**Day4\_Learning Guide\_Session 4 - Booleans & Comparison Operators in Python**

**What are Booleans?**

A **Boolean** is a data type that can only have two values:

* True
* False

Think of Booleans like yes/no questions or on/off switches. They're used to represent truth - something is either true or it's false, nothing in between.

**Creating Booleans**

# Direct assignment

is\_sunny = True

is\_raining = False

# Boolean variables in action

has\_license = True

is\_adult = False

print(is\_sunny) # Output: True

print(is\_raining) # Output: False

**Important**: Notice that *True* and *False* are capitalized and have no quotes around them. With quotes, they become strings:

# These are Booleans

correct = True

wrong = False

# These are strings (text)

not\_boolean1 = "True"

not\_boolean2 = "false"

print(type(correct)) # Output: <class 'bool'>

print(type(not\_boolean1)) # Output: <class 'str'>

**Comparison Operators**

Comparison operators compare two values and return a Boolean result (True or False).

**1. Equal to (==)**

Checks if two values are exactly the same:

# Numbers

print(5 == 5) # Output: True

print(5 == 3) # Output: False

# Strings

print("hello" == "hello") # Output: True

print("Hello" == "hello") # Output: False (case matters)

# Variables

age = 25

legal\_age = 18

print(age == 25) # Output: True

print(age == legal\_age) # Output: False

# Real-world example

user\_password = "secret123"

entered\_password = "secret123"

if user\_password == entered\_password:

print("Access granted!") # Output: Access granted!

**2. Not equal to (!=)**

Checks if two values are different:

# Numbers

print(5 != 3) # Output: True

print(5 != 5) # Output: False

# Strings

print("cat" != "dog") # Output: True

print("hello" != "hello") # Output: False

# Real-world example

current\_user = "admin"

guest\_user = "visitor"

if current\_user != guest\_user:

print("Different users") # Output: Different users

**3. Greater than (>)**

Checks if the left value is bigger than the right:

# Numbers

print(10 > 5) # Output: True

print(3 > 8) # Output: False

print(5 > 5) # Output: False (equal is not greater)

# Variables

score = 85

passing\_grade = 70

print(score > passing\_grade) # Output: True

# Real-world example

temperature = 75

comfortable\_temp = 72

if temperature > comfortable\_temp:

print("It's warm today!") # Output: It's warm today!

**4. Less than (<)**

Checks if the left value is smaller than the right:

# Numbers

print(3 < 8) # Output: True

print(10 < 5) # Output: False

print(5 < 5) # Output: False (equal is not less)

# Real-world example

bank\_balance = 50

item\_cost = 75

if bank\_balance < item\_cost:

print("Not enough money") # Output: Not enough money

**5. Greater than or equal to (>=)**

Checks if the left value is bigger than OR equal to the right:

# Numbers

print(10 >= 5) # Output: True (10 is greater than 5)

print(5 >= 5) # Output: True (5 equals 5)

print(3 >= 8) # Output: False

# Real-world example

student\_age = 18

minimum\_age = 18

if student\_age >= minimum\_age:

print("Eligible to vote") # Output: Eligible to vote

**6. Less than or equal to (<=)**

Checks if the left value is smaller than OR equal to the right:

# Numbers

print(3 <= 8) # Output: True (3 is less than 8)

print(5 <= 5) # Output: True (5 equals 5)

print(10 <= 5) # Output: False

# Real-world example

speed\_limit = 65

current\_speed = 60

if current\_speed <= speed\_limit:

print("Driving safely") # Output: Driving safely

**Practical Examples**

**Example 1: Age Verification System**

user\_age = 22

drinking\_age = 21

driving\_age = 16

# Multiple comparisons

can\_drive = user\_age >= driving\_age

can\_drink = user\_age >= drinking\_age

is\_teenager = user\_age >= 13 and user\_age <= 19

print(f"Age: {user\_age}")

print(f"Can drive: {can\_drive}") # Output: True

print(f"Can drink: {can\_drink}") # Output: True

print(f"Is teenager: {is\_teenager}") # Output: False

**Example 2: Grade System**

item\_price = 29.99

user\_budget = 50.00

discount\_threshold = 100.00

# Price comparisons

can\_afford = user\_budget >= item\_price

qualifies\_for\_discount = item\_price >= discount\_threshold

is\_expensive = item\_price > 25.00

print(f"Item price: ${item\_price}")

print(f"Budget: ${user\_budget}")

print(f"Can afford: {can\_afford}") # Output: True

print(f"Qualifies for discount: {qualifies\_for\_discount}") # Output: False

print(f"Is expensive: {is\_expensive}") # Output: True

**Example 3: Shopping Cart**

item\_price = 29.99

user\_budget = 50.00

discount\_threshold = 100.00

# Price comparisons

can\_afford = user\_budget >= item\_price

qualifies\_for\_discount = item\_price >= discount\_threshold

is\_expensive = item\_price > 25.00

print(f"Item price: ${item\_price}")

print(f"Budget: ${user\_budget}")

print(f"Can afford: {can\_afford}") # Output: True

print(f"Qualifies for discount: {qualifies\_for\_discount}") # Output: False

print(f"Is expensive: {is\_expensive}") # Output: True

**Using Booleans with if Statements**

Booleans work perfectly with *if* statements for decision making:

# Simple boolean check

is\_logged\_in = True

if is\_logged\_in:

print("Welcome to your dashboard!")

# Using comparison operators

password = "python123"

user\_input = "python123"

if password == user\_input:

print("Login successful!")

else:

print("Wrong password!")

# Multiple conditions

age = 25

has\_license = True

if age >= 18 and has\_license:

print("You can rent a car")

elif age >= 18:

print("You're old enough but need a license")

else:

print("Too young to rent a car")

**Common Boolean Expressions**

# Checking if a number is even

number = 10

is\_even = (number % 2) == 0

print(f"{number} is even: {is\_even}") # Output: 10 is even: True

# Checking if a string is empty

user\_name = ""

is\_empty = user\_name == ""

# or better: is\_empty = len(user\_name) == 0

print(f"Name is empty: {is\_empty}") # Output: Name is empty: True

# Range checking

temperature = 75

is\_comfortable = temperature >= 68 and temperature <= 78

print(f"Temperature is comfortable: {is\_comfortable}") # Output: True

**Boolean with Strings**

# String comparisons

name1 = "Alice"

name2 = "Bob"

name3 = "alice"

print(name1 == name2) # Output: False

print(name1 == name3) # Output: False (case sensitive)

print(name1.lower() == name3.lower()) # Output: True (case insensitive)

# Alphabetical comparison

print("apple" < "banana") # Output: True (alphabetical order)

print("zebra" > "apple") # Output: True

**Combining Boolean Values**

You can combine boolean values using *and*, *or*, and *not*:

# AND operator (both must be True)

sunny = True

warm = True

perfect\_day = sunny and warm

print(f"Perfect day: {perfect\_day}") # Output: Perfect day: True

# OR operator (at least one must be True)

has\_umbrella = False

inside\_building = True

stay\_dry = has\_umbrella or inside\_building

print(f"Will stay dry: {stay\_dry}") # Output: Will stay dry: True

# NOT operator (flips True/False)

is\_raining = False

good\_for\_picnic = not is\_raining

print(f"Good for picnic: {good\_for\_picnic}") # Output: Good for picnic: True

**Key Points to Remember**

1. **Booleans are either True or False** (capitalized, no quotes)
2. **Comparison operators return Booleans** - they answer yes/no questions
3. **Use == for equality, not =** - = assigns, == compares
4. **Comparisons are case-sensitive** for strings
5. **You can store comparison results in variables** for later use
6. **Perfect for if statements** - they control program flow

**Summary Table**

| **Operator** | **Meaning** | **Example** | **Result** |
| --- | --- | --- | --- |
| == | Equal to | 5 == 5 | True |
| != | Not equal to | 5 != 3 | True |
| > | Greater than | 10 > 5 | True |
| < | Less than | 3 < 8 | True |
| >= | Greater than or equal | 5 >= 5 | True |
| <= | Less than or equal | 3 <= 8 | True |

Booleans and comparison operators are essential for making decisions in your programs. They help your code respond differently based on different conditions, making your programs smart and interactive!