📘 Python Variables and Data Types Tutorial

Variables are containers that store values.

Let's create some variables:

```
name = "Vipin"     # string (text inside quotes)
age = 22           # integer (whole number)
height = 5.9       # float (decimal number)

print("Name:", type(name))
print("Age:", age)
print("Height:", height)
```

```
Name: <class 'str'>
Age: 22
Height: 5.9
```

```
a3="house"
```

📝 Strings in Python

Strings are sequences of characters inside quotes.

```
text1 = "Hello World"   # using double quotes
text2 = 'Python Rocks'  # using single quotes
text3 = str(12345)      # using str() function

print(text1)
print(text2)
print(text3, "→ now it's a string, not a number!")
```

```
num = str(3)
name= "vipin"
print(num + name)
```

```
3vipin
```

🔢 Integers and Floats

Integers = whole numbers

Floats = numbers with decimals

```
 def test(num1, num2):
  num1 = 10       # integer
  num2 = 3.14     # float

  print("num1:", num1, "is of type:", type(num1))
  print("num2:", num2, "is of type:", type(num2))
  # print(type(num1 + num2))
  sum=num1+ num2
  return sum
```

input

```
input_text=int(input("Enter a number: "))
print(input_text)
```

```
Enter a number: 55
55
```

⚠️ TypeError Example

Let's see what happens when we mix data types incorrectly.

```
x = 7       # integer
y = "8"     # string (because it's inside quotes)

# Uncomment the next line to see the error:
# print(x + y)

# The error will say: TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
/tmp/ipython-input-1835189738.py in <cell line: 0>()
      3 
      4 # Uncomment the next line to see the error:
----> 5 print(x + y)
      6 
      7 # The error will say: TypeError: unsupported operand type(s) for +: 'int' and 'str'

TypeError: unsupported operand type(s) for +: 'int' and 'str'
```

✅ Identifying Data Types with type()

```
a = "Python"
b = 2
c = 2.5

print(a, "is of type:", type(a))
print(b, "is of type:", type(b))
print(c, "is of type:", type(c))
```

🔄 Implicit Conversion

Python automatically converts smaller data types to larger (int → float)

```
num_int = 5
num_float = 2.5
result = num_int + num_float

print("Result:", result)
print("Type of result:", type(result))
```

🔄 Explicit Conversion (Typecasting)

Converting between data types using int(), float(), str()

```
# Convert string to integer
num_str = "100"
converted_num = int(num_str)

print("Before:", num_str, type(num_str))
print("After:", converted_num, type(converted_num))

# Convert float to string
pi = 3.14159
pi_str = str(pi)
```

```
print("Before:", pi, type(pi))
print("After:", pi_str, type(pi_str))
```

⌨️ Input and Output in Python

```
# Input always takes data as a string
user_name = input("Enter your name: ")
user_age = input("Enter your age: ")

print("Hello", user_name, "👋 You are", user_age, "years old.")

# To use numbers from input, convert them:
age_int = int(user_age)
print("Next year, you will be:", age_int + 1)
```

🐞 Debugging Tip

If your code shows an error, always read the last line carefully.

It tells you the exact problem (like TypeError, ValueError, etc.).

Example:

Uncomment to test:

wrong_number = int("Hello") # ValueError: invalid literal for int()

📝 Sample Problems

Problem 1: String and Integer

Ask the user for their name and age, then print a sentence like: 👉 "Hello Rahul, you are 21 years old."

Hint: Use input() and print() with string concatenation or f-strings.

Problem 2: Add Two Numbers

Take two numbers from the user and print their sum.

Hint: Remember input() gives a string → convert it to int or float.

Problem 3: Type Checking

Create variables:

"Python"

25

3.14

Print their type using the type() function.

Problem 4: TypeError Experiment

Try adding an integer and a string. Observe the error, then fix it using type conversion.

Example:

x = 10 y = "20" print(x + y) # ❌ error

Fix using int(y) or str(x).

Problem 5: Implicit Conversion

Take two variables:

a = 7 (int)

b = 3.5 (float) Add them and check the type of the result.

Problem 6: Explicit Conversion Convert:

String "**1234**" → Integer

Float **99.99** → String

Print before and after conversion with types.