Python Data Structures: Range:

Programming for Data Science with Python

1. Overview

In Python, ranges are the objects of the class range that has the constructor range().

Range is an immutable sequence data type/structure, i.e., its contents can not be changed after being created.

The range type:

- Represent an immutable sequence of numbers
- Is commonly used for looping a specific number of times in for loops.

  ### **Run the following code block:**

```
In [17]:  range(10)

Out[17]:  range(0, 10)

In [18]:  range(50)

Out[18]:  range(0, 50)
```

1.1 Properties of ranges

The advantage of the range type over a regular list or tuple:

- A **range** object always takes the **same (small) amount of memory** (no matter the size of the range it represents because it only stores the start, stop, and step values).

1.2 Constructors

1.2.1 Constructor: range(stop)

1.2.2 Constructor: range (start, stop, [step])

The arguments to the range constructor must be integers:

- Either built-in int or any object that implements the index special method.
- If the step argument is omitted, it defaults to 1.
- If the start argument is omitted, it defaults to 0.
- If step is zero, ValueError is raised.

For a positive step, the contents of a range r are determined by the formula:

- ***r[i]=start+step*I where i>=0 and r[i] < stop***

- Start: The value of the start parameter (or 0 if the parameter was not supplied)
- Stop: The value of the stop parameter.
- Step: The value of the step parameter (or 1 if the parameter was not supplied).

---

2. Examples:

Using range() in creating other sequence objects

Run the following 7 code blocks:

```
In [1]:  list(range(10))
```

```
Out[1]:  [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

```
In [3]:  list(range(15))
```

```
Out[3]:  [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14]
```

```
In [4]:  list(range(1, 11))
```

```
Out[4]:  [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

```
In [5]:  list(range(40, 51))
```

```
Out[5]:  [40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50]
```

```
In [6]:  list(range(0, 30, 5))
```

```
Out[6]:  [0, 5, 10, 15, 20, 25]
```

```
In [8]:  list(range(0, 1100, 100))
```

```
Out[8]:  [0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000]
```

```
In [9]:  list(range(0, 10, 3))
```

```
Out[9]:  [0, 3, 6, 9]
```

```
In [10]:  list(range(0, 22, 2))
```

```
Out[10]:  [0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20]
```

```
In [11]:   list(range(0, -10, -1))
```

Out[11]:   [0, -1, -2, -3, -4, -5, -6, -7, -8, -9]

```
In [12]:   list(range(100, 0, -10))
```

Out[12]:   [100, 90, 80, 70, 60, 50, 40, 30, 20, 10]

```
In [13]:   list(range(0))
```

Out[13]:   []

```
In [14]:   list(range(1))
```

Out[14]:   [0]

```
In [15]:   list(range(1, 0))
```

Out[15]:   []

```
In [16]:   list(range(0, 1))
```

Out[16]:   [0]

```
In [11]:   list(range(0, -10, -1))
```

Out[11]:   [0, -1, -2, -3, -4, -5, -6, -7, -8, -9]