

# AI Assisted Coding

## ASSIGNMENT 3.1

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Design and refine prompts using different prompting strategies to generate Python programs for basic computational problems.

### 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.

#### Prompt:

Create a Python function that checks if an integer is a palindrome.

Return `True` if it reads the same forward and backward, otherwise return `False`.

## Code:

```
def is_palindrome(n):
    """
    Check if an integer is a palindrome number.

    Args:
        n: An integer to check

    Returns:
        True if n is a palindrome, False otherwise
    """
    # Convert to string and remove negative sign if present
    s = str(abs(n))
    # Compare string with its reverse
    return s == s[::-1]

print(is_palindrome(121)) # Output: True
print(is_palindrome(331)) # Output: False
```

## Output(O/P)

```
[Running] python -u "z:\AIAC\20260113\zeroshot.py"
True
False
```

```
[Done] exited with code=0 in 0.208 seconds
```

## Explanation:

- A zero-shot prompt with no examples was used.
- AI created a Python function to check if a number is a palindrome.
- It works by reversing the number and comparing it to the original.
- The function returns True if it's a palindrome, otherwise False.

## 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:

Here's an example: Input: 5 → Output: 120.

Write a Python function that takes a number as input and returns its factorial.

### Code:

```
1  def factorial(n):
2      """
3          Compute the factorial of a non-negative integer.
4
5      Args:
6          n: A non-negative integer
7
8      Returns:
9          The factorial of n
10         """
11     if n < 0:
12         raise ValueError("Input must be a non-negative integer")
13     if n == 0 or n == 1:
14         return 1
15     return n * factorial(n - 1)
16
17
18 # Example usage
19 if __name__ == "__main__":
20     print(factorial(5)) # Output: 120
21
```

### Output:

```
[Running] python -u "z:\AIAC\20260113\oneshot.py"
120

[Done] exited with code=0 in 0.253 seconds
```

### Explanation:

- One-shot prompting gives the AI a concrete example, making the task clearer.
- Compared to zero-shot, it usually produces code that is more accurate and easier to understand.
- Helps reduce ambiguity about input-output behavior.

### 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.

## Prompt:

Write a Python function that checks 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"  
The function should return "Armstrong Number" if the number is an Armstrong number, otherwise "Not an Armstrong Number".

## Code:

```
1 def check_armstrong(num):
2     """
3         Check whether a given number is an Armstrong number.
4         An Armstrong number is a number that is equal to the sum of its own digits each raised
5         to the power of the number of digits.
6     """
7     try:
8         num_str = str(num)
9         num_digits = len(num_str)
10        sum_of_powers = sum(int(digit) ** num_digits for digit in num_str)
11
12        if sum_of_powers == num:
13            return "Armstrong Number"
14        else:
15            return "Not an Armstrong Number"
16    except ValueError:
17        return "Invalid Input"
18 # Test cases
19 print(check_armstrong(153)) # Armstrong Number
20 print(check_armstrong(370)) # Armstrong Number
21 print(check_armstrong(123)) # Not an Armstrong Number
```

## Output:

```
[Running] python -u "z:\AIAC\20260113\fewshot.py"
Armstrong Number
Armstrong Number
Not an Armstrong Number
```

```
[Done] exited with code=0 in 0.168 seconds
```

## Explanation:

- Checks if a number is an Armstrong number.
- Examples show expected input-output.
- Function returns "Armstrong Number" or "Not an Armstrong Number".
- Including examples makes the prompt clearer and more accurate.

## 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:

You are a Python programmer. Write an optimized Python function that takes a number as input and classifies it as "Prime", "Composite", or "Neither" (for numbers  $\leq 1$ ).

## Constraints:

- Validate the input to ensure it is a positive integer.
- Optimize the logic for efficiency (avoid unnecessary checks).
- Return the classification as a string.

## Code:

```
contextmanaged.py
20260113 > contextmanaged.py > classify_number
1 def classify_number(n):
2     """
3         Classifies a number as Prime, Composite, or Neither.
4
5     Args:
6         n: Input value to classify
7
8     Returns:
9         str: "Prime", "Composite", or "Neither"
10    """
11
12    # Validate input type
13    if not isinstance(n, int) or isinstance(n, bool):
14        return "Neither"
15
16    # Numbers <= 1 are Neither
17    if n <= 1:
18        return "Neither"
19
20    # 2 is prime
21    if n == 2:
22        return "Prime"
23
24    # Even numbers > 2 are composite
25    if n % 2 == 0:
26        return "Composite"
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
```

```
contextmanaged.py
20260113 > contextmanaged.py > ...
26     # Check odd divisors up to sqrt(n)
27     i = 3
28     while i * i <= n:
29         if n % i == 0:
30             return "Composite"
31         i += 2
32
33     return "Prime"
34
35
36
37     # Test cases
38     if __name__ == "__main__":
39         test_cases = [1, 2, 3, 4, 17, 20, 97, 0, -5, 1.5]
40         for num in test_cases:
41             print(f"{num}: {classify_number(num)}")
```

## Output:

```
[Running] python -u "z:\AIAC\20260113\contextmanaged.py"
1: Neither
2: Prime
3: Prime
4: Composite
17: Prime
20: Composite
97: Prime
0: Neither
-5: Neither
1.5: Neither

[Done] exited with code=0 in 0.2 seconds
```

## Explanation:

- The prompt provides clear context: the AI acts as a Python programmer.
- It includes constraints for input validation and optimized logic.
- Helps produce efficient, reliable, and readable code.
- Compared to zero-shot or one-shot prompting, context-managed prompting guides the AI better, improving correctness and performance.

## 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.
- Identify any missing conditions or inefficiencies in the logic.

### Prompt:

Write a Python function that checks whether a given number is a perfect number. The function should return True if it is perfect, and False otherwise.

### Code:

```
1  def is_perfect_number(n):
2      """
3          Check if a number is a perfect number.
4
5          A perfect number equals the sum of its proper divisors (excluding itself).
6          Examples: 6 (1+2+3), 28 (1+2+4+7+14)
7
8      Args:
9          n: Integer to check
10
11     Returns:
12         True if n is a perfect number, False otherwise
13         """
14     if n <= 1:
15         return False
16
17     # Calculate sum of proper divisors
18     divisor_sum = 0
19     for i in range(1, n // 2 + 1):
20         if n % i == 0:
21             divisor_sum += i
22
23     return divisor_sum == n
24
25 print(is_perfect_number(6))    # True
26 print(is_perfect_number(7))    # False
```

### Output:

```
[Running] python -u "z:\AIAC\20260113\perfectnum.py"
True
False

[Done] exited with code=0 in 0.171 seconds
```

### Explanation:

- Zero-shot means no examples are given only the task description.
- The AI generates code based solely on the instruction.
- After generation, you can test with multiple inputs to verify correctness.
- Helps identify missing conditions or inefficiencies in the logic.

## 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:

Write a Python function that checks whether a given number is even or odd. Include proper input validation to handle non-integer inputs.

Examples:

- Input: 8 → Output: "Even"
- Input: 15 → Output: "Odd"
- Input: 0 → Output: "Even"

## Code:

```
1  def check_even_or_odd(number):
2      """Determine if a number is even or odd."""
3      if number % 2 == 0:
4          return "Even"
5      else:
6          return "Odd"
7
8  def main():
9      try:
10         user_input = input("Enter a number: ")
11         number = int(user_input)
12         result = check_even_or_odd(number)
13         print(f"Output: {result}")
14     except ValueError:
15         print("Invalid input. Please enter a valid integer.")
16
17 if __name__ == "__main__":
18     main()
```

## Output:

```
Enter a number: 2
```

```
Output: Even
```

```
PS Z:\AIAC> █
```

## Explanation:

- Few-shot prompting provides multiple examples to guide the AI.
- Examples help the AI understand expected outputs and edge cases.
- Ensures the program handles input validation clearly.
- Improves accuracy when testing with negative numbers, zero, or non-integer inputs.