📚 Module 3: Number Properties (Even & Odd) - Complete Notes

🎯 What You'll Learn

In this module, you'll master **parity** — the concept of even and odd numbers. This simple idea powers alternating patterns, toggle switches, pair matching, and so much more in programming.

📖 Concept Explained (Like a YouTube Video)

The Basics

Here's the million-dollar question: **How does a computer know if a number is even or odd?**

It divides by 2 and checks the **remainder**!

```
Even: remainder is 0 when divided by 2
Odd: remainder is 1 when divided by 2
```

The Modulo Operator: Your "Parity Detector"

```
10 % 2 = 0  (even)
11 % 2 = 1  (odd)
0 % 2 = 0   (zero is even!)
```

💻 Programming Connection

Code Examples

```python
# Example 1: Check Even or Odd
def is_even(n):
    return n % 2 == 0

def is_odd(n):
    return n % 2 != 0
```

```python
# Example 2: Zebra Striping (Alternating Rows)
items = ["Apple", "Banana", "Cherry", "Date", "Elderberry"]

for i, item in enumerate(items):
    if i % 2 == 0:
        style = "⬜ Light"
    else:
        style = "⬛ Dark"
    print(f"{style}: {item}")
```

```python
# Example 3: Toggle Switch
def toggle(current_state):
    return 1 - current_state
    # 0 → 1, 1 → 0
```

🧪 SDET/Testing Application

```python
# SDET Scenario: Distribute Tests Across Runners

def distribute_tests(test_list, num_runners=2):
    distribution = {i: [] for i in range(num_runners)}
    for i, test in enumerate(test_list):
        runner_id = i % num_runners
        distribution[runner_id].append(test)
    return distribution
```

🔑 Key Takeaways

✅ **Even:** `n % 2 == 0`
✅ **Odd:** `n % 2 != 0`
✅ **Zero is EVEN**
✅ **Alternating pattern uses index % 2**

Next up: Module 4 - Basic Operations! 🚀