

# Challenge-3

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## I. Questions

### Question 1: Emoji Expressions

Imagine you're analyzing social media posts for sentiment analysis. If you were to create a variable named "postSentiment" to store the sentiment of a post using emojis (😊 for positive, 😐 for neutral, 😞 for negative), what data type would you assign to this variable? Why? *(narrative type question, no code required)*

**Solution:** Character data type. The data is non-numeric and is ordinal, with the options being 'positive', 'neutral' and 'negative'. There is a natural ordering to the options. Hence, I would assign a character data type to this variable.

### Question 2: Hashtag Havoc

In a study on trending hashtags, you want to store the list of hashtags associated with a post. What data type would you choose for the variable "postHashtags"? How might this data type help you analyze and categorize the hashtags later? *(narrative type question, no code required)*

**Solution:** Character data type. The data is non-numeric and is nominal, with different types of hashtags being the elements of the variable. This data type can allow me to better understand which hashtags are more popular and lead to more viewership and what other posts are associated with the hashtags.

### Question 3: Time Traveler's Log

You're examining the timing of user interactions on a website. Would you use a numeric or non-numeric data type to represent the timestamp of each interaction? Explain your choice *(narrative type question, no code required)*

**Solution:** Non-numeric. Using a non-numeric data type can allow me to better categorise the different users on the website according to the time different users visit the website, allowing me to better cater the website for the users. As there is not much arithmetic calculation needed, I would not use numeric but rather non-numeric.

### Question 4: Event Elegance

You're managing an event database that includes the date and time of each session. What data type(s) would you use to represent the session date and time? *(narrative type question, no code required)*

**Solution:** I will use character data type to represent both the date and time. Both the date and time variable are non-numeric variables and can hence be represented via character data types.

### Question 5: Nominee Nominations

You're analyzing nominations for an online award. Each participant can nominate multiple candidates. What data type would be suitable for storing the list of nominated candidates for each participant? *(narrative type question, no code required)*

**Solution:** Character data type. It allows the different names of the candidates to be recorded.

### Question 6: Communication Channels

In a survey about preferred communication channels, respondents choose from options like “email,” “phone,” or “social media.” What data type would you assign to the variable “preferredChannel”? *(narrative type question, no code required)*

**Solution:** Character data type. The options are categoric variables that are nominal in nature and have no natural ordering.

### Question 7: Colorful Commentary

In a design feedback survey, participants are asked to describe their feelings about a website using color names (e.g., “warm red,” “cool blue”). What data type would you choose for the variable “feedbackColor”? *(narrative type question, no code required)*

**Solution:** Character data type. The options are categoric variables that are nominal in nature and have no natural ordering. Participants get to input their own data into the variable.

### Question 8: Variable Exploration

Imagine you’re conducting a study on social media usage. Identify three variables related to this study, and specify their data types in R. Classify each variable as either numeric or non-numeric.

**Solution:** Age (numeric), Hours\_spent\_online (numeric), Clicks (numeric).

### Question 9: Vector Variety

Create a numeric vector named “ages” containing the ages of five people: 25, 30, 22, 28, and 33. Print the vector.

**Solution:**

```
# Enter code here
ages <- c(25L,30L,22L,28L,33L)
print(ages)
```

```
## [1] 25 30 22 28 33
```

### Question 10: List Logic

Construct a list named “student\_info” that contains the following elements:

- A character vector of student names: “Alice,” “Bob,” “Catherine”
- A numeric vector of their respective scores: 85, 92, 78
- A logical vector indicating if they passed the exam: TRUE, TRUE, FALSE

Print the list.

**Solution:**

```
# Enter code here

student_info <- list(names = c("Alice", "Bob", "Catherine"), scores=c(85,92,78), passed=c(TRUE,TRUE,FALSE) )
student_info
```

```
## $names
## [1] "Alice"      "Bob"        "Catherine"
##
## $scores
## [1] 85 92 78
##
## $passed
## [1] TRUE TRUE FALSE
```

## Question 11: Type Tracking

You have a vector “data” containing the values 10, 15.5, “20”, and TRUE. Determine the data types of each element using the `typeof()` function.

### Solution:

```
# Enter code here
data <- c(10L, 15.5, "20", TRUE)

typeof(data[1])
```

```
## [1] "character"
```

```
typeof(data[2])
```

```
## [1] "character"
```

```
typeof(data[3])
```

```
## [1] "character"
```

```
typeof(data[4])
```

```
## [1] "character"
```

## Question 12: Coercion Chronicles

You have a numeric vector “prices” with values 20.5, 15, and “25”. Use explicit coercion to convert the last element to a numeric data type. Print the updated vector.

### Solution:

```
# Enter code here
prices <- as.numeric(c(20.5, 15, "25"))
typeof(prices)
```

```
## [1] "double"
```

```
print(prices)
```

```
## [1] 20.5 15.0 25.0
```

### Question 13: Implicit Intuition

Combine the numeric vector `c(5, 10, 15)` with the character vector `c("apple", "banana", "cherry")`. What happens to the data types of the combined vector? Explain the concept of implicit coercion.

#### Solution:

```
# Enter code here

typeof(c(5, 10, 15))
```

```
## [1] "double"
```

```
typeof(c("apple", "banana", "cherry"))
```

```
## [1] "character"
```

```
x <- c(5, 10, 15)
x <- c(x, "apple", "banana", "cherry")
typeof(x)
```

```
## [1] "character"
```

Since the elements of both vectors are of different types, R will convert the numeric vector into character vector such that the new vector can accomodate all the different element types.

### Question 14: Coercion Challenges

You have a vector “numbers” with values 7, 12.5, and “15.7”. Calculate the sum of these numbers. Will R automatically handle the data type conversion? If not, how would you handle it?

#### Solution:

```
# Enter code here

numbers <- as.numeric(c(7, 12.5, "15.7"))
typeof(numbers)
```

```
## [1] "double"
```

```
sum(numbers)
```

```
## [1] 35.2
```

### Question 15: Coercion Consequences

Suppose you want to calculate the average of a vector “grades” with values 85, 90.5, and “75.2”. If you directly calculate the mean using the `mean()` function, what result do you expect? How might you ensure accurate calculation?

#### Solution:

```
# Enter code here
grades <- as.numeric(c(85,90.5,"75.2"))
typeof(grades)
```

```
## [1] "double"
```

```
mean(grades)
```

```
## [1] 83.56667
```

The result is 83.6 (3s.f.). I will make sure that all the elements are numeric before using the mean function.

## Question 16: Data Diversity in Lists

Create a list named “mixed\_data” with the following components:

- A numeric vector: 10, 20, 30
- A character vector: “red”, “green”, “blue”
- A logical vector: TRUE, FALSE, TRUE

Calculate the mean of the numeric vector within the list.

### Solution:

```
# Enter code here
mixed_data <- list(numeric=c(10,20,30), character=c("red","green","blue"), logical=c(
(TRUE,FALSE,TRUE)))
print(mixed_data)
```

```
## $numeric
## [1] 10 20 30
##
## $character
## [1] "red" "green" "blue"
##
## $logical
## [1] TRUE FALSE TRUE
```

```
mean(as.numeric(mixed_data$numeric))
```

```
## [1] 20
```

## Question 17: List Logic Follow-up

Using the “student\_info” list from Question 10, extract and print the score of the student named “Bob.”

### Solution:

```
# Enter code here
student_info <- list(names = c("Alice", "Bob", "Catherine"), scores=c(85,92,78), pass
ed=c(TRUE,TRUE,FALSE) )
student_info
```

```
## $names
## [1] "Alice"      "Bob"        "Catherine"
##
## $scores
## [1] 85 92 78
##
## $passed
## [1] TRUE TRUE FALSE
```

```
index <- which(student_info$names=="Bob")
index
```

```
## [1] 2
```

```
student_info$scores[2]
```

```
## [1] 92
```

## Question 18: Dynamic Access

Create a numeric vector values with random values. Write R code to dynamically access and print the last element of the vector, regardless of its length.

### Solution:

```
# Enter code here
x <- c(1,34,35.87,92,109,902)
print(tail(x,1))
```

```
## [1] 902
```

## Question 19: Multiple Matches

You have a character vector words <- c("apple", "banana", "cherry", "apple"). Write R code to find and print the indices of all occurrences of the word "apple."

### Solution:

```
# Enter code here
x <- c("apple", "banana", "cherry", "apple")
apple_occurences <- which(x=="apple")
print(apple_occurences)
```

```
## [1] 1 4
```

## Question 20: Conditional Capture

Assume you have a vector ages containing the ages of individuals. Write R code to extract and print the ages of individuals who are older than 30.

### Solution:

```
# Enter code here
ages <- c(23,34,54,65,21)
print(ages[ages>30])
```

```
## [1] 34 54 65
```

## Question 21: Extract Every Nth

Given a numeric vector sequence <- 1:20, write R code to extract and print every third element of the vector.

**Solution:**

```
# Enter code here
x <- seq(from=1L,to=20L,by=3L)
print(x)
```

```
## [1] 1 4 7 10 13 16 19
```

## Question 22: Range Retrieval

Create a numeric vector numbers with values from 1 to 10. Write R code to extract and print the values between the fourth and eighth elements.

**Solution:**

```
# Enter code here
x <- 1:10
print(x[4:8])
```

```
## [1] 4 5 6 7 8
```

## Question 23: Missing Matters

Suppose you have a numeric vector data <- c(10, NA, 15, 20). Write R code to check if the second element of the vector is missing (NA).

**Solution:**

```
# Enter code here
x <- c(10,NA,15,20)
which(is.na(x))
```

```
## [1] 2
```

## Question 24: Temperature Extremes

Assume you have a numeric vector temperatures with daily temperatures. Create a logical vector hot\_days that flags days with temperatures above 90 degrees Fahrenheit. Print the total number of hot days.

**Solution:**

```
# Enter code here
temperatures <- c(78,87,92,83,102,99)

hot_days <- as.logical(c(temperatures>90))

print(hot_days)
```

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

```
sum(hot_days, na.rm=TRUE)
```

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

## Question 25: String Selection

Given a character vector `fruits` containing fruit names, create a logical vector `long_names` that identifies fruits with names longer than 6 characters. Print the long fruit names.

### Solution:

```
# Enter code here
fruit_names <- c("pineapple", "watermelon", "strawberry", "apple", "peach")
long_names <- as.logical(c(nchar(fruit_names)>6))
print(long_names)
```

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

```
fruit_names[nchar(fruit_names)>6]
```

```
## [1] "pineapple" "watermelon" "strawberry"
```

## Question 26: Data Divisibility

Given a numeric vector `numbers`, create a logical vector `divisible_by_5` to indicate numbers that are divisible by 5. Print the numbers that satisfy this condition.

### Solution:

```
# Enter code here
x <- c(2L,5L,15L,10L,9L,8L,7L)
divisible_by_5 <- x %% 5 == 0
print(divisible_by_5)
```

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

## Question 27: Bigger or Smaller?

You have two numeric vectors `vector1` and `vector2`. Create a logical vector `comparison` to indicate whether each element in `vector1` is greater than the corresponding element in `vector2`. Print the comparison results.

### Solution:



```
# Enter code here
vector1 <- c(1,4,5,8,10)
vector2 <- c(2,3,6,9,11)
comparison <- vector1 > vector2
print(comparison)
```

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