Vectors are the most basic R data objects and there are six types of atomic vectors. They are logical, integer, double, complex, character and raw.

Vector Creation

Single Element Vector

Even when you write just one value in R, it becomes a vector of length 1 and belongs to one of the above vector types.

# Atomic vector of type character.

print("abc");

# Atomic vector of type double.

print(12.5)

# Atomic vector of type integer.

print(63L)

# Atomic vector of type logical.

print(TRUE)

# Atomic vector of type complex.

print(2+3i)

# Atomic vector of type raw.

print(charToRaw('hello'))

When we execute the above code, it produces the following result −

[1] "abc"

[1] 12.5

[1] 63

[1] TRUE

[1] 2+3i

[1] 68 65 6c 6c 6f

Multiple Elements Vector

**Using colon operator with numeric data**

# Creating a sequence from 5 to 13.

v <- 5:13

print(v)

# Creating a sequence from 6.6 to 12.6.

v <- 6.6:12.6

print(v)

# If the final element specified does not belong to the sequence then it is discarded.

v <- 3.8:11.4

print(v)

When we execute the above code, it produces the following result −

[1] 5 6 7 8 9 10 11 12 13

[1] 6.6 7.6 8.6 9.6 10.6 11.6 12.6

[1] 3.8 4.8 5.8 6.8 7.8 8.8 9.8 10.8

**Using sequence (Seq.) operator**

# Create vector with elements from 5 to 9 incrementing by 0.4.

print(seq(5, 9, by = 0.4))

When we execute the above code, it produces the following result −

[1] 5.0 5.4 5.8 6.2 6.6 7.0 7.4 7.8 8.2 8.6 9.0

**Using the c() function**

The non-character values are coerced to character type if one of the elements is a character.

# The logical and numeric values are converted to characters.

s <- c('apple','red',5,TRUE)

print(s)

When we execute the above code, it produces the following result −

[1] "apple" "red" "5" "TRUE"

Accessing Vector Elements

Elements of a Vector are accessed using indexing. The **[ ] brackets** are used for indexing. Indexing starts with position 1. Giving a negative value in the index drops that element from result.**TRUE**, **FALSE** or **0** and **1** can also be used for indexing.

# Accessing vector elements using position.

t <- c("Sun","Mon","Tue","Wed","Thurs","Fri","Sat")

u <- t[c(2,3,6)]

print(u)

# Accessing vector elements using logical indexing.

v <- t[c(TRUE,FALSE,FALSE,FALSE,FALSE,TRUE,FALSE)]

print(v)

# Accessing vector elements using negative indexing.

x <- t[c(-2,-5)]

print(x)

# Accessing vector elements using 0/1 indexing.

y <- t[c(0,0,0,0,0,0,1)]

print(y)

When we execute the above code, it produces the following result −

[1] "Mon" "Tue" "Fri"

[1] "Sun" "Fri"

[1] "Sun" "Tue" "Wed" "Fri" "Sat"

[1] "Sun"

Vector Manipulation

Vector arithmetic

Two vectors of same length can be added, subtracted, multiplied or divided giving the result as a vector output.

# Create two vectors.

v1 <- c(3,8,4,5,0,11)

v2 <- c(4,11,0,8,1,2)

# Vector addition.

add.result <- v1+v2

print(add.result)

# Vector substraction.

sub.result <- v1-v2

print(sub.result)

# Vector multiplication.

multi.result <- v1\*v2

print(multi.result)

# Vector division.

divi.result <- v1/v2

print(divi.result)

When we execute the above code, it produces the following result −

[1] 7 19 4 13 1 13

[1] -1 -3 4 -3 -1 9

[1] 12 88 0 40 0 22

[1] 0.7500000 0.7272727 Inf 0.6250000 0.0000000 5.5000000

Vector element recycling

If we apply arithmetic operations to two vectors of unequal length, then the elements of the shorter vector are recycled to complete the operations.

v1 <- c(3,8,4,5,0,11)

v2 <- c(4,11)

# V2 becomes c(4,11,4,11,4,11)

add.result <- v1+v2

print(add.result)

sub.result <- v1-v2

print(sub.result)

When we execute the above code, it produces the following result −

[1] 7 19 8 16 4 22

[1] -1 -3 0 -6 -4 0

Vector Element Sorting

Elements in a vector can be sorted using the **sort()** function.

v <- c(3,8,4,5,0,11, -9, 304)

# Sort the elements of the vector.

sort.result <- sort(v)

print(sort.result)

# Sort the elements in the reverse order.

revsort.result <- sort(v, decreasing = TRUE)

print(revsort.result)

# Sorting character vectors.

v <- c("Red","Blue","yellow","violet")

sort.result <- sort(v)

print(sort.result)

# Sorting character vectors in reverse order.

revsort.result <- sort(v, decreasing = TRUE)

print(revsort.result)

When we execute the above code, it produces the following result −

[1] -9 0 3 4 5 8 11 304

[1] 304 11 8 5 4 3 0 -9

[1] "Blue" "Red" "violet" "yellow"

[1] "yellow" "violet" "Red" "Blue"

**Vector Arithmetics**

Arithmetic operations of vectors are performed member-by-member, *i.e*., memberwise.

For example, suppose we have two vectors a and b.

> a = c(1, 3, 5, 7)   
> b = c(1, 2, 4, 8)

Then, if we multiply a by 5, we would get a vector with each of its members multiplied by 5.

> 5 \* a   
[1]  5 15 25 35

And if we add a and b together, the sum would be a vector whose members are the sum of the corresponding members from a and b.

> a + b   
[1]  2  5  9 15

Similarly for subtraction, multiplication and division, we get new vectors via memberwise operations.

> a - b   
[1]  0  1  1 -1   
   
> a \* b   
[1]  1  6 20 56   
   
> a / b   
[1] 1.000 1.500 1.250 0.875

**Recycling Rule**

If two vectors are of unequal length, the shorter one will be recycled in order to match the longer vector. For example, the following vectors u and v have different lengths, and their sum is computed by recycling values of the shorter vector u.

> u = c(10, 20, 30)   
> v = c(1, 2, 3, 4, 5, 6, 7, 8, 9)   
> u + v   
[1] 11 22 33 14 25 36 17 28 39