02 - Variables & Data Types

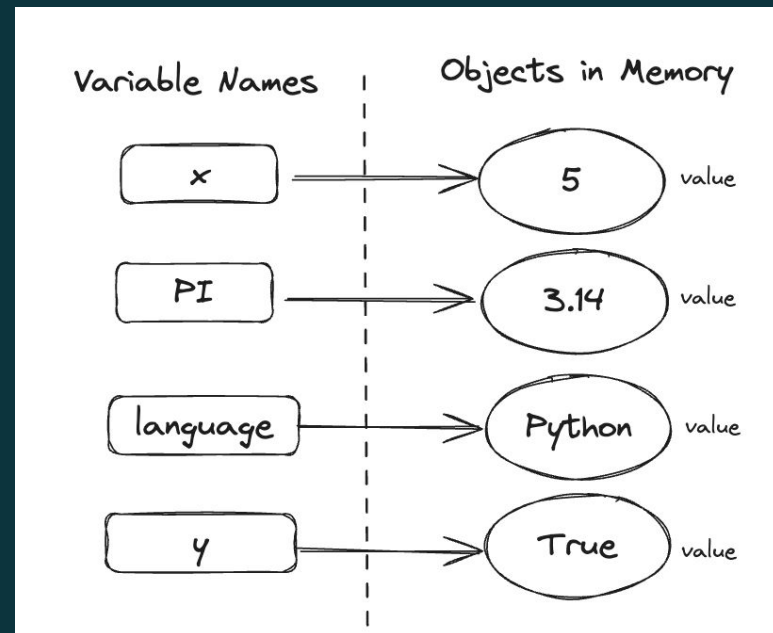# What is a variable?

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What is a variable?

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What is a variable?

- A variable is a name that points to an object stored in memory. Think of an object as a container that holds the data values.
- We assign values to variables using the `=` operator.
- Python provides basic data types that we can work with (integers, floats, strings, etc.).
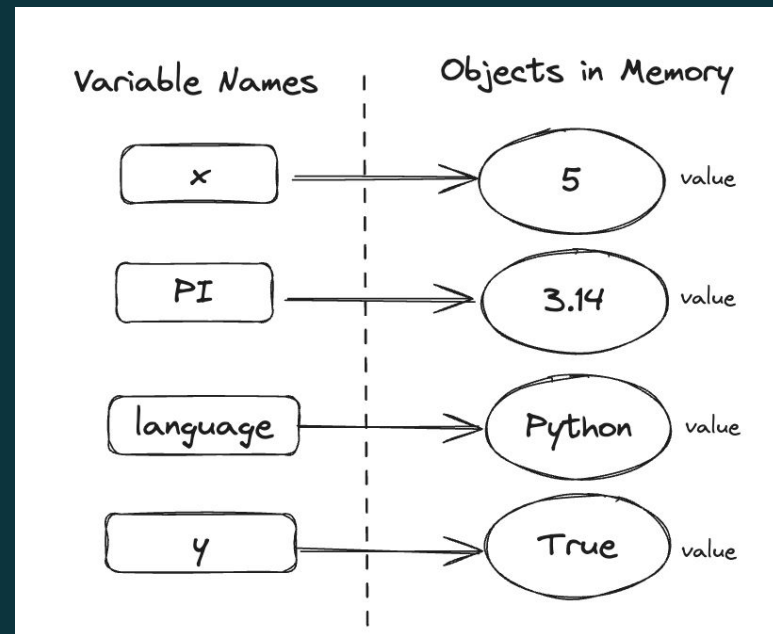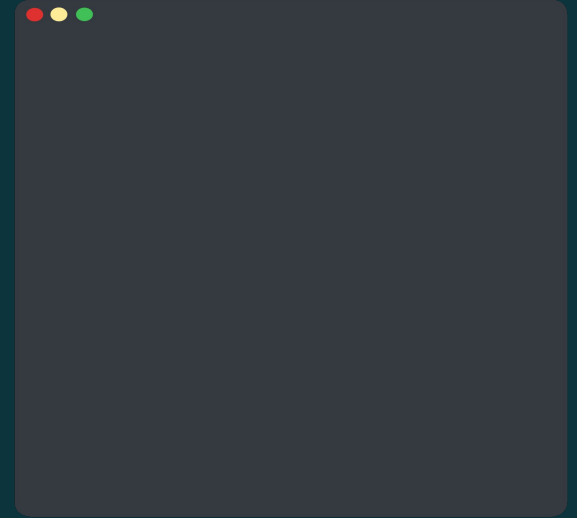
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Remember:

- In Python, everything is an object.
- Python is dynamically typed, we don't need to explicitly write the data type when declaring a variable.

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What is a data type?

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What is a data type?

The kind or type of value a variable can hold. It also determines the operations that can be performed on that value.

Examples:

- Adding two numbers together

- Removing a word from a text document

- etc.

```python
a = 1             # int
b = 1.5           # float
c = True          # bool
z = "Python"      # str
w = None          # NoneType
x = b"binary data" # bytes
```

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Basic Data Types

```python
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x = b"binary data" # bytes
```

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Basic Data Types

Python has five basic data types:

1. Numeric Type: **int**, **float**, and **complex**

2. Text Type: **str**

3. Boolean Type: **bool**

4. Binary Type: **bytes** and **bytearray**

5. None Type: **None**

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b = 1.5            # float
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x = b"binary data" # bytes
```

You can also get the data type of any variable by using `type()` function:

```python
x = 10
print(type(x))

y = True
print(type(y))
```

Numeric Type

int - Represent whole numbers with no decimals.

float - Represent decimal numbers.

complex - Represent complex numbers, formatted as "a + bi"

```python
a = 10 # positive integer
b = -5 # negative integer




pi = 3.14159     # floating number
temperature = 36.6 # floating number



a = 3
b = 5
z = complex(a, b)  # complex
```

Text Type - Strings

Strings are sequences of characters enclosed in either **single** or **double** quotes.
Strings allow us to store textual data and is represented as type **str**.

Note:

- *We can also enclose strings in **triple quotes** for multi-line text. Often useful for code documentation.*
- We'll cover Strings more in-depth in future sections.

```
string_with_double_quotes = "Hi there"

string_with_single_quotes = 'Hi there'
```

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Boolean Type

Booleans represents one of two values:
True or **False**

Used for conditional statements and comparison.

```
is_learning_python_fun = True

is_python_hard_to_learn = False
```

Binary Type

Binary data is represented using the
`**bytes**` type

Useful for handling binary files and data
from network connections.

```python
binary_data = b"Hello, binary world!"

print(binary_data) # Output: b'Hello, binary world!'
```

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None Type

`**None**` represents the absence of a value or a null value.

Commonly used to indicate a no value or unavailable data.

```
value = None

print("Value = ", value)  # None
```

Type Conversion

You can also convert from one type to another using built-in functions such as `int()`, `float()`, `str()`, etc.

```python
x = 5 # int
y = float(x) # Convert to float
z = str(x)   # Convert to string

binary = bytes("hi", "utf-8") # str to bytes
```
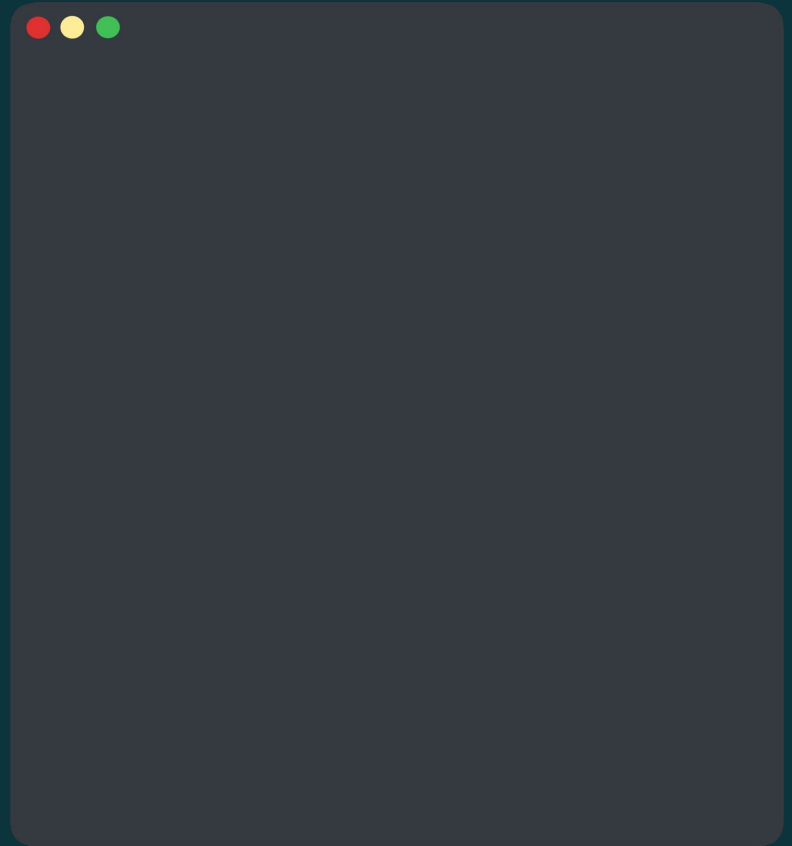
Conclusion

- ## Variables & Data Types

  - Every value in Python is an object. We'll cover this in more detail later in OOP chapter.

- ## Five primitive data types

  - Numeric, Text, Boolean, Binary, and None types.

- ## Type Conversion

  - float ←→ int

  - int ←→ str

  - etc.

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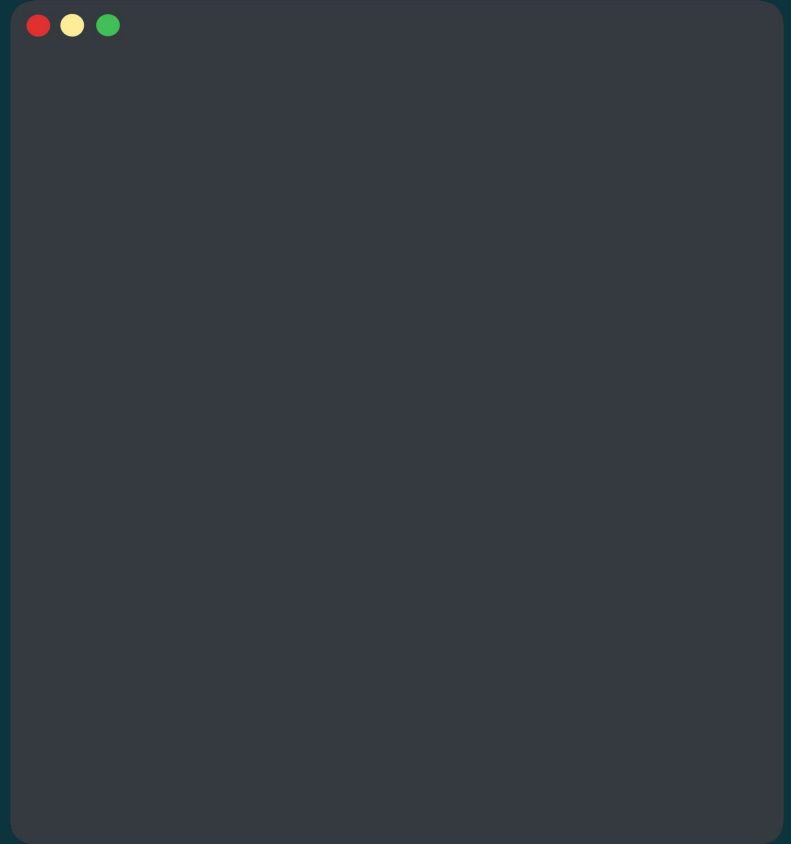
Literals

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Literals

What is a Literal?

- Fixed values assigned to variables.

- Represented directly without any computation.

```
# Literals

x = 10
y = 3.14
z = "Python"
```

Constants

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Constants

What is a Constant?

- Variables whose values **should not** change during the program's execution.

- Typically named using uppercase letters and underscores.

- Python does not have built-in constant support, but naming conventions are used to indicate constants.

```python
# Constants (by convention)

PI = 3.14159
GRAVITY = 9.8
```

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Built-in Functions

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In this course, you'll find a summarised cheat sheet (PDF) for most commonly used functions called **functions-cheat-sheet.**

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Base Conversion

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- Base conversion in Python refers to converting a number from one base (or numeral system) to another.

- <u>The most common numeral systems are:</u>
  - **Decimal** (Base 10):
    - This is the standard number system we use every day. It has digits from 0 to 9.
  - **Binary** (Base 2):
    - This is used for machines. It has digits 0 and 1.
  - **Octal** (Base 8):
    - It uses digits from 0 to 7.
  - **Hexadecimal** (Base 16):
    - This system uses digits 0 to 9 and letters A to F (where A represents 10, B represents 11, etc.).

Base Conversion

Python contains 3 built-in functions that lets you convert integers to **string representation** in the following bases:

- Binary (bin)

- Octal (oct)

- Hexadecimal (hex)

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Conclusion

- Variables & data types
  - What is a variable?
  - What is a data type?
- Five primitive data types
  - Numeric, Text, Boolean, Binary, and None types.
- Type Conversion
  - int(), str(), float(), etc.
- Literals & Constants
- Built-in functions
  - Always refer to Python documentation
- Base Conversion

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