COMPLEX DATA TYPE →

In Python, the complex type is used to represent complex numbers, which consist of a real and an imaginary part.
You can create complex numbers and perform mathematical operations on them using the built-in support for complex numbers.

Creating a Complex Number

A complex number is created by appending the letter j (or J) to the imaginary part. The format is:

```python
z = real + imaginary * 1j
```

For example:

```python
z = 3 + 4j
```

Here, 3 is the real part, and 4j is the imaginary part.

Accessing the Real and Imaginary Parts

You can access the real and imaginary parts of a complex number using the .real and .imag attributes:

```python
z = 3 + 4j
print(z.real)  # 3.0
print(z.imag)  # 4.0
```

Operations with Complex Numbers

You can perform various operations like addition, subtraction, multiplication, division, and more with complex numbers. Python handles these operations automatically.

```python
a = 3 + 4j
b = 1 + 2j

# Addition
print(a + b)  # (4+6j)

# Subtraction
print(a - b)  # (2+2j)

# Multiplication
print(a * b)  # (-5+10j)

# Division
print(a / b)  # (2.2-0.4j)
```

Using Built-in Functions

Python provides several functions to work with complex numbers, such as:

- abs(z): Returns the magnitude (absolute value) of the complex number.
- conj(z): Returns the complex conjugate of the number.

```python
z = 3 + 4j
print(abs(z))       # 5.0 (Magnitude)
print(z.conj())     # (3-4j) (Complex Conjugate)
```

Complex Number in the cmath Module

The cmath module provides additional functionality for complex numbers, such as trigonometric functions, logarithms, and square roots.

```
import cmath

z = 1 + 1j

# Getting the phase (angle) of the complex number
print(cmath.phase(z))  # 0.7853981633974483 (radians)

# Getting the polar form of a complex number (magnitude, angle)
print(cmath.polar(z))  # (1.4142135623730951, 0.7853981633974483)

# Getting the square root of a complex number
print(cmath.sqrt(z))  # (1.09868411346781+0.45508986056454j)
```

- Complex numbers are written with j or J for the imaginary part.
- You can perform basic arithmetic operations on complex numbers.
- You can access the real and imaginary parts using .real and .imag.
- The cmath module offers additional functions for complex numbers.