Expressions and Statements in Python

Python, like all programming languages, is built on two fundamental building blocks: **expressions** and **statements**. Understanding the difference between them is essential for writing efficient and readable code.

Expressions in Python

An **expression** is a combination of values, variables, operators, and function calls that are evaluated to produce a result. Expressions always return a value. They are primarily used in assignments and function calls.

Examples of Expressions:

```
x = 10 + 5  # 10 + 5 is an expression

y = x * 2   # x * 2 is an expression

z = (y - 3) / 2  # (y - 3) / 2 is an expression
```

Here, 10 + 5, x * 2, and (y - 3) / 2 are all expressions because they evaluate to a value.

Types of Expressions:

1. **Arithmetic Expressions:** These involve arithmetic operators (+, -, *, /, %, //, **).
2. result = (5 + 3) * 2 # Arithmetic expression
3. **Comparison Expressions:** These evaluate to True or False using comparison operators (==, !=, <, >, <=, >=).
4. is_greater = (10 > 5) # True
5. **Logical Expressions:** These use logical operators (and, or, not) to return Boolean values.
6. flag = (10 > 5) and (5 < 8) # True
7. **Function Call Expressions:** These involve function calls that return values.
8. length = len("Python") # Returns 6

Since expressions always return a value, they can be used in assignments, conditions, and loops.

Statements in Python

A **statement** is an instruction that performs an action. Unlike expressions, statements do not return a value; they execute an operation. A Python program is made up of multiple statements.

Types of Statements:

1. **Assignment Statements:** These assign values to variables.

2. x = 100 # Assigns 100 to x
3. **Conditional Statements:** These control the flow of execution using if, elif, and else.
4. age = 18
5. if age >= 18:
6. print("You are an adult.") # Statement
7. **Looping Statements:** These execute a block of code multiple times (for, while).
8. for i in range(5):
9. print(i) # Statement
10. **Function Definition Statements:** These define functions.
11. def greet():
12. print("Hello, World!") # Statement
13. **Import Statements:** These import modules.
14. import math # Imports math module
15. **Pass, Break, and Continue Statements:** Used for controlling loops.
16. for i in range(5):
17. if i == 2:
18. break # Terminates loop at i = 2

Difference Between Expressions and Statements

Feature	Expressions	Statements
Definition	Produces a value	Performs an action
Return Value	Always returns a value	Does not return a value
Examples	x + 5, a * b	x = 10, if condition:, for loop
Usage	Can be part of a statement	Cannot be part of an expression

Example of Expression vs. Statement:

Expression

x = (5 + 3) * 2 # (5 + 3) * 2 is an expression