# SWE 1301: Introduction to Problem Solving and Software Development

Lecture 04: Problem Solving Concepts for Computer
At: 11-12a.m
CIT
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## Lecture Outline

- Constant and Variables
- Data Types
- Data Storage
- Exercises



## Introduction

- A programmer cannot effectively use the computer to solve problems:
  - Without an understanding of how the computer **uses and defines data**,
  - without knowing **what the operators are**, and
  - without knowing how to **construct computer expressions and equations**.



## Variable

- The computer uses variables and constants to solve problems.
- A variable is a value that changes during the processing of all the instructions in a solution.
- A programmer must give a name to each variable value used in a solution. This is because of two (2) reasons:
  - The programmer uses a variable name as a reference name for a specific value of the variable.
  - The computer uses the name as a reference to help it find that value in its memory.



## Constant

- A **constant** is a value that never changes during the processing of all the instructions in a solution.
- The conventions for naming constants is to write them in capital letters in order to easily distinguish them from variables.



## Example: Variable & Constants

- Identify the Variable and Constant in the Equations:
  - Area $= \Pi r^2$
  - Area and r are variables, $\Pi$ is a constant
  - $A = ½ (a + b) * c$
  - A, a, b, c are variables, ½ is a constant
  - Wages = Hours worked * 1000
  - Wages, Hours worked are variables, 1000 is constant

## Rules for Naming Variables and Constants

- Do not use spaces in a variable name.
- Do not start a variable name with number.
- Do not use a dash (or any other symbol that is used as a mathematical operator) in a variable name.
- Name a variable according to what it represents
- Be consistent when using upper- and lower-case characters.
  - In some languages *HOURS* is a different variable name than *Hours or hours* ***(case sensitivity).***



## Incorrect Variables Names

| Data Item | Incorrect Variable Name | Problem | Corrected Name |
|---|---|---|---|
| Wages paid | Wages Paid | Space between words | WagesPaid |
| Name of Employee | EN | Does not define data item | EmployeeName |
| Rate of pay | Pay - Rate | Use of mathematical operator | PayRate |
| 10% bonus | 10% _bonus | Start with number | TenPercentBonus or Bonus |
| Employee Address | Employee_address_for_Bayero_University_Kano | Too long | Employee_Address |
| Variable Introduced as Example | Eg | Inconsistent Name | Example |



## Data

- To process solutions, the computer must have data.
  - **Data** are unorganized facts.
- They go into the computer as input and are processed by the program.
  - **Information** is returned to the user as output



## Data Type

- The data the computer uses are of many different types.
- Computers must be told the **data type** of each variable or constant.
- The most common data types are numeric, character, and logical.
  - Other data type include date data type and user defined data type.



## Numeric Data Type

- **Numeric data** include all types of numbers.
- Numeric is the only data type that can be used in numeric calculations.
  - Numbers such as an account number or telephone number code, which would not have calculations performed on them, would not be labeled by the programmer as numeric data.
- Numeric data are divided into **integers** and **real** numbers.



## Integer and Real: Numeric Data Type

- Integers are whole numbers.
  - example 25 or -376.
  - They can be positive or negative.
- Real numbers, sometimes called floating point numbers, are whole numbers plus decimal parts.
  - example 16.5 or -780.00
  - They can be positive or negative.

## Character-Alphanumeric Data Type

- The **character** data type, sometimes called **alphanumeric** data set, consists of
  - all single digit numbers, letters, and special characters.
  - They are placed within **quotation marks**.
  - Example a, A, Z, 3, #, &
- When more than one character are join together, the computer considers this item as **string**
  - **String data type**: derived from a string of characters.



## Character-Alphanumeric Data Type..

- Character or string data can be joined together with the + operator in an operation called **concatenation**.
- When two pieces of character data are joined, the concatenation results in the second being placed at the end of the first, example:
  - "2" + "2" = "22" (not 4).
  - "Ado" + "Isa" = "AdoIsa"
  - "Ado" + " Isa" = "Ado Isa"
    - Space is considered a character
  - The concatenation operator varies with each language.



## Logical Data Type

- **Logical data** consist of two values namely **True** and **False.**
  - These are used in making yes-or-no decisions.
- logical data set True and False are not string data and are considered **reserved** words.
  - Reserved word: a word that cannot be used as variable names.



## Example of Data Types

- What would be the most appropriate data type to use for the following?
- 12
  - Numeric- Integer
- 89.5
  - Numeric- Real
- "1"
  - Character
- True
  - Logical



## Example of Data Types..

- What would be the most appropriate data type to use for the following?
- Name of a company
  - Character--String
- Quantity of oranges in a basket
  - Numeric --- Integer
- ATM card number
  - Character--String
- Price of computer system
  - Numeric-- Real



## Lecture Summary

- Constants are values that never change during processing of instructions.
- Variables are values that do change during processing of instructions.
- Constants and variables are assigned data types and are used in expressions and equations.
- The most common data types include numeric, character, and logical.

## Quiz

- Identify the Variable and Constant in the Equations:
  1. $C = 2\Pi r$  2. $X^2 + 2x - 3 = 0$
- Explain the problems with variables names below:
  1. SWE 1301  2. 3Credits
- What would be the most appropriate data type to use for the following?
  - The weight of each student in the class.
  - The number of passengers in an aircraft.
  - The 25th Letter of the alphabet.
  - The Course Code of a course offered in B.U.K.
  - A variable that stores true or false.



## Questions !!!