🎬 Operators & Expressions in Python

☑ What is an Operator?

An **operator** is a symbol that performs a specific operation on one or more values (called operands).

Examples of operators:

- `+, -, *, /` → Arithmetic

- `==, !=, <, >` → Comparison

- `and, or, not` → Logical

- `&, |, ^` → Bitwise

☑ What is an Expression?

An **expression** is a combination of **variables**, **values**, and **operators** that **evaluates to a result**.

📦 Example:

```
x = 10 + 5   # ← '10 + 5' is an expression; '+' is the operator
```

➕ 1. Arithmetic Operators

Used for math calculations.

```
a = 10
b = 3

print(a + b)   # Addition → 13
print(a - b)   # Subtraction → 7
print(a * b)   # Multiplication → 30
```

```python
print(a / b)   # Division → 3.333...
print(a % b)   # Modulus → 1
print(a ** b)  # Exponent → 1000
print(a // b)  # Floor division → 3
```

⚖️ 2. Comparison Operators

Used to compare values — returns `True` or `False`.

```python
x = 5
y = 10

print(x == y)  # False
print(x != y)  # True
print(x < y)   # True
print(x >= y)  # False
```

🧠 3. Logical Operators

Used to combine multiple conditions.

```python
a = True
b = False

print(a and b)  # False
print(a or b)   # True
print(not a)    # False
```

⚡ 4. Bitwise Operators

Works on bits (binary-level operations) — commonly used in systems, sensors, etc.

```python
a = 5   # 0101
b = 3   # 0011
```

```
print(a & b)  # AND → 1  (0001)
print(a | b)  # OR  → 7  (0111)
print(a ^ b)  # XOR → 6  (0110)
print(~a)     # NOT → -6 (inverts bits)
print(a << 1) # Left shift → 10
print(a >> 1) # Right shift → 2
```

🎯 Wrap Up with a Quick Comparison Table:

Category	Examples	Use Case
Arithmetic	+, -, *	Math operations
Comparison	==, !=, <	If conditions, logic
Logical	and, or, not	Combining conditions
Bitwise	&, `, ^`	

✅ Real-Time Examples Using Operators

🧮 1. Calculate Total Bill with Tax & Discount (Arithmetic + Comparison)

Problem:
You're building a billing system for a store.
If the total is above ₹1000, apply 10% discount.

```python
amount = 1200
tax = amount * 0.18     # 18% tax
total = amount + tax

# Apply discount if total > 1000
if total > 1000:
    discount = total * 0.10
    total -= discount

print("Final bill:", total)
```

✅ Uses:

- *, +, - → Arithmetic

- \> → Comparison

🎟 3. Movie Ticket Discount System (Logical + Comparison)

Problem:
If the user is either a **student** or **senior citizen**, give discount.

```python
age = 65
student = 'yes'

if age >= 60 or student=='yes':
    print("You get a discount!")
else:
    print("No discount")
```

✅ Uses:

- \>= → Comparison

- or → Logical

About the Author

Gowtham SB is a **Data Engineering expert, educator, and content creator** with a passion for **big data technologies, as well as cloud and Gen AI** . With years of experience in the field, he has worked extensively with **cloud platforms, distributed systems, and data pipelines**, helping professionals and aspiring engineers master the art of data engineering.

Beyond his technical expertise, Gowtham is a **renowned mentor and speaker**, sharing his insights through engaging content on **YouTube and LinkedIn**. He has built one of the **largest Tamil Data Engineering communities**, guiding thousands of learners to excel in their careers.

Through his deep industry knowledge and hands-on approach, Gowtham continues to **bridge the gap between learning and real-world implementation**, empowering individuals to build **scalable, high-performance data solutions**.

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🤝**Connect for 1:1** - https://topmate.io/dataengineering/

💼**LinkedIn** - https://www.linkedin.com/in/sbgowtham/

🌐**Website** - https://codewithgowtham.blogspot.com

💻**GitHub** - http://github.com/Gowthamdataengineer

💬**Whats App** - https://lnkd.in/g5JrHw8q

📧**Email** - atozknowledge.com@gmail.com

🗒 **All My Socials** - https://lnkd.in/gf8k3aCH

Gowtham SB
www.linkedin.com/in/sbgowtham/   Instagram - @dataengineeringtamil