# 1. Mathematical Expressions

* Use **arithmetic operators** to perform calculations.
* Common operators: +, -, \*, /, // (floor division), % (modulus), \*\* (exponentiation).

## Examples:

a = 10

b = 3

sum = a + b # Addition → 13

diff = a - b # Subtraction → 7

prod = a \* b # Multiplication → 30

quot = a / b # Division (float) → 3.3333...

floor-div = a // b # Floor division → 3

mod = a % b # Modulus (remainder) → 1

power = a \*\* b # Exponentiation → 1000

# 2. Logical Expressions

* Use **logical operators** to combine boolean expressions.
* Operators: and, or, not.
* Result is always a boolean (True or False).

## Examples:

x = True

y = False

result1 = x and y # False (both must be True)

result2 = x or y # True (one or both True)

result3 = not x # False (negates x)

# 3. Comparison Expressions

* Use **comparison operators** to compare two values.
* Operators: ==, !=, <, >, <=, >=.
* Result is a boolean (True or False).

## Examples:

a = 5

b = 10

print(a == b) # False (equal to)

print(a != b) # True (not equal to)

print(a < b) # True (less than)

print(a > b) # False (greater than)

print(a <= 5) # True (less than or equal)

print(b >= 10) # True (greater than or equal)

# 4. Bitwise Expressions

* Work with bits (binary digits).
* Operators: & (AND), | (OR), ^ (XOR), ~ (NOT), << (left shift), >> (right shift).

## Examples:

a = 6 # binary 110

b = 3 # binary 011

print(a & b) # 2 (binary 010) bitwise AND

print(a | b) # 7 (binary 111) bitwise OR

print(a ^ b) # 5 (binary 101) bitwise XOR

print(~a) # -7 (bitwise NOT, flips bits)

print(a << 1) #12 (binary 1100) left shift by 1 bit

print(b >> 1) #1 (binary 001) right shift by 1 bit

# 5. Ternary Expression (Conditional Expression)

* Shortcut for simple if-else.
* Syntax: value\_if\_true if condition else value\_if\_false

## Examples:

age = 20

status = "Adult" if age >= 18 else "Minor"

print(status) # Output: Adult

num = 15

result = "Even" if num % 2 == 0 else "Odd"

print(result) # Output: Odd