

# Week 1 - Quiz 1

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## 1. R was developed by statisticians working at

- ☐ The University of New South Wales
- ☐ Bell Labs
- ☒ The University of Auckland
- ☐ Harvard University

## 2. The definition of free software consists of four freedoms (freedoms 0 through 3). Which of the following is NOT one of the freedoms that are part of the definition? Select all that apply.

- ☐ The freedom to redistribute copies so you can help your neighbor.
- ☐ The freedom to improve the program, and release your improvements to the public, so that the whole community benefits.
- ☒ The freedom to sell the software for any price.
- ☐ The freedom to run the program, for any purpose.
- ☐ The freedom to study how the program works, and adapt it to your needs.
- ☐ The freedom to prevent users from using the software for undesirable purposes.
- ☐ The freedom to restrict access to the source code for the software.

## 3. In R the following are all atomig data types EXCEPT: (Select all that apply)

- ☐ table
- ☐ complex
- ☒ matrix
- ☐ numeric
- ☐ character
- ☐ list
- ☐ array
- ☐ data frame
- ☐ logical
- ☐ integer

## 4. If I execute the expression `x <- 4` in R, what is the class of the object 'x' as determined by the 'class()' function?

```
x <- 4  
class(x)
```

```
## [1] "numeric"
[ ] real
[ ] integer
[ x ] numeric
[ ] complex
[ ] vector
[ ] list
[ ] matrix
```

**5. What is the class of the object defined by the expression `x <- c(4, "a", TRUE)`, `TRUE`)?**

```
x <- c(4, "a", TRUE)
class(x)
```

```
## [1] "character"
[ ] integer
[ ] numeric
[ x ] character
[ ] mixed
[ ] logical
```

**6. If I have two vectors `x <- c(1, 3, 5)` and `y <- c(3, 2, 10)`, what is produced by the expression `cbind(x, y)`?**

```
x <- c(1, 3, 5); y <- c(3, 2, 10)
cbind(x, y)
```

```
##      x  y
## [1,] 1  3
## [2,] 3  2
## [3,] 5 10
[ ] a vector of length 3
[ ] a 2 by 2 matrix
[ x ] a matrix with 2 columns and 3 rows
[ ] a 2 by 3 matrix
[ ] a vector of length 2
[ ] a 3 by 3 matrix
```

**7. A key property of vectors in R is that**

```
[ ] the length of a vector must be less than 32,768
[ x ] elements of a vector all must be of the same class
[ ] a vector cannot have have attributes like dimensions
```

☐ elements of a vector can only be character or numeric

☐ elements of a vector can be of different classes

**8. Suppose I have a list defined as `x <- list(2, "a", "b", TRUE)`. What does `x[[1]]` give me? Select all that apply.**

```
x <- list(2, "a", "b", TRUE)
x[[1]]
```

## [1] 2

☐ a character vector containing the element "2".

☐ a numeric vector of length 1.

☐ a list containing the number 2.

☐ a list containing the letter "a".

☒ a numeric vector containing the element 2.

**9. Suppose I have a vector `x <- 1:4` and a vector `y <- 2`. What is produced by the expression `x + y`?**

```
x <- 1:4; y <- 2
x + y
```

## [1] 3 4 5 6

☒ a numeric vector with elements 3, 4, 5, 6.

☐ a numeric vector with elements 1, 2, 3, 6.

☐ an integer vector with elements 3, 2, 3, 6.

☐ a numeric vector with elements 3, 2, 3, 4.

☐ a numeric vector with elements 3, 2, 3, 6.

☐ an integer vector with elements 3, 2, 3, 4.

**10. Suppose I have a vector `x <- c(3, 5, 1, 10, 12, 6)` and I want to set all elements of this vector that are less than 6 to be equal to zero. What R code achieves this? Select all that apply.**

```
# x[x >= 6] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x >= 6] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

## [1] TRUE

```
# x[x > 6] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x > 6] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

## [1] FALSE

```
# x[x != 6] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x != 6] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x %in% 1:5] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x %in% 1:5] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x <= 5] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x <= 5] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x < 6] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x < 6] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x == 6] <- 0
x <- c(3, 5, 1, 10, 12, 6)
x[x == 6] <- 0
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x == 0] <- 6
x <- c(3, 5, 1, 10, 12, 6)
x[x == 0] <- 6
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x < 6] == 0
x <- c(3, 5, 1, 10, 12, 6)
x[x < 6] == 0
```

```
## [1] FALSE FALSE FALSE
```

```
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x > 0] <- 6
x <- c(3, 5, 1, 10, 12, 6)
x[x > 0] <- 6
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)
```

```
## [1] FALSE
```

```
# x[x == 0] < 6
x <- c(3, 5, 1, 10, 12, 6)
x[x == 0] < 6

## logical(0)
ifelse(sum(x[c(4, 5, 6)]) == 0, TRUE, FALSE)

## [1] FALSE
[ x ] x[x >= 6] <- 0
[ x ] x[x > 6] <- 0
[ ] x[x != 6] <- 0
[ ] x[x %in% 1:5] <- 0
[ ] x[x <= 5] <- 0
[ ] x[x < 6] <- 0
[ ] x[x == 6] <- 0
[ ] x[x == 0] <- 6
[ ] x[x < 6] == 0
[ ] x[x > 0] <- 6
[ ] x[x == 0] < 6
```

## 11. Use the Week 1 Quiz Data Set to answer questions 11-20.

In the dataset provided for this Quiz, what are the column names of the dataset?

```
dt <- read.csv("rprogramming/quizzes/hw1_data.csv")
names(dt)

## [1] "Ozone" "Solar.R" "Wind" "Temp" "Month" "Day"
[ x ] Ozone, Solar.R, Wind, Temp, Month, Day
[ ] Month, Day, Temp, Wind
[ ] Ozone, Solar.R, Wind
[ ] 1, 2, 3, 4, 5, 6
```

## 12. Extract the first 2 rows of the data frame and print them to the console. What does the output look like?

```
head(dt, 2)

##   Ozone Solar.R Wind Temp Month Day
## 1   41    190  7.4   67     5    1
## 2   36    118  8.0   72     5    2
```

## 13. How many observations (i.e. rows) are in this data frame?

```
nrow(dt)

## [1] 153
```

```
[ ] 160
[ ] 45
[ x ] 153
[ ] 129
```

**14. Extract the last 2 rows of the data frame and print them to the console. What does the output look like?**

```
tail(dt, 2)
```

```
##      Ozone Solar.R Wind Temp Month Day
## 152     18     131  8.0   76     9  29
## 153     20     223 11.5   68     9  30
```

**15. What is the value of Ozone in the 47th row?**

```
dt$Ozone[47]
```

```
## [1] 21
[ ] 18
[ x ] 21
[ ] 63
[ ] 34
```

**16. How many missing values are in the Ozone column of this data frame?**

```
sum(is.na(dt$Ozone))
```

```
## [1] 37
[ ] 9
[ ] 43
[ ] 78
[ x ] 37
```

**17. What is the mean of the Ozone column in this dataset? Exclude missing values (coded as NA) from this calculation.**

```
mean(dt$Ozone, na.rm = TRUE)
```

```
## [1] 42.12931
[ ] 18.0
[ ] 31.5
[ ] 53.2
[ x ] 42.1
```

18. Extract the subset of rows of the data frame where Ozone values are above 31 and Temp values are above 90.

```
dt2 <- dt[(dt$Ozone > 31 & dt$Temp>90), ]  
mean(dt2$Solar.R, na.rm = TRUE)
```

```
## [1] 212.8  
[ ] 185.9  
[ ] 205.0  
[ ] 334.0  
[ x ] 212.8
```

19. What is the mean of “Temp” when “Month” is equal to 6?

```
dt.temp <- dt$Temp[which(dt$Month == 6)]  
mean(dt.temp, na.rm = TRUE)
```

```
## [1] 79.1  
[ ] 75.3  
[ ] 90.2  
[ ] 85.6  
[ x ] 79.1
```

20. What was the maximum ozone value in the month of May (i.e. Month is equal to 5)?

```
dt.oz <- dt$Ozone[which(dt$Month == 5)]  
max(dt.oz, na.rm = TRUE)
```

```
## [1] 115  
[ x ] 115  
[ ] 18  
[ ] 97  
[ ] 100
```