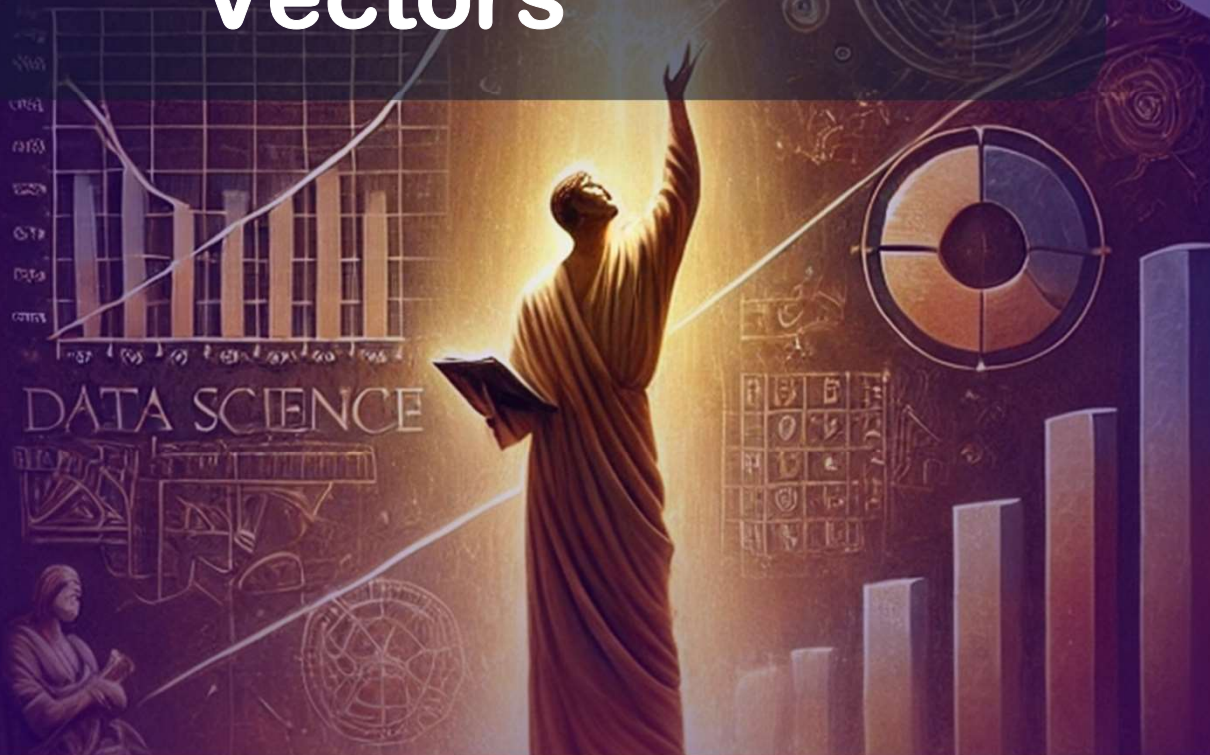


DATA STRUCTURES IN R

Vectors



MASTER R PROGRAMMING

Lesson Goal

- Learn to assign multiple values to objects in R.

Vectors in R

- A vector is a collection of objects of the **same data type**.
- Create a vector using:

`c()`



concatenate / combine

DATA STRUCTURES IN R

Vector Operations (Arithmetic Operators)



MASTER R PROGRAMMING

Lesson Goal

- Learn to perform arithmetic operations on vectors.

Arithmetic Operators

Description	Operator
Addition	+
Subtraction	-
Multiplication	*
Division	/
Exponent	** or ^
Modulo	%%
Integer Division	%/%

Arithmetic Operations on Vectors – Scalar Operation

- Perform arithmetic operations on a vector with a single number.
- The single number (or **scalar**) is distributed over all elements in the vector.

5 + c(3, 10, 7, 9)

This is what
happens

c(3+5, 10+5, 7+5, 9+5)

[1] 8 15 12 14

Arithmetic Operations on Vectors – Vector by Vector

- Each matching pair of elements in the two vectors are used for the operation (or calculation).

$c(9, 6, 1, 0) + c(3, 10, 7, 9)$

This is what happens

$c(3+9, 10+6, 7+1, 9+0)$

$[1] \ 12 \ 16 \ 8 \ 9$

Arithmetic Operations on Vectors – Vector by Vector

- Each matching pair of elements in the two vectors are used for the operation.

Elements of shorter vector are recycled to match the pair of elements in the vector.

$c(9, 6)$ becomes $c(9, 6, 9, 6)$

$c(9, 6) + c(3, 10, 7, 9)$

This is what happens

$c(3+9, 10+6, 7+9, 9+6)$

[1] 12 16 16 15

Arithmetic Operations on Vectors – Vector by Vector

- Each matching pair of elements in the two vectors are used for the operation.

$c(9, 6, 1) + c(3, 10, 7, 9)$

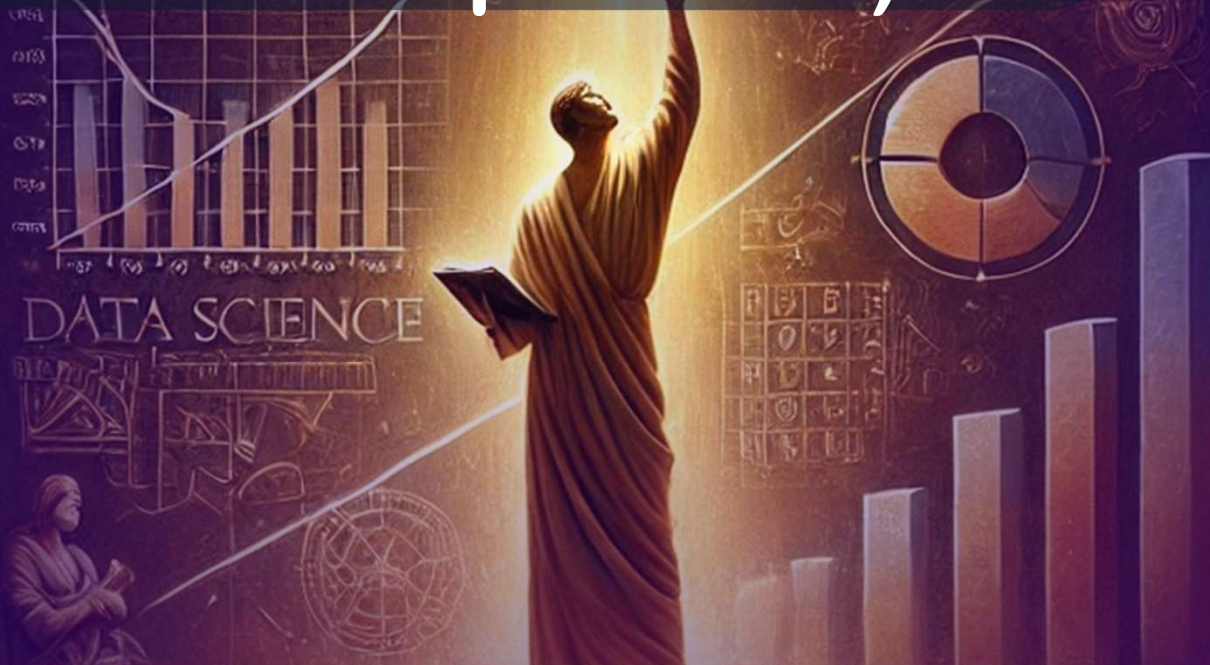
This is what happens

$c(3+9, 10+6, 7+1, 9+9)$

$[1] \ 12 \ 16 \ 16 \ 15$

DATA STRUCTURES IN R

Vector Operations (Relational Operators)



MASTER R PROGRAMMING

Lesson Goal

- Learn to perform relational operations on vectors.

Relational/Comparison Operators

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

Relational Operations on Vectors

- These return TRUE or FALSE depending on the relation or comparison being made.

- **Scalar Operation**

```
c(5, 9, 10, 2, 8) >= 5
```

```
[1] TRUE TRUE TRUE FALSE TRUE
```

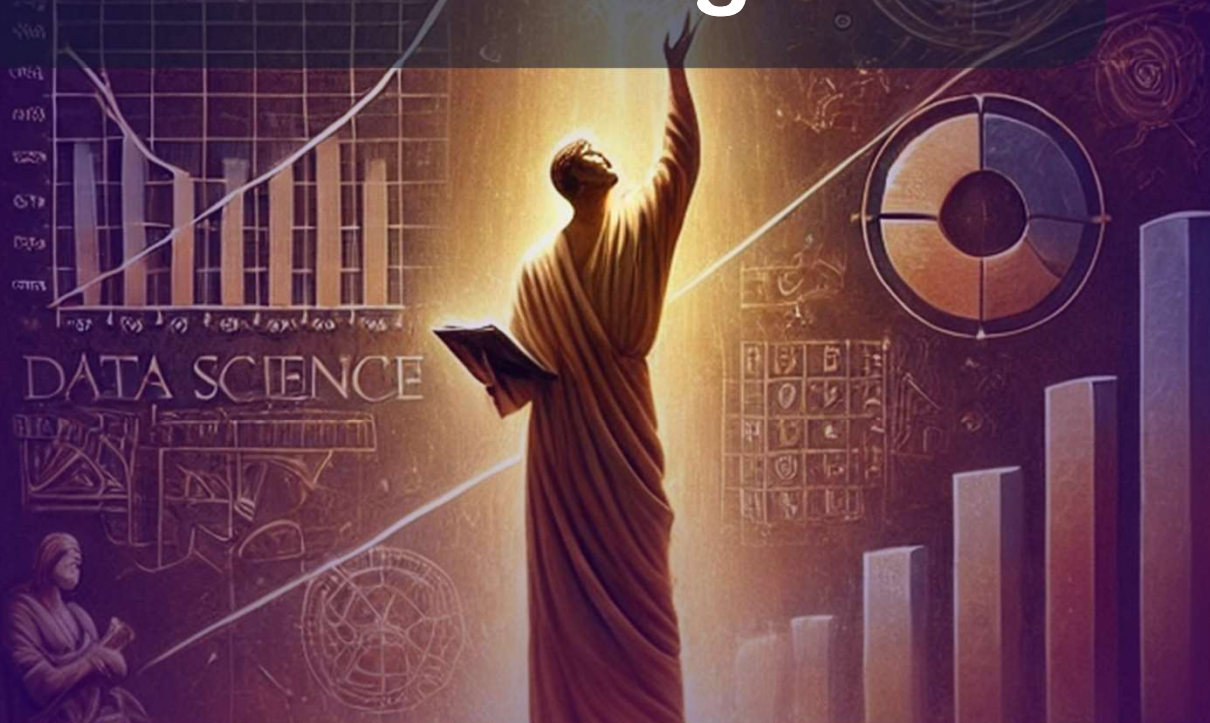
- **Vector by Vector Operation**

```
c(5, 9, 10, 2) >= c(4, 9, 1, 5)
```

```
[1] TRUE TRUE TRUE FALSE
```

DATA STRUCTURES IN R

Vector Indexing



MASTER R PROGRAMMING

Lesson Goal

- Learn to extract values or items from vectors in R.

Vector Indexing in R

- Index a vector using the square brackets `[]`.

vector[]



specify position of
value/item to extract

Vector Indexing in R

- Example:

```
vec <- c(3, 8, 10, -5, 7, 14, -2, 6)
```

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
1st 2nd 3rd 4th 5th 6th 7th 8th

Index
1
2
3
4
5
6
7
8

```
vec[3]
```

```
[1] 10
```