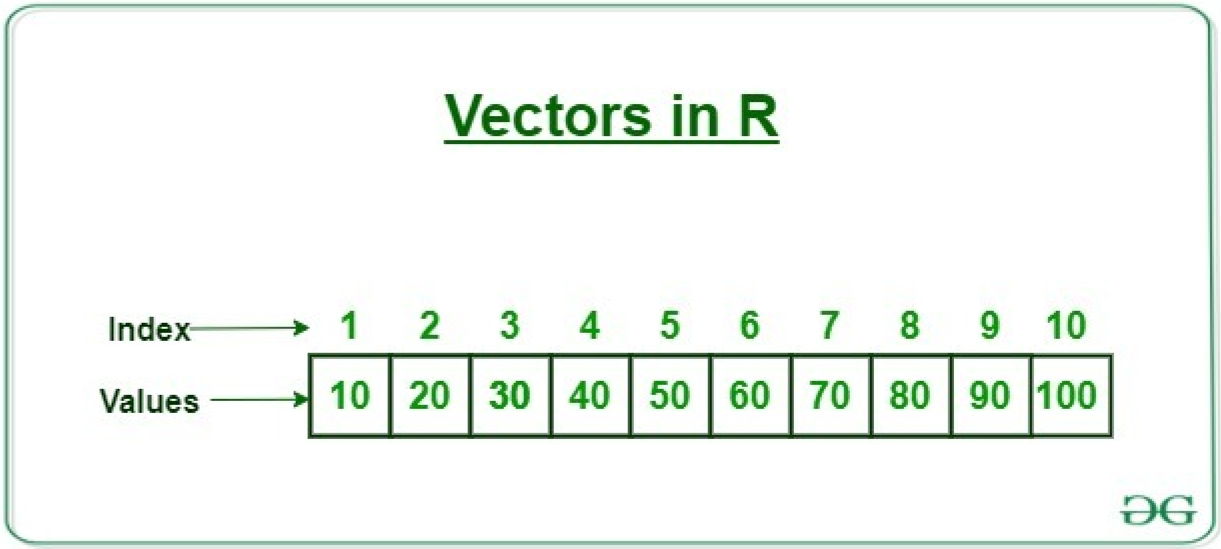
PRACTICAL NO 3 :-3. Implementation of vector data objects operations.

Theory:-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.A vector is simply a list of items that are of the same type.To combine the list of items to a vector, use the c() function and separate the items by a comma.

R Vectors are the same as the arrays in R language which are used to hold multiple data values of the same type. One major key point is that in R Programming Language the indexing of the vector will start from '1' and not from '0'. We can create numeric vectors and character vectors as well.



(Atomic) vectors

A vector is nothing else than a sequence of elements of a certain type. *R* distinguishes vectors with two different modes.

- Atomic vectors: All elements must have the same basic type (e.g., numeric, character, ...).
- Lists: Special vector mode. Different elements can have different types
- (Atomic) vectors are the most basic objects in *R* as they can contain only data of one type (e.g., only numeric values, or only character strings, etc.). Six different types of data can be stored in atomic vectors.

Sr.no	Type	Example	Comment
1	double (or numeric)	-0.5, 120.9, 5.0	Floating point numbers with do precision
2	integer	-1L, 121L, 5L	“Long” integers
3	logical	TRUE, FALSE	Boolean
4	character	"R", "5" or 'R', '5'	Text
5	complex	-5+11i, 3+2i, 0+4i	Real+imaginary numbers
6	raw	01, ff	Raw bytes (as hexadecimal)

Table 1: Six types of atomic vectors in *R*.

❖ **Important vector functions**

- c(): Combines multiple elements into one atomic vector.
- length(): Returns the length (number of elements) of an object.
- class(): Returns the class of an object.
- typeof(): Returns the type of an object. There is a small (sometimes important) difference between typeof() and class() as we will see later.
- attributes(): Returns further metadata of arbitrary type.

❖ **Multiple Elements Vector**

1. Using colon operator with numeric data

```
# Creating a sequence from 5 to 13.
v <- 5:13
print(v)
```

2. Using sequence (Seq.) operator

```
# Create vector with elements from 5 to 9 incrementing by 0.4.
print(seq(5, 9, by = 0.4))
```

3. 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)
```

❖ 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.

Operators in R

An operator is a symbol that tells the compiler to perform specific mathematical or logical manipulations. R language is rich in built-in operators and provides the following types of operators.

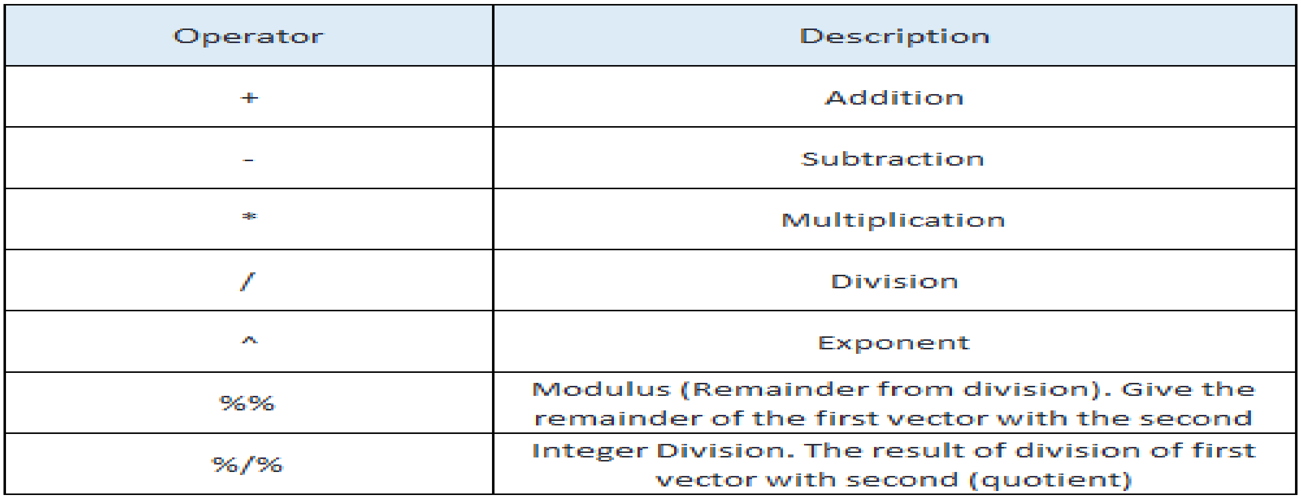
Types of Operators

We have the following types of operators in R programming −

Arithmetic Operators
Relational Operators
Logical Operators
Assignment Operators

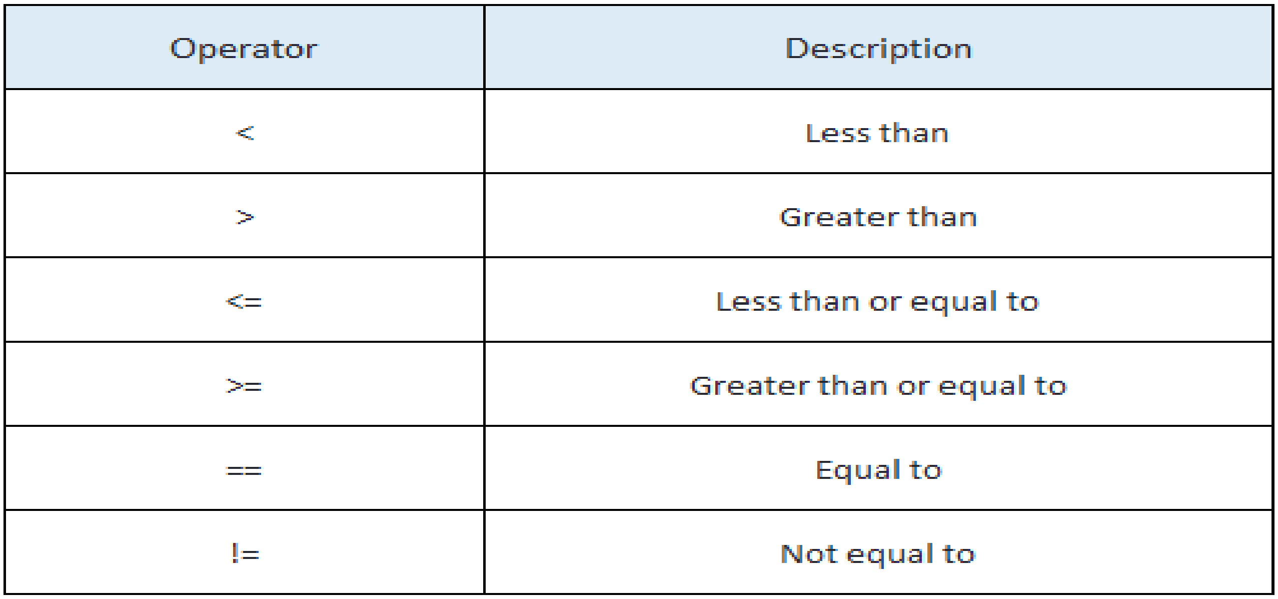
Miscellaneous Operators

1. Arithmetic Operators



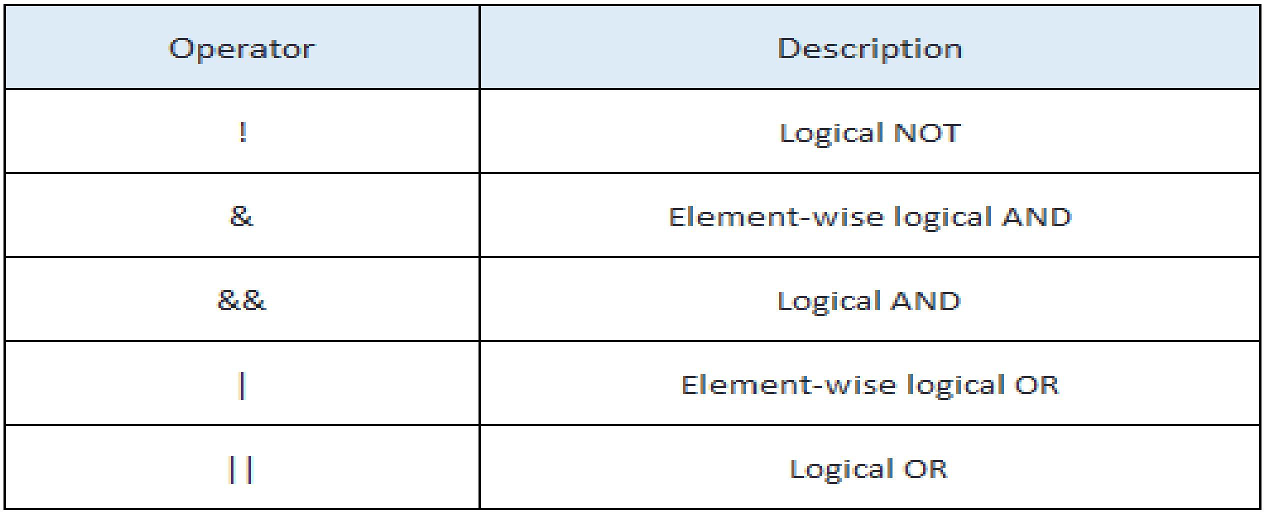
Operator	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Exponent
%%	Modulus (Remainder from division). Give the remainder of the first vector with the second
%/%	Integer Division. The result of division of first vector with second (quotient)

2. Relational Operators



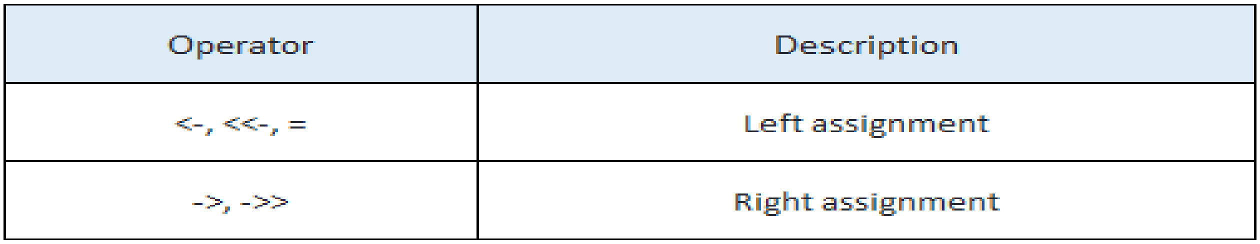
Operator	Description
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	Equal to
!=	Not equal to

3. Logical Operators



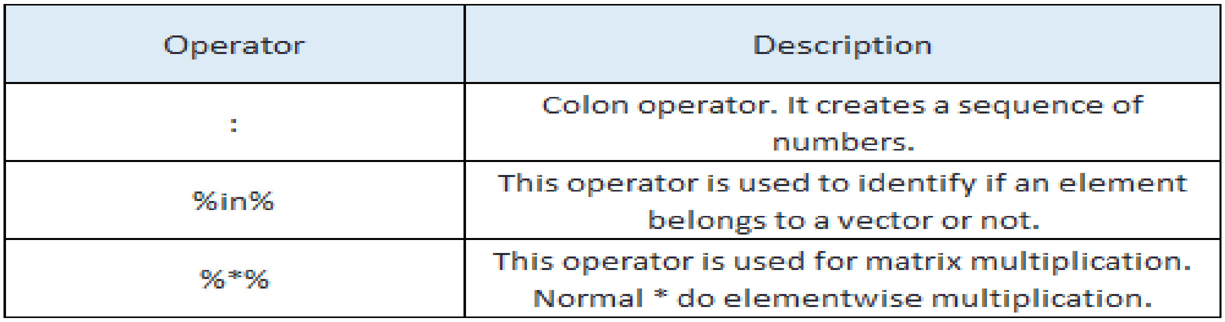
Operator	Description
!	Logical NOT
&	Element-wise logical AND
&&	Logical AND
|	Element-wise logical OR
||	Logical OR

4. Assignment Operators in R:



Operator	Description
<-, <<-, =	Left assignment
->, ->>	Right assignment

5. Mixed Operators in R:



Operator	Description
:	Colon operator. It creates a sequence of numbers.
%in%	This operator is used to identify if an element belongs to a vector or not.
%*%	This operator is used for matrix multiplication. Normal * do elementwise multiplication.

Conclusion :-Thus ,we have studied the Concept of vector in R programming with different operators.