 Marwadi University	Marwadi University Faculty of Technology Department of Information and Communication Technology	
Subject: Introduction to R and R Studio (01CT0106)	Aim: Understanding Looping and Loop Control Statements using R	
Experiment: 05	Date: 14/03/2023	Enrollment No: 92200133030

Aim: Understanding Looping and Loop Control Statements using R

IDE: R Studio

Theory:

Looping statements are expressions used to control the execution and flow of the program based on the conditions provided in the statements. These structures are used to make a decision after assessing the variable. In R programming, there are 7 types of loop control statements as follows:

- **if condition**
- **if-else condition**
- **for loop**
- **nested loops**
- **while loop**
- **break statement**
- **next statement**

if condition


This control structure checks the expression provided in parenthesis is true or not. If true, the execution of the statements in braces { } continues.

```
if(expression){
    statements
    .... ....
}
```

if-else condition

It is similar to if condition but when the test expression in if condition fails, then statements in else condition are executed.

```
if(expression){
    statements
    .... ....
}
else{
    statements
    .... ....
}
```

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for loop

It is a type of loop or sequence of statements executed repeatedly until exit condition is reached.

```
for(value in vector){
    statements
    ....
}
```

Nested loops

Nested loops are similar to simple loops. Nested means loops inside loop. Moreover, nested loops are used to manipulate the matrix.

while loop

while loop is another kind of loop iterated until a condition is satisfied. The testing expression is checked first before executing the body of loop.

```
while(expression){
    statement
    ....
}
```

break statement

break statement can be used in any type of loop to exit from the loop.

```
if(expression) {
    break
}
```


next statement

next statement is used to skip the current iteration without executing the further statements and continues the next iteration cycle without terminating the loop.

Programs:

Write R script that demonstrates the functionality of all the loop control statements:

1. Print the total of first 100 even numbers
2. Print 0 1 1 2 3 5 8 13 21 34 55 ... (Fibonacci series)

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3. Generate the value of n! factorial of a number n
4. Except one no from user and find if it is Armstrong or not.
5. Accept a number from user and display Reverse of it.
6. Accept a number of length n (n>3) from user and display its sum of digits.
7. Print pattern like follow.

```
12345
12345
12345
12345
12345
```


8. Print pattern like follow.

```
A A A A A
B B B B B
C C C C C
D D D D D
E E E E E
```

```
total <- 0
count <- 0
number <- 2

while (count < 100) {
  total <- total + number
  number <- number + 2
  count <- count + 1
}

print(paste("The total of the first 100 even numbers is:", total))
```

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```

limit <- as.integer(readline("Enter the limit for the Fibonacci series: "))

if (!is.na(limit) && limit > 0 && round(limit) == limit){

  num1 <- 0
  num2 <- 1

  print(paste(num1," " , num2))

  for (i in 3:limit) {
    num3 <- num1 + num2
    print(paste(num3," "))

    num1 <- num2
    num2 <- num3
  }
} else {
  print("Invalid input. Please enter a positive integer as the limit.")
}

```


```

n <- as.integer(readline("Enter a number to calculate its factorial: "))

if (!is.na(n) && n >= 0 && round(n) == n) {
  factorial <- 1

  if (n == 0 || n == 1) {
    print(paste("The factorial of", n, "is", factorial))
  } else {
    for (i in 2:n) {
      factorial <- factorial * i
    }
    print(paste("The factorial of", n, "is", factorial))
  }
} else {
  print(paste("Invalid input. Please enter a non-negative integer. "))
}

```

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```

num <- as.integer(readline("Enter a number: "))

if (!is.na(num) && num >= 0 && round(num) == num) {
  temp <- num
  digits <- nchar(temp)
  sum <- 0

  while (temp > 0) {
    digit <- temp %% 10
    sum <- sum + digit^digits
    temp <- temp %/% 10
  }

  if (num == sum) {
    print(paste(num, "is an Armstrong number."))
  } else {
    print(paste(num, "is not an Armstrong number."))
  }
} else {
  print(paste("Invalid input. Please enter a non-negative integer."))
}

```

```


num <- as.integer(readline("Enter a number: "))

if (!is.na(num)) {
  reverse <- 0
  temp <- num

  while (temp > 0) {
    digit <- temp %% 10
    reverse <- reverse * 10 + digit
    temp <- temp %/% 10
  }

  print(paste("The reverse of", num, "is", reverse))
} else {
  print(paste("Invalid input. Please enter a valid number."))
}

```

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```

num <- as.integer(readline("Enter a number: "))

if (!is.na(num) && num > 0) {
  sum <- 0
  temp <- num

  while (temp > 0) {
    digit <- temp %% 10
    sum <- sum + digit
    temp <- temp %/% 10
  }

  print(paste("The sum of digits of", num, "is", sum))
} else {
  print(paste("Invalid input. Please enter a positive integer. "))
}

```

```

rows <- 5
cols <- 5

for (i in 1:rows) {
  for (j in 1:cols) {
    cat(j)
  }
  cat("\n")
}


```

```

rows <- 5

for (i in 1:rows) {
  for (j in 1:rows) {
    letter <- LETTERS[i]
    cat(letter, " ")
  }
  cat("\n")
}


```

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Output:

```
> print(paste("The total of the first 100 even numbers is:", total))
[1] "The total of the first 100 even numbers is: 10100"
> |

> limit <- as.integer(readline("Enter the limit for the Fibonacci series: "))
Enter the limit for the Fibonacci series: 6
> if (!is.na(limit) && limit > 0 && round(limit) == limit){
+
+   num1 <- 0
+   num2 <- 1
+
+   print(paste(num1," " , num2))
+
+   for (i in 3:limit) {
+     num3 <- num1 + num2
+     print(paste(num3," "))
+
+     num1 <- num2
+     num2 <- num3
+   }
+ } else {
+   print("Invalid input. Please enter a positive integer as the limit.")
+ }
[1] "0  1"
[1] "1  "
[1] "2  "
[1] "3  "
[1] "5  "
> |
```

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```


> n <- as.integer(readline("Enter a number to calculate its factorial: "))
Enter a number to calculate its factorial: 4
> if (!is.na(n) && n >= 0 && round(n) == n) {
+   factorial <- 1
+
+   if (n == 0 || n == 1) {
+     print(paste("The factorial of", n, "is", factorial))
+   } else {
+     for (i in 2:n) {
+       factorial <- factorial * i
+     }
+     print(paste("The factorial of", n, "is", factorial))
+   }
+ } else {
+   print(paste("Invalid input. Please enter a non-negative integer."))
+ }
[1] "The factorial of 4 is 24"
>

```

```

> num <- as.integer(readline("Enter a number: "))
Enter a number: 123
> if (!is.na(num) && num >= 0 && round(num) == num) {
+   temp <- num
+   digits <- nchar(temp)
+   sum <- 0
+
+   while (temp > 0) {
+     digit <- temp %% 10
+     sum <- sum + digit^digits
+     temp <- temp %/% 10
+   }
+
+   if (num == sum) {
+     print(paste(num, "is an Armstrong number."))
+   } else {
+     print(paste(num, "is not an Armstrong number."))
+   }
+ } else {
+   print(paste("Invalid input. Please enter a non-negative integer."))
+ }
[1] "123 is not an Armstrong number."
>

```


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```


> num <- as.integer(readline("Enter a number: "))
Enter a number: 123
> if (!is.na(num)) {
+   reverse <- 0
+   temp <- num
+
+   while (temp > 0) {
+     digit <- temp %% 10
+     reverse <- reverse * 10 + digit
+     temp <- temp %% 10
+   }
+
+   print(paste("The reverse of", num, "is", reverse))
+ } else {
+   print(paste("Invalid input. Please enter a valid number."))
+ }
[1] "The reverse of 123 is 321"
> |

```

```

> num <- as.integer(readline("Enter a number: "))
Enter a number: 123
> if (!is.na(num) && num > 0) {
+   sum <- 0
+   temp <- num
+
+   while (temp > 0) {
+     digit <- temp %% 10
+     sum <- sum + digit
+     temp <- temp %% 10
+   }
+
+   print(paste("The sum of digits of", num, "is", sum))
+ } else {
+   print(paste("Invalid input. Please enter a positive integer."))
+ }
[1] "The sum of digits of 123 is 6"
> |

```

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```

> rows <- 5
> cols <- 5
>
> for (i in 1:rows) {
+   for (j in 1:cols) {
+     cat(j)
+   }
+   cat("\n")
+ }
12345
12345
12345
12345
12345
> |

```

```

> rows <- 5
>
> for (i in 1:rows) {
+   for (j in 1:rows) {
+     letter <- LETTERS[i]
+     cat(letter, " ")
+   }
+   cat("\n")
+ }
A A A A A
B B B B B
C C C C C
D D D D D
E E E E E
> |

```

Observation and Learnings:
