

Problem Set 01: Python and Latex Practice

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1 Introduction:-

This report covers the solutions to the Python tasks and provides the associated mathematical explanations. The tasks involve basic Python operations such as working with data types, lists, dictionaries, functions, and object-oriented programming.

2 Python Codes:-

2.1 Task 1: Basic Data Types

```
x = 5 # Integer
y = 2.5 # Float

add_result = x + y
sub_result = y - x
mul_result = x * y
power_result = x ** 2
floor_div_result = x // 2

print("Addition of x and y:", add_result)
print("Subtraction of y from x:", sub_result)
print("Multiplication of x and y:", mul_result)
print("x raised to the power of 2:", power_result)
print("Floor division of x by 2:", floor_div_result)
```

Results:-
Addition of x **and** y: 7.5
Subtraction of y **from** x: -2.5
Multiplication of x **and** y: 12.5
x raised to the power of 2: 25
Floor division of x by 2: 2

2.2 Task 2: Lists

```
my_list = [1, 2, 3, 4, 5]

my_list[2] = "hello"
my_list.append("world")
my_list.pop(0)

print("Final list:", my_list)
```

Results:—

```
Final list: [2, 'hello', 4, 5, 'world']
```

2.3 Task 3: Dictionaries

```
student_scores = {'Alice': 85, 'Bob': 90, 'Charlie': 78}

student_scores['David'] = 88
student_scores['Alice'] = 95
del student_scores['Charlie']

print("Final student scores:", student_scores)
```

Results:—

```
Final student scores: {'Alice': 95, 'Bob': 90, 'David': 88}
```

2.4 Task 4: Functions

```
def calculate_area(width, height):
    return width * height

area = calculate_area(5, 10)
print("Area of the rectangle:", area)
```

Results:—

```
Area of the rectangle: 50
```

2.5 Task 5: Classes and Inheritance

```
class Animal:
    def __init__(self, name):
        self.name = name
```

```

def speak(self):
    print("The animal speaks")

class Dog(Animal):
    def speak(self):
        print("Woof! Woof!")

buddy = Dog("Buddy")
buddy.speak()

```

Results:—
Woof! Woof!

3 Mathematical Explanation:-

3.1 Task 1: Basic Data Types

In Task 1, we performed several basic operations:

1. **Addition**:

$$\text{sum} = x + y$$

Where $x = 5$ and $y = 2.5$, so the result is $\text{sum} = 5 + 2.5 = 7.5$.

2. **Subtraction**:

$$\text{difference} = y - x$$

Where $y = 2.5$ and $x = 5$, so the result is $\text{difference} = 2.5 - 5 = -2.5$.

3. **Multiplication**:

$$\text{product} = x \times y$$

Where $x = 5$ and $y = 2.5$, so the result is $\text{product} = 5 \times 2.5 = 12.5$.

4. **Exponentiation** (raising x to the power of 2):

$$\text{power} = x^2$$

Where $x = 5$, so the result is $\text{power} = 5^2 = 25$.

5. **Floor Division**:

$$\text{floor_division} = x // 2$$

Where $x = 5$, and floor division gives $\text{floor_division} = 5 // 2 = 2$.

3.2 Task 2: Lists

Task 2 involves modifying a list. No specific mathematical formula is required here since the operations involve replacing elements, adding new ones, and removing items from a list.

3.3 Task 3: Dictionaries

In Task 3, we are working with a dictionary (key-value pairs). The operations involve updating the dictionary, which also doesn't involve direct mathematical operations, so no formula is needed here.

3.4 Task 4: Functions

In Task 4, we calculate the area of a rectangle using the formula:

$$A = \text{width} \times \text{height}$$

Where A is the area, and the width and height are the dimensions of the rectangle. For this task, the width is 5 and the height is 10, so the area is calculated as:

$$A = 5 \times 10 = 50$$

3.5 Task 5: Classes and Inheritance

In Task 5, we create classes to model the behavior of animals. While no specific mathematical operations are performed, the concept of inheritance allows us to override methods from the parent class in the child class.

4 Conclusion:-

This assignment helped me practice basic Python concepts such as working with variables, data structures, functions, and classes. Additionally, I learned how to document my work using LaTeX, which is a powerful tool for creating professional reports with embedded code and mathematical explanations.