Variables and Constants

- A **variable** is a named memory location that can vary.
- A **named constant** is assigned a value only once and cannot be changed. It is used to assign a useful name to a value that does not change, like pi.
- One can also use **literal constants**, like 2 in the previous example.

- Constants and variables have **data types**:
- Numeric (integer, float, double)
- String (0 or more characters) – a string with 0 characters is null
- Boolean (true/false)

- A **data type** is a classification that defines:
- What values can be stored in the variable
- How the variable is stored in computer memory
- What operations can be performed on the data item

- The name of a variable or constant is known as its **identifier**.
- The data assigned is its **value**.

Declarations

- In most programming languages, the variables and constants used in the program must be declared before being used.
- A **declaration** is a statement that provides a data type and an identifier for a variable.

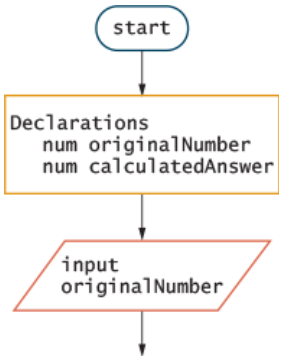
  num mySalary
  string myName
- A language that enforces declarations of variables before usage and does not allow the data type to change is called a **strongly-typed** language.

Initialization

- Before using a variable it is good practice to **initialize** it.
- An **initialization** statement is one assigning a value to a variable and is usually part of the declaration

  string myName = “Sharyn”
- Some programming languages initialize numeric values to zero and string values to null but you CANNOT always rely on this.
- If a language does not initialize variables and you do not explicitly initialize a variable, it will either be consider to be **undefined**, or may contain **garbage** – a value that cannot be processed.

Declarations/Initializations



To add declarations / Initializations to Pseudocode or flowcharts:

```
start
  Declarations
    num originalNumber
    num calculatedAnswer
  input originalNumber
```

Naming Variables and Constants

- Most programming languages have syntax rules regarding legal names for variables and constants.
- For example, it is illegal to use **reserved words**, such as **if, else, while** or **return** as variable or constant names.
- It is good practice to use a **naming convention** to differentiate constants and variables (some languages enforce this in their syntax).

```
constant num PI = 3.14159
string myName = “Sharyn”
constant string STATE = “Pennsylvania”
num myZip = “16803”
```

Naming Variables and Constants

- It is good practice to use **meaningful** names for variables and constants.
- Example Not MEANINGFUL:

```
start
  Declarations
    num a, b, c = 0
    constant num d = 3.1415
  input a
  b = a * 2
  c = b * d
  output a, b, c
end
```

- MEANINGFUL

```
start
  Declarations
    num radius = 0
    num diameter = 0
    num circumference = 0
    constant num PI = 3.1415
```

```
  input radius
  set diameter to radius * 2
  set circumference to diameter * PI
  output radius, diameter, circumference
end
```