Shri Vile Parle Kelavani Mandal's

INSTITUTE OF TECHNOLOGY

DHULE (M.S.)

DEPARMENT OF COMPUTER ENGINEERING

Subject : Cloud Computing Lab

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Class : B.tech Final Year **Batch : B2** **Division: -**

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Title : Demonstrate the use of map and reduce tasks.

Remark

Signature

Aim:

To demonstrate the use of **map()** and **reduce()** functions in Python for performing data transformation and aggregation tasks.

Software / Tools Used:

- **Software:** Python (IDLE / VS Code / Jupyter Notebook / any IDE)
- **Version:** Python 3.8 or above
- **Operating System:** Windows / Linux / macOS
- **Theory:**

The **map()** and **reduce()** functions are part of Python's functional programming features. They help in applying operations over data collections efficiently.

1. **map(function, iterable)**
   - Applies a function to each element of the iterable.
   - Returns a map object (can be converted into a list).
   - Example:
   - `list(map(lambda x: x*2, [1,2,3]))`
   - `→ [2,4,6]`
2. **reduce(function, iterable)**
   - Performs a cumulative operation on all items in an iterable to reduce it to a single value.
   - Imported from the **functools** module.
   - Example:
   - `from functools import reduce`
   - `reduce(lambda a,b: a+b, [1,2,3,4])`
   - `→ 10`

Together, these mimic the **MapReduce** concept used in Big Data, where:

- **Map step:** transforms or filters data.

- **Reduce step:** aggregates results.
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Algorithm:

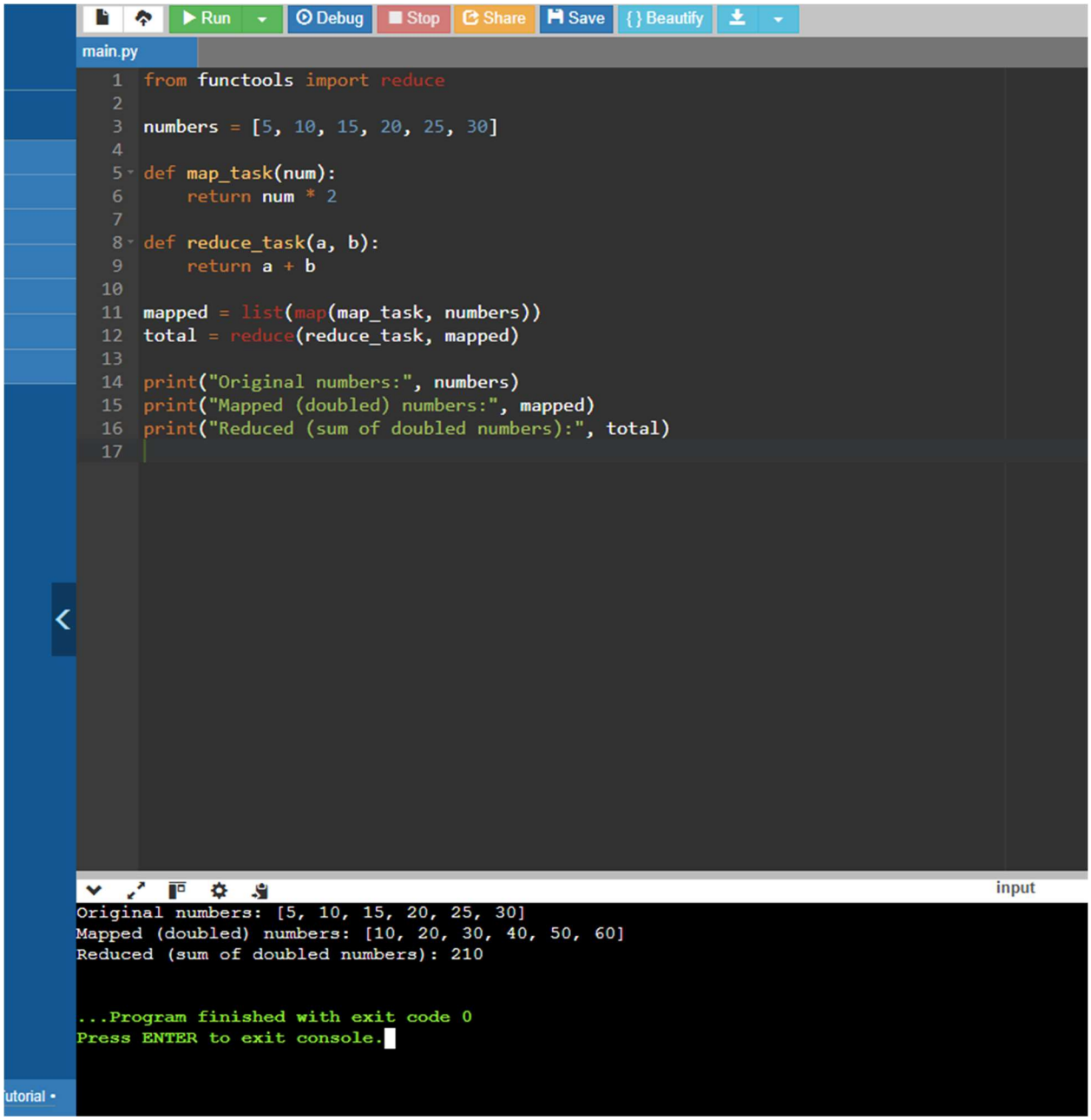
1. Start the program.
2. Import the **reduce** function from the **functools** module.
3. Initialize a list of numbers.
4. Use **map()** to:
    - Double each number.
    - Convert each number to string.
5. Use **reduce()** to:
    - Calculate the sum of all numbers.
    - Calculate the product of all numbers.
6. Display all the results.
7. Stop the program.

Program:

```
from functools import reduce

numbers = [5, 10, 15, 20, 25, 30]

def map_task(num):
   return num * 2

def reduce_task(a, b):
   return a + b

mapped = list(map(map_task, numbers))
total = reduce(reduce_task, mapped)

print("Original numbers:", numbers)
print("Mapped (doubled) numbers:", mapped)
print("Reduced (sum of doubled numbers):", total)
```

Output:

```
After map (doubled): [4, 8, 12, 16, 20]
Numbers as strings: ['2', '4', '6', '8', '10']
Sum of all numbers: 30
Product of all numbers: 3840
```



Conclusion:

The practical demonstrates how the **map()** function performs element-wise operations, while **reduce()** performs cumulative aggregation.
These are powerful tools for functional programming and are conceptually similar to the **MapReduce model** used in distributed data processing systems like Hadoop