**Roles of variabales and data types in programming and how they are used to store and manipulate data**

**ROLES OF VARIABLES**

1. Storage of Data:
   * Variables are containers for storing data values. They provide a way to name and reference data in the program.
2. Dynamic Nature:
   * Variables allow for flexibility in programming by enabling the dynamic assignment of values. The data stored in a variable can change during the execution of the program.
3. Memory Allocation:
   * When a variable is declared, the programming language allocates memory space to store the data associated with that variable. The type of data the variable can hold is determined by its data type.
4. Ease of Reference:
   * Using variables makes the code more readable and understandable. Instead of directly using values, you can use variable names that convey meaning.
5. Scope:
   * Variables have a scope, which defines the region of the program where the variable is accessible. Local variables are limited to a specific block or function, while global variables can be accessed throughout the program.

Data Types:

1. Type Safety:
   * Data types define the kind of data that a variable can hold. This ensures type safety, preventing unintended operations on variables of incompatible types.
2. Memory Optimization:
   * Different data types require different amounts of memory. Choosing the appropriate data type helps optimize memory usage and improves the efficiency of the program.
3. Operations and Functions:
   * Data types determine the operations that can be performed on variables and the functions that can be applied to them. For example, arithmetic operations are defined differently for integers and floating-point numbers.
4. Input Validation:
   * Data types help in input validation by restricting the kind of data that can be assigned to a variable. This reduces the chances of errors due to incompatible data.
5. Compatibility:
   * Data types ensure compatibility between variables when performing operations. For example, adding two integers or concatenating two strings follows different rules, and data types help define these rules.