

```

#1.a
first11_letters <- LETTERS[1:11]
first11_letters

## [1] "A" "B" "C" "D" "E" "F" "G" "H" "I" "J" "K"

#1.b
odd_numberedletters <- LETTERS[seq(1, length(LETTERS), by = 2)]
odd_numberedletters

## [1] "A" "C" "E" "G" "I" "K" "M" "O" "Q" "S" "U" "W" "Y"

#1.c
vowels <- c("A", "E", "I", "O", "U")
vowel_letters <- LETTERS[LETTERS %in% vowels]
vowel_letters

## [1] "A" "E" "I" "O" "U"

#1.d
last5l_letters <- letters[22:26]
last5l_letters

## [1] "v" "w" "x" "y" "z"

#1.e
letters_15_to_24 <- letters[15:24]
letters_15_to_24

## [1] "o" "p" "q" "r" "s" "t" "u" "v" "w" "x"

#2.a
city <- c("Tuguegarao City", "Manila", "Iloilo City", "Tacloban", "Samal Island", "Davao City")
city

## [1] "Tuguegarao City" "Manila" "Iloilo City" "Tacloban"
## [5] "Samal Island" "Davao City"

#2.b
temp <- c(42, 39, 34, 34, 30, 27)
temp

## [1] 42 39 34 34 30 27

#2.c
city_temperature_df <- data.frame(city, temp)
city_temperature_df

##           city temp
## 1 Tuguegarao City  42
## 2      Manila    39
## 3  Iloilo City   34
## 4    Tacloban   34
## 5 Samal Island   30
## 6   Davao City   27

#2.d
names(city_temperature_df) <- c("City", "Temperature")
city_temperature_df

```

```
##           City Temperature
## 1 Tuguegarao City         42
## 2           Manila         39
## 3      Iloilo City         34
## 4      Tacloban           34
## 5      Samal Island        30
## 6      Davao City          27
```

#2.e

```
str(city_temperature_df)
```

```
## 'data.frame':   6 obs. of  2 variables:
## $ City          : chr  "Tuguegarao City" "Manila" "Iloilo City" "Tacloban" ...
## $ Temperature: num  42 39 34 34 30 27
```

#2.f

```
city_temperature_df[3:4,]
```

```
##           City Temperature
## 3 Iloilo City             34
## 4   Tacloban              34
```

#2.g

```
highest_temp_city <- city_temperature_df[which.max(city_temperature_df$Temperature), ]
lowest_temp_city  <- city_temperature_df[which.min(city_temperature_df$Temperature), ]
highest_temp_city
```

```
##           City Temperature
## 1 Tuguegarao City         42
```

```
lowest_temp_city
```

```
##           City Temperature
## 6 Davao City              27
```

#Using Matrices

```
matrix(c(5, 6, 7, 4, 3, 2, 1, 2, 3, 7, 8, 9), nrow = 2)
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6]
## [1,]   5   7   3   1   3   8
## [2,]   6   4   2   2   7   9
```

#1

```
matrix(data = c(3, 4, 5, 6, 7, 8), 3, 2)
```

```
##      [,1] [,2]
## [1,]   3   6
## [2,]   4   7
## [3,]   5   8
```

```
diag(1, nrow = 6, ncol = 5)
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]   1   0   0   0   0
## [2,]   0   1   0   0   0
## [3,]   0   0   1   0   0
## [4,]   0   0   0   1   0
## [5,]   0   0   0   0   1
## [6,]   0   0   0   0   0
```

```
diag(6)
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6]
## [1,]    1    0    0    0    0    0
## [2,]    0    1    0    0    0    0
## [3,]    0    0    1    0    0    0
## [4,]    0    0    0    1    0    0
## [5,]    0    0    0    0    1    0
## [6,]    0    0    0    0    0    1
```

```
#2.a
```

```
values <- c(1:8, 11:14)
matrix_4X3 <- matrix(values, nrow = 3, ncol = 4)
matrix_4X3
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   12
## [2,]    2    5    8   13
## [3,]    3    6   11   14
```

```
#2.b
```

```
matrix_multiplied <- matrix_4X3 * 2
matrix_multiplied
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    2    8   14   24
## [2,]    4   10   16   26
## [3,]    6   12   22   28
```

```
#2.c
```

```
row2 <- matrix_4X3[2, ]
row2
```

```
## [1]  2  5  8 13
```

```
#2.d
```

```
d_result <- matrix_4X3[1:2, 3:4]
d_result
```

```
##      [,1] [,2]
## [1,]    7   12
## [2,]    8   13
```

```
#2.e
```

```
e_result <- matrix_4X3[3, 2:3]
e_result
```

```
## [1]  6 11
```

```
#2.f
```

```
f_result <- matrix_4X3[, 4]
f_result
```

```
## [1] 12 13 14
```

```
#2.g
```

```
rownames(matrix_multiplied) <- c("isa", "dalawa", "tatlo")
colnames(matrix_multiplied) <- c("uno", "dos", "tres", "quatro")
matrix_multiplied
```

```
##      uno dos tres quatro
## isa      2   8   14   24
## dalawa   4  10   16   26
## tatlo    6  12   22   28
```

#2.h

```
dim(matrix_4X3) <- c(6, 2)
matrix_4X3
```

```
##      [,1] [,2]
## [1,]    1    7
## [2,]    2    8
## [3,]    3   11
## [4,]    4   12
## [5,]    5   13
## [6,]    6   14
```

#Using arrays

#1.

```
array_data <- array(c(1:24), c(3, 4, 2))
array_data
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    3    6    9   12
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

```
dim(array_data)
```

```
## [1] 3 4 2
```

```
length(array_data)
```

```
## [1] 24
```

#2

```
vectorA <- c(1:24)
```

```
an_Array <- array(vectorA, dim = c(3, 4, 2))
an_Array
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    3    6    9   12
##
## , , 2
```

```
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

#3.a

```
values <- rep(c(1, 2, 3, 6, 7, 8, 9, 0, 3, 4, 5, 1), times = 2)
```

```
array_data <- array(values, dim = c(2, 4, 3))
array_data
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    3    7    9
## [2,]    2    6    8    0
```

```
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]    3    5    1    3
## [2,]    4    1    2    6
```

```
##
## , , 3
##
##      [,1] [,2] [,3] [,4]
## [1,]    7    9    3    5
## [2,]    8    0    4    1
```

#3.b

```
dim(array_data)
```

```
## [1] 2 4 3
```

#3.c

```
dimnames(array_data) <- list(c("a", "b" ), c("A", "B", "C", "D"), c("1st-Dimensional Array", "2nd-Dimensional Array"))
```

```
array_data
```

```
## , , 1st-Dimensional Array
```

```
##
##   A B C D
## a 1 3 7 9
## b 2 6 8 0
```

```
## , , 2nd-Dimensional Array
```

```
##
##   A B C D
## a 3 5 1 3
## b 4 1 2 6
```

```
## , , 3rd-Dimensional Array
```

```
##
##   A B C D
## a 7 9 3 5
```

b 8 0 4 1