Chapter 4: Arithmetic and Comparison Operators

How Python calculates and compares values

🧠 Introduction

Python is great at math and logic. In this chapter, we'll cover:

- Arithmetic Operators (for math)
- Comparison Operators (for checking conditions)
- Order of operations (PEMDAS)
- Practice problems and a mini-project

By the end, you'll be able to build calculators and decision-making logic with ease.

➕ Arithmetic Operators

These are used to perform basic math:

Operator	Meaning	Example	Result
`+`	Addition	`4 + 3`	`7`
`-`	Subtraction	`9 - 5`	`4`
`*`	Multiplication	`6 * 2`	`12`
`/`	Division	`8 / 4`	`2.0`
`//`	Floor Division	`9 // 2`	`4`
`%`	Modulus (Remainder)	`9 % 2`	`1`
`**`	Exponentiation	`2 ** 3`	`8`

Code Example:

```
x = 10
y = 3

print(x + y)
print(x - y)
print(x * y)
print(x / y)
print(x // y)
print(x % y)
print(x ** y)
```

🔢 Order of Operations (PEMDAS)

Python follows math rules:

- **P**: Parentheses `()`
- **E**: Exponents `**`
- **MD**: Multiply/Divide (`*`, `/`, `//`, `%`)
- **AS**: Add/Subtract (`+`, `-`)

Example:

```
print(2 + 3 * 4)       # → 14
print((2 + 3) * 4)     # → 20
```

Use parentheses to control calculation order.

🧪 Comparison Operators

These check if values are equal, larger, or smaller.

Operator	Meaning	Example	Result
`==`	Equal to	`5 == 5`	`True`
`!=`	Not equal to	`4 != 3`	`True`
`>`	Greater than	`10 > 7`	`True`
`<`	Less than	`2 < 1`	`False`
`>=`	Greater than or equal to	`6 >= 6`	`True`
`<=`	Less than or equal to	`3 <= 2`	`False`

Code Example:

```python
age = 18
print(age >= 18)  # → True

x = 5
y = 10

print(x < y)      # → True
print(x == y)     # → False
```

🧠 Tips and Mistakes

✓ Use `==` to **compare**, not `=`
✓ Strings compare alphabetically: `"apple" < "banana"` → `True`
✗ Don't confuse `=` (assign) with `==` (check)

🧪 Mini Quiz

1. What is `5 != 5`?
2. Is `"Apple" == "apple"` true?
3. What is `6 <= 6`?

🧮 Mini-Project Exercise

🎯 *Create a calculator that takes two numbers and compares them*

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

print("Sum:", a + b)
print("Difference:", a - b)
print("Product:", a * b)
print("Quotient:", a / b)

if a > b:
    print("First number is greater.")
elif a < b:
    print("Second number is greater.")
else:
    print("Both numbers are equal.")
```

📝 Practice Exercises

✅ Basic

1. Calculate `12 + 15`
2. Divide `9` by `2` using floor division
3. Check if `10 == 10`
4. Test if `7 < 5`
5. Write a math expression using all four basic operators

🚀 Intermediate

A1. Ask the user for three numbers and print their total using parentheses.
A2. Write a program to compare two input numbers and say which is larger.
A3. Write a program that checks if a number is both **even** and **greater than 10**
