308  3.17315  7.33790  2.13322 1.94163 2.34511 3.76121  5.12059
       [,718]   [,719]   [,720]   [,721]  [,722]   [,723]   [,724]  [,725]  [,726]  [,727]
[1,] 11.08726 15.04871 13.56828  7.94450 8.29053  4.76444 10.23744 9.52744 7.19164 9.26613
[2,]  2.42446  2.83345  6.08237 -5.04336 2.84760 -1.42736 -3.69830 1.51931 1.83434 2.56558
      [,728]   [,729]   [,730]  [,731]   [,732]  [,733]  [,734]   [,735]   [,736]   [,737]
[1,] 9.09882 10.36241 11.55335 8.50235 10.06120 7.58464 7.13084  7.74948  4.16153  3.15014
[2,] 0.88626  5.15548  5.58351 3.14867  0.60647 5.71444 3.69779 -0.52757 -1.34801 -0.83505
       [,738]   [,739] [,740]  [,741]  [,742]   [,743]   [,744]  [,745]  [,746]  [,747]
[1,] 11.44782 13.76657 6.2511 7.15128 9.20541 11.36559 11.22825 6.95610 9.96498 8.42305
[2,]  1.17866  2.42462 0.9440 0.75663 2.20763  3.53107  2.64799 2.61032 1.30761 4.21677
       [,748]  [,749]   [,750]   [,751]   [,752]   [,753]   [,754]  [,755]  [,756]  [,757]
[1,] 12.79338 8.66881  5.10822 10.94449 11.05873 10.41984 12.10253 8.99545 3.85647 5.71764
[2,]  2.86961 5.43383 -0.56973  0.36831  0.35408  1.85087  5.32007 3.29785 0.59374 1.88826
      [,758]  [,759]  [,760]  [,761]   [,762]  [,763]  [,764]  [,765]  [,766]  [,767]
[1,] 8.85229 8.91401 9.42691 3.85254 14.37575 6.59442 9.14567 8.60091 9.84512 1.22747
[2,] 1.47896 3.99423 5.98559 1.90634  0.49212 0.76231 1.52016 6.00105 4.44560 3.09572
       [,768]  [,769]  [,770]   [,771]   [,772]  [,773]  [,774]   [,775]  [,776]   [,777]
[1,] 12.43809 9.14307 9.59466 10.56665  7.52895 3.02276 9.52040 10.97948 8.07233 12.75971
[2,]  1.55030 5.54488 4.29038  1.92517 -1.24143 0.96285 1.02423  3.32970 1.95113  3.28676
       [,778]   [,779]  [,780]  [,781]  [,782]   [,783]   [,784]   [,785]   [,786]   [,787]
[1,] 11.46130 13.86240 6.02519 9.53872 8.83405  5.94916 14.83589 11.78623  8.26644 10.21512
[2,]  3.43374  3.02133 0.53532 1.52041 3.37628 -2.55731  3.88511  1.80234 -2.66753  3.18900
      [,788]   [,789]  [,790]  [,791]   [,792]   [,793]  [,794]  [,795]   [,796]  [,797]
[1,] 6.22538 12.96605 8.46426 5.78354  3.20975 11.42064 4.44265 9.93705  6.85726 9.98088
[2,] 0.42298  3.64778 2.69059 3.94179 -1.07928  4.83371 2.51500 2.08066 -0.16200 4.70945
       [,798]   [,799]  [,800]  [,801]  [,802]  [,803]   [,804]   [,805]   [,806]   [,807]
[1,]  4.36093 13.01259 1.67994 9.96633 6.72107 8.93072 10.16012 10.09673 10.06361  9.82256
[2,] -0.98576  0.11529 0.82490 2.18685 2.34644 3.93397  3.65604  3.04311 -2.65282 -0.70826
       [,808]  [,809]  [,810]  [,811]  [,812]   [,813]   [,814]  [,815]   [,816]   [,817]
[1,] 10.62080 7.37565 9.49175 9.35072 7.23142  7.87537 12.28871 3.40826  7.49968 14.20337
[2,]  5.04422 0.02476 5.42876 2.37215 0.59308 -1.54196  1.83625 1.03732 -2.03188  0.50271
       [,818]   [,819]   [,820]   [,821]  [,822]   [,823]  [,824]   [,825]  [,826]   [,827]
[1,] 5.43151 11.79266  9.12507 11.81017 9.62749 11.44911 9.88477 15.43246 8.67347  7.87575
[2,] 2.36202  2.04880 -0.30639  3.12576 3.68341  0.85892 0.05744  4.02933 0.91045 -0.51115
       [,828]   [,829]  [,830]  [,831]  [,832]   [,833]  [,834]   [,835]  [,836]  [,837]
[1,] 9.44670  7.19210 4.71632 9.83377 7.58156  4.48213 4.80031 11.53661 8.07811 5.57515
[2,] 3.30597 -0.01489 2.49190 1.69188 2.31063 -1.85748 0.54187  3.92886 4.84125 0.39245
       [,838]  [,839]   [,840]  [,841]   [,842]  [,843]   [,844]   [,845]   [,846]  [,847]
[1,] 7.02803 4.66081 12.81983 9.30541 10.80137 9.63114  2.85427 11.87636  5.15649 8.42941
[2,] 2.00969 3.78313  4.69658 4.49181  4.32269 2.72153 -0.15353  2.69005 -0.65981 6.38549
       [,848]   [,849]   [,850]   [,851]  [,852]  [,853]  [,854]   [,855]   [,856]   [,857]
[1,] 8.20099  2.28209 12.01734 13.37182 3.52148 5.74546 9.21214  4.06435 12.56705 12.09931
[2,] 0.50646 -3.12774  0.70238  2.02899 5.72306 0.39206 1.78142 -2.00652  1.09488  6.11877
       [,858]  [,859]  [,860]  [,861]   [,862]   [,863]   [,864]  [,865]   [,866]  [,867]
[1,] 6.49919 4.31669 6.71523 5.53676 13.60038  7.11102 13.47918 9.44207 12.40988 6.02459
[2,] 0.09345 5.23584 0.82373 2.99311  3.24177 -1.83778  4.20157 4.61596  1.58868 3.54113
       [,868]   [,869]  [,870]   [,871]  [,872]   [,873]  [,874]  [,875]  [,876]  [,877]
[1,] 10.70272 16.62325 9.50342 13.58725 9.77845 10.54324 7.11449 7.88385 9.71168 3.28973
[2,]  1.22331 -2.11982 4.48768  4.81983 3.79453  2.19767 4.25570 1.19364 2.14211 0.15444
       [,878]   [,879]  [,880]  [,881]  [,882]   [,883]   [,884]  [,885]  [,886]  [,887]
[1,] 11.27724  5.15333 2.64291 9.37973 7.52724 11.61830 11.67028 4.70457 1.93438 7.86321
[2,]  4.97569 -0.01042 3.05150 3.73298 2.20761  1.93912  3.82286 1.94210 0.24228 3.66139
      [,888]  [,889] [,890]   [,891]  [,892]  [,893]  [,894]  [,895]   [,896]  [,897]
[1,] 9.54303 8.64643 5.8591  4.82315 7.52774 4.84033 7.28019 9.22497  2.83466 2.53973
[2,] 0.82898 2.33033 0.0446 -1.93248 1.71712 2.29908 2.37205 1.24754 -2.39401 3.80610
      [,898]  [,899]   [,900]   [,901]  [,902]  [,903]  [,904]  [,905]  [,906]  [,907]
[1,] 8.88822 5.62210 11.65288 11.26122 9.28682 9.15682 6.26966 7.70146 8.73848 9.17825
[2,] 6.06985 4.56951  0.83993  3.60188 5.22921 6.30718 4.31867 2.53294 1.67559 3.96726
      [,908]  [,909]  [,910]   [,911]   [,912]   [,913]   [,914]   [,915]  [,916]  [,917]
[1,] 9.71557 9.39723 8.65452 10.03890 11.73118 14.00007 10.15195  8.35541 6.20604 5.65433
[2,] 4.98762 2.43379 1.04600  4.26839  4.55509  3.58169  5.46917 -0.23540 0.15552 4.44031
      [,918]   [,919]  [,920]   [,921]   [,922]   [,923]   [,924]  [,925]  [,926]   [,927]
[1,] 7.85977 15.46631 9.76697 16.64746 12.69027 12.07177 10.99146 6.71729 9.26658 11.43203
```

```
[2,] 4.17373  2.21915 0.91236  0.98824  4.44701  4.67202  3.61381 2.57645 8.04069  4.17727
       [,928]  [,929]  [,930]  [,931]   [,932]  [,933]   [,934]  [,935]  [,936]  [,937]
[1,]  2.19290 6.00345 7.71236 8.19986 11.34505 9.19441 11.90380 7.70584 7.60093 5.13142
[2,] -1.92975 0.26436 3.14574 1.23713 -2.06439 3.85511  2.04616 1.40099 0.87187 0.94441
       [,938]   [,939]  [,940]  [,941]   [,942]  [,943]  [,944]   [,945]  [,946]   [,947]
[1,] 9.39585  5.13997 8.71367 7.14740 15.85702 9.70472 8.21129 11.27216 5.89198  7.69556
[2,] 0.88910 -2.08190 5.58963 0.34907 -0.99709 3.51965 4.36857  2.48877 2.16811 -0.08650
       [,948]  [,949]  [,950]  [,951]   [,952]   [,953]  [,954]  [,955]  [,956]   [,957]
[1,] 9.68980 9.17123 2.33430 7.53906 12.26684  8.03299 5.94954 4.99700 9.68483  5.94958
[2,] 3.33743 3.82037 2.45553 2.36309  2.83554 -3.71322 3.07664 1.09995 1.36595 -1.59006
       [,958]  [,959]  [,960]   [,961]   [,962]  [,963]  [,964]   [,965]   [,966]   [,967]
[1,]  8.85616 6.36665 6.23131 11.40865 10.12172 8.82131 3.47822  6.31375 11.78709 11.21813
[2,] -2.05087 1.32844 1.19766  2.43701  5.56149 2.57310 1.15067 -1.02905  2.41597  0.44913
       [,968]  [,969]   [,970]  [,971]  [,972]  [,973]  [,974]   [,975]  [,976]  [,977]
[1,] 2.37208 12.8076 11.96558 7.44482 7.86862 5.52006 4.94804 10.28915 7.10749 4.31275
[2,] 1.24664  8.0029  4.72993 2.48750 2.70378 0.61361 1.42576  2.33498 1.18273 0.75401
       [,978]   [,979]   [,980]  [,981]  [,982]  [,983]  [,984]  [,985]  [,986]   [,987]
[1,] 4.03824 14.21154 13.75774 8.24721 4.31295 7.42785 4.30858 8.25521 8.65124 10.36348
[2,] 1.14583  4.34968  5.64412 2.64283 3.11103 3.72542 3.64494 4.88722 0.59508  2.10277
       [,988]   [,989]  [,990]   [,991]   [,992]  [,993]  [,994]   [,995]   [,996]   [,997]
[1,]  6.83926 15.28638 10.4626  5.51746  4.19647 5.14185 9.26295 11.52850 10.79342 10.11807
[2,] -0.24659  1.03581  1.7958 -1.51174 -1.76393 2.80989 6.26437  5.89852  4.08199  1.33625
       [,998]   [,999]  [,1000]
[1,] 11.57332 11.51551 11.65812
[2,]  2.40905  0.72927  1.78142
```

Random Numbers from MOBE(5, 5, 2)

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]	[,9]	[,10]	[,11]
y1	0.24925	0.04757	0.17882	0.02488	0.01228	0.24198	0.12769	0.02276	0.11905	0.15678	0.00883
y2	0.25920	0.10422	0.36629	0.03170	0.03304	0.14768	0.05132	0.24388	0.54475	0.16395	0.08069

	[,12]	[,13]	[,14]	[,15]	[,16]	[,17]	[,18]	[,19]	[,20]	[,21]	[,22]
y1	0.15823	0.07785	0.11150	0.00394	0.02111	0.14159	0.63373	0.22300	0.00931	0.00129	0.07340
y2	0.21521	0.25658	0.13585	0.00394	0.05132	0.11608	0.08880	0.15167	0.25515	0.00129	0.04645

	[,23]	[,24]	[,25]	[,26]	[,27]	[,28]	[,29]	[,30]	[,31]	[,32]	[,33]
y1	0.00116	0.00115	0.08441	0.06891	0.12174	0.10413	0.24816	0.15792	0.00754	0.02056	0.07401
y2	0.00116	0.18590	0.04184	0.22879	0.10845	0.15728	0.26275	0.11769	0.27740	0.12204	0.16078

	[,34]	[,35]	[,36]	[,37]	[,38]	[,39]	[,40]	[,41]	[,42]	[,43]	[,44]
y1	0.04577	0.74089	0.14771	0.05529	0.02501	0.02048	0.1473	0.38926	0.17611	0.17651	0.1356
y2	0.40760	0.09505	0.12030	0.24518	0.02501	0.02048	0.1473	0.03647	0.06582	0.15666	0.1303

	[,45]	[,46]	[,47]	[,48]	[,49]	[,50]	[,51]	[,52]	[,53]	[,54]	[,55]
y1	0.04222	0.04897	0.10197	0.15273	0.26487	0.03067	0.26348	0.16320	0.02518	0.42091	0.04087
y2	0.04222	0.04897	0.10197	0.80534	0.02843	0.00148	0.06882	0.03806	0.02288	0.12346	0.04087

	[,56]	[,57]	[,58]	[,59]	[,60]	[,61]	[,62]	[,63]	[,64]	[,65]	[,66]
y1	0.31546	0.20569	0.05666	0.02218	0.19645	0.08156	0.08049	0.19144	0.08932	0.04100	0.16036
y2	0.25715	0.08335	0.12165	0.13419	0.06688	0.06362	0.08049	0.23663	0.08932	0.51092	0.06761

	[,67]	[,68]	[,69]	[,70]	[,71]	[,72]	[,73]	[,74]	[,75]	[,76]	[,77]
y1	0.04213	0.04156	0.04605	0.03432	0.05635	0.04532	0.06845	0.45779	0.14875	0.13224	0.19361
y2	0.11923	0.39922	0.00524	0.03432	0.04755	0.03276	0.02601	0.04451	0.08921	0.09275	0.26083

	[,78]	[,79]	[,80]	[,81]	[,82]	[,83]	[,84]	[,85]	[,86]	[,87]	[,88]
y1	0.09795	0.01741	0.43940	0.28243	0.08068	0.15887	0.04760	0.38332	0.16653	0.00303	0.00481
y2	0.46506	0.01741	0.20688	0.18713	0.18060	0.15887	0.17659	0.05506	0.22149	0.43155	0.00481

	[,89]	[,90]	[,91]	[,92]	[,93]	[,94]	[,95]	[,96]	[,97]	[,98]	[,99]
y1	0.02410	0.34853	0.40698	0.08520	0.21370	0.08409	0.22765	0.14891	0.02036	0.43877	0.15238
y2	0.04292	0.14674	0.04307	0.50765	0.43198	0.40894	0.06056	0.05565	0.00151	0.09414	0.24848

	[,100]	[,101]	[,102]	[,103]	[,104]	[,105]	[,106]	[,107]	[,108]	[,109]	[,110]
y1	0.13408	0.10217	0.22003	0.14324	0.00932	0.14559	0.02323	0.01789	0.09927	0.06588	0.08865
y2	0.32198	0.04440	0.06356	0.30553	0.01845	0.02862	0.12720	0.10262	0.01288	0.01011	0.08294

	[,111]	[,112]	[,113]	[,114]	[,115]	[,116]	[,117]	[,118]	[,119]	[,120]	[,121]
y1	0.01338	0.23998	0.56029	0.01074	0.06554	0.38997	0.11983	0.00940	0.10706	0.08665	0.03584
y2	0.16382	0.03815	0.14698	0.18769	0.24138	0.28186	0.13518	0.01285	0.17020	0.08665	0.03584

	[,122]	[,123]	[,124]	[,125]	[,126]	[,127]	[,128]	[,129]	[,130]	[,131]	[,132]
y1	0.20618	0.23571	0.30304	0.07089	0.00318	0.08124	0.32320	0.39052	0.03559	0.09585	0.02299
y2	0.20618	0.06609	0.23198	0.07089	0.56936	0.01428	0.11301	0.41567	0.03559	0.12314	0.03977

	[,133]	[,134]	[,135]	[,136]	[,137]	[,138]	[,139]	[,140]	[,141]	[,142]	[,143]
y1	0.07920	0.06101	0.13035	0.08315	0.03925	0.04809	0.00408	0.16445	0.17569	0.17858	0.51787
y2	0.07049	0.11322	0.06534	0.05689	0.19277	0.10468	0.01917	0.26969	0.03683	0.18059	0.51787

	[,144]	[,145]	[,146]	[,147]	[,148]	[,149]	[,150]	[,151]	[,152]	[,153]	[,154]
y1	0.33873	0.03422	0.29293	0.28617	0.47408	0.22773	0.06236	0.03310	0.01772	0.18088	0.28012
y2	0.00947	0.30540	0.18047	0.09379	0.09291	0.22280	0.17332	0.01784	0.01772	0.05764	0.01690

	[,155]	[,156]	[,157]	[,158]	[,159]	[,160]	[,161]	[,162]	[,163]	[,164]	[,165]
y1	0.43947	0.18832	0.11175	0.09723	0.16204	0.30466	0.0144	0.20775	0.08616	0.17558	0.20688
y2	0.12744	0.19778	0.39048	0.03148	0.13451	0.31213	0.0144	0.31465	0.15564	0.17558	0.26280

	[,166]	[,167]	[,168]	[,169]	[,170]	[,171]	[,172]	[,173]	[,174]	[,175]	[,176]
y1	0.00174	0.06013	0.00499	0.14698	0.26509	0.09242	0.33875	0.02932	0.05845	0.08061	0.09625
y2	0.00174	0.07393	0.00499	0.14698	0.00559	0.17807	0.18235	0.08660	0.01748	0.09875	0.12030

	[,177]	[,178]	[,179]	[,180]	[,181]	[,182]	[,183]	[,184]	[,185]	[,186]	[,187]
y1	0.19764	0.08574	0.02678	0.10834	0.01956	0.20706	0.06898	0.26559	0.10406	0.14626	0.08392
y2	0.06569	0.08574	0.47289	0.09086	0.01956	0.20706	0.07742	0.02873	0.04470	0.40050	0.08392

	[,188]	[,189]	[,190]	[,191]	[,192]	[,193]	[,194]	[,195]	[,196]	[,197]	[,198]
y1	0.11433	0.01816	0.02066	0.19906	0.22696	0.00289	0.0361	0.01295	0.12354	0.17987	0.08334
y2	0.04753	0.07337	0.10408	0.19906	0.11773	0.15996	0.0361	0.08069	0.12354	0.02529	0.26266

	[,199]	[,200]	[,201]	[,202]	[,203]	[,204]	[,205]	[,206]	[,207]	[,208]	[,209]
y1	0.37632	0.11142	0.09913	0.00767	0.10171	0.13271	0.18198	0.02551	0.20207	0.17314	0.28664
y2	0.00639	0.19080	0.03049	0.02390	0.11892	0.06623	0.14402	0.00227	0.54744	0.17314	0.04833

	[,210]	[,211]	[,212]	[,213]	[,214]	[,215]	[,216]	[,217]	[,218]	[,219]	[,220]
y1	0.35185	0.14594	0.19821	0.30626	0.07879	0.3142	0.07109	0.20889	0.17884	0.03946	0.01692
y2	0.12243	0.17515	0.00022	0.27277	0.13550	0.3142	0.04124	0.19237	0.04408	0.28631	0.01102

	[,221]	[,222]	[,223]	[,224]	[,225]	[,226]	[,227]	[,228]	[,229]	[,230]	[,231]
y1	0.25280	0.00793	0.06338	0.07527	0.00385	0.18566	0.14769	0.11587	0.07183	0.01762	0.09614
y2	0.21245	0.13000	0.09271	0.02421	0.00385	0.64188	0.14120	0.29739	0.03044	0.12662	0.11448

	[,232]	[,233]	[,234]	[,235]	[,236]	[,237]	[,238]	[,239]	[,240]	[,241]	[,242]
y1	0.07608	0.12247	0.21678	0.26876	0.18469	0.02966	0.03680	0.37561	0.01674	0.12072	0.08240
y2	0.07608	0.22466	0.10597	0.27751	0.38164	0.02966	0.07027	0.01258	0.01674	0.50895	0.21224

	[,243]	[,244]	[,245]	[,246]	[,247]	[,248]	[,249]	[,250]	[,251]	[,252]	[,253]
y1	0.35240	0.01562	0.04249	0.06444	0.18379	0.00622	0.00663	0.06385	0.00036	0.00652	0.10450

```
y2 0.09403 0.01562 0.04249 0.07069 0.11217 0.12357 0.33139 0.06374 0.00036 0.00652 0.11322
     [,254]  [,255]  [,256]  [,257]  [,258]  [,259]  [,260]  [,261]  [,262]  [,263]  [,264]
y1 0.13572 0.12657 0.04834 0.24075 0.18107 0.15033 0.00911 0.01544 0.02512 0.07885 0.01022
y2 0.13572 0.38790 0.02878 0.24075 0.28165 0.00373 0.00911 0.18695 0.07414 0.38642 0.38425
     [,265]  [,266]  [,267]  [,268]  [,269]  [,270]  [,271]  [,272]  [,273]  [,274]  [,275]
y1 0.13216 0.11015 0.21793 0.05501 0.78216 0.13751 0.02761 0.58259 0.52606 0.36132 0.05100
y2 0.07046 0.54496 0.09503 0.01294 0.48632 0.00551 0.70524 0.06425 0.15806 0.11377 0.02723
     [,276]  [,277]  [,278]  [,279]  [,280]  [,281]  [,282]  [,283]  [,284]  [,285]  [,286]
y1 0.02072 0.00571 0.15251 0.41315 0.08652 0.05526 0.05455 0.18497 0.29834 0.31971 0.18532
y2 0.02072 0.02942 0.09460 0.23357 0.18720 0.31981 0.03185 0.09990 0.05592 0.11507 0.25754
     [,287]  [,288]  [,289]  [,290]  [,291]  [,292]  [,293]  [,294]  [,295]  [,296]  [,297]
y1 0.30939 0.29754 0.24379 0.08001 0.24231 0.05184 0.52648 0.02547 0.05641 0.04052 0.00360
y2 0.06143 0.11983 0.21219 0.13273 0.04073 0.05184 0.31887 0.03295 0.06144 0.23859 0.05212
     [,298]  [,299]  [,300]  [,301] [,302]  [,303]  [,304]  [,305]  [,306]  [,307] [,308]
y1 0.06597 0.23977 0.04492 0.04852 0.0559 0.04993 0.06311 0.09237 0.14641 0.28219 0.1991
y2 0.06200 0.03513 0.07698 0.36982 0.0559 0.12225 0.03567 0.06331 0.11772 0.28219 0.1991
     [,309]  [,310]  [,311]  [,312]  [,313]  [,314]  [,315]  [,316]  [,317]  [,318]  [,319]
y1 0.04212 0.14174 0.18853 0.15329 0.06758 0.22501 0.20725 0.04393 0.03590 0.20522 0.20770
y2 0.04212 0.46127 0.30188 0.20104 0.03340 0.22501 0.06995 0.10027 0.04993 0.20522 0.12028
     [,320]  [,321]  [,322]  [,323]  [,324]  [,325]  [,326]  [,327]  [,328]  [,329]  [,330]
y1 0.03089 0.03162 0.24355 0.38340 0.07020 0.37359 0.67789 0.00012 0.67120 0.21671 0.01775
y2 0.26648 0.04311 0.21709 0.01749 0.17943 0.00499 0.19123 0.14321 0.14235 0.67802 0.08880
     [,331]  [,332]  [,333]  [,334]  [,335]  [,336]  [,337]  [,338]  [,339]  [,340]  [,341]
y1 0.09650 0.25015 0.06082 0.03629 0.12625 0.14163 0.07209 0.02755 0.03581 0.00448 0.17602
y2 0.13366 0.22767 0.10845 0.09647 0.12625 0.35396 0.06707 0.02755 0.03394 0.04090 0.21544
     [,342]  [,343]  [,344]  [,345]  [,346]  [,347]  [,348]  [,349]  [,350]  [,351]  [,352]
y1 0.42505 0.04708 0.04057 0.14414 0.19873 0.00336 0.18919 0.29459 0.09455 0.12493 0.00661
y2 0.15683 0.04708 0.04057 0.08474 0.00914 0.24683 0.08610 0.12459 0.10302 0.12493 0.09699
     [,353]  [,354]  [,355]  [,356]  [,357]  [,358]  [,359]  [,360]  [,361]  [,362]  [,363]
y1 0.13269 0.15737 0.09499 0.00283 0.08046 0.17402 0.22581 0.03600 0.29914 0.16862 0.02180
y2 0.40593 0.15737 0.35062 0.14865 0.32526 0.04099 0.28207 0.14316 0.08650 0.16862 0.03559
     [,364]  [,365]  [,366]  [,367]  [,368]  [,369]  [,370]  [,371]  [,372]  [,373]  [,374]
y1 0.05508 0.20250 0.04868 0.32862 0.20451 0.15869 0.14548 0.06466 0.21412 0.02866 0.15744
y2 0.05508 0.29092 0.24156 0.36724 0.10703 0.15869 0.27980 0.06466 0.33867 0.18051 0.09770
     [,375]  [,376]  [,377]  [,378]  [,379]  [,380]  [,381]  [,382]  [,383]  [,384]  [,385]
y1 0.12556 0.00737 0.03896 0.31320 0.23502 0.00582 0.10726 0.05467 0.00983 0.05248 0.00712
y2 0.07547 0.03883 0.03896 0.00966 0.79444 0.02923 0.15376 0.20728 0.00983 0.48704 0.00712
     [,386]  [,387]  [,388]  [,389]  [,390]  [,391]  [,392]  [,393]  [,394]  [,395]  [,396]
y1 0.01799 0.28793 0.11511 0.47085 0.17075 0.00463 0.24328 0.06405 0.04824 0.03797 0.00236
y2 0.33403 0.28793 0.02796 0.55991 0.17075 0.00140 0.07766 0.16626 0.19494 0.03797 0.00236
     [,397]  [,398]  [,399]  [,400]  [,401]  [,402]  [,403]  [,404]  [,405]  [,406]  [,407]
y1 0.26146 0.30331 0.21895 0.00176 0.00281 0.24739 0.01990 0.04378 0.10985 0.15979 0.06949
y2 0.08221 0.15271 0.21895 0.05207 0.15577 0.24739 0.55701 0.04378 0.10985 0.05537 0.12055
     [,408]  [,409] [,410]  [,411]  [,412]  [,413]  [,414] [,415]  [,416]  [,417]  [,418]
y1 0.20958 0.15345 0.0769 0.07332 0.03689 0.30726 0.13945 0.0719 0.33003 0.01013 0.22681
y2 0.01067 0.15345 0.0107 0.06504 0.01624 0.09760 0.36531 0.0719 0.06289 0.10569 0.23264
     [,419]  [,420]  [,421]  [,422]  [,423]  [,424]  [,425]  [,426]  [,427]  [,428]  [,429]
y1 0.14744 0.54055 0.12049 0.08794 0.10341 0.22668 0.02306 0.09360 0.23887 0.08366 0.36592
y2 0.05155 0.21795 0.03117 0.09336 0.17555 0.01396 0.15414 0.35086 0.15295 0.00321 0.01553
     [,430]  [,431]  [,432]  [,433]  [,434]  [,435]  [,436]  [,437]  [,438]  [,439]  [,440]
y1 0.02957 0.00961 0.11467 0.22201 0.00068 0.28979 0.09799 0.44479 0.14388 0.46163 0.11282
y2 0.14359 0.02792 0.24056 0.04514 0.04450 0.18990 0.19268 0.08754 0.02978 0.08413 0.11282
     [,441]  [,442]  [,443]  [,444]  [,445] [,446]  [,447]  [,448]  [,449]  [,450]  [,451]
y1 0.20579 0.10761 0.06247 0.35973 0.02867 0.0689 0.05478 0.38335 0.20541 0.07910 0.10894
y2 0.20579 0.09795 0.63418 0.13929 0.06035 0.0565 0.55263 0.16307 0.13836 0.26169 0.10256
     [,452]  [,453]  [,454]  [,455]  [,456]  [,457]  [,458]  [,459]  [,460]  [,461]  [,462]
y1 0.21008 0.28498 0.12834 0.06549 0.00605 0.04169 0.05820 0.22201 0.39857 0.00512 0.16596
y2 0.06135 0.06749 0.12834 0.06549 0.00605 0.21170 0.06436 0.03534 0.39857 0.00838 0.05813
     [,463]  [,464]  [,465]  [,466]  [,467]  [,468]  [,469]  [,470]  [,471]  [,472]  [,473]
y1 0.01285 0.36000 0.10725 0.26129 0.29385 0.07386 0.25257 0.04205 0.47307 0.03920 0.16999
y2 0.01285 0.33223 0.41648 0.02929 0.01685 0.39664 0.14778 0.15402 0.07128 0.54491 0.06211
     [,474]  [,475]  [,476]  [,477]  [,478]  [,479]  [,480]  [,481]  [,482]  [,483]  [,484]
y1 0.05597 0.08238 0.16215 0.09332 0.88874 0.08502 0.06995 0.30727 0.04118 0.11792 0.07487
y2 0.18530 0.15466 0.06423 0.14229 0.00010 0.03346 0.03770 0.05446 0.43766 0.03511 0.04120
     [,485]  [,486]  [,487]  [,488]  [,489]  [,490]  [,491]  [,492]  [,493]  [,494]  [,495]
y1 0.01394 0.43121 0.41161 0.07766 0.16928 0.03621 0.00580 0.53046 0.15540 0.04406 0.17236
y2 0.00172 0.60600 0.05839 0.17383 0.10821 0.03709 0.14893 0.66903 0.00071 0.04406 0.17236
     [,496]  [,497]  [,498]  [,499]  [,500]  [,501]  [,502]  [,503]  [,504]  [,505]  [,506]
y1 0.00142 0.04172 0.60100 0.07528 0.04792 0.07919 0.20078 0.15508 0.50521 0.20132 0.34518
y2 0.04165 0.00176 0.32113 0.08738 0.16531 0.01280 0.00241 0.15508 0.29340 0.07263 0.11717
```

	[,507]	[,508]	[,509]	[,510]	[,511]	[,512]	[,513]	[,514]	[,515]	[,516]	[,517]
y1	0.12470	0.12054	0.01131	0.21499	0.15327	0.49892	0.03014	0.18544	0.06133	0.23330	0.15760
y2	0.10733	0.12054	0.05173	0.10322	0.15878	0.00887	0.03382	0.30032	0.16213	0.17351	0.39663
	[,518]	[,519]	[,520]	[,521]	[,522]	[,523]	[,524]	[,525]	[,526]	[,527]	[,528]
y1	0.05222	0.31791	0.04089	0.13020	0.20175	0.12786	0.65738	0.13125	0.019	0.02035	0.73361
y2	0.19328	0.17238	0.33065	0.06982	0.22707	0.06261	0.16753	0.06260	0.019	0.48734	0.17426
	[,529]	[,530]	[,531]	[,532]	[,533]	[,534]	[,535]	[,536]	[,537]	[,538]	[,539]
y1	0.00220	0.02579	0.01256	0.07491	0.16102	0.04055	0.03948	0.06048	0.21070	0.03745	0.06972
y2	0.08806	0.02579	0.03644	0.07284	0.02127	0.17626	0.03948	0.27725	0.19682	0.12281	0.01417
	[,540]	[,541]	[,542]	[,543]	[,544]	[,545]	[,546]	[,547]	[,548]	[,549]	[,550]
y1	0.05182	0.04439	0.47797	0.03676	0.13755	0.05671	0.00730	0.47108	0.02199	0.04407	0.19081
y2	0.05182	0.10451	0.05136	0.15752	0.11852	0.07821	0.04824	0.47108	0.02199	0.09882	0.00485
	[,551]	[,552]	[,553]	[,554]	[,555]	[,556]	[,557]	[,558]	[,559]	[,560]	[,561]
y1	0.22319	0.31701	0.11264	0.02374	0.09484	0.10656	0.08137	0.12702	0.13473	0.72943	0.57905
y2	0.00613	0.48499	0.13928	0.18543	0.09484	0.22883	0.07638	0.25132	0.18827	0.00198	0.04664
	[,562]	[,563]	[,564]	[,565]	[,566]	[,567]	[,568]	[,569]	[,570]	[,571]	[,572]
y1	0.01465	0.05246	0.32081	0.08608	0.08500	0.18565	0.04158	0.12065	0.02440	0.11837	0.01973
y2	0.07144	0.04039	0.30200	0.13820	0.09112	0.42462	0.02160	0.47350	0.02899	0.25704	0.31524
	[,573]	[,574]	[,575]	[,576]	[,577]	[,578]	[,579]	[,580]	[,581]	[,582]	[,583]
y1	0.10639	0.17186	0.01035	0.06877	0.17671	0.79947	0.11357	0.13629	0.02587	0.04144	0.01942
y2	0.04781	0.20508	0.73695	0.05858	0.70382	0.16700	0.27203	0.13629	0.08513	0.49621	0.01942
	[,584]	[,585]	[,586]	[,587]	[,588]	[,589]	[,590]	[,591]	[,592]	[,593]	[,594]
y1	0.19999	0.02695	0.28554	0.03505	0.08108	0.00458	0.10800	0.12827	0.11362	0.00629	0.42366
y2	0.45179	0.04155	0.09320	0.03505	0.09921	0.16775	0.21075	0.04625	0.02400	0.08581	0.10456
	[,595]	[,596]	[,597]	[,598]	[,599]	[,600]	[,601]	[,602]	[,603]	[,604]	[,605]
y1	0.48526	0.02539	0.13531	0.12599	0.02234	0.60712	0.28775	0.07523	0.29760	0.06053	0.34976
y2	0.22306	0.08592	0.10506	0.12599	0.05986	0.24492	0.08951	0.23873	0.27309	0.03955	0.04369
	[,606]	[,607]	[,608]	[,609]	[,610]	[,611]	[,612]	[,613]	[,614]	[,615]	[,616]
y1	0.04427	0.22435	0.03903	0.20435	0.19661	0.09249	0.46737	0.76340	0.00140	0.10759	0.04923
y2	0.61654	0.02658	0.41113	0.09924	0.15119	0.11693	0.06283	0.15106	0.00229	0.00309	0.15038
	[,617]	[,618]	[,619]	[,620]	[,621]	[,622]	[,623]	[,624]	[,625]	[,626]	[,627]
y1	0.02288	0.05624	0.00420	0.03288	0.02032	0.02889	0.05087	0.17956	0.13511	0.20189	0.25911
y2	0.09924	0.21256	0.16551	0.03288	0.04699	0.74697	0.56686	0.05369	0.13511	0.03231	0.10835
	[,628]	[,629]	[,630]	[,631]	[,632]	[,633]	[,634]	[,635]	[,636]	[,637]	[,638]
y1	0.03239	0.20300	0.23783	0.05512	0.03372	0.15621	0.06304	0.45252	0.30284	0.00943	0.05699
y2	0.33545	0.09917	0.02256	0.04605	0.13700	0.17206	0.08481	0.02382	0.02285	0.05430	0.24295
	[,639]	[,640]	[,641]	[,642]	[,643]	[,644]	[,645]	[,646]	[,647]	[,648]	[,649]
y1	0.03995	0.17456	0.10423	0.02831	0.02366	0.19080	0.01449	0.09376	0.00017	0.49213	0.24045
y2	0.22259	0.04534	0.44230	0.02831	0.05200	0.01159	0.01449	0.01241	0.00017	0.02680	0.18605
	[,650]	[,651]	[,652]	[,653]	[,654]	[,655]	[,656]	[,657]	[,658]	[,659]	[,660]
y1	0.09737	0.05676	0.01732	0.05848	0.11344	0.06114	0.03076	0.01905	0.17180	0.13747	0.20965
y2	0.46112	0.11015	0.06360	0.05848	0.19209	0.68860	0.13023	0.42226	0.02439	0.51900	0.04861
	[,661]	[,662]	[,663]	[,664]	[,665]	[,666]	[,667]	[,668]	[,669]	[,670]	[,671]
y1	0.03355	0.04303	0.15519	0.06774	0.28941	0.18964	0.01330	0.30610	0.08706	0.35030	0.78167
y2	0.03153	0.64918	0.15519	0.08861	0.04839	0.18323	0.01338	0.18806	0.17162	0.25006	0.09829
	[,672]	[,673]	[,674]	[,675]	[,676]	[,677]	[,678]	[,679]	[,680]	[,681]	[,682]
y1	0.13028	0.11227	0.25246	0.17329	0.10645	0.04296	0.0789	0.15556	0.16053	0.06192	0.06716
y2	0.11639	0.11227	0.05880	0.31550	0.08417	0.12986	0.0789	0.09639	0.25113	0.29939	0.12360
	[,683]	[,684]	[,685]	[,686]	[,687]	[,688]	[,689]	[,690]	[,691]	[,692]	[,693]
y1	0.03697	0.02408	0.00970	0.11934	0.12989	0.03081	0.14710	0.0057	0.64487	0.09089	0.12340
y2	0.00073	0.03626	0.22581	0.15783	0.12864	0.03081	0.05966	0.0057	0.14282	0.49709	0.26947
	[,694]	[,695]	[,696]	[,697]	[,698]	[,699]	[,700]	[,701]	[,702]	[,703]	[,704]
y1	0.26874	0.20901	0.00192	0.36033	0.10137	0.16944	0.00725	0.03370	0.16135	0.75320	0.02961
y2	0.02674	0.03202	0.00192	0.01091	0.08533	0.14342	0.00725	0.06765	0.16135	0.15478	0.01325
	[,705]	[,706]	[,707]	[,708]	[,709]	[,710]	[,711]	[,712]	[,713]	[,714]	[,715]
y1	0.21897	0.04217	0.10416	0.07767	0.10121	0.16929	0.01135	0.13046	0.08322	0.06312	0.14397
y2	0.03361	0.04217	0.10416	0.07767	0.00204	0.09709	0.01135	0.34721	0.34800	0.02705	0.20277
	[,716]	[,717]	[,718]	[,719]	[,720]	[,721]	[,722]	[,723]	[,724]	[,725]	[,726]
y1	0.04861	0.75453	0.60590	0.00102	0.28403	0.01456	0.06629	0.05954	0.02739	0.06795	0.05016
y2	0.01118	0.11656	0.13363	0.01073	0.28403	0.01456	0.19492	0.11717	0.04421	0.06795	0.04971
	[,727]	[,728]	[,729]	[,730]	[,731]	[,732]	[,733]	[,734]	[,735]	[,736]	[,737]
y1	0.03315	0.09795	0.04633	0.75572	0.17497	0.02673	0.05041	0.01570	0.10566	0.23052	0.04357
y2	0.12501	0.08445	0.16641	0.32476	0.00107	0.12591	0.05041	0.01301	0.02763	0.10175	0.19386
	[,738]	[,739]	[,740]	[,741]	[,742]	[,743]	[,744]	[,745]	[,746]	[,747]	[,748]
y1	0.00222	0.19037	0.08269	0.00157	0.38163	0.60171	0.10305	0.05134	0.11404	0.04578	0.53493
y2	0.04231	0.00981	0.03202	0.41223	0.00632	0.11700	1.04559	0.05134	0.11404	0.04045	0.04914
	[,749]	[,750]	[,751]	[,752]	[,753]	[,754]	[,755]	[,756]	[,757]	[,758]	[,759]
y1	0.07276	0.01055	0.15373	0.27773	0.36722	0.29687	0.11688	0.14274	0.14093	0.02367	0.15558
y2	0.01428	0.19956	0.00518	0.03878	0.04779	0.09470	0.00664	0.13866	0.02248	0.04081	0.15558
	[,760]	[,761]	[,762]	[,763]	[,764]	[,765]	[,766]	[,767]	[,768]	[,769]	[,770]

```
y1 0.31818 0.13319 0.28850 0.11053 0.14586 0.11265 0.38738 0.17032 0.17721 0.07625 0.08510
y2 0.01328 0.07615 0.62154 0.20515 0.14030 0.17041 0.00160 0.02354 0.21240 0.06967 0.01914
    [,771]  [,772]  [,773]  [,774]  [,775]  [,776] [,777]  [,778]  [,779]  [,780]  [,781]
y1 0.01755 0.04138 0.07834 0.04276 0.30369 0.07356 0.1335 0.17966 0.09071 0.04249 0.27034
y2 0.07823 0.08954 0.37995 0.10179 0.25984 0.07356 0.1335 0.27336 0.08503 0.15016 0.36532
    [,782]  [,783]  [,784]  [,785]  [,786]  [,787]  [,788]  [,789]  [,790]  [,791]  [,792]
y1 0.03982 0.83367 0.01134 0.04172 0.15471 0.05292 0.79512 0.12132 0.01771 0.01372 0.12230
y2 0.15576 0.06767 0.01134 0.07844 0.26899 0.00686 0.19979 0.07788 0.03346 0.28405 0.38198
    [,793]  [,794]  [,795]  [,796]  [,797]  [,798]  [,799]  [,800]  [,801]  [,802]  [,803]
y1 0.19700 0.14290 0.04434 0.17948 0.28398 0.21255 0.20352 0.05718 0.15071 0.20111 0.42194
y2 0.10376 0.03578 0.06675 0.22041 0.08778 0.00845 0.10343 0.05718 0.37253 0.03348 0.30800
    [,804]  [,805]  [,806]  [,807]  [,808]  [,809]  [,810]  [,811]  [,812]  [,813]  [,814]
y1 0.61155 0.13548 0.00637 0.14329 0.04734 0.05786 0.02753 0.05139 0.07274 0.16531 0.02463
y2 0.08013 0.09633 0.25013 0.01039 0.04734 0.02994 0.02753 0.05139 0.10304 0.04574 0.07442
    [,815]  [,816]  [,817]  [,818]  [,819]  [,820]  [,821]  [,822]  [,823]  [,824]  [,825]
y1 0.04506 0.39436 0.24415 0.00592 0.10556 0.11537 0.07458 0.23342 0.10031 0.00180 0.05936
y2 0.04506 0.15274 0.09612 0.00592 0.10126 0.17050 0.00100 0.18005 0.16525 0.02796 0.12317
    [,826] [,827]  [,828]  [,829]  [,830]  [,831]  [,832]  [,833]  [,834]  [,835]  [,836]
y1 0.50113 0.1179 0.58548 0.21602 0.06186 0.25206 0.05178 0.15402 0.06547 0.08114 0.11170
y2 0.02520 0.1179 0.02524 0.06505 0.05232 0.02933 0.13833 0.01541 0.10281 0.39518 0.23053
    [,837]  [,838]  [,839]  [,840]  [,841]  [,842]  [,843]  [,844]  [,845]  [,846]  [,847]
y1 0.07025 0.08395 0.14948 0.08165 0.00766 0.06121 0.08072 0.15940 0.11947 0.17834 0.02144
y2 0.08307 0.23123 0.01143 0.04996 0.21610 0.14611 0.08072 0.05063 0.14455 0.17834 0.08849
    [,848]  [,849]  [,850]  [,851]  [,852]  [,853]  [,854]  [,855]  [,856]  [,857]  [,858]
y1 0.67000 0.28859 0.40798 0.02935 0.06393 0.00166 0.06706 0.11049 0.16600 0.01051 0.03567
y2 0.28978 0.05833 0.24374 0.01970 0.03172 0.15445 0.52804 0.10970 0.10909 0.00129 0.03567
    [,859]  [,860]  [,861]  [,862]  [,863]  [,864]  [,865]  [,866]  [,867]  [,868]  [,869]
y1 0.47096 0.02353 0.12192 0.63231 0.08695 0.15159 0.09628 0.13213 0.21305 0.03424 0.13558
y2 0.08105 0.01268 0.11073 0.07372 0.48213 0.02867 0.13817 0.13213 0.17714 0.02414 0.14040
    [,870]  [,871]  [,872]  [,873]  [,874]  [,875]  [,876]  [,877]  [,878]  [,879]  [,880]
y1 0.12028 0.22026 0.35466 0.05437 0.12796 0.02993 0.07904 0.56205 0.07329 0.02292 0.02237
y2 0.07928 0.22026 0.04041 0.28040 0.19904 0.14698 0.01328 0.17586 0.39690 0.01791 0.02237
    [,881]  [,882]  [,883]  [,884]  [,885]  [,886]  [,887]  [,888]  [,889]  [,890]  [,891]
y1 0.34931 0.01644 0.04434 0.24803 0.05878 0.01182 0.17011 0.24232 0.22824 0.07965 0.11395
y2 0.03182 0.18232 0.04434 0.24803 0.61623 0.04227 0.17011 0.18738 0.22567 0.07965 0.12277
    [,892]  [,893]  [,894]  [,895]  [,896]  [,897]  [,898]  [,899]  [,900]  [,901]  [,902]
y1 0.02458 0.08021 0.12084 0.04178 0.05511 0.17175 0.19304 0.36063 0.04515 0.01587 0.12228
y2 0.00184 0.27425 0.06150 0.00453 0.11666 0.17175 0.03855 0.36063 0.12481 0.01632 0.25896
    [,903]  [,904]  [,905]  [,906]  [,907]  [,908]  [,909]  [,910]  [,911]  [,912]  [,913]
y1 0.03195 0.10772 0.08060 0.13415 0.04773 0.02033 0.03957 0.15620 0.18192 0.41586 0.02864
y2 0.16641 0.02743 0.11017 0.11932 0.04773 0.06354 0.08959 0.09741 0.18192 0.11413 0.10643
    [,914]  [,915]  [,916]  [,917]  [,918]  [,919]  [,920]  [,921]  [,922]  [,923]  [,924]
y1 0.11024 0.04466 0.00828 0.10512 0.12644 0.19146 0.17613 0.04254 0.25702 0.13252 0.03096
y2 0.09286 0.04466 0.23115 0.12605 0.07506 0.03719 0.17613 0.04879 0.14412 0.00216 0.13899
    [,925]  [,926]  [,927]  [,928]  [,929]  [,930]  [,931]  [,932]  [,933]  [,934]  [,935]
y1 0.07192 0.07582 0.15256 0.02845 0.20467 0.04843 0.02401 0.31783 0.05211 0.10338 0.00865
y2 0.11516 0.19444 0.13131 0.02845 0.12380 0.00794 0.12780 0.16549 0.37819 0.65544 0.14113
    [,936]  [,937]  [,938]  [,939]  [,940]  [,941]  [,942]  [,943]  [,944]  [,945]  [,946]
y1 0.36816 0.12850 0.02713 0.02792 0.31250 0.00488 0.07408 0.18875 0.17467 0.47519 0.03325
y2 0.36532 0.15139 0.04315 0.25417 0.05626 0.13008 0.07408 0.81052 0.08059 0.54068 0.03325
    [,947]  [,948]  [,949]  [,950]  [,951]  [,952]  [,953]  [,954]  [,955]  [,956]  [,957]
y1 0.18057 0.19697 0.17577 0.23811 0.11586 0.23899 0.00888 0.62486 0.19769 0.00762 0.08757
y2 0.39999 0.08436 0.03536 0.27123 0.39903 0.05397 0.07258 0.26338 0.12629 0.07240 0.19700
    [,958]  [,959]  [,960]  [,961]  [,962]  [,963]  [,964]  [,965]  [,966]  [,967]  [,968]
y1 0.12272 0.17835 0.17071 0.04894 0.15988 0.09456 0.39325 0.01931 0.11262 0.06293 0.42941
y2 0.05089 0.11661 0.37256 0.00213 0.28175 0.14645 0.30959 0.19351 0.20454 0.06293 0.62290
    [,969]  [,970]  [,971]  [,972]  [,973]  [,974]  [,975]  [,976]  [,977]  [,978]  [,979]
y1 0.05435 0.14747 0.04919 0.47601 0.03973 0.26231 0.25257 0.08825 0.00674 0.97549 0.09086
y2 0.01349 0.11287 0.13250 0.02603 0.15216 0.12237 0.04857 0.08681 0.00674 0.22687 0.01004
    [,980]  [,981]  [,982]  [,983]  [,984]  [,985]  [,986]  [,987]  [,988]  [,989]  [,990]
y1 0.17396 0.12503 0.06802 0.01671 0.09333 0.02059 0.03405 0.00562 0.37513 0.33077 0.16732
y2 0.33405 0.05743 0.15567 0.39128 0.31676 0.07852 0.03405 0.00562 0.15915 0.09466 0.20701
    [,991]  [,992]  [,993]  [,994]  [,995]  [,996]  [,997]  [,998]  [,999] [,1000]
y1 0.26815 0.29942 0.10292 0.18317 0.08371 0.03736 0.07428 0.18755 0.06862 0.19273
y2 0.15351 0.35975 0.03068 0.37087 0.08371 0.02254 0.07428 0.05698 0.18246 0.16034
```

Random Numbers from BBBE(5, 5, 2)

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]	[,9]	[,10]	[,11]
y1	0.02551	0.20991	0.13558	0.02366	0.25069	0.15979	0.22080	0.05248	0.24328	0.56880	0.05671
y2	0.09808	0.02763	0.31676	0.26382	0.01772	0.06688	0.25281	0.03361	0.04779	0.24156	0.35246
	[,12]	[,13]	[,14]	[,15]	[,16]	[,17]	[,18]	[,19]	[,20]	[,21]	[,22]
y1	0.15251	0.04734	0.02713	0.12049	0.13539	0.38198	0.03355	0.18924	0.11174	0.36993	0.04205
y2	0.19671	0.34244	0.45081	0.24145	0.04839	0.09808	0.01143	0.35799	0.21240	0.15119	0.03719
	[,23]	[,24]	[,25]	[,26]	[,27]	[,28]	[,29]	[,30]	[,31]	[,32]	[,33]
y1	0.08500	0.16215	0.47111	0.53046	0.01900	0.11537	0.07890	0.07408	0.18379	0.22824	0.04852
y2	0.37924	0.00107	0.01956	0.00936	0.06505	0.09414	0.07049	0.06765	0.04996	0.03361	0.39554
	[,34]	[,35]	[,36]	[,37]	[,38]	[,39]	[,40]	[,41]	[,42]	[,43]	[,44]
y1	0.11537	0.15979	0.02033	0.14769	0.20323	0.17671	0.23568	0.02551	0.19361	0.14624	0.01762
y2	0.22306	0.17426	0.09403	0.01294	0.03578	0.10468	0.06331	0.07839	0.09829	0.02048	0.14159
	[,45]	[,46]	[,47]	[,48]	[,49]	[,50]	[,51]	[,52]	[,53]	[,54]	[,55]
y1	0.00481	0.02111	0.38718	0.19999	0.04773	0.07785	0.15752	0.45304	0.19948	0.18317	0.62486
y2	0.01428	0.00613	0.11301	0.03081	0.08681	0.13456	0.16636	0.06086	0.13560	0.01143	1.07595
	[,56]	[,57]	[,58]	[,59]	[,60]	[,61]	[,62]	[,63]	[,64]	[,65]	[,66]
y1	0.12796	0.03697	0.31524	0.29943	0.28859	0.45908	0.08510	0.80610	0.04378	0.31320	0.00036
y2	0.03505	0.31981	0.11764	0.15274	0.29230	0.16034	0.00216	0.00172	0.19545	0.08013	0.11772
	[,67]	[,68]	[,69]	[,70]	[,71]	[,72]	[,73]	[,74]	[,75]	[,76]	[,77]
y1	0.15238	0.21544	0.23177	0.10406	0.38334	0.21470	0.18695	0.32482	0.06186	0.02111	0.04254
y2	0.02414	0.12459	0.02414	0.18323	0.27322	0.13131	0.00174	0.08069	0.04466	0.01553	0.26680
	[,78]	[,79]	[,80]	[,81]	[,82]	[,83]	[,84]	[,85]	[,86]	[,87]	[,88]
y1	0.02551	0.03567	0.20253	0.02144	0.19118	0.10450	0.06393	0.08706	0.06311	0.15143	0.10031
y2	0.30369	0.00652	0.10845	0.15691	0.00148	0.14321	0.05833	0.03573	0.14455	0.11322	0.51113
	[,89]	[,90]	[,91]	[,92]	[,93]	[,94]	[,95]	[,96]	[,97]	[,98]	[,99]
y1	0.60150	0.03089	0.05699	0.23413	0.35185	0.04894	0.33411	0.07274	0.02323	0.06082	0.04492
y2	0.11772	0.09740	0.08778	0.18694	0.02763	0.05132	0.06053	0.01917	0.08069	0.02674	0.02502
	[,100]	[,101]	[,102]	[,103]	[,104]	[,105]	[,106]	[,107]	[,108]	[,109]	[,110]
y1	0.64629	0.22320	0.04757	0.39325	0.00068	0.00766	0.13629	0.08574	0.08137	0.13269	0.21470
y2	0.07263	0.21224	0.11287	0.05689	0.34673	0.12481	0.02254	0.11015	0.27802	0.19572	0.04897
	[,111]	[,112]	[,113]	[,114]	[,115]	[,116]	[,117]	[,118]	[,119]	[,120]	[,121]
y1	0.29760	0.36271	0.28775	0.00036	0.23314	0.33680	0.04773	0.00174	0.04434	0.30726	0.04699
y2	0.45179	0.42780	0.15167	0.03683	0.17558	0.01956	0.15274	0.00236	0.20056	0.07240	0.13273
	[,122]	[,123]	[,124]	[,125]	[,126]	[,127]	[,128]	[,129]	[,130]	[,131]	[,132]
y1	0.02867	0.05786	0.01789	0.03957	0.07332	0.05478	0.31990	0.08706	0.04834	0.91190	0.23568
y2	0.04434	0.08932	0.14316	0.18664	0.02923	0.03977	0.13419	0.01917	0.01118	0.00148	0.05839
	[,133]	[,134]	[,135]	[,136]	[,137]	[,138]	[,139]	[,140]	[,141]	[,142]	[,143]
y1	0.41015	0.03626	0.06706	0.07183	0.26231	0.02341	0.09184	0.15540	0.07523	0.19661	0.14264
y2	0.03815	0.03346	0.03584	0.10451	0.58593	0.00216	0.05839	0.38106	0.11227	0.12030	0.29989
	[,144]	[,145]	[,146]	[,147]	[,148]	[,149]	[,150]	[,151]	[,152]	[,153]	[,154]
y1	0.25196	0.04809	0.02673	0.14258	0.08500	0.04407	0.25246	0.15238	0.25206	0.05184	0.24045
y2	0.24374	0.20045	0.45081	0.01784	0.04664	0.10569	0.10246	0.49884	0.11666	0.03231	0.13979
	[,155]	[,156]	[,157]	[,158]	[,159]	[,160]	[,161]	[,162]	[,163]	[,164]	[,165]
y1	0.04089	0.10759	0.03372	0.12657	0.03626	0.03154	0.09927	0.32081	0.02889	0.04760	0.14388
y2	0.18713	0.05212	0.26266	0.36531	0.02867	0.03081	0.09336	0.32678	0.01772	0.12629	0.14040
	[,166]	[,167]	[,168]	[,169]	[,170]	[,171]	[,172]	[,173]	[,174]	[,175]	[,176]
y1	0.00220	0.03581	0.04081	0.38331	0.22817	0.06716	0.10197	0.14770	0.00385	0.07844	0.01228
y2	0.34401	0.02755	0.08778	0.49955	0.01428	0.01784	0.02796	0.16653	0.42625	0.06688	0.00794
	[,177]	[,178]	[,179]	[,180]	[,181]	[,182]	[,183]	[,184]	[,185]	[,186]	[,187]
y1	0.33077	0.21489	0.04843	0.02587	0.17139	0.28243	0.07910	0.08665	0.31783	0.07329	0.02587
y2	0.00499	0.32113	0.05455	0.12030	0.03559	0.03117	0.10909	0.21219	0.10643	0.01440	0.19248
	[,188]	[,189]	[,190]	[,191]	[,192]	[,193]	[,194]	[,195]	[,196]	[,197]	[,198]
y1	0.09216	0.11167	0.03903	0.30535	0.01755	0.39307	0.01587	0.04897	0.15238	0.02993	0.22080
y2	0.10909	0.04184	0.10197	0.06688	0.04408	0.16003	0.06688	0.00936	0.11932	0.28201	0.25069
	[,199]	[,200]	[,201]	[,202]	[,203]	[,204]	[,205]	[,206]	[,207]	[,208]	[,209]
y1	0.36506	0.25013	0.02713	0.41161	0.21412	0.00394	0.30466	0.05016	0.28859	0.08137	0.02695
y2	0.04192	0.06967	0.00499	0.27123	0.03304	0.04753	0.00216	0.11362	0.04192	0.10146	0.09086
	[,210]	[,211]	[,212]	[,213]	[,214]	[,215]	[,216]	[,217]	[,218]	[,219]	[,220]
y1	0.03089	0.15678	0.02218	0.02306	0.01035	0.02367	0.10341	0.36722	0.04434	0.05219	0.04217
y2	0.09470	0.02867	0.10985	0.28631	0.60871	0.14402	0.03182	0.06356	0.05506	0.18738	0.11613
	[,221]	[,222]	[,223]	[,224]	[,225]	[,226]	[,227]	[,228]	[,229]	[,230]	[,231]
y1	0.10772	0.01562	0.51817	0.18107	0.00448	0.22319	0.28793	0.10512	0.01131	0.06082	0.12281
y2	0.36946	0.04450	0.66962	0.15376	0.05698	0.10894	0.28201	0.10703	0.04837	0.04857	0.08865
	[,232]	[,233]	[,234]	[,235]	[,236]	[,237]	[,238]	[,239]	[,240]	[,241]	[,242]
y1	0.02180	0.08910	0.08080	0.00793	0.12796	0.03689	0.05100	0.25246	0.00036	0.02234	0.08069
y2	0.10643	0.02933	0.06356	0.70382	0.07190	0.24830	0.06505	0.03581	0.09776	0.00216	0.00499
	[,243]	[,244]	[,245]	[,246]	[,247]	[,248]	[,249]	[,250]	[,251]	[,252]	[,253]
y1	0.00166	0.03148	0.39746	0.03925	0.21724	0.10217	0.28775	0.21897	0.09237	0.05641	0.02440

```
y2 0.06425 0.00570 0.05626 0.37576 0.41679 0.03644 0.15119 0.01749 0.04734 0.22567 0.00551
     [,254]  [,255]  [,256]  [,257]  [,258]  [,259]  [,260]  [,261]  [,262]  [,263]  [,264]
y1 0.14771 0.10566 0.00767 0.78167 0.00463 0.08681 0.12072 0.12599 0.03432 0.00360 0.26146
y2 0.10978 0.11983 0.21489 0.10179 0.07928 0.05446 0.03878 0.08459 0.14657 0.00227 0.06211
     [,265]  [,266]  [,267]  [,268]  [,269]  [,270]  [,271]  [,272]  [,273]  [,274]  [,275]
y1 0.01066 0.04809 0.00192 0.01285 0.03559 0.34817 0.24518 0.03067 0.03744 0.09332 0.19984
y2 0.11426 0.15683 0.05100 0.00613 0.28089 0.00966 0.08072 0.00192 0.72778 0.31454 0.31213
     [,276]  [,277]  [,278]  [,279]  [,280]  [,281] [,282]  [,283]  [,284]  [,285]  [,286]
y1 0.12049 0.25419 0.00142 0.03920 0.25330 0.28589 0.2111 0.01973 0.28979 0.00931 0.06629
y2 0.29092 0.15139 0.29914 0.32877 0.10456 0.31465 0.1970 0.11983 0.01241 0.11377 0.02482
     [,287]  [,288]  [,289]  [,290]  [,291]  [,292]  [,293]  [,294]  [,295]  [,296]  [,297]
y1 0.23075 0.42366 0.05786 0.22435 0.02323 0.02234 0.05467 0.21370 0.02066 0.06706 0.28071
y2 0.68993 0.03806 0.05132 0.04124 0.03683 0.06749 0.13213 0.16307 0.14698 0.02899 0.15792
     [,298]  [,299]  [,300]  [,301]  [,302]  [,303]  [,304]  [,305]  [,306]  [,307]  [,308]
y1 0.25301 0.30183 0.01755 0.12049 0.02199 0.10645 0.38406 0.09271 0.12932 0.19764 0.02864
y2 0.33139 0.03770 0.21075 0.20323 0.06035 0.11790 0.05813 0.04534 0.12357 0.15119 0.04124
     [,309]  [,310]  [,311]  [,312]  [,313]  [,314]  [,315]  [,316]  [,317]  [,318]  [,319]
y1 0.39823 0.08001 0.02753 0.09875 0.47479 0.20536 0.22883 0.46991 0.78216 0.12769 0.35235
y2 0.02256 0.09882 0.32397 0.03348 0.03855 0.21709 0.05207 0.06707 0.12780 0.04450 0.12165
     [,320]  [,321]  [,322]  [,323]  [,324]  [,325]  [,326]  [,327]  [,328]  [,329]  [,330]
y1 0.05676 0.10566 0.11150 0.08608 0.19906 0.03422 0.19273 0.00970 0.17329 0.07785 0.12556
y2 0.04184 0.02843 0.04699 0.28165 0.04605 0.02929 0.03536 0.17314 0.08738 0.52542 0.60214
     [,331]  [,332]  [,333]  [,334]  [,335]  [,336]  [,337]  [,338]  [,339]  [,340]  [,341]
y1 0.04090 0.33873 0.37765 0.05671 0.09376 0.04118 0.27157 0.05184 0.10292 0.02755 0.11947
y2 0.31524 0.07766 0.14316 0.13439 0.08574 0.22879 0.00524 0.31814 0.06283 0.11639 0.07768
     [,342]  [,343]  [,344]  [,345]  [,346]  [,347]  [,348]  [,349]  [,350]  [,351]  [,352]
y1 0.00582 0.20791 0.37632 0.02761 0.34518 0.02180 0.00192 0.05430 0.08500 0.33077 0.02866
y2 0.07372 0.07414 0.05063 0.04605 0.43092 0.04378 0.00184 0.18464 0.01328 0.21709 0.10304
     [,353]  [,354]  [,355]  [,356]  [,357]  [,358]  [,359]  [,360]  [,361]  [,362]  [,363]
y1 0.04421 0.04578 0.30183 0.03676 0.05526 0.53493 0.09723 0.06890 0.03559 0.09875 0.02066
y2 0.02878 0.25754 0.01301 0.06508 0.30959 0.47691 0.14698 0.07844 0.10126 0.15440 0.05455
     [,364]  [,365]  [,366]  [,367]  [,368]  [,369]  [,370]  [,371]  [,372]  [,373]  [,374]
y1 0.07582 0.15345 0.03505 0.22026 0.02739 0.14163 0.19999 0.10171 0.04144 0.30466 0.25654
y2 0.04861 0.24968 0.04222 0.33469 0.02414 0.30079 0.02072 0.33065 0.09770 0.15167 0.45525
     [,375]  [,376]  [,377]  [,378]  [,379]  [,380]  [,381]  [,382]  [,383] [,384]  [,385]
y1 0.30560 0.02323 0.20894 0.08481 0.13962 0.39052 0.16928 0.01692 0.08706 0.0587 0.09723
y2 0.35084 0.04510 0.18590 0.09612 0.16626 0.15141 0.15996 0.17011 0.07767 0.1908 0.15478
     [,386]  [,387]  [,388]  [,389]  [,390]  [,391]  [,392]  [,393]  [,394]  [,395]  [,396]
y1 0.02957 0.05848 0.12796 0.03680 0.01732 0.26559 0.04434 0.10645 0.11688 0.00157 0.17611
y2 0.00172 0.02199 0.12519 0.05155 0.22773 0.12165 0.11772 0.04514 0.12864 0.35246 0.00241
     [,397]  [,398]  [,399]  [,400]  [,401]  [,402]  [,403]  [,404]  [,405]  [,406]  [,407]
y1 0.01449 0.03567 0.13046 0.02501 0.03154 0.03014 0.03946 0.39631 0.45304 0.20175 0.03982
y2 0.20402 0.25132 0.08069 0.08806 0.15295 0.04861 0.05184 0.12780 0.09505 0.26476 0.08294
     [,408]  [,409]  [,410]  [,411]  [,412]  [,413]  [,414]  [,415]  [,416]  [,417]  [,418]
y1 0.07920 0.35179 0.30335 0.20569 0.39307 0.03372 0.14258 0.09456 0.05041 0.08238 0.58144
y2 0.18543 0.02994 0.06795 0.05848 0.08778 0.08049 0.14865 0.09709 0.02256 0.10281 0.43766
     [,419]  [,420]  [,421]  [,422]  [,423]  [,424]  [,425]  [,426]  [,427]  [,428]  [,429]
y1 0.46737 0.02957 0.04852 0.06845 0.04057 0.01762 0.00408 0.10413 0.22319 0.07329 0.04138
y2 0.05839 0.04781 0.05212 0.02458 0.01685 0.18964 0.09291 0.08307 0.07049 0.01301 0.06504
     [,430]  [,431]  [,432]  [,433]  [,434]  [,435]  [,436]  [,437]  [,438]  [,439]  [,440]
y1 0.07209 0.56984 0.47519 0.22824 0.06862 0.02993 0.03590 0.00570 0.00420 0.04434 0.03982
y2 0.00838 0.07788 0.11772 0.04773 0.16498 0.10566 0.01258 0.26348 0.12864 0.05743 0.26083
     [,441]  [,442]  [,443]  [,444]  [,445]  [,446]  [,447]  [,448]  [,449]  [,450]  [,451]
y1 0.03310 0.00481 0.02831 0.01644 0.05478 0.01285 0.17721 0.04212 0.04357 0.10512 0.15345
y2 0.19386 0.25896 0.19209 0.04087 0.05134 0.01102 0.10390 0.52542 0.00394 0.02994 0.03584
     [,452]  [,453]  [,454]  [,455]  [,456]  [,457]  [,458]  [,459]  [,460]  [,461]  [,462]
y1 0.02072 0.13319 0.02056 0.00580 0.00883 0.06972 0.08910 0.18088 0.19386 0.42091 0.06053
y2 0.23931 0.19210 0.12204 0.00198 0.36946 0.12380 0.02862 0.02899 0.04217 0.01956 0.05430
     [,463]  [,464]  [,465]  [,466] [,467]  [,468]  [,469]  [,470]  [,471]  [,472]  [,473]
y1 0.01900 0.01256 0.09927 0.28617 0.2107 0.05597 0.04578 0.22800 0.12786 0.09360 0.15471
y2 0.06374 0.17020 0.04231 0.24038 0.0626 0.00725 0.12834 0.39479 0.18738 0.00936 0.05184
     [,474]  [,475]  [,476]  [,477]  [,478]  [,479]  [,480]  [,481]  [,482]  [,483]  [,484]
y1 0.09144 0.06588 0.57512 0.16215 0.12989 0.35179 0.13028 0.09723 0.11983 0.09376 0.14274
y2 0.30560 0.08738 0.18192 0.28972 0.05446 0.01624 0.24877 0.09913 0.08049 0.15508 0.07919
     [,485]  [,486]  [,487]  [,488]  [,489]  [,490]  [,491]  [,492]  [,493]  [,494]  [,495]
y1 0.20045 0.21370 0.02292 0.29687 0.09249 0.02942 0.00592 0.20132 0.43877 0.05139 0.23303
y2 0.18051 0.28972 0.06135 0.05966 0.08474 0.09500 0.00499 0.02601 0.04708 0.01070 0.19821
     [,496]  [,497]  [,498]  [,499]  [,500]  [,501]  [,502]  [,503]  [,504]  [,505]  [,506]
y1 0.04897 0.00571 0.08315 0.03744 0.07608 0.00663 0.12072 0.27034 0.00580 0.01074 0.17396
y2 0.25651 0.01268 0.02354 0.10569 0.03202 0.06360 0.05212 0.19697 0.83599 0.02831 0.00107
```

	[,507]	[,508]	[,509]	[,510]	[,511]	[,512]	[,513]	[,514]	[,515]	[,516]	[,517]
y1	0.06774	0.14710	0.00140	0.04172	0.08665	0.15033	0.19361	0.53346	0.30284	0.00283	0.02761
y2	0.41015	0.02831	0.11217	0.13866	0.18192	0.11282	0.20594	0.19378	0.02873	0.04120	0.22879
	[,518]	[,519]	[,520]	[,521]	[,522]	[,523]	[,524]	[,525]	[,526]	[,527]	[,528]
y1	0.13531	0.12708	0.39436	0.11362	0.07332	0.06101	0.05416	0.27423	0.79947	0.00637	0.51578
y2	0.00073	0.03340	0.01268	0.07928	0.14229	0.07046	0.01325	0.15167	0.10175	0.52492	0.35213
	[,529]	[,530]	[,531]	[,532]	[,533]	[,534]	[,535]	[,536]	[,537]	[,538]	[,539]
y1	0.17835	0.17966	0.18232	0.04406	0.06381	0.01131	0.02180	0.04057	0.03432	0.05526	0.07885
y2	0.11282	0.15141	0.03581	0.03578	0.05455	0.02414	0.49286	0.37253	0.25704	0.10126	0.11661
	[,540]	[,541]	[,542]	[,543]	[,544]	[,545]	[,546]	[,547]	[,548]	[,549]	[,550]
y1	0.15471	0.16862	0.06312	0.06774	0.02323	0.45304	0.15979	0.00674	0.19851	0.02761	0.14875
y2	0.01900	0.01685	0.49286	0.11791	0.18766	0.01562	0.19545	0.16080	0.18738	0.23931	0.04434
	[,551]	[,552]	[,553]	[,554]	[,555]	[,556]	[,557]	[,558]	[,559]	[,560]	[,561]
y1	0.21470	0.06554	0.04100	0.08592	0.03995	0.12769	0.30258	0.48526	0.55852	0.04138	0.86793
y2	0.17332	0.10304	0.15216	0.13030	0.05136	0.04120	0.04734	0.30800	0.03304	0.17807	0.02285
	[,562]	[,563]	[,564]	[,565]	[,566]	[,567]	[,568]	[,569]	[,570]	[,571]	[,572]
y1	0.07582	0.04016	0.00166	0.06972	0.03629	0.40052	0.36993	0.20522	0.38201	0.14559	0.18198
y2	0.11526	0.09924	0.05718	0.50870	0.15878	0.15737	0.11792	0.35396	0.14832	0.41617	0.17314
	[,573]	[,574]	[,575]	[,576]	[,577]	[,578]	[,579]	[,580]	[,581]	[,582]	[,583]
y1	0.38738	0.06247	0.12786	0.02237	0.05511	0.09376	0.01256	0.05870	0.10305	0.15345	0.00236
y2	0.23348	0.52492	0.05966	0.18059	0.68674	0.04039	0.41617	0.04212	0.38106	0.00172	0.00838
	[,584]	[,585]	[,586]	[,587]	[,588]	[,589]	[,590]	[,591]	[,592]	[,593]	[,594]
y1	0.03744	0.13125	0.20078	0.20688	0.30626	0.10171	0.17186	0.10450	0.04993	0.23342	0.39468
y2	0.12277	0.10845	0.24075	0.05764	0.28040	0.13366	0.07442	0.14402	0.24301	0.02501	0.08921
	[,595]	[,596]	[,597]	[,598]	[,599]	[,600]	[,601]	[,602]	[,603]	[,604]	[,605]
y1	0.06891	0.02792	0.54689	0.04052	0.54738	0.12848	0.08910	0.03067	0.14626	0.31990	0.02923
y2	0.00887	0.03536	0.05718	0.80167	0.34482	0.03044	0.05155	0.05340	0.02458	0.30331	0.03325
	[,606]	[,607]	[,608]	[,609]	[,610]	[,611]	[,612]	[,613]	[,614]	[,615]	[,616]
y1	0.10450	0.17884	0.30726	0.12228	0.04843	0.37664	0.11983	0.08366	0.04773	0.00663	0.00762
y2	0.06466	0.01396	0.02256	0.04605	0.00373	0.08165	0.42226	0.06505	0.12055	0.07768	0.04996
	[,617]	[,618]	[,619]	[,620]	[,621]	[,622]	[,623]	[,624]	[,625]	[,626]	[,627]
y1	0.25619	0.08510	0.36427	0.14744	0.00017	0.00605	0.15678	0.38335	0.21470	0.07920	0.05786
y2	0.04897	0.43877	0.30800	0.33972	0.28207	0.05848	0.22680	0.32198	0.01067	0.18961	0.01917
	[,628]	[,629]	[,630]	[,631]	[,632]	[,633]	[,634]	[,635]	[,636]	[,637]	[,638]
y1	0.12932	0.33875	0.20217	0.01285	0.06101	0.18232	0.03372	0.00605	0.09455	0.15327	0.14414
y2	0.21170	0.10473	0.07919	0.01067	0.04699	0.44230	0.66962	0.54068	0.05132	0.11700	0.24295
	[,639]	[,640]	[,641]	[,642]	[,643]	[,644]	[,645]	[,646]	[,647]	[,648]	[,649]
y1	0.15159	0.73361	0.02957	0.06547	0.03081	0.46266	0.05936	0.17948	0.06144	0.03355	0.31554
y2	0.03361	0.04073	0.19595	0.03584	0.18232	0.02873	0.05134	0.06982	0.19682	0.19261	0.15295
	[,650]	[,651]	[,652]	[,653]	[,654]	[,655]	[,656]	[,657]	[,658]	[,659]	[,660]
y1	0.12065	0.26280	0.19361	0.06114	0.07089	0.01013	0.28576	0.03315	0.10772	0.05478	0.17858
y2	0.03883	0.05689	0.19700	0.00914	0.09776	0.70382	0.07578	0.07638	0.12314	0.23264	0.20045
	[,661]	[,662]	[,663]	[,664]	[,665]	[,666]	[,667]	[,668]	[,669]	[,670]	[,671]
y1	0.05820	0.00571	0.00394	0.27157	0.09249	0.15678	0.06554	0.24328	0.12019	0.11362	0.14324
y2	0.22811	0.06534	0.04836	0.15292	0.24038	0.03567	0.01070	0.22466	0.41617	0.00481	0.64188
	[,672]	[,673]	[,674]	[,675]	[,676]	[,677]	[,678]	[,679]	[,680]	[,681]	[,682]
y1	0.03903	0.03567	0.06774	0.02829	0.06304	0.25257	0.37513	0.14664	0.08240	0.09332	0.15249
y2	0.03185	0.06967	0.17314	0.24848	0.18005	0.00983	0.10894	0.10390	0.00664	0.04406	0.04853
	[,683]	[,684]	[,685]	[,686]	[,687]	[,688]	[,689]	[,690]	[,691]	[,692]	[,693]
y1	0.13213	0.04205	0.23811	0.18317	0.02440	0.00116	0.39307	0.03162	0.05718	0.08697	0.10726
y2	0.08592	0.03644	0.11322	0.01102	0.25515	0.21240	0.04861	0.16078	0.01070	0.10343	0.13220
	[,694]	[,695]	[,696]	[,697]	[,698]	[,699]	[,700]	[,701]	[,702]	[,703]	[,704]
y1	0.09799	0.02713	0.14744	0.40698	0.14264	0.05437	0.11787	0.31546	0.05590	0.20541	0.17467
y2	0.16753	0.10597	0.07284	0.47289	0.04699	0.04311	0.01456	0.22879	0.09112	0.02482	0.04853
	[,705]	[,706]	[,707]	[,708]	[,709]	[,710]	[,711]	[,712]	[,713]	[,714]	[,715]
y1	0.30567	0.63231	0.09237	0.00983	0.05184	0.13408	0.07329	0.23887	0.07408	0.02066	0.08049
y2	0.07608	0.20217	0.16234	0.11322	0.02923	0.48632	0.01748	0.21240	0.03513	0.02382	0.08371
	[,716]	[,717]	[,718]	[,719]	[,720]	[,721]	[,722]	[,723]	[,724]	[,725]	[,726]
y1	0.12786	0.06554	0.05467	0.25196	0.14388	0.14093	0.05478	0.09376	0.03697	0.14113	0.02539
y2	0.28339	0.04227	0.16071	0.01690	0.17555	0.18530	0.03505	0.01301	0.11656	0.00010	0.08681
	[,727]	[,728]	[,729]	[,730]	[,731]	[,732]	[,733]	[,734]	[,735]	[,736]	[,737]
y1	0.11790	0.14825	0.07332	0.00116	0.16929	0.02539	0.30272	0.10217	0.01990	0.09456	0.20904
y2	0.25896	0.19700	0.36946	0.01541	0.26680	0.05743	0.31465	0.13833	0.13836	0.03185	0.19832
	[,738]	[,739]	[,740]	[,741]	[,742]	[,743]	[,744]	[,745]	[,746]	[,747]	[,748]
y1	0.05416	0.29459	0.11790	0.29131	0.03736	0.08238	0.15357	0.17180	0.02401	0.01632	0.20889
y2	0.10835	0.24056	0.03896	0.16034	0.11276	0.39365	0.07823	0.20194	0.13585	0.19545	0.10909
	[,749]	[,750]	[,751]	[,752]	[,753]	[,754]	[,755]	[,756]	[,757]	[,758]	[,759]
y1	0.07919	0.07850	0.25247	0.75453	0.03736	0.11537	0.02755	0.07839	0.19948	0.06949	0.19081
y2	0.09647	0.00845	0.31807	0.09403	0.03626	0.15295	0.03346	0.28438	0.15274	0.12380	0.13131
	[,760]	[,761]	[,762]	[,763]	[,764]	[,765]	[,766]	[,767]	[,768]	[,769]	[,770]

```
y1 0.00943 0.38738 0.10894 0.07340 0.16320 0.29522 0.00674 0.02942 0.66097 0.12501 0.00166
y2 0.16575 0.20594 0.18827 0.01942 0.28631 0.00632 0.19386 0.06362 0.13363 0.09503 0.04450
    [,771]  [,772]  [,773]  [,774]  [,775]  [,776]  [,777]  [,778]  [,779]  [,780]  [,781]
y1 0.39764 0.35179 0.21517 0.06972 0.04169 0.58808 0.05246 0.37765 0.01055 0.04100 0.02867
y2 0.65841 0.08459 0.02199 0.12357 0.02036 0.14455 0.04755 0.08754 0.39128 0.14359 0.11608
    [,782]  [,783]  [,784]  [,785]  [,786]  [,787]  [,788]  [,789]  [,790]  [,791]  [,792]
y1 0.07766 0.37513 0.31783 0.06053 0.37561 0.11433 0.01905 0.06153 0.00420 0.00828 0.01134
y2 0.06086 0.10422 0.05063 0.01900 0.19955 0.00481 0.01268 0.31981 1.02081 0.12864 0.37253
    [,793]  [,794]  [,795]  [,796]  [,797]  [,798]  [,799]  [,800]  [,801]  [,802]  [,803]
y1 0.02547 0.28012 0.19948 0.02218 0.29253 0.03946 0.05526 0.30022 0.08695 0.04515 0.03920
y2 0.04421 0.17206 0.34482 0.31989 0.09724 0.05207 0.13000 0.07356 0.22761 0.08294 0.06967
    [,804]  [,805]  [,806]  [,807]  [,808]  [,809]  [,810]  [,811]  [,812]  [,813]  [,814]
y1 0.33003 0.19081 0.20965 0.00961 0.05954 0.08240 0.56782 0.07885 0.19080 0.63350 0.26146
y2 0.38106 0.18323 0.15666 0.15106 0.03883 0.26047 0.06135 0.23175 0.08502 0.06676 0.03709
    [,815]  [,816]  [,817]  [,818]  [,819]  [,820]  [,821]  [,822]  [,823]  [,824]  [,825]
y1 0.06082 0.04532 0.01285 0.03493 0.08046 0.08240 0.04217 0.04357 0.20894 0.48526 0.02579
y2 0.02482 0.04839 0.09460 0.11773 0.22707 0.11015 0.04090 0.32198 0.15915 0.15577 0.05966
    [,826]  [,827]  [,828]  [,829]  [,830]  [,831]  [,832]  [,833]  [,834]  [,835]  [,836]
y1 0.06133 0.06082 0.12556 0.07144 0.01692 0.00943 0.03076 0.08794 0.10706 0.18565 0.00961
y2 0.31887 0.24156 0.14120 0.29230 0.11717 0.05650 0.07742 0.05292 0.04406 0.28793 0.00116
    [,837]  [,838]  [,839]  [,840]  [,841]  [,842]  [,843]  [,844]  [,845]  [,846]  [,847]
y1 0.04708 0.08049 0.30726 0.05577 0.25237 0.20904 0.33003 0.09795 0.01931 0.07020 0.12702
y2 0.21132 0.17264 0.01325 0.24038 0.07356 0.20728 0.19652 0.40760 0.09990 0.19572 0.11717
    [,848]  [,849]  [,850]  [,851]  [,852]  [,853]  [,854]  [,855]  [,856]  [,857]  [,858]
y1 0.00385 0.06186 0.24301 0.00911 0.10406 0.12769 0.06758 0.19210 0.05676 0.00129 0.00180
y2 0.05590 0.02036 0.06423 0.05016 0.03719 0.12054 0.38635 0.49192 0.34482 0.22687 0.04057
    [,859]  [,860]  [,861]  [,862]  [,863]  [,864]  [,865]  [,866]  [,867]  [,868]  [,869]
y1 0.39325 0.60171 0.32081 0.19004 0.35235 0.10292 0.32920 0.17075 0.67000 0.00281 0.10726
y2 0.03996 0.06150 0.00160 0.00485 0.09724 0.21219 0.06354 0.01791 0.23125 0.02501 0.49884
    [,870]  [,871]  [,872]  [,873]  [,874]  [,875]  [,876]  [,877]  [,878]  [,879]  [,880]
y1 0.06675 0.07386 0.37765 0.04757 0.27664 0.07785 0.16944 0.17948 0.13020 0.03797 0.05108
y2 0.33403 0.02518 0.12346 0.00725 0.04231 0.00129 0.15402 0.14040 0.03626 0.10146 0.16307
    [,881]  [,882]  [,883]  [,884]  [,885]  [,886]  [,887]  [,888]  [,889]  [,890] [,891]
y1 0.02678 0.15577 0.00663 0.01066 0.12848 0.09927 0.18919 0.01692 0.24803 0.13408 0.0891
y2 0.09336 0.19682 0.10451 0.06569 0.18713 0.02796 0.35206 0.08269 0.08650 0.38201 0.1303
    [,892]  [,893]  [,894]  [,895]  [,896]  [,897]  [,898]  [,899]  [,900]  [,901] [,902]
y1 0.11587 0.00318 0.13539 0.03982 0.00116 0.14174 0.05430 0.04406 0.03239 0.05292 0.1477
y2 0.36215 0.10137 0.48533 0.03081 0.05689 0.12481 0.07442 0.06362 0.06289 0.05173 0.0107
    [,903]  [,904]  [,905]  [,906]  [,907]  [,908]  [,909]  [,910]  [,911]  [,912]  [,913]
y1 0.24816 0.46612 0.03903 0.07965 0.00176 0.04824 0.11792 0.15256 0.07356 0.17882 0.26559
y2 0.02796 0.01241 0.10292 0.29092 0.06967 0.30079 0.06356 0.30079 0.01674 0.01241 0.42226
    [,914]  [,915]  [,916]  [,917]  [,918]  [,919] [,920]  [,921]  [,922]  [,923]  [,924]
y1 0.03096 0.02367 0.19080 0.04303 0.39325 0.02961 0.2067 0.01990 0.07834 0.15556 0.01135
y2 0.46127 0.08072 0.10451 0.11523 0.01285 0.11772 0.1663 0.04779 0.15119 0.02680 0.19682
    [,925]  [,926]  [,927]  [,928]  [,929]  [,930]  [,931]  [,932]  [,933]  [,934]  [,935]
y1 0.07458 0.07240 0.33654 0.04809 0.00289 0.01900 0.06466 0.03995 0.29827 0.27740 0.14258
y2 0.80167 0.07608 0.13220 0.03340 0.02502 0.04861 0.09477 0.04155 0.02923 0.66864 0.01917
    [,936]  [,937]  [,938]  [,939]  [,940]  [,941]  [,942] [,943]  [,944]  [,945]  [,946]
y1 0.05676 0.49697 0.03493 0.75320 0.01372 0.04249 0.01465  0.601 0.22113 0.20056 0.18102
y2 0.21219 0.10376 0.13273 0.17558 0.00453 0.03683 0.08474  0.001 0.20991 0.68860 0.06707
    [,947]  [,948]  [,949]  [,950]  [,951]  [,952]  [,953]  [,954]  [,955]  [,956]  [,957]
y1 0.21470 0.17698 0.13511 0.37009 0.08046 0.00582 0.05699 0.01741 0.16445 0.03957 0.12230
y2 0.09484 0.04532 0.24295 0.11507 0.08307 0.01772 0.00321 0.12519 0.29939 0.10506 0.07144
    [,958]  [,959]  [,960]  [,961]  [,962]  [,963]  [,964]  [,965]  [,966]  [,967]  [,968]
y1 0.02867 0.19361 0.00970 0.11792 0.02673 0.01013 0.01900 0.24925 0.14229 0.02488 0.02923
y2 0.03325 0.27725 0.04779 0.04755 0.14030 0.32877 0.04155 0.28403 0.25417 0.01325 0.20467
    [,969]  [,970]  [,971]  [,972]  [,973]  [,974]  [,975]  [,976]  [,977]  [,978]  [,979]
y1 0.08865 0.04492 0.02306 0.05512 0.20175 0.24355 0.22761 0.06393 0.27474 0.27218 0.05437
y2 0.46112 0.01241 0.05764 0.49937 0.20277 0.06293 0.03185 0.02414 0.04222 0.09112 0.19700
    [,980]  [,981]  [,982]  [,983]  [,984] [,985]  [,986]  [,987]  [,988]  [,989]  [,990]
y1 0.20175 0.04633 0.15249 0.17613 0.10894 0.2976 0.26146 0.32862 0.05529 0.44644 0.02867
y2 0.03996 0.28089 0.14653 0.15567 0.03883 0.1272 0.06260 0.01004 0.03534 0.02390 0.04857
    [,991]  [,992]  [,993]  [,994]  [,995]  [,996]  [,997]  [,998]  [,999] [,1000]
y1 0.00754 0.05455 0.09561 0.02829 0.15256 0.12174 0.11053 0.03584 0.07386 0.04760
y2 0.14359 0.10175 0.29939 0.13220 0.15519 0.05212 0.01349 0.01070 0.11511 0.03744
```

Random Numbers from Weibull(7, 3)

```
  [1] 0.882060 0.696218 0.841191 0.634649 0.573719 1.004176 0.801681 0.626634 0.793692
 [10] 0.825535 0.547299 0.826615 0.746964 0.786303 0.961177 0.619922 0.897030 1.007845
 [19] 0.868145 0.551520 0.629145 0.740714 0.761508 0.409032 0.755648 0.734066 0.796230
 [28] 0.778655 0.881505 0.937994 0.535084 0.617592 0.741586 0.692373 1.030590 0.818538
 [37] 0.711335 0.908340 0.871461 0.902465 0.940061 0.839361 0.839631 0.854431 0.935485
 [46] 0.942006 0.901930 0.822452 0.889753 0.653898 1.003897 0.830278 0.690483 0.950617
 [55] 0.790393 0.912249 0.947675 0.713814 0.624296 0.852569 0.751949 0.966042 0.849426
 [64] 0.886734 0.681588 0.828201 0.684232 0.682894 0.692984 0.831057 0.713256 0.765777
 [73] 0.733355 1.137188 0.819359 0.906891 0.850798 0.771884 0.860108 0.956473 0.897948
 [82] 0.750782 0.838343 0.696276 0.961212 0.832679 0.469817 0.626075 0.631767 0.925335
 [91] 0.946056 0.756661 0.862882 0.755237 0.870713 0.919954 0.699376 0.966815 0.822182
[100] 0.807291 0.776545 0.866485 0.814946 0.551573 0.816844 0.628443 0.605428 0.773364
[109] 0.840628 0.938003 0.580808 0.877295 0.990267 0.562853 0.728816 0.940305 0.794434
[118] 0.552248 0.781754 0.842659 0.758677 0.870901 0.875051 0.907028 0.854217 0.473067
[127] 0.934668 0.968418 0.940493 0.741875 0.769492 0.627533 0.748806 0.721408 0.804043
[136] 0.754030 0.677350 0.697288 0.490130 0.831188 0.873680 0.841028 1.061625 0.921570
[145] 0.664213 0.902642 0.899640 0.978031 0.897165 0.723660 0.661069 0.811975 0.848126
[154] 0.896896 0.956495 0.847438 0.786549 0.908150 0.829434 0.907721 0.810380 0.859404
[163] 0.757869 0.852486 0.858889 0.799782 0.719909 0.906509 0.839953 0.889856 0.765494
[172] 0.921579 0.649701 0.717006 0.750691 0.769950 0.853306 0.801093 0.641345 0.783082
[181] 0.666148 0.873424 0.734169 0.890098 0.778582 0.817379 0.890092 0.789123 0.606742
[190] 0.617995 0.886812 0.870334 0.466681 0.769219 0.578102 0.822264 0.841896 0.754269
[199] 0.935530 0.786221 0.899780 0.536475 0.776046 0.806105 0.843296 0.636915 0.856010
[208] 0.881828 0.927257 0.926589 0.817130 0.894489 0.908400 0.748253 1.002063 0.737338
[217] 0.860077 0.841202 0.677862 0.600655 0.883841 0.539042 0.725346 0.743373 0.997138
[226] 0.845716 0.818521 0.790635 0.738431 0.604103 0.769827 0.834805 0.796912 0.992156
[235] 0.891605 0.845080 0.915799 0.671146 0.935279 0.687992 0.795281 0.753055 0.926796
[244] 0.764334 0.873623 0.727063 0.844492 0.520674 0.525377 0.726104 0.892931 0.906243
[253] 0.779049 0.889194 0.800673 0.697809 0.928397 0.842696 0.820597 0.646388 0.592823
[262] 0.635504 0.748329 0.558920 0.805628 0.784934 0.865301 0.861605 1.038602 0.810208
[271] 0.644160 1.077754 0.981387 0.930110 0.705483 0.722274 0.514237 0.822283 0.979684
[280] 0.758320 0.711270 0.942843 0.845267 0.905008 0.992601 0.845495 0.986848 0.904661
[289] 0.995521 0.749894 0.878506 0.962478 0.981501 0.636758 0.713365 0.680437 0.481577
[298] 0.960782 0.963482 0.690535 0.698185 1.065062 0.701046 0.724899 0.765435 0.817505
[307] 0.933545 1.069504 0.826904 0.813721 0.847572 0.822880 0.732016 0.994921 0.859110
[316] 0.688330 0.668758 0.900148 0.859376 0.654565 0.656753 0.879149 0.938025 0.736006
[325] 0.960661 1.017589 0.295886 1.016148 0.864606 0.604764 0.770240 0.882515 0.721078
[334] 0.669808 0.872799 0.813630 0.738804 0.761144 0.760203 0.496762 0.839299 0.951946
[343] 0.802386 0.904974 0.815679 0.853977 0.476733 0.847990 0.903373 0.767991 0.943123
[352] 0.525210 0.806090 0.930622 0.768510 0.465203 0.750497 0.837926 0.869700 0.669047
[361] 0.939570 0.917823 0.622765 0.874913 0.856273 0.698514 0.917591 1.043084 0.841970
[370] 0.816756 0.836964 0.863120 0.647603 0.826031 0.799755 0.533342 0.703334 0.911313
[379] 0.874683 0.515638 0.781962 0.710186 0.853150 0.706053 0.798420 0.605895 0.920960
[388] 0.883950 0.965967 0.910673 0.499172 0.879007 0.726426 0.697601 0.959725 0.899454
[397] 0.888108 0.962278 0.952748 0.434719 0.464724 0.942862 0.614693 0.785010 0.845641
[406] 0.827778 0.734936 0.974007 0.864296 0.745659 0.871882 0.671371 0.908824 0.811834
[415] 0.886140 0.918151 0.558171 0.870251 0.818319 1.025400 0.795063 0.760081 0.777891
[424] 0.870179 0.627778 0.766887 0.876714 0.848028 0.931794 0.650500 0.553975 0.789453
[433] 0.867594 0.379301 0.901253 0.771921 0.958142 0.815472 0.963240 0.931481 0.883676
[442] 0.782327 0.723853 0.929525 0.647615 0.734047 0.710393 0.938008 0.858018 0.748672
[451] 0.803134 0.860775 0.899103 0.992401 0.900573 0.628679 0.683218 0.716561 0.934340
[460] 0.949123 0.506341 0.832273 0.823094 0.929624 0.781949 0.888024 0.903048 0.741377
[469] 0.883726 0.684041 0.966615 0.677215 0.835131 0.712577 0.753028 0.829513 0.766554
[478] 1.143566 0.908013 0.735632 0.908827 0.681999 0.875036 0.742810 0.584225 0.953907
[487] 0.947586 0.746700 0.834632 0.669589 0.515389 0.982556 0.824490 0.737028 0.971059
[496] 0.421415 0.894440 1.000238 0.743394 0.696948 0.859503 0.855229 0.882228 0.975735
[505] 0.855557 0.924057 0.798974 0.809827 0.567019 0.863620 0.822864 0.973988 0.652269
[514] 0.845571 0.721947 0.926776 0.826145 0.705547 0.988679 0.681330 0.877325 0.855817
[523] 0.873539 1.013132 0.804831 0.746380 0.616700 1.029137 0.448679 0.876720 0.575589
[532] 0.742866 0.828688 0.680512 1.010675 0.720510 0.861138 0.672813 0.799149 0.886676
[541] 0.689367 0.968038 0.671033 0.885853 0.713909 0.532676 0.974711 0.656334 0.688650
[550] 0.849028 0.868255 0.912887 0.787445 0.630420 0.801135 0.781228 0.751704 0.801074
[559] 0.807850 1.046551 1.002017 0.588418 0.706008 0.914443 0.757762 0.756403 0.845705
[568] 0.682943 0.795213 0.632891 0.793043 0.613970 0.781048 0.836433 0.559872 0.733848
[577] 0.839769 1.041855 0.788373 0.814464 0.638183 0.682626 0.656519 0.854746 0.641917
[586] 0.936001 0.884094 0.751319 0.498271 0.782730 0.802196 0.990215 0.521453 0.951501
[595] 0.970134 0.636495 0.808344 0.864908 0.624933 1.019867 0.900343 0.743326 0.904687
[604] 0.871354 0.925799 0.689100 0.938389 0.676802 0.867103 0.852666 0.765580 0.964941
```

```
 [613] 1.035006 0.420547 0.782304 0.699621 0.627093 0.713068 0.492269 1.005629 0.616539
 [622] 0.648333 0.702919 0.851790 1.007792 0.855903 0.886960 0.659025 0.856572 0.876170
 [631] 0.711007 0.662821 0.825104 0.724790 0.960502 0.906944 0.552494 0.714420 0.679050
 [640] 0.838300 0.778764 0.690539 0.630117 0.849022 0.968877 0.767079 0.717443 0.972085
 [649] 0.877541 0.771225 0.713994 0.602624 0.819215 0.788239 0.721618 0.654167 0.610890
 [658] 0.993968 0.810176 0.860527 0.662340 0.686297 0.953063 0.732273 0.901083 0.979271
 [667] 0.580348 0.933302 0.758999 0.926002 1.038508 0.803983 0.971493 0.883673 0.837427
 [676] 0.781114 0.686150 0.914073 0.824609 0.828324 0.722928 0.731375 0.671587 0.631685
 [685] 0.554761 0.793975 0.803637 0.927234 0.818049 0.894175 1.010357 0.763675 0.797775
 [694] 0.941370 0.883422 0.782627 0.929746 0.965144 0.834742 0.858784 0.662755 0.891869
 [703] 1.033019 0.650611 0.865889 0.764811 0.795419 0.851913 0.920717 0.834634 0.765194
 [712] 0.804143 0.754116 0.724912 0.815542 0.849265 1.075270 1.093364 0.401849 0.958308
 [721] 0.838007 0.730008 0.718888 0.643427 0.773680 0.712425 0.661212 0.771881 0.693588
 [730] 1.033512 0.838584 0.641188 0.758887 0.594270 0.926566 0.872271 0.687523 0.449354
 [739] 0.870027 1.122406 0.427747 0.937406 1.000406 0.777498 0.870387 0.801741 0.692398
 [748] 0.983733 0.739790 0.561413 0.885528 0.895800 0.932266 0.981704 0.791614 0.814539
 [757] 0.813055 0.630149 1.013922 0.913368 0.806525 0.900679 0.785316 0.817058 0.787456
 [766] 0.939409 0.938663 0.840105 0.744752 0.756535 0.603779 0.682475 0.747643 0.685694
 [775] 0.947401 0.895294 0.866917 0.841752 0.763460 0.685061 0.892353 0.678746 1.048108
 [784] 0.756156 0.683281 0.823968 0.913499 1.041043 0.883627 0.604542 0.582913 0.796757
 [793] 0.907162 0.814675 0.689255 0.841634 0.960716 0.884536 0.856883 0.892192 0.820893
 [802] 0.855427 0.950950 1.002727 0.890901 0.522420 0.814986 0.818529 0.715959 0.750947
 [811] 1.000356 0.739754 0.856286 0.633724 0.702976 0.941811 0.879458 0.948425 0.780176
 [820] 0.790140 0.742407 0.873829 0.774513 0.436145 0.718578 0.978625 0.827328 0.996506
 [829] 0.864214 0.722835 1.090311 0.704691 0.823438 0.728708 0.751398 0.786500 0.736083
 [838] 0.755056 0.881437 0.964572 0.536345 0.721749 0.771902 0.951665 0.794098 0.890916
 [847] 0.621279 1.065937 0.900718 0.946387 0.868718 0.726240 0.431006 0.731210 0.809663
 [856] 0.832300 0.561102 0.951530 0.979135 0.629591 0.836108 1.007520 0.758851 0.821574
 [865] 0.769984 0.888011 0.933243 0.954743 0.808575 0.794866 0.941106 0.927643 0.709618
 [874] 0.801922 0.651633 0.748583 1.054156 0.740550 0.627254 0.764788 0.958646 0.598191
 [883] 0.747856 0.937292 0.717581 0.570647 0.837313 0.878512 0.892125 0.905820 0.788751
 [892] 0.712210 0.750165 0.795386 0.683428 0.710992 1.038519 0.850438 0.998963 0.691044
 [901] 0.595178 0.796734 0.657722 0.782437 0.750675 0.807355 0.709243 0.616576 0.678146
 [910] 0.981851 1.091797 0.997732 0.647546 0.785030 0.872946 0.542296 0.779713 0.800558
 [919] 0.849437 0.870992 0.685190 1.007996 0.856126 0.654769 0.738563 0.744148 0.861374
 [928] 0.792569 0.942775 0.697998 0.631434 0.913226 0.705338 0.777855 0.545738 0.932606
 [937] 0.802405 0.642537 0.645180 1.032106 0.502900 0.814410 0.847710 0.838373 0.967233
 [946] 0.931190 0.842362 0.863454 0.839128 0.876317 0.790625 0.933896 0.547768 1.005818
 [955] 0.853332 0.535941 0.759625 0.989817 0.840873 0.835631 0.808416 0.827844 0.768005
 [964] 0.941432 0.612093 0.787424 0.794780 0.953336 0.709597 0.818348 0.699545 1.003699
 [973] 0.678522 0.888516 0.883727 0.760471 0.562231 1.074534 0.860168 0.837884 0.825119
 [982] 0.732703 0.599556 0.766568 0.617703 0.711882 0.942472 0.935108 0.918446 0.833240
 [991] 0.970877 0.905473 0.786474 0.844087 0.788817 0.672582 0.760895 0.846942 0.733615
[1000] 0.957775
```

Random Numbers from Mixture of N(3, 2) and N(10, 3)

```
  [1]  0.063655  3.222715  4.871445  2.117662  5.359565  4.341720  2.308069  2.290575
  [9]  2.751812  3.818552  4.978220  4.524995  2.085115  1.477665  2.722214  2.298108
 [17]  3.177435  3.456837  3.233746  3.619664  4.669150  5.365889  4.603576  6.034521
 [25]  2.718533  0.417352  3.224993  2.125477  5.175732  1.396539  3.110188  3.435449
 [33]  3.802881  3.138973  3.533544  5.749386  3.052884  3.695149  3.743656  4.403111
 [41]  5.009199  4.552990  2.179402  2.835512  6.302832  1.545504  2.504848  3.558432
 [49]  1.757220  3.324330  3.746056  1.650285  1.715414  1.659726  4.679787  1.624888
 [57]  0.898678  5.112083  3.154670  2.890286  2.136711  2.536831  2.578661  1.519836
 [65]  2.548957  3.255060  2.170303  1.142007  4.236086  2.582418  3.658269  6.078086
 [73]  2.080944  3.810248  1.845224  1.199500  2.788496  4.044888  3.267215  2.019972
 [81]  3.762857  2.904104  2.031475  3.887121  5.359565  2.624412  5.939444  2.771141
 [89] -0.910136  4.271455  0.899684  2.964460  4.182853  3.920364  1.218885  4.631371
 [97]  4.773998  0.831257  1.929418  1.804099  0.360757  2.170303  1.510766  0.285376
[105]  1.025589  3.942338  2.330078  2.993425  4.473993  1.519836  4.066903  3.121772
[113]  2.890840  2.992393  4.191427  4.751508  3.702520  1.804099  3.183839  2.679043
[121]  4.804496  5.292005  4.110734  4.059946  4.003523  3.888632  4.552990  3.590462
[129]  0.882072  3.764411  3.883692  4.524093  2.949394  2.757357  4.365606  1.938811
[137]  1.155301  2.665701  4.368346  4.631371  3.645451  2.878475  4.721620  2.518252
[145]  1.811145  2.074864  1.966020  3.084437  2.802585  3.053862  1.722340  1.813905
[153]  2.923858  1.488833  2.156043  3.431181  3.075816  3.617740  1.523907  4.055701
[161]  3.048521  2.103302  4.144051  2.885700  2.789349  1.175014  3.208482  1.879191
[169]  5.034549  3.084437  0.597375  0.075970  5.284235  5.920013 -0.074850  3.358248
[177]  2.580605  1.510766  2.744121 -0.027353  2.137671  2.666642  3.028606  0.947822
[185]  2.789349  4.560720  2.782364  0.434801  4.535625  5.920013  0.972030  2.241593
[193]  4.710167  3.948412  5.074049  4.882919  3.161912  1.142007  2.277436  2.375234
[201]  3.381836  5.371992  2.081589  2.362598  4.275270  5.023109  5.554232  2.058446
[209]  2.031475  5.519035  1.989088  5.641644  3.641505  2.114237  2.024316  3.918944
[217]  2.369692  2.526331  2.294667  3.179827  0.487955  3.528601  5.090226  1.163502
[225]  2.626894  1.832370  4.547105  3.948087 -0.088329  1.729179  2.437352  2.536831
[233]  2.290575  1.399804  5.499707  2.032151  2.112770  3.040152  2.536949  1.830846
[241]  2.860392  5.365889  2.016701  3.469550  3.217074  2.641703  4.977201  4.624770
[249]  3.225042  2.671347  0.441610  3.022060  2.600492  3.952875  1.813905  3.171580
[257]  2.362598  3.138973  3.479537  1.161183  3.862581  1.656151  2.196006  4.271455
[265]  2.643594  3.360445  0.823893  2.644532  2.130568  5.009199  2.593128  3.626858
[273]  1.377170  1.155301  3.267306  3.066637  2.714267  4.049297  3.767720  4.243428
[281]  5.153068  3.235262  2.954843  1.037195  4.775877  5.641644  1.754303  4.646042
[289]  2.114237  1.867837  1.141813  2.525776  1.854576  3.180669  3.739655  4.879096
[297]  1.141813  1.927163  3.698084  2.443728  4.105982  0.284351  1.754298  1.163502
[305]  4.295792  3.746056  2.883661  4.889243  3.162936  3.446649  2.123074  5.804953
[313]  3.222715  5.173362  1.637526  3.694884  3.697118  1.037195  2.295858 -1.590196
[321]  3.529790  4.640382  5.362296  3.453901  2.137671  3.613334  3.053862  1.641478
[329]  2.346791  2.333405  4.507918  5.080491  2.983611  0.155553  3.011666  4.041339
[337]  2.239372  5.349108  3.440275  4.646042  2.215528  5.195721  5.523569  2.245267
[345]  3.224993  0.597375  3.063587  4.200391  3.645451  4.286505  3.541631  4.593355
[353] -0.037834  3.208770  2.070724  4.650481  3.144671  3.360445  2.238033  0.830141
[361]  4.580797  6.837487  2.243614  3.862581  2.884395  2.998364  3.311591  1.659726
[369]  1.392909  1.083554  4.203015  2.782364  2.582418  0.904277  1.662010  4.375468
[377]  2.789349  1.990363  2.888691  3.621810  2.081589  2.104695  3.386438  3.389100
[385]  1.558697 -0.553562  2.585990  4.743682  3.568469  1.254952  2.883661 -1.266781
[393]  2.497357  4.934408  0.289161  2.125437  4.934408  2.802585  2.770821  3.050201
[401]  9.703692  9.382484  8.833782 10.527736  8.160128 10.535973 11.056297  7.327361
[409] 10.663923 10.241409  8.769497  9.936220  9.514706  8.864591 11.670388  7.420980
[417] 10.077186  9.304653 11.897436 13.652629 13.036381  9.672011 12.826169  5.672235
[425]  8.260000 12.140641  6.964641 12.591061 12.185463 11.096544 12.808160  8.523045
[433] 10.846148  8.468476  9.477809 11.170408 12.790050  8.763753  8.044889  9.514706
[441]  8.989447 10.685886 10.024010  6.640305 11.716712 11.976366 11.744266  9.593061
[449]  9.255134 10.416150  9.242015  9.518607  8.886105  8.395128 10.474659 10.505176
[457] 11.089906 12.106026 10.091215  7.868367 11.304733 10.649981 12.503617 12.903518
[465]  8.028319 10.095852 10.301132  9.897724  9.453155  8.527824  8.078987  9.381828
[473] 14.429223 11.230464  9.774222 10.533513  9.897724 12.192662  6.997157  9.102622
[481] 11.031556 11.080320  8.914107 12.222167 10.152287 11.608323  6.458129 11.814897
[489]  8.991187 10.898865 11.961073 10.740265 13.148146  9.934720 10.958977 11.620490
[497] 11.242917 10.105884  7.429261  4.789006  6.128888  9.372071 10.164122  7.754060
[505] 13.262588  8.530145  8.853192 11.118642 10.186059 14.338905 10.365158 10.929568
[513]  7.079255 12.841550 11.564023  8.721808  8.079933 11.404172 10.687280 10.570488
[521] 12.904269 11.256222 11.415183  9.774845 10.251114 10.095852 10.958257 13.878138
[529] 11.987527  7.579084  9.758060 10.848196  9.233068  8.403655  9.883093  6.930690
[537]  8.004024  9.242015 10.311146 11.360901  8.195920 10.443982  7.392136  9.838426
```

```
[545]  8.088063 11.676259  7.566412 10.168137  7.569414  8.479964 10.205546 12.192662
[553]  9.484306  5.903478 10.853597 10.369610 10.098127 12.135797  6.948485 10.095213
[561]  7.494520 10.549608  9.672430  7.714783  6.640305 11.116167  8.763753  8.720297
[569] 10.446870 13.879152  9.237311 10.372783 10.962809 10.727798 12.673541 12.297700
[577]  9.421644  8.038289  7.156013 11.387926  7.988852  7.929076  8.298653 10.474659
[585] 11.069516 13.878138 12.008017 10.832839  9.758060 12.144575 10.977847  9.976737
[593]  7.658652 10.140267  8.853192  9.966791  8.530145 10.717534 12.406948 12.073567
[601] 12.179264 11.521516 12.446034  8.115727  8.016665 11.525292 10.136898  9.652918
[609] 10.214437  8.572501 10.527736  9.837213 12.350939  6.556314  8.821236 12.205583
[617]  8.210002  9.693415  8.728453  9.312070 11.028692  8.658708 10.995652 10.664042
[625]  8.556138  9.813039  9.397708 10.731801  8.656694 10.664042 12.826169 12.323558
[633] 11.696557 12.007954 10.649981 10.241409  8.511233 12.159692 10.481760 13.193581
[641]  9.483578  9.884604 10.994866  7.725888  8.823892  8.853192  9.753882  9.662032
[649]  9.951698 12.535531  9.774222  7.789155 10.301132  5.785834  7.696547  8.871556
[657] 11.966503  8.531320  8.294137  7.079255 10.098576  8.576184  7.608212 10.155225
[665] 12.535656  8.467224 11.895949  9.415594 11.218939  9.941486 12.001051  9.072155
[673] 10.887467  7.983473  8.604519 11.000151 10.441154  6.434071 14.647383  9.941486
[681]  9.514706  7.629538  9.107596 10.975190 10.479847 11.579552  7.265066 11.387926
[689] 10.675726  7.608212  9.480337  8.055570  9.713943  8.403655  9.677571 11.024696
[697]  9.945588 11.448630  9.609183  4.964506  9.586709  8.669611 12.503617  6.790831
[705] 10.815415 10.869797  6.997157 10.445082  7.274682 12.221329 11.793847  8.779937
[713] 12.342105  8.658708 11.304733 11.312811 11.004545 11.276312  7.274682 10.669804
[721] 13.309276  8.595796  8.712361 11.254715 13.278803 10.344476  9.546081  8.717628
[729]  7.503919  7.725141  8.395515  9.244023  9.341271  9.683520 10.641795  9.419381
[737]  9.716035  8.543958 12.007954  8.842869 12.428965  9.132659 14.007581 10.946680
[745]  9.172333  9.949892  9.555298 12.228179 11.004978  9.691552 10.129261 10.634580
[753] 11.448630 13.533568 10.773658 11.527702 11.149628 11.745572 13.278803  9.070046
[761] 12.074332  8.216803 11.242917 10.497948 10.143202  8.867021  9.920636  8.468411
[769] 10.527736  9.593061  8.509241 13.000881  8.086622 11.242917 12.450412 10.732840
[777]  9.640397 10.383990 10.958257 10.884086 11.157956 11.039850 13.193581 12.673541
[785] 11.996992  9.730234 12.520103 13.982741  9.799838 11.658972 12.334686  8.533967
[793] 10.649657  8.092550  9.341643 10.164675 10.098576  7.620869 11.286359 11.513263
[801]  9.358582 12.348332  7.309398  9.402113 10.861429  9.704143  8.324803 10.186607
[809] 10.833984  9.849187  8.240079 11.847019  9.384215  8.511233  9.380574 11.392725
[817]  8.940308 13.225745  7.791535 10.429774 10.162496 12.002851 10.069660 10.025579
[825] 11.795530 11.744266  7.680737 10.257894  7.975406  8.641971  9.718276 12.515376
[833]  7.444887  9.687886 10.567799  7.281858  7.349995  5.785834 13.087808 11.754776
[841] 10.066503  8.543958 10.231312 10.196699 10.108107 11.197572  8.878052  9.398444
[849] 11.116167  8.309909  8.324803  8.560837  6.700183 10.588620  9.992130  7.993709
[857]  9.907194 14.051443  7.566412  7.649886 10.830292 10.575025 10.732840  9.730256
[865] 10.553603  7.800744  6.956440 10.070185 11.218939  9.125827  8.983975 11.569557
[873]  8.619483  8.732016  9.555652  9.078734 11.411832  7.912649 10.985058 12.648134
[881]  8.411731 12.185463 11.174622  9.898531  8.576184  7.503919  9.952996  8.938973
[889] 12.856219  8.695484 10.369046  7.356288 12.549496 11.291006 13.609197  9.058281
[897]  9.451268  9.301101  8.977485  9.028322 10.301132  9.490165 11.482147  9.415665
[905] 12.323558 12.769900 10.365158 10.725841  7.929076 12.970737 10.164122 10.629403
[913]  8.833782 13.129999 11.170408  9.632538  8.982667 12.359817 10.634580 11.301145
[921] 10.617010 10.923337 14.155018  9.005817 11.437779 10.800313  9.886237 10.601285
[929]  7.655558  7.281858  8.562670 11.437779  9.708142 10.360446 13.659946  9.555956
[937]  8.126165 13.479289 11.166221  7.746814 12.520103  9.677571  9.566048  9.683520
[945] 10.649657 11.976366  9.683499 11.819545 12.323558  8.647649 11.896137 12.072759
[953]  8.474288  8.345066 12.587746 10.344476  9.632538 12.350939  8.640329  8.576184
[961] 10.339931  9.920636  8.980988 10.994866 10.009699 11.232779  9.238961  9.774845
[969]  6.458129 12.547870 11.033993 12.123450  8.980988  8.899335  9.687886 14.533600
[977] 11.892443  7.579426 11.003564  8.241092  9.998569 10.869797 13.442993 10.818181
[985] 12.164718 10.687730 10.848196  9.813039  9.610476 11.291462 11.780451  6.577266
[993]  9.699933 11.661979 11.177451 10.443269  7.444887  7.566116  9.070127  9.065964
```