## What are variables in python ?

Variables in Python are essentially **reserved memory locations to store values**. Think of them as named containers or labels that you use to hold data in your programs. When you create a variable, you're telling Python to set aside a space in memory, and you're giving that space a name so you can refer to it later.

Here's a breakdown of key aspects of variables in Python:

1. **Naming Convention:**
    - Variable names must start with a letter (a-z, A-Z) or an underscore (_).
    - They can contain letters, numbers (0-9), and underscores.
    - They are case-sensitive (myVar is different from myvar).
    - Keywords (like if, for, while, True, False, etc.) cannot be used as variable names.
    - It's good practice to use descriptive names (e.g., user_age instead of ua).
    - Python's conventional style for variable names is snake_case (all lowercase, words separated by underscores).
2. **Assignment:**
    - You assign a value to a variable using the assignment operator (=).
    - Example: name = "Alice" assigns the string "Alice" to the variable name.
    - Example: age = 30 assigns the integer 30 to the variable age.
3. **Dynamic Typing:**
    - Python is a **dynamically typed** language. This means you don't need to declare the data type of a variable explicitly when you create it. Python automatically infers the type based on the value you assign.
    - You can even reassign a variable to a different type later:

```
Python

x = 10       # x is an integer
x = "hello"  # now x is a string
```

- This is in contrast to statically typed languages (like Java or C++) where you'd typically declare int age = 30; and couldn't later assign a string to age.

4. **No Fixed Memory Location (Reference Semantics):**
    - Unlike some other languages, a Python variable doesn't strictly *contain* the value in a fixed memory slot. Instead, it holds a **reference** (or pointer) to a memory location where the actual data object resides.
    - When you reassign a variable, you're simply making it refer to a different object in memory. The old object (if no longer referenced) will eventually be garbage collected.
5. **Types of Data Variables Can Hold:** Python variables can hold various types of data, including:
    - **Numbers:**
        - int (integers: 10, -5, 0)
        - float (floating-point numbers: 3.14, -0.5, 2.0)
        - complex (complex numbers: 1 + 2j)
    - **Text:**
        - str (strings: "Hello", 'Python')
    - **Boolean:**
        - bool (True, False)
    - **Collections:**
        - list (ordered, mutable sequence: [1, 2, 3])
        - tuple (ordered, immutable sequence: (1, 2, 3))

        - dict (unordered, mutable key-value pairs: {'name': 'Bob', 'age': 25})
        - set (unordered, mutable collection of unique items: {1, 2, 3})
    - And many more custom objects, functions, etc.