```
LETTERS
```

```
##  [1] "A" "B" "C" "D" "E" "F" "G" "H" "I" "J" "K" "L" "M" "N" "O" "P" "Q" "R" "S"
## [20] "T" "U" "V" "W" "X" "Y" "Z"
```

```
letters
```

```
##  [1] "a" "b" "c" "d" "e" "f" "g" "h" "i" "j" "k" "l" "m" "n" "o" "p" "q" "r" "s"
## [20] "t" "u" "v" "w" "x" "y" "z"
```

```
# A.
first_11 <- LETTERS[1:11]
first_11
```

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

```
# B.
odd_letters <- LETTERS[seq(1, length(LETTERS), by = 2)]
odd_letters
```

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

```
# C.
vowels <- LETTERS[c(1, 5, 9, 15, 21)]  # A, E, I, O, U
vowels
```

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

```
# D.
last_5_lowercase <- letters[22:26]
last_5_lowercase
```

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

```
# E.
lowercase <- letters[15:24]
lowercase
```

```
##  [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"
```

```
# B.
temp <- c("42°c", "39°c", "34°c", "34°c", "30°c", "27°c")
temp
```

```
## [1] "42°c" "39°c" "34°c" "34°c" "30°c" "27°c"
```

```
# C.
df <- data.frame(city = city, temp = temp)
print(df)
```

```
##              city temp
## 1 Tuguegarao City 42°c
## 2          Manila 39°c
## 3     Iloilo City 34°c
```

```
## 4        Tacloban 34°c
## 5    Samal Island 30°c
## 6      Davao City 27°c
```

```
# D.
names(df) <- c("City", "Temperature")
(df)
```

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

```
# E.
str(df)
```

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

```
# F.
row_3 <- df[3, ]
row_4 <- df[4, ]
row_3
```

```
##          City Temperature
## 3 Iloilo City        34°c
```

```
row_4
```

```
##       City Temperature
## 4 Tacloban        34°c
```

```
highest_temp <- df[df$Temperature == max(df$Temperature), ]
lowest_temp <- df[df$Temperature == min(df$Temperature), ]
highest_temp
```

```
##              City Temperature
## 1 Tuguegarao City        42°c
```

```
lowest_temp
```

```
##         City Temperature
## 6 Davao City        27°c
```

```
# 3.
# A.
matrix_data <- matrix(c(1:8, 11:14), nrow = 3, ncol = 4, byrow = TRUE)
matrix_data
```

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

```
# B.
matrix_multiplied <- matrix_data * 2
```

```
matrix_multiplied
```

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

```
# C.
row_2 <- matrix_data[2, ]
row_2
```

```
## [1] 5 6 7 8
```

```
# D.
subset_columns <- matrix_data[1:2, 3:4]
subset_columns
```

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

```
# E.
columns_2_3 <- matrix_data[3, 2:3]
columns_2_3
```

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

```
# F.
column_4 <- matrix_data[, 4]
column_4
```

```
## [1]  4  8 14
```

```
# G.
rownames(matrix_multiplied) <- c("one", "two", "three")
colnames(matrix_multiplied) <- c("uno", "dos", "tres", "quatro")
(matrix_multiplied)
```

```
##       uno dos tres quatro
## one     2   4    6      8
## two    10  12   14     16
## three  22  24   26     28
```

```
# H.
reshaped_matrix <- matrix(matrix_data, nrow = 6, ncol = 2)
reshaped_matrix
```

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

```
# 4.
# A.
values <- c(1, 2, 3, 6, 7, 8, 9, 0, 3, 4, 5, 1)
repeated_values <- rep(values, each = 2)
```

```r
array_3d <- array(repeated_values, dim = c(2, 4, 3))
array_3d
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    2    3    6
## [2,]    1    2    3    6
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]    7    8    9    0
## [2,]    7    8    9    0
##
## , , 3
##
##      [,1] [,2] [,3] [,4]
## [1,]    3    4    5    1
## [2,]    3    4    5    1
```

```r
# B.
num_dimensions <- dim(array_3d)
(length(num_dimensions))
```

```
## [1] 3
```

```r
# C.
rownames(array_3d) <- letters[1:2]  # a, b
colnames(array_3d) <- LETTERS[1:4]  # A, B, C, D

dimnames(array_3d) <- list(rownames(array_3d), colnames(array_3d),
                           c("1st-Dimensional Array", "2nd-Dimensional Array", "3rd-Dimensional Array"))

(array_3d)
```

```
## , , 1st-Dimensional Array
##
##   A B C D
## a 1 2 3 6
## b 1 2 3 6
##
## , , 2nd-Dimensional Array
##
##   A B C D
## a 7 8 9 0
## b 7 8 9 0
##
## , , 3rd-Dimensional Array
##
##   A B C D
## a 3 4 5 1
## b 3 4 5 1
```