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**Lab Assignment # 3**

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**Question 1: Zero-Shot Prompting (Palindrome Number Program)** Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a palindrome.

**Task:**

- Record the AI-generated code.
- Test the code with multiple inputs.
- Identify any logical errors or missing edge-case handling.

Code:-

```
Assignment3.py > ...
1 #Task1
2 from logging import root
3
4
5 def palindrome(number):
6     str_num = str(number)
7     return str_num == str_num[::-1]
8 print(palindrome(121))
9 print(palindrome(123))
10 print(palindrome(12321))
11 print(palindrome(45654))
12 print(palindrome(789))
13
```

Output:-

```
True
False
True
True
False
```

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**Question 2: One-Shot Prompting (Factorial Calculation)**

Write a one-shot prompt by providing one input-output example and ask the AI to generate a Python function to compute the factorial of a given number.

Example:

Input: 5 → Output: 120 Task:

- Compare the generated code with a zero-shot solution.
- Examine improvements in clarity and correctness.

**Prompt:-** input: 5 => output: 120 write a function to calculate factorial of a number

Code:-

```
Assignment3.py > ...
15  #Task2
16  # input: 5 -> output: 120 write a function to calculate factorial of a number
17  def factorial(n):
18      if n == 0 or n == 1:
19          return 1
20      else:
21          return n * factorial(n - 1)
22  print(factorial(5))
23  print(factorial(0))
24  print(factorial(6))
25
```

Output:-

```
120
1
720
```

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**Question 3: Few-Shot Prompting (Armstrong Number Check)** Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python function to check whether a given number is an Armstrong number.

Examples:

- Input: 153 → Output: Armstrong Number
  - Input: 370 → Output: Armstrong Number
  - Input: 123 → Output: Not an Armstrong Number
  - Analyze how multiple examples influence code structure and accuracy.
  - Test the function with boundary values and invalid inputs.
- (Optional Extension)

**Prompt:-** input: 370 => output: Armstrong write a function to check if a number is an Armstrong number.

Code:-

```
Assignment3.py > CheckArmstrong
27 #Task3
28 # input: 153 -> output: Armstrong
29 # input: 123 -> output: Not Armstrong
30 # input: 370 -> output: Armstrong
31 # write a program check whether function to check if a number is an Armstrong number or not Armstrong number.
32 def is_Armstrong(number):
33     num_str = str(number)
34     num_digits = len(num_str)
35     sum_of_powers = sum(int(digit) ** num_digits for digit in num_str)
36     return sum_of_powers == number
37 def CheckArmstrong(number):
38     if is_Armstrong(number):
39         print("Armstrong")
40     else:
41         print("Not Armstrong")
42 CheckArmstrong(153)
43 CheckArmstrong(123)
44 CheckArmstrong(370)
45 CheckArmstrong(9474)
```

**Output:-**

```
Armstrong
Not Armstrong
Armstrong
Armstrong
```

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#### Question 4: Context-Managed Prompting (Optimized Number Classification)

Design a context-managed prompt with clear instructions and constraints to generate an optimized Python program that classifies a number as prime, composite, or neither.

**Task:**

- Ensure proper input validation.
- Optimize the logic for efficiency.
- Compare the output with earlier prompting strategies.

**Prompt:-** write a program on a context-managed that classifies number as prime, composite or neither.

**Code:-**

```

Assignment3.py > ...

48  #Task4
49  # write a program on a context-managed that classifies number as prime, composite or neither.
50  class NumberClassifier:
51      def __init__(self, number):
52          self.number = number
53
54      def __enter__(self):
55          if self.number <= 1:
56              self.classification = "Neither prime nor composite"
57          elif self.number == 2:
58              self.classification = "Prime"
59          else:
60              for i in range(2, int(self.number ** 0.5) + 1):
61                  if self.number % i == 0:
62                      self.classification = "Composite"
63                      break
64          else:
65              self.classification = "Prime"
66
67      return self.classification
68
69      def __exit__(self, exc_type, exc_value, traceback):
70          pass
71
72  with NumberClassifier(7) as classification:
73      print(classification)
74  with NumberClassifier(10) as classification:
75      print(classification)
76  with NumberClassifier(1) as classification:
77      print(classification)
78  with NumberClassifier(13) as classification:
79      print(classification)
80  with NumberClassifier(15) as classification:
81      print(classification)
82

```

### Output:-

```

Prime
Composite
Neither prime nor composite
Prime
Composite
Neither prime nor composite

```

**Question 5: Zero-Shot Prompting (Perfect Number Check)** Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a perfect number.

Task:

- Record the AI-generated code.
- Test the program with multiple inputs.

Code:-

```
#Task5
def perfect_number(n):
    if n < 2:
        return False
    divisors_sum = sum(i for i in range(1, n) if n % i == 0)
    return divisors_sum == n
print(perfect_number(6))
print(perfect_number(28))
print(perfect_number(12))
print(perfect_number(496))
print(perfect_number(15))
```

Output:-

```
True
True
False
True
False
```

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#### Question 6: Few-Shot Prompting (Even or Odd Classification with Validation)

Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python program that determines whether a given number is even or odd, including proper input validation.

Examples:

- Input: 8 → Output: Even
- Input: 15 → Output: Odd
- Input: 0 → Output: Even
- Task: Analyze how examples improve input handling and output clarity.
- Test the program with negative numbers and non-integer inputs.

Prompt:-

input: 8 -> output: Even

write a function to check if a number is even or odd.

**Code:-**

```
Assignment3.py > ...
...
97  #Task6
98  # input: 8 -> output: Even
99  # input: 15 -> output: Odd
100 # input: 0 -> output: Even write a function to check if a number is even or odd.
101 def even_or_odd(number):
102     return "Even" if number % 2 == 0 else "Odd"
103 print(even_or_odd(8))
104 print(even_or_odd(6.2))
105 print(even_or_odd([6/3]))
106 print(even_or_odd(5**0.5))
107 print(even_or_odd(3.14159))
```

**Output:-**

```
Even
Odd
Even
Odd
Odd
```