>>>> Day 6-10:

🔹 1. Loops in Python

Loops are used to repeat a block of code multiple times.

➤ `for` Loop

Used when the number of iterations is known.

```
for i in range(1, 6):
    print(i)
```

Output:

```
1
2
3
4
5
```

➤ `while` Loop

Used when the number of iterations is unknown and depends on a condition.

```
i = 1
while i <= 5:
    print(i)
    i += 1
```

Key points:

- Use `break` to stop the loop early.
- Use `continue` to skip the current iteration.

🔹 2. Armstrong Number

A number that equals the sum of its digits each raised to the power of the number of digits.

Example:
153 → $1^3 + 5^3 + 3^3 = 153$ ✅

```
num = int(input("Enter a number: "))
digits = [int(d) for d in str(num)]
power = len(digits)

if sum(d ** power for d in digits) == num:
    print("Armstrong Number")
else:
    print("Not an Armstrong Number")
```

🔹 3. Palindrome Number

A number that reads the same forward and backward.

Example: 121 → same from both sides ✅

```
num = int(input("Enter a number: "))
if str(num) == str(num)[::-1]:
    print("Palindrome Number")
else:
    print("Not a Palindrome")
```

🔹 4. Power of a Number (Using Loops)

```
base = int(input("Enter base: "))
exp = int(input("Enter exponent: "))
result = 1

for i in range(exp):
    result *= base

print(f"{base}^{exp} = {result}")
```

Logic: Multiply the base repeatedly `exp` times.

🔹 5. Reverse a Number

Example:
Input → 1234
Output → 4321

```
num = int(input("Enter a number: "))
rev = 0

while num > 0:
    digit = num % 10
    rev = rev * 10 + digit
    num //= 10

print("Reversed Number:", rev)
```

🔹 6. Sum of Digits

Example:
Input → 1234 → Output → 10

```
num = int(input("Enter a number: "))
total = 0

while num > 0:
    total += num % 10
    num //= 10

print("Sum of digits:", total)
```

🔹 7. GCD (Greatest Common Divisor) and LCM (Least Common Multiple)

Using Euclidean Algorithm:

```
a = int(input("Enter first number: "))
b = int(input("Enter second number: "))

x, y = a, b
while y != 0:
    x, y = y, x % y

gcd = x
lcm = (a * b) // gcd

print(f"GCD = {gcd}")
print(f"LCM = {lcm}")
```

✅ **Formula:**

LCM(a,b)=a×bGCD(a,b)\text{LCM}(a,b) = \frac{a \times b}{\text{GCD}(a,b)}LCM(a,b)=GCD(a,b)a×b

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🗒️ **Summary Table**

Concept	Description	Example
Armstrong	Sum of digits raised to power of digits count equals number	153
Palindrome	Reads same backward	121
Power of Number	Base × Base × ... (exp times)	2^5 = 32
Reverse Number	Reverse digits order	123 → 321
Sum of Digits	Add all digits	123 → 6
GCD	Largest common divisor	12 & 18 → 6
LCM	Smallest common multiple	12 & 18 → 36