Problem Set: Data Types & Structures in R

Section A: Atomic Data Types

1. Identify Data Types
What is the data type of the following R objects? Use appropriate functions (typeof(), class()):

```
a <- 42
b <- 3.14
c <- "hello"
d <- TRUE
e <- 2 + 3i
```

2. Type Coercion
Predict the output and explain:

```
result <- c(1, "2", TRUE)
typeof(result)
```

3. Convert Types
Convert the following using R functions:
- "25" to numeric
- 0 to logical
- FALSE to integer
- 15.7 to character

Section B: Data Structures

4. Vector Operations
Create a numeric vector of length 5. Perform the following:
- Add 10 to each element
- Find the sum and mean
- Replace the third element with 100

5. List Creation
Create a list that contains:
- A vector of numbers
- A character string
- A logical value

Access the second item in the list.

6. Matrix Manipulation
- Create a 3×3 matrix filled by rows.
- Multiply each element by 2.
- Extract the second row.

7. Array Handling
- Create a 2×2×2 array with values 1 to 8.
- Access the first matrix (slice) of the array.

8. Data Frame Practice
Create a data frame with the following columns:
- StudentID (numeric)
- Name (character)
- Passed (logical)
Then:
- Add a new row
- Extract names of students who passed

9. Factor Levels
- Create a factor from: c("High", "Low", "Medium", "Low", "High")
- Show the levels
- Convert it to character

Section C: Type Checking & Coercion

10. Check and Coerce
Write a function that accepts a vector and returns:
- Its type
- Whether it is numeric
- If not numeric, tries to coerce it to numeric