1. What happens if you assign a string value to a variable that previously held an integer?

Answer:

Initially, the variable holds a reference to the integer value/object. When I assign a string value to the same variable, the **variable references the new string value/object** instead because python is **dynamically typed**, meaning variables can reference values/objects of different types at any time.

2. How can you check the data type of a variable in Python?

Answer:

To check the data type of a variable we can use the **type()** function like: **type(variable_name).**

3. What's the difference between int("15") and str(15)?

Answer:

Aspect	int("15")	str(15)
Purpose	Type casting	Type casting
Conversion	String to Integer	Integer to String
Output	"15" => 15	15 => "15"
Return type	int	String

4. Write a Python program that takes two numbers as input from the user. Performs the following arithmetic operations:

- Addition
- Subtraction
- Multiplication
- Division
- Modulus
- Exponentiation

Answer:

```
num1 = int(input("Enter num1: "))
num2 = int(input("Enter num2: "))
print("Addition",num1 + num2)
print("Subtraction", num1 - num2)
print("Multiplication", num1 * num2)
print("Division", num1 / num2)        # num2 != 0
print("Modulus", num1 % num2)
print("Exponentiation", num1 ** num2)
```

5. How can you take multiple inputs from the user in a single line?
Answer:

var1, var2 = input("Enter two names: ").split() # split() separate on whitespace
Or,
var1, var2 = map(int, input("Enter two numbers: ").split()) # use map() to convert input() to a specific type.

6. What happens if you try to convert a string like "hello" to an integer using int()?
Answer:

Python will raise an **error** message (ValueError exception) because “hello” contains **non-numeric** characters that int() function cannot convert to integer.

7. Can a variable change its data type during program execution in Python?
Answer:

Yes. Because python is a dynamically typed language.

8. What’s the difference between the print() and input() functions?
Answer:

Aspect	print()	input()
Purpose	Displays output to console	Accepts user input from console
Syntax	print("What's your name?")	input("Enter your name: ")
Return	None	String

9. Why does input() always return a string, and how do you handle it?
Answer:

The input() always returns a string, this is a **built-in** feature of python to handle input to textual data.
We can explicitly use **type casting** techniques like: int(), float(), bool(), complex() these functions to handle this problem.

10. How would you convert the string "15.5" to an integer, float, boolean & complex?
Answer:

Aspect	Integer	Float	Boolean	Complex
Conversion	int(float("15.5"))	float("15.5")	bool("15.5")	complex("15.5")
Output	15	15.5	True	15.5+0j

Bonus Question

1. How does a variable work in memory? In Python, does it hold a reference or a value?

Answer:

When we assign a value to a variable, the variable holds a reference to the object/value in memory.
In Python, variables hold references to objects/values.

2. What is the difference between mutable and immutable data types? Explain with real-life Examples.

Answer:

Aspect	Mutable	Immutable
Concept	Can be changed after creation	Cannot be changed after creation
Data types	list, set, dict	int, float, str, bool , tuple
Memory	Modified in place,same object	New object created after change

Example:

```
name = "ziaul"
name[0] = "Z"  # This will raise an error because strings are
immutable in Python.

list1 = [1, 2, 3]
list1[0] = 4  # This is a valid operation because lists are mutable
in Python.
```

3. What is the difference between type conversion and type casting in Python?

Answer:

Aspect	Type Conversion (Implicit)	Type Casting (Explicit)
Concept	Automatic conversion of data type	Manual conversion of data type
Use case	Prevent data loss	Change data type when needed
Syntax	a = 3, b = 3.3 , c = a + b	int(15.5) , int("16")
Control	Python control this process	Programmer control this process

4. What data type is always returned from input() in Python, and how can it be used as a numeric type?

Answer:

input() function always returns **str** data type.
We can use **int()** or **float()** for type casting from string to numeric type.

5. What happens when multiple values are given inside the print() function?

Answer:

When multiple values are given inside the print() function like: print(10 20) , python raises an **error (SyntaxError).**
To avoid this we can use “,” like: print(10 , 20)