**UNIT 1: Introduction to R Programming**

**1. Arithmetic Operations:**

a <- 8

b <- 2

sum <- a + b

print(sum)

diff <- a - b

print(diff)

product <- a \* b

print(product)

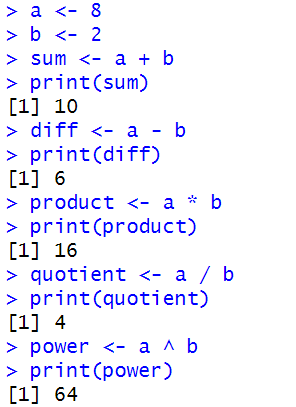
quotient <- a / b

print(quotient)

power <- a ^ b

print(power)

**Output:**

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**2. Employee Details:**

employees <- data.frame(

ID = c(101, 102, 103),

Name = c("Alice", "Bob", "Charlie"),

Age = c(25, 30, 28),

Salary = c(50000, 60000, 55000)

)

employees$Department <- c("HR", "IT", "Finance")

high\_salary <- subset(employees, Salary > 55000)

sorted\_employees <- employees[order(employees$Salary), ]

print("Original Data Frame:")

print(employees)

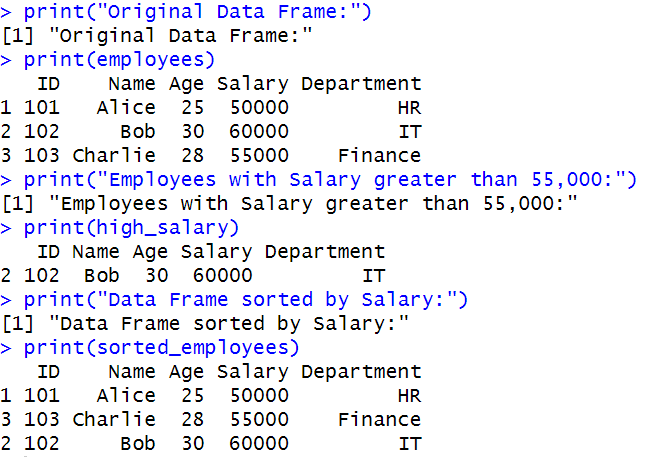
print("Employees with Salary greater than 55,000:")

print(high\_salary)

print("Data Frame sorted by Salary:")

print(sorted\_employees)

**Output:**

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**3. Vector Sum:**

mat <- matrix(1:9, nrow = 3)

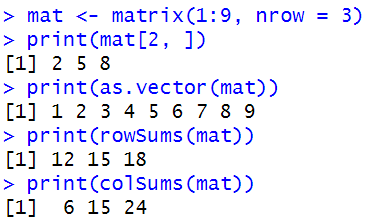
print(mat[2, ])

print(as.vector(mat))

print(rowSums(mat))

print(colSums(mat))

**Output:**

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**4. Sequence of Numbers**

sequence <- 20:50

print("Sequence from 20 to 50:")

print(sequence)

mean\_value <- mean(20:60)

print("Mean of numbers from 20 to 60:")

print(mean\_value)

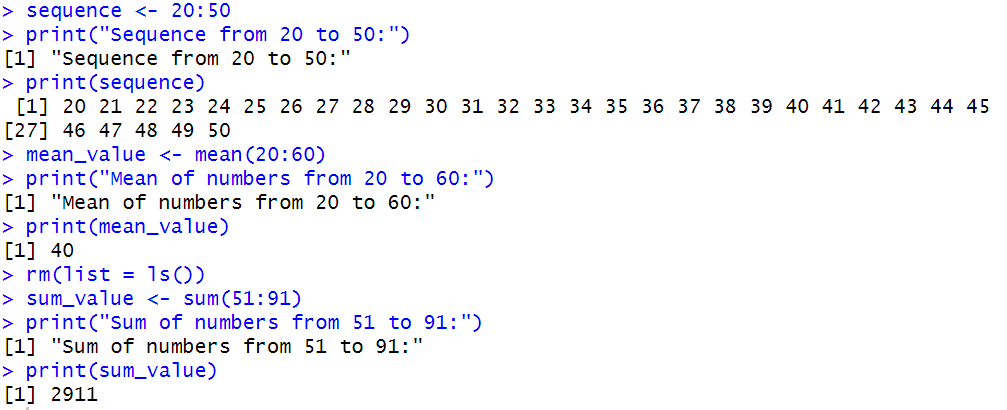
rm(list = ls())

sum\_value <- sum(51:91)

print("Sum of numbers from 51 to 91:")

print(sum\_value)

**Output:**

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**5. English Letters**first\_10\_lower <- letters[1:10]

print("First 10 English letters in lowercase:")

print(first\_10\_lower)

last\_10\_upper <- LETTERS[17:26]

print("Last 10 English letters in uppercase:")

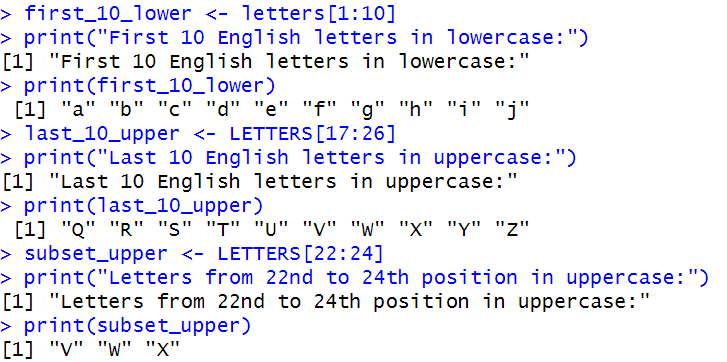
print(last\_10\_upper)

subset\_upper <- LETTERS[22:24]

print("Letters from 22nd to 24th position in uppercase:")

print(subset\_upper)

**Output:**

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**6. Logical Operations**

numbers <- c(5, 12, 18, 25, 30, 35, 42, 50, 60, 75)

logical\_vector <- (numbers > 20 & numbers %% 2 == 0) | (numbers < 10)

print("Logical vector (Numbers > 20 AND even) OR (Numbers < 10):")

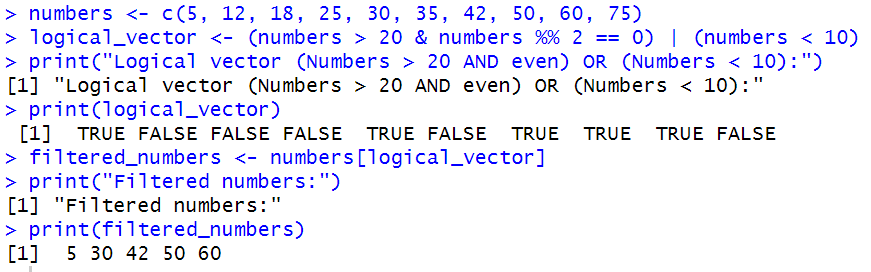
print(logical\_vector)

filtered\_numbers <- numbers[logical\_vector]

print("Filtered numbers:")

print(filtered\_numbers)

**Output:**

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**7. Character Vector of Categorical Data**

colors <- c("Red", "Blue", "Green", "Blue", "Red", "Green", "Yellow")

color\_factor <- factor(colors)

print("Factor levels before modification:")

print(levels(color\_factor))

levels(color\_factor) <- c("Crimson", "SkyBlue", "Green", "Yellow")

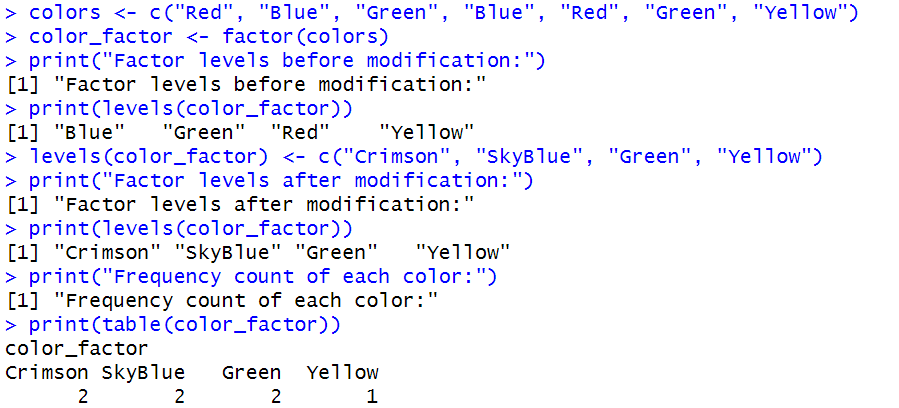
print("Factor levels after modification:")

print(levels(color\_factor))

print("Frequency count of each color:")

print(table(color\_factor))

**Output:**

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**8. Data Types in R**

num\_val <- 12.5

int\_val <- 10L

char\_val <- "100"

log\_val <- TRUE

comp\_val <- 2 + 3i

num\_to\_int <- as.integer(num\_val)

char\_to\_num <- as.numeric(char\_val)

log\_to\_num <- as.numeric(log\_val)

int\_to\_char <- as.character(int\_val)

num\_to\_comp <- as.complex(num\_val)

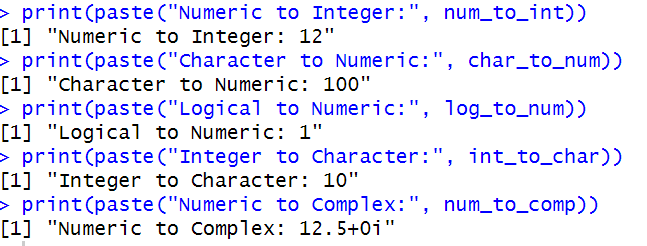
print(paste("Numeric to Integer:", num\_to\_int))

print(paste("Character to Numeric:", char\_to\_num))

print(paste("Logical to Numeric:", log\_to\_num))

print(paste("Integer to Character:", int\_to\_char))

print(paste("Numeric to Complex:", num\_to\_comp))  
**Output:**

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**9. Matrix**

mat1 <- matrix(1:20, nrow = 5, ncol = 4)

print("5x4 Matrix:")

print(mat1)

mat2 <- matrix(1:9, nrow = 3, byrow = TRUE,

dimnames = list(c("R1", "R2", "R3"), c("C1", "C2", "C3")))

print("3x3 Matrix (filled by rows):")

print(mat2)

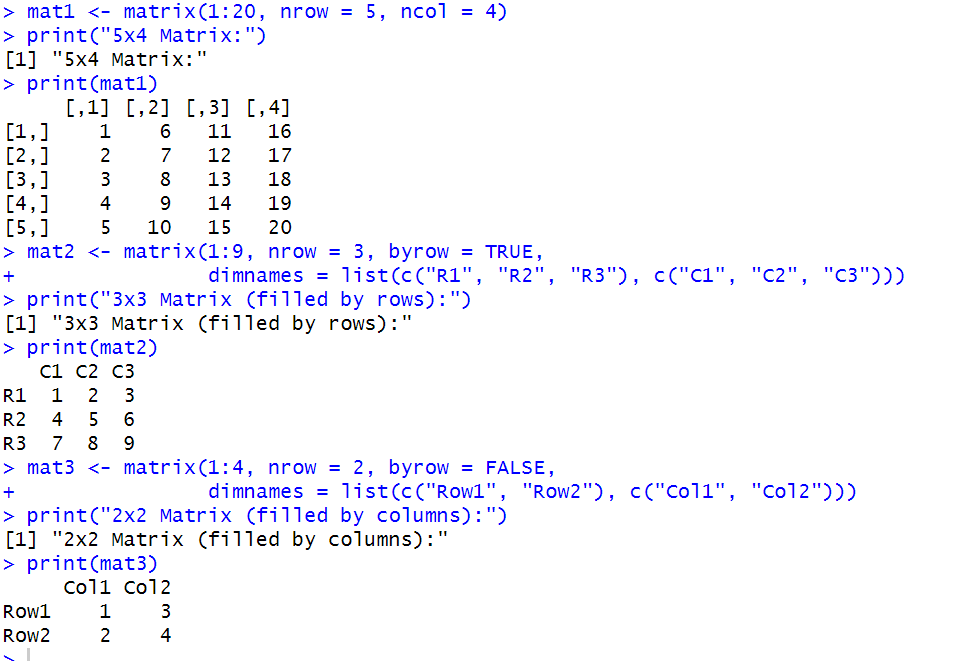
mat3 <- matrix(1:4, nrow = 2, byrow = FALSE,

dimnames = list(c("Row1", "Row2"), c("Col1", "Col2")))

print("2x2 Matrix (filled by columns):")

print(mat3)

**Output:**

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**10. Two-dimensional 5x3 Array**

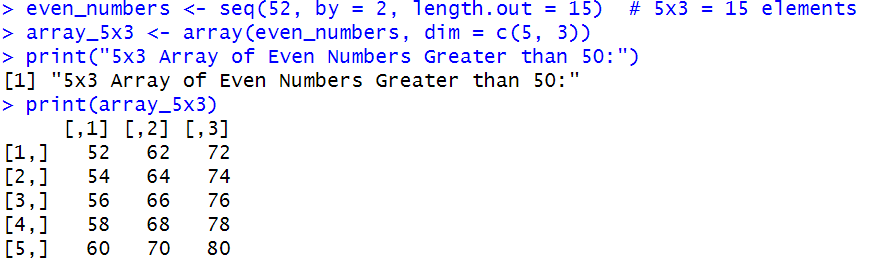
even\_numbers <- seq(52, by = 2, length.out = 15) # 5x3 = 15 elements

array\_5x3 <- array(even\_numbers, dim = c(5, 3))

print("5x3 Array of Even Numbers Greater than 50:")

print(array\_5x3)

**Output:**

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**11. Access Values in a Vector**

numbers <- c(10, 20, 30, 40, 50)

print("Original Vector:")

print(numbers)

print("First element:")

print(numbers[1]) # First element

print("Last element:")

print(numbers[length(numbers)]) # Last element

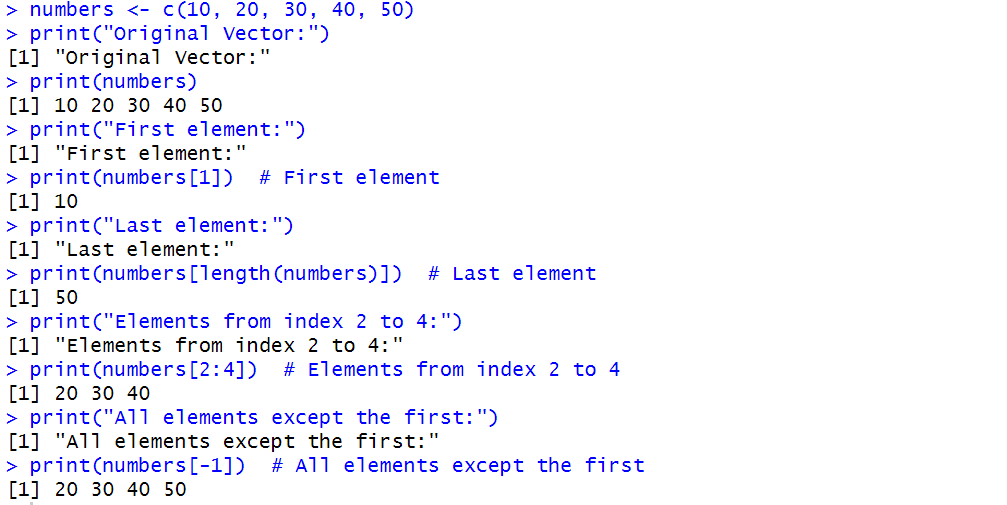
print("Elements from index 2 to 4:")

print(numbers[2:4]) # Elements from index 2 to 4

print("All elements except the first:")

print(numbers[-1]) # All elements except the first

**Output:**



**12. Nth Smallest Value in Vector**

nth\_smallest <- function(vec, n) {

sorted\_vec <- sort(vec)

return(sorted\_vec[n])

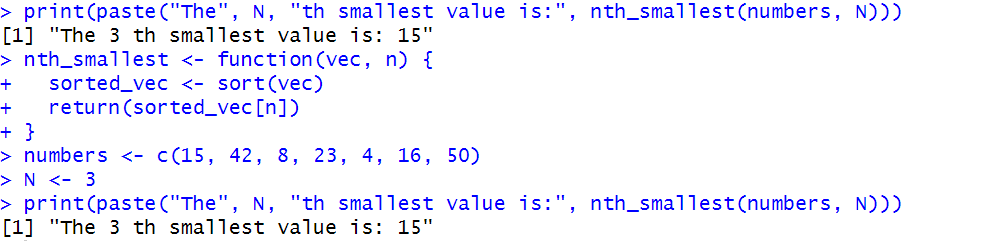
}

numbers <- c(15, 42, 8, 23, 4, 16, 50)

N <- 3

print(paste("The", N, "th smallest value is:", nth\_smallest(numbers, N)))

**Output:**

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**13. Concatenate a Vector of Strings**

words <- c("Hello", "World", "from", "R")

concatenated\_string <- paste(words, collapse = " ")

print("Concatenated string with spaces:")

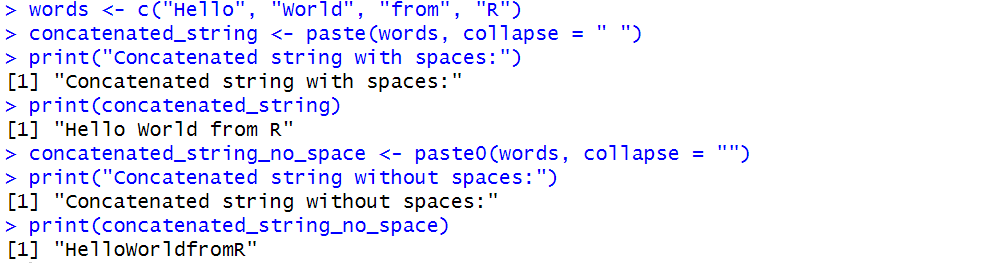
print(concatenated\_string)

concatenated\_string\_no\_space <- paste0(words, collapse = "")

print("Concatenated string without spaces:")

print(concatenated\_string\_no\_space)

**Output:**

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