

Harvard University
CS50P 2025 Trimester
Introduction to Programming with Python

Variables and Data Types

Variables

Variables are like containers for storing values.

Values in the variables can be changed during the execution of a program.

Values

Think of variables as containers for storing information.

In programming, this information is often referred to as a value.

Data Type

In programming languages, every value has an associated type, known as a data type.

Common Data Types:

- String
- Float
- Integer
- Boolean

The data type determines how a value can be used in the program.

For example, mathematical operations can be performed on Integer and Float types.

String

A String is a stream of characters enclosed within quotes.

Stream of Characters Includes:

- Capital Letters: `A – Z`
- Small Letters: `a – z`
- Digits: `0 – 9`
- Special Characters: `~ ! @ # \$ % ^ . ? ,`
- Space ()

Examples:

```
"Hello World!"  
"some@example.com"  
"1234"  
'hello' or "hello"
```

Note: Strings can be enclosed in **single** or **double** quotes.

Integer

All **whole numbers** (positive, negative, and zero) without any **fractional part** are called **Integers**.

Examples:

... -3, -2, -1, 0, 1, 2, 3, ...

Float

A **Float** is any number that includes a **decimal point**.

Examples:

24.3, 345.210, -321.86

Boolean

A **Boolean** represents one of two possible values.

Examples:

- True or False
- Yes or No
- 0 or 1
- On or Off

In Python, True and False are considered **Boolean values** and **must start with a capital letter**.

Assigning Value to a Variable

To assign a value to a variable, use the = symbol (called the **Assignment Operator**).

Example (Python):

```
age = 10
```

The = sign assigns the value on the right to the variable on the left.

☐ ***End of the Session!!***