

Chapter-7

VARIABLES & DATA TYPES

- ♣ Why do we **code**?
 - ✓ To **solve** a particular **requirement**.
- ♣ What do you mean by requirement?
 - ✓ Requirements can be anything like
 - ✓ Calculate the sum of **500** numbers
 - ✓ How will be the **weather** today
 - ✓ **Control** and **Set** the AC temperature

All these requirements are considered as data to computers. Thus we need to be able to **understand**, **store** and **manage** these data while developing software i.e while coding.

For Example – High level data in “Control and Set the AC temperature” could be

- ✓ **Calculate** the current temperature in the Room.
- ✓ **Check** if the temperature is what is Set.
- ✓ If not, **Set** the temperature to the required by user. Repeat.

Data in other words is **Information**. These could be anything like **facts**, **statistics** or any **other information**. These data are mostly represented as **Numeric or Statement**.

In order to deal with data, you will need to familiar with

- **Variables**
- **Data Types**



In this chapter we will learn some basic concepts that are related to data.

Variables

Let us understand the concept of Variables using your favourite **Pizza**.

Assume

- You are in Domino's Pizza store.
- You want to eat Pizza at home.
- You have ordered delicious "Cheese Mushroom" Pizza
- Your pizza is now perfectly baked.



Think

- What happens if the baker gives you the Pizza without box?
- Will you be able to carry it to home?
- What do you think you need?

*To carry this delicious Pizza.
You need*

Container

(In this case a Box)



Think it like this from computers perspective

- **Pizza is your data (or value)**
- **Box is your variable (or container)**

This box (variable) contains your pizza (value)

General Definition – A Variable is just like a container that contains something which can be accessed. For example

- Bottle is a variable for water
- Diary is a variable for your tasks
- Your report card is a variable for your result information

Technical Definition – **Variables** are the **names** you give to **computer memory locations** which are used to **store values** in a computer program.

For Example – Store a value of 5 in computer's memory and retrieve it later. Your logical steps will be to

- Create a variable with appropriate name "Number"
- Store the value in it "Number = 5"
- Retrieve the value using variable name "print(Number)"

Code snippet in Python

```
Number = 5  
print(Number)
```

In other words,

Variable in computer programming language is just like a general container which contains information that can be

- Accessed
- Modified
- Replaced
- Named or Renamed

*“In computer science, a variable has a **name** and it contains a **value**”*

In our previous general example

- **Pizza Box** is a **variable** and
- **Domino,s Pizza** is the **name** of variable
- **Pizza** is a **value**

Important Facts:

- Every programming language uses variables for the same purpose of storing & retrieving value. The value of variable can be changed and thus the name **“Variable”**.
- In any computer software or program, the information or data is stored in 2 ways
 - Either the data is already stored in the program Or,
 - The data comes from the user

Example of variable in which data is already stored

Name = “Rahul Hinduja”

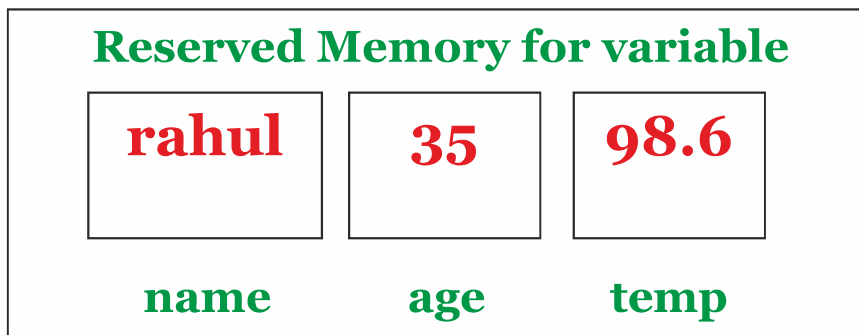
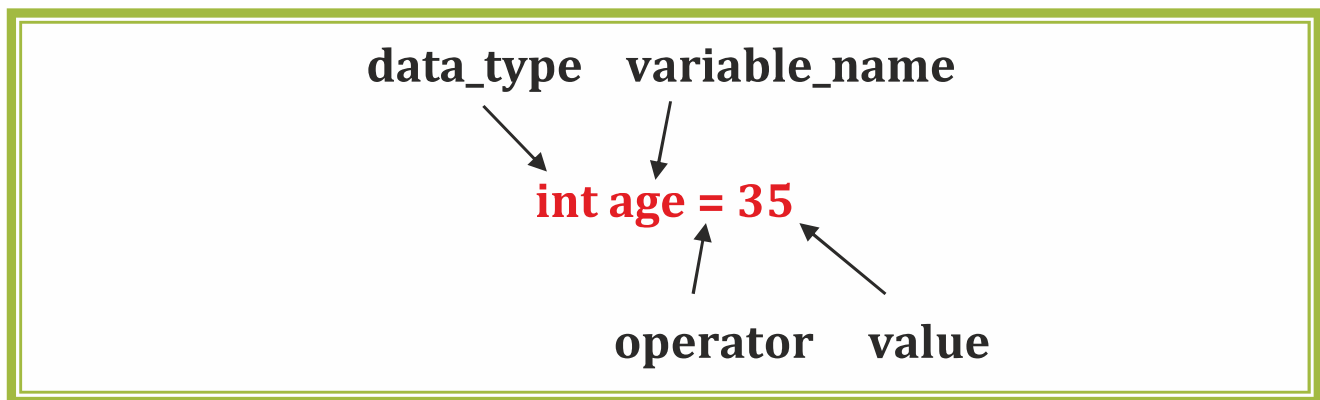
Example of variable in which data is asked from user and stored into a variable

Name = input(“Enter your name: ”)

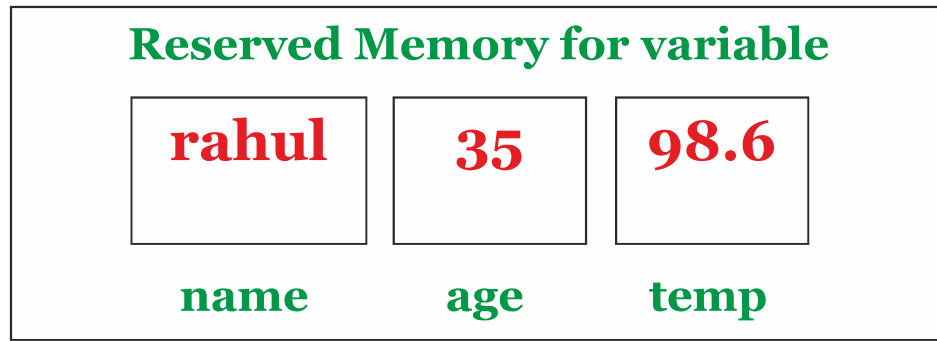
Variable Declaration & Data Type

Declaration of Variables

- The process of creating a variable is also known as **declaration of variable**.
- Every programming language has its own way of declaring a variable.
- Declaration of variable does **2** things
 - It **tells** the computer what the **variable name is** i.e to give a name to computer memory location
 - It specifies what **type of data** the variable will **hold** i.e data type



RAM



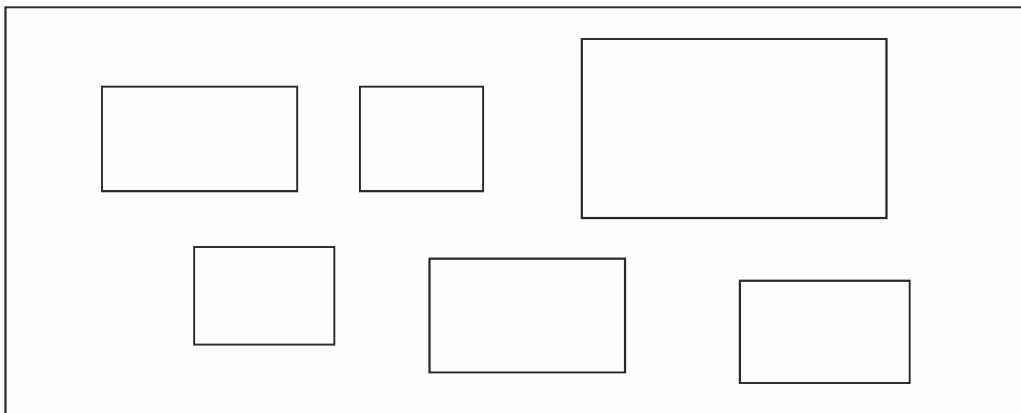
RAM

Above memory address represents following variables which were declared

- **name** = "rahul" ⇒ variable name is **name**, value is **rahul** and type is **string**
- **age** = 35 ⇒ variable name is **age** and value is **35** and type is **int**
- **temp** = 98.6 ⇒ variable name is **temp** and value is **98.6** and type is **float**

Identify variables and values in the following

- City = "katni"
- state = "M.P"
- population = 1292042
- temperature = 36.5



Variable Conventions

Best Practice – Every programming language has its own way of declaring variable and assigning value in it. But there exists few conventions which are good to follow while declaring variable.

1. Variable names must **begin** with a **letter, underscore, non-number** character. Each language has its own conventions.

For example

- a. Name
- b. age
- c. r123_456
- d. X
- e. y
- f. _temp
- g. _____
- h. _____
- i. _____
- j. _____
- k. _____
- l. _____

2. Few programming languages like Python **do not require specifying data type** at the start. During input, default is string in python.
3. Do not use a comma with numbers.
4. Once a **data type is defined** for the variable, **then only that type of data can be stored in it**. For example, if the variable is declared as Int, then it can only store integer values.

Data Types

As the name implies “Data Types” in programming language indicates the **type of data (value)** that you can store in a **variable**.

In most programming language, a variable can store a single type of value. Usually these values are in the form of

- **Phrases** – Known as **String** type.
 - For example – “My name is Rahul Hinduja”
- **Numeric** – Known as **Number** type. Specifically **Int** type or **Float** type.
 - For example – 6 or -32 are of int type and 23.6 or 2.5 is of float type
- **Truth Value** – Known as **Booleans** type.
 - For example – TRUE or FALSE



We will look into each of these data types in detail from Python programming language point of view. It will remain similar in other programming languages.

String data type

- String data type has the value which is string.
- **String** is “A series of characters”. Usually denoted within single quote ‘ ’ or double quotes “ ”
- This is default data type in python when you input it from user.

For example

- Cityname = “Pune”
- State_Name = ‘Maharashtra’
- pin_code = “411048”
- **Important Note** – Use either single quotes or double quotes to open and close the string.
 - **Correct_var1 = “This is string variable using double quote”**
 - **Correct_var2 = ‘This is string variable using single quote’**
 - **Incorrect_var = ‘ This is going to error in the programming language” X**

Practice Area –

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Numeric data type

- **Numeric** data type has the value which is a **number**.
- These numbers can be **positive** or **negative** in nature.
- There are 2 different numeric data types in python
 - **Int** (plain integers) – Any positive or negative **whole number** is called an integer (int) data type. For example,
 - Age = 35
 - your_score = -25
 - **Float** (Floating point) – Basically the number with a **decimal value** is called float data type. For example,
 - Fever = 100.4
 - result = 67.5
- **Important Note** – If your program asks the user to input a whole number then you should declare it with int or float data type explicitly. For example,
 - age = int(input("Enter your age: "))

Practice Area –

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Boolean data type

- **Boolean** data type has the value which is either **TRUE** or **FALSE**
- **0** – is represented by FALSE
- **1** – is represented by TRUE
- These values are in-built and mostly used in conditional or loop statements

For example,

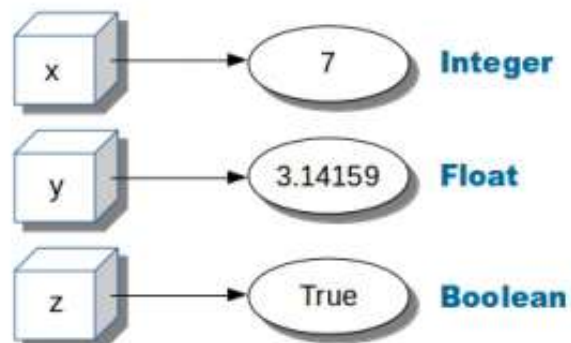
```
check = TRUE
```

```
if Check:
```

```
    print("This is checked")
```

Practice Area –

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Practice Scenarios

1. Create a string variable with name ***myname*** and assign it with your ***real name***.
2. Create an integer variable with name ***math*** and assign your ***last score*** from math exam.
3. Create a float variable name and assign any negative value in it.
4. Write 7 variable names by following some or all the best practices of variable declarations.

- _____
- _____
- _____
- _____
- _____
- _____
- _____

5. Create following variables and assign relevant value in it
 - Variable to store your father's name
 - Variable to store your last result in percentage
 - Variable to store the pie (π) value i.e 3.141529
 - Variable to store the final result of 20 - 45
 - Variable to store the final result of 3 * 10
 - Variable to store the current month and year like May-2022
 - Variable to store the date in the format MM/DD/YY like 03/21/2022