



4.1.1 Data Types

Primitive Data Types

A primitive data type is a basic, built-in data type provided by a programming language that stores a single value and cannot be broken down into simpler data types.

Integers

```
x = 2  
y = 3
```

Real/float

```
x = 2.5  
y = 1.1
```

Boolean

```
running = True  
jumping = False
```

Character

Python has no separate char data type like some other languages. Characters are just single-character strings. (Strings can be declared using single or double quotes)

```
char_1 = 'a'  
char_2 = 'B'
```

String

```
language = "Python"  
phrase = "I love programming in Python!"
```





Additional Data Types

Date/Time

Python does not have a built-in primitive date or time data type. Instead, it provides the `datetime` module, which contains classes such as `date`, `time`, and `datetime` for representing dates and times.

```
from datetime import datetime

current_time = datetime.now()
```

Dictionary (Record)

A Python **dictionary** is commonly used as the equivalent of a record, storing related values using named keys.

```
student = {
    "name": "Alice",
    "age": 17,
    "grade": "A"
}
```

List

There is no array data type in Python but lists can be used instead to store collections of data under one identifier.

```
numbers = [10, 20, 30]
animals = ["cat", "dog", "rabbit"]
```





Pointer/Reference

Python does not use pointers in the same way as languages such as C or C++. **Python variables store references to objects** rather than containing the objects themselves.

Multiple variables can refer to the **same object**. Changes made through one reference can therefore affect the same object seen through another reference.

```
numbers = [1, 2, 3]
copy = numbers

copy.append(4)

print(numbers)
```

Output:

```
[1, 2, 3, 4]
```

Both the *numbers* and *copy* variables both refer to the same list object.

User-defined Data Types

A **user-defined data type (UDT)** is a type created by the programmer rather than being built into the programming language. In Python, user-defined data types are commonly created using **classes**.

```
class Student:
    def __init__(self, name, age, grade):
        self.__name = name
        self.__age = age
        self.__grade = grade

    def get_name(self):
        return self.__name

    def get_age(self):
        return self.__age

    def get_grade(self):
        return self.__grade

student = Student("Alice", 17, "A")
```

