



R Syntax 2: Loops

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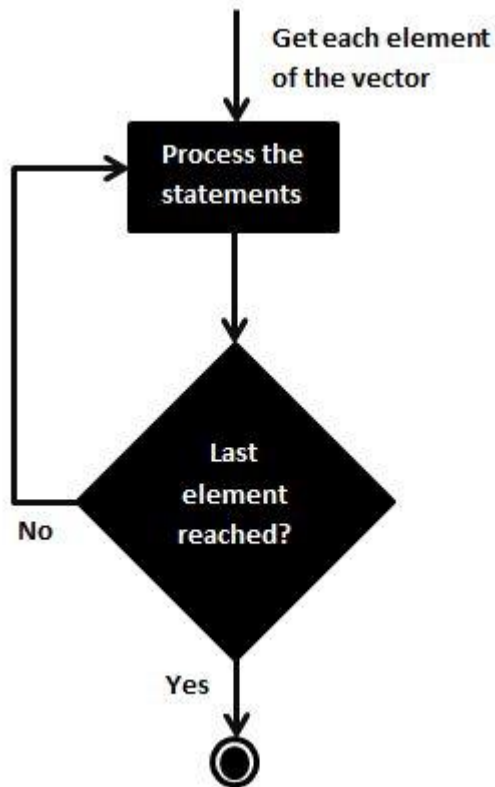
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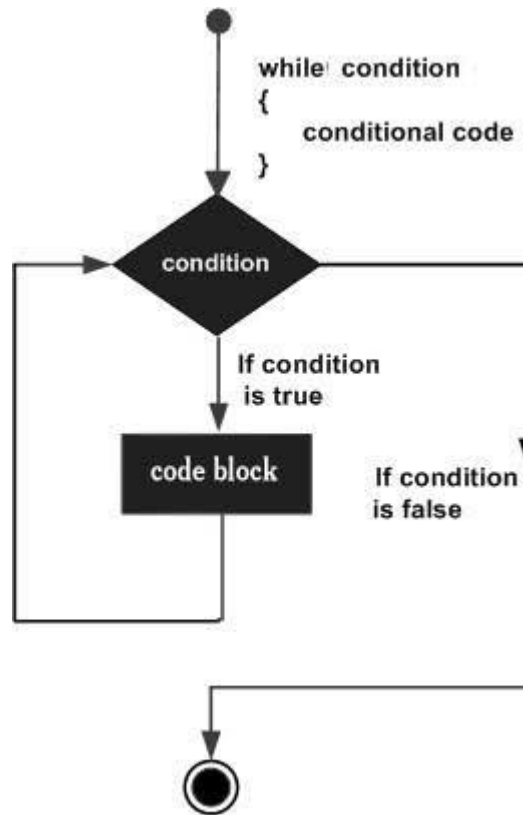
Three Types of Loops

- For loop, While loop, and Repeat-Break loop

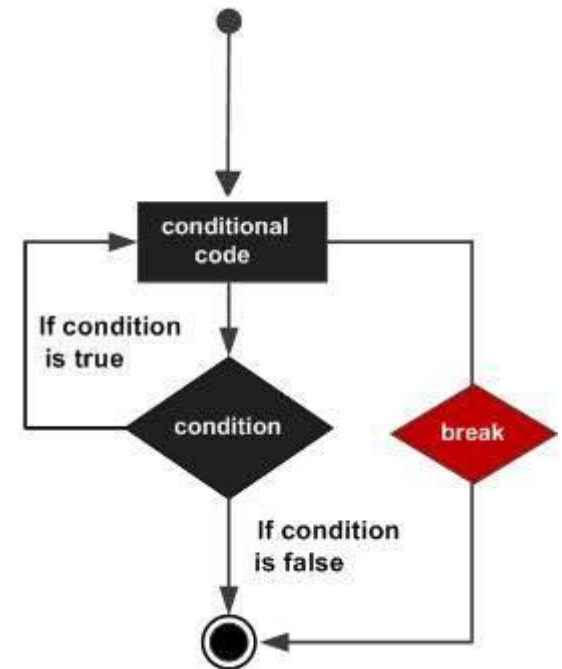
For loop



While loop



Repeat-Break loop



Loops: for

- for loop

```
for (i in x) {  
    statement  
}
```

- ✓ i: index of loop
- ✓ x: a set of element for which the loop runs
- ✓ statement: running part

Loops: for

- for loop example 1

```
# Loop: for statement  
n <- c(1:10)  
for (i in n) {  
  print(i^2)  
}
```

- ✓ Take the integer values from 1 to 10 step by 1
- ✓ Print the square value of it

```
> for (i in n) {  
+   print(i^2)  
+ }  
[1] 1  
[1] 4  
[1] 9  
[1] 16  
[1] 25  
[1] 36  
[1] 49  
[1] 64  
[1] 81  
[1] 100
```

Loops: for

- for loop example 2: for loop with an if statement inside

```
# For loop with an if statement inside
n <- c(1:10)
for (i in n){
  if (i %% 2 == 0) {
    cat(i, "is an even number \n")
  } else {
    cat(i, "is an odd number \n")
  }
}
```

✓ Take the numbers from 1 to 10

- If the number is divided by 2, then print the first statement
- Otherwise, print the second statement

```
1 is an odd number
2 is an even number
3 is an odd number
4 is an even number
5 is an odd number
6 is an even number
7 is an odd number
8 is an even number
9 is an odd number
10 is an even number
```

Loops: for

- for loop example 3: multiple for loops

```
# Multiple for loops
mat <- matrix(data = seq(11, 20, by=1), nrow = 5, ncol = 2)
mat
# Create the loop with r and c to iterate over the matrix
for (r in 1:nrow(mat)){
  for (c in 1:ncol(mat)){
    cat("The square of row", r, "and column", c, "is", mat[r,c]^2), "\n")
  }
}
```

	[,1]	[,2]
[1,]	11	16
[2,]	12	17
[3,]	13	18
[4,]	14	19
[5,]	15	20

The square of row 1 and column 1 is 121
The square of row 1 and column 2 is 256
The square of row 2 and column 1 is 144
The square of row 2 and column 2 is 289
The square of row 3 and column 1 is 169
The square of row 3 and column 2 is 324
The square of row 4 and column 1 is 196
The square of row 4 and column 2 is 361
The square of row 5 and column 1 is 225
The square of row 5 and column 2 is 400

Loops: while

- while loop

```
while (condition) {  
    statement  
}
```

✓ run the statement until the condition is not met

Loops: while

- while loop example I

```
# While loop
i <- 1
while (i <= 10) {
  i <- i+4
  print(i)
}
```

- ✓ Initialize the variable to 1

- ✓ if i is smaller than or equal to 10, run the statement

```
> i <- 1
> while (i <= 10) {
+   i <- i+4
+   print(i)
+ }
[1] 5
[1] 9
[1] 13
```


Loops: while

- while loop example 2

```
# While loop example 2
# Set variable price
price <- 100
# Loop variable counts the number of loops
loop <- 1
# Set the while statement
while (price > 95){
  # Add a random variation between -10 and 10 to the current price
  price <- price + sample(-10:10, 1)
  # Print the number of loop and price
  cat("The", loop, "-th price is", price, "\n")
  # Count the number of loop
  loop = loop +1
}
```

- ✓ Initialize the variable price to 100
- ✓ If the price is greater than 95, add a random variation between -10 and 10 to the current price
- ✓ It can fall into an infinite loop (loop that never ends)

Loops: while

- while loop example 2

1st trial

```
The 1 -th price is 94  
> |
```

2nd trial

```
The 2086 -th price is 125  
The 2087 -th price is 119  
The 2088 -th price is 125  
The 2089 -th price is 120  
The 2090 -th price is 125  
The 2091 -th price is 115  
The 2092 -th price is 121  
The 2093 -th price is 128  
The 2094 -th price is 124  
The 2095 -th price is 118  
The 2096 -th price is 119  
The 2097 -th price is 114  
The 2098 -th price is 109  
The 2099 -th price is 105  
The 2100 -th price is 99  
The 2101 -th price is 98  
The 2102 -th price is 106  
The 2103 -th price is 108  
The 2104 -th price is 100  
The 2105 -th price is 110  
The 2106 -th price is 100  
The 2107 -th price is 92
```

3rd trial

```
The 1 -th price is 101  
The 2 -th price is 91  
> |
```

4th trial

```
The 41 -th price is 142  
The 42 -th price is 143  
The 43 -th price is 148  
The 44 -th price is 144  
The 45 -th price is 145  
The 46 -th price is 140  
The 47 -th price is 136  
The 48 -th price is 127  
The 49 -th price is 131  
The 50 -th price is 124  
The 51 -th price is 119  
The 52 -th price is 115  
The 53 -th price is 107  
The 54 -th price is 113  
The 55 -th price is 119  
The 56 -th price is 112  
The 57 -th price is 107  
The 58 -th price is 98  
The 59 -th price is 104  
The 60 -th price is 101  
The 61 -th price is 100  
The 62 -th price is 94
```

Loops: repeat-break

- repeat-break loop

repeat {

statement

condition break

}

- ✓ run the statement first, check the condition, stop if the condition is met

Loops: repeat-break

- repeat-break example I

```
# repeat-break example 1
i <- 1
repeat {
  i <- i+4
  print(i)
  if (i > 10) break
}
```

✓ The result is the same as that of the while example I

```
> repeat {
+   i <- i+4
+   print(i)
+   if (i > 10) break
+ }
[1] 5
[1] 9
[1] 13
```

Loops: repeat-break

- repeat-break example 2: Infinite loop prevention

```
# repeat-break example 2: Infinite loop prevention
price <- 100
loop = 1
repeat{
  # Add a random variation between -10 and 10 to the current price
  price <- price + sample(-10:10, 1)
  # Print the number of loop and price
  cat("The", loop, "-th price is", price, "\n")
  # Count the number of loop
  loop = loop + 1
  # Stop the loop if price > 110 or loop > 10
  if (price > 110 | loop > 10) break
}
```

1st trial

The 1 -th price is 104
The 2 -th price is 94
The 3 -th price is 97
The 4 -th price is 104
The 5 -th price is 108
The 6 -th price is 118

2nd trial

The 1 -th price is 97
The 2 -th price is 107
The 3 -th price is 100
The 4 -th price is 95
The 5 -th price is 93
The 6 -th price is 91
The 7 -th price is 93
The 8 -th price is 90
The 9 -th price is 94
The 10 -th price is 92

3rd trial

The 1 -th price is 91
The 2 -th price is 81
The 3 -th price is 76
The 4 -th price is 83
The 5 -th price is 91
The 6 -th price is 83
The 7 -th price is 86
The 8 -th price is 86
The 9 -th price is 79
The 10 -th price is 89

