Worksheet 14: Python While Loop

Name: _____ Date: _____

Instructions

- Answer in the blanks.
- For “write code” questions, write valid Python code.
- For “what does it print” questions, write the exact output.

Part A — While Loop Basics

1) Fill in the blanks: What is a `while` loop?

A `while` loop keeps running while the condition is _____. (True or False?)

- The condition is checked _____ each loop. (Before or after?)
- The code inside the loop must be indented _____ spaces.
- If variables inside the loop don't change, the while loop _____ stop. (Will or won't?)

2) What does this print?

```
i = 3

while i <= 7:
    print(i)
    i = i + 2
```

Output:

```

```

3) Fix the infinite loop

This loop will never stop. Add **one line** so it counts down and stops.

```
n = 5

while n > 0:
    print(n)
    # add one line here
```

Expected output:

```
5
4
3
2
1
```

4) What does this print?

```
x = 1
total = 0

while x <= 4:
    total = total + x
    x = x + 1

print(total)
```

Output:

```

```

Part B — Digits with `//` and `%`

5) Count digits

What is the output?

```
n = 9000
count = 0

while n > 0:
    count = count + 1
    n = n // 10

print(count)
```

Output:

```

```

6) Sum of digits

What is the output?

```
n = 507
total = 0

while n > 0:
    x = n % 10
    total = total + x
    n = n // 10

print(total)
```

Output:

```

```

7) Product of digits (write code)

Write code to compute the **product** of the digits of `n = 2468`.

(Example: for `2468`, the answer is `2 * 4 * 6 * 8`.)

```
n = 2468

product = 1

# complete the code:
```

8) Count even digits

What is the output?

```
n = 24861
count_even = 0

while n > 0:
    digit = n % 10
    if digit % 2 == 0:
        count_even = count_even + 1
    n = n // 10

print(count_even)
```

Output:

```
```

Part C — Lists with `while`

9) Fibonacci numbers up to 20

What is the output?

```
fib = [1, 1]

while fib[-2] + fib[-1] <= 20:
    fib.append(fib[-2] + fib[-1])

print(fib)
```

Output:

```

```

10) Squares up to 50 (write code)

Build a list of squares `1 * 1, 2 * 2, 3 * 3, ...` while the square is `<= 50`.

Complete the code:

```
squares = []
i = 1

while _________________:
    ______________________________  # append something to the list
    ______________________________  # increment i

print(squares)
```

Expected output:

```
[1, 4, 9, 16, 25, 36, 49]
```

11) Traverse a list with an index

What is the output?

```
numbers = [10, 20, 30]
i = 0

while i < len(numbers):
    print(numbers[i])
    i = i + 1
```

Output:

```

```

Part D — Collatz Game

12) Collatz list

What is the output?

```
n = 6
result = [n]

while n != 1:
    if n % 2 == 0:
        n = n // 2
    else:
        n = 3 * n + 1
    result.append(n)

print(result)
```

Output:

```

```

13) Fill in the Collatz rules

Understand the code in Question 12. Then fill in the blanks:

- If `n` is even: `n = _____`
- If `n` is odd: `n = _____`

14) Challenge: Count Collatz steps (write code)

- Start with `n = 7`. Count how many steps it takes to reach `1`.
- Rules are defined in Question 12 and Question 13.
- Print the number of steps (do **not** count the starting number as a step).

```
n = 7
steps = 0

while n != 1:
    if ____________________:  # n is even
        n = _______________
    else:                     # n is odd
        n = _______________
    steps = _______________

print(steps)
```

Expected output:

```
16
```