

## Worksheet 4a

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1. The table below shows the data about shoe size and height. Create a data frame.
  - a. Describe the data.

```
household <- data.frame(
  Shoe_size = c(6.5, 9.0, 8.5, 8.5, 10.5, 7.0, 9.5, 9.0, 13.0, 7.5, 10.5, 8.5, 12.0, 10.5, 13.0, 11.5, 8.5),
  Height = c(66.0, 68.0, 64.5, 65.0, 70.0, 64.0, 70.0, 71.0, 72.0, 64.0, 74.5, 67.0, 71.0, 71.0, 77.0, 70.0, 70.0),
  Gender = c("F", "F", "F", "F", "M", "F", "F", "F", "M", "F", "M", "F", "M", "M", "M", "M", "F", "F", "F")
)

print(household)
```

##	Shoe_size	Height	Gender
## 1	6.5	66.0	F
## 2	9.0	68.0	F
## 3	8.5	64.5	F
## 4	8.5	65.0	F
## 5	10.5	70.0	M
## 6	7.0	64.0	F
## 7	9.5	70.0	F
## 8	9.0	71.0	F
## 9	13.0	72.0	M
## 10	7.5	64.0	F
## 11	10.5	74.5	M
## 12	8.5	67.0	F
## 13	12.0	71.0	M
## 14	10.5	71.0	M
## 15	13.0	77.0	M
## 16	11.5	72.0	M
## 17	8.5	59.0	F
## 18	5.0	62.0	F
## 19	10.0	72.0	M
## 20	6.5	66.0	F
## 21	7.5	64.0	F
## 22	8.5	67.0	M
## 23	10.5	73.0	M
## 24	8.5	69.0	F
## 25	10.5	72.0	M
## 26	11.0	70.0	M
## 27	9.0	69.0	M
## 28	13.0	70.0	M

- b. Create a subset by males and females with their corresponding shoe size and height. What its result?  
Show the R scripts.

```
males <- household[household$Gender == "M",]  
females <- household[household$Gender == "F",]  
  
print(males)
```

```
##      Shoe_size Height Gender  
## 5          10.5   70.0      M  
## 9          13.0   72.0      M  
## 11         10.5   74.5      M  
## 13         12.0   71.0      M  
## 14         10.5   71.0      M  
## 15         13.0   77.0      M  
## 16         11.5   72.0      M  
## 19         10.0   72.0      M  
## 22          8.5   67.0      M  
## 23         10.5   73.0      M  
## 25         10.5   72.0      M  
## 26         11.0   70.0      M  
## 27          9.0   69.0      M  
## 28         13.0   70.0      M
```

```
print(females)
```

```
##      Shoe_size Height Gender  
## 1           6.5   66.0      F  
## 2           9.0   68.0      F  
## 3           8.5   64.5      F  
## 4           8.5   65.0      F  
## 6           7.0   64.0      F  
## 7           9.5   70.0      F  
## 8           9.0   71.0      F  
## 10          7.5   64.0      F  
## 12          8.5   67.0      F  
## 17          8.5   59.0      F  
## 18          5.0   62.0      F  
## 20          6.5   66.0      F  
## 21          7.5   64.0      F  
## 24          8.5   69.0      F
```

- c. Find the mean of shoe size and height of the respondents. Write the R scripts and its result.

```
mean(household$Shoe_size)
```

```
## [1] 9.410714
```

```
mean(household$Height)
```

```
## [1] 68.57143
```

- d. Is there a relationship between shoe size and height? Why?

Yes

```
cor(household$Shoe_size, household$Height)
```

```
## [1] 0.7766089
```

2. Construct character vector months to a factor with factor() and assign the result to factor\_months\_vector. Print out factor\_months\_vector and assert that R prints out the factor levels below the actual values.

```
months <- c("March", "April", "January", "November", "January",
            "September", "October", "September", "November",
            "August", "January", "November", "November",
            "February", "May", "August", "July",
            "December", "August", "August", "September",
            "November", "February", "April")

factor_months_vector <- factor(months)

print(factor_months_vector)

## [1] March    April     January  November January  September October
## [8] September November August   January  November November  February
## [15] May       August    July     December August   August   September
## [22] November February April
## 11 Levels: April August December February January July March May ... September

levels(factor_months_vector)

## [1] "April"      "August"      "December"    "February"    "January"     "July"
## [7] "March"      "May"         "November"    "October"     "September"
```

3. Then check the summary() of the months\_vector and factor\_months\_vector. | Interpret the results of both vectors. Are they both equally useful in this case?

```
direction <- c("East", "West", "North", "West", "North")
frequency <- c(1, 4, 3, 2, 1)
factor_direction <- factor(direction, levels = c("East", "West", "North"))
print(factor_direction)

## [1] East  West  North West  North
## Levels: East West North
```

4. Create a vector and factor for the table below.

```
factor_data <- c("East", "West", "North")
frequency_vector <- c(1, 4, 3)
new_order_data <- factor(factor_data, levels = c("East", "West", "North"))
print(new_order_data)

## [1] East  West  North
## Levels: East West North
```

5. Enter the data below in Excel with file name = import\_march.csv

- a. Import the excel file into the Environment Pane using read.table() function. Write the code.

```
data <- read.table("import_march.csv", header = TRUE, sep = ",")
```

- b. View the dataset. Write the R scripts and its result.

```
#b
data

##   Students Strategy.1 Strategy.2 Strategy.3
## 1      Male         8         10         8
## 2              4          8          6
```

```
## 3      0      6      4
## 4  Female 14      4     15
## 5      10     2     12
## 6      6      0      9
```

#### 6. Full Search

```
exhaustive_search <- function() {
  # Get input from the user and check if it's a valid number
  number <- suppressWarnings(as.integer(readline(prompt = "Please select a number between 1 and 50: ")))
  if (is.na(number)) {
    print("Invalid input. Please enter a number.")
  } else if (number < 1 || number > 50) {
    print("The number selected is beyond the range of 1 to 50")
  } else if (number == 20) {
    print(TRUE)
  } else {
    print(number)
  }
}
exhaustive_search()
```

```
## Please select a number between 1 and 50:
## [1] "Invalid input. Please enter a number."
```

#### 7. Change

```
min_bills <- function(price) {
  bills <- c(1000, 500, 200, 100, 50)
  count <- 0
  for (bill in bills) {
    while (price >= bill) {
      price <- price - bill
      count <- count + 1
    }
  }
  return(count)
}
snack_price <- 2700
cat("Minimum number of bills needed:", min_bills(snack_price), "\n")
```

```
## Minimum number of bills needed: 4
```

8. The following is each student's math score for one semester. Based on this, answer the following questions.

a. Create a dataframe from the above table. Write the R codes and its output.

```
grades <- data.frame(
  Name = c("Annie", "Thea", "Steve", "Hanna"),
  Grade1 = c(85, 65, 75, 95),
  Grade2 = c(65, 75, 55, 75),
  Grade3 = c(85, 90, 80, 100),
  Grade4 = c(100, 90, 85, 90)
)
print(grades)
```

```
##      Name Grade1 Grade2 Grade3 Grade4
## 1 Annie      85      65      85      100
## 2 Thea       65      75      90      90
## 3 Steve      75      55      80      85
## 4 Hanna      95      75     100      90
```

- b. Without using the rowMean function, output the average score of students whose average math score over 90 points during the semester. write R code and its output.

```
for (i in 1:nrow(grades)) {
  avg <- sum(grades[i, 2:5]) / 4
  print(paste(grades$Name[i], "'s average grade this semester is", avg))
}
```

```
## [1] "Annie 's average grade this semester is 83.75"
## [1] "Thea 's average grade this semester is 80"
## [1] "Steve 's average grade this semester is 73.75"
## [1] "Hanna 's average grade this semester is 90"
```

- c. Without using the mean function, output as follows for the tests in which the average score was less than 80 out of 4 tests.

```
for (j in 2:5) {
  avg_test <- mean(grades[,j])
  if (avg_test < 80) {
    print(paste("The", j-1, "test was difficult with an average score of", avg_test))
  }
}
```

```
## [1] "The 2 test was difficult with an average score of 67.5"
```

- d. Without using the max function, output as follows for students whose highest score for a semester exceeds 90 points.

```
for (i in 1:nrow(grades)) {
  highest_score <- grades[i, 2]
  for (j in 3:5) {
    if (grades[i, j] > highest_score) {
      highest_score <- grades[i, j]
    }
  }
  if (highest_score > 90) {
    print(paste(grades$Name[i], "'s highest grade this semester is", highest_score))
  }
}
```

```
## [1] "Annie 's highest grade this semester is 100"
## [1] "Hanna 's highest grade this semester is 100"
```