



**SELF-LEARNING PACKAGE IN**

# **ICT 9**

Quarter 2 | Week 2

**Variables in programming**

**Learning Competency:**

Write codes using variables .

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## Ready to Launch!

Every variable must be declared, indicating its data type, before it can be used. A variable declaration consists of a name that is assigned to the variable and its data type.

Optionally, the variable can be initialized to a default value in the variable section. *Initializing a variable means specifying an initial value to assign to it*. Remember, that a variable that is not initialized does not have a defined value, hence it cannot be used until it is assigned such a value. If the variable has been declared but not initialized, we can use an assignment statement to assign it a value.



## Aim at the Target!

*At the end of this module you are expected to:*

1. Demonstrate in declaring a variable .
2. Apply Assignment statement .
2. Explain Assignment and initialization of a variable.
3. Evaluate Strings in expression.



## Try This!

Direction. Answer the question given below.

**Which of the following are valid variable names?**

- |                  |            |
|------------------|------------|
| • \$amount       | • studIDNo |
| • 12January      | • x*y      |
| • salary         | • average  |
| • My name        | • A= b+c   |
| • _student_name_ | • total\$  |



## Keep This in Mind!

In the last module, it was mentioned that variables are extremely useful in programming because we use variables to store the results of a computation and use those results in our program. Unlike an ordinary calculator, which may only have enough to store a few values, we can declare as many variables as we want, limited only by the memory our program is allowed to use.

### Activity 1. Finding variables

#### Program Code:

```

char letter = 'M';
String title = "Java in easy steps";
int number = 365;
float decimal = 98.6f;
boolean result = true;
int a, b, c

```

## Analysis:

Direction: Copy and fill in the table with the correct answer based on the program code.

Variable name	Data type	Values it hold

## Abstraction and Generalization

The act of writing code or instructions that commands a computer or other electronic device how to operate or function is called **programming**.

**Algorithms** are designed to solve problems. Programming languages such Java, Python, JavaScript, PHP, SQL, and others are used to implement algorithms. They create the programs (**software**) that communicate instructions to a computer.

All the tasks carried out by a computer can be stated as algorithms, once algorithms have been designed, it is implemented via a programming language, and the program is executed by a computer.

There are many different types of programming languages. But they all have the ability to:

- **input** data from a device such as a keyboard
- **output** data to a device such as a screen
- process **calculations** like addition and subtraction
- process **decisions** based on certain conditions being met
- process **repetition** for a certain number of times, or while a condition is met, or until a condition is met.

Languages are defined as **human-readable** or **machine-readable**.

**Human-readable** instructions are encoded in a language that humans can use and understand, while **machine-readable** instructions are in a language that computers understand, and are in **binary** code. Languages are also described as **high level** or **low level**.

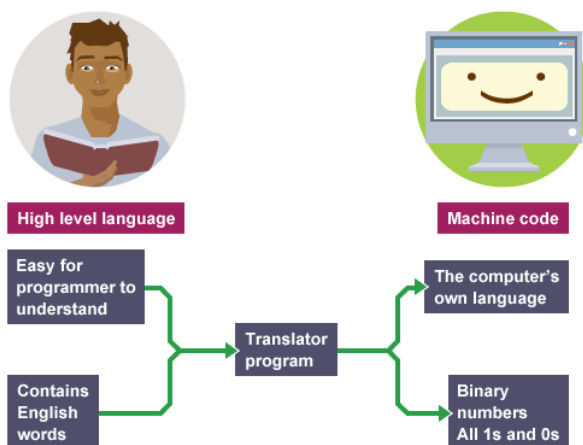


Figure 1. Illustration between high level language and machine code

**High-level languages** include Java, JavaScript, C++, Ruby, Python, while **low-level languages** include C, assembly language, and **machine code**.

A computer's CPU only understands (**executes**) series of binary numbers - so all programming languages are converted into binary code. Low-level instructions can be processed more speedily than high-level languages, but they are more difficult for people to read and write.

## Variables in programming

### How to declare a variable?

A variable is declared by writing a statement that says its type, and then its name.

In the next succeeding example , we will be using Java programming language.

- Declaration statement syntax: ( **Syntax** are set of rules use by a programming language in order to process and run your code)

**Syntax :** <type> <name>;

Example: `int x;`

Example: `double myGPA;`

- It is also legal to declare multiple variables of the same type on one line:

**Syntax:** <type> <name>, <name>, . . . , <name>;

Example: `int a, b, c;`

### Assignment Statement

A statement that stores a value into a variable's memory location. Variables must be declared before they can be assigned a value.

- Assignment statement syntax:

<name> = <value>;

Example: `x = 5;`

Example: `myGPA = 2.90;`

Technically, = is an operator like + or \*, called the **assignment operator** , with very low precedence (it is carried out last).

### Variable initialization

When we assign a value to a variable when we declare a variable then it is called **variable initialization**.

Example: `int x = 5;`

Example: `float myGPA = 2.90;`

Other than the initialization assignment is called **variable assignment**.

Example: `x = 5;`

### Declaration and Initialization

- A variable can be declared and assigned an initial value in the same statement, to save lines in your program.
- Declaration and initialization syntax:

<type> <name> = <value>;

Example: `myGPA = 2.90;`

Example: `int x = (11 % 3) + 12;`

**Same effect as:**

`double = myGPA;`

`myGPA = 2.90;`

`int x;`

`x = (11 % 3) + 12;`

- It also legal to declare/ initialize several at once:  
`<type> <name> = <value> , <name> = <value>;`  
**Example:** `int a = 1, b = 2, c = 3;`  
**Example:** `double grade = 3.5, delta = 0.1;`

### More about assignment

- The `<value>` assigned to a variable can be complex expression. The expression will be evaluated, and the variable will store the result.

Example:


```
x = ( 2 + 8 ) / 3 * 5;
```

(the variable will store the value 15)

**Code in java:**

```
int x;
x = (2 + 8) / 3 * 5;
System.out.println(x);
```

**Output:**



(show command prompt window)

- A variable can be assigned a value more than once in the program

Example:

```
int x;
x = 3;
System.out.println(x);
```

**Output:**



```
x = 5 + 2;
System.out.println(x);
```

**Output:**



### Using variables values

- Once a variable has been assigned a value, it can be used in an expression, just like a literal value.

Example:

```
int x;
x = 3;
System.out.println(x * 5 - 1);
```

**Output:**



- A variable that has been assigned a value cannot be used in an expression or println statement.

Example :

**THIS IS ILLEGAL:**

```
int x;
System.out.println(x);
```

**Output:**



- Though the assignment uses the = character, it is not like an algebraic equation. = means , “to store the value on the right into the memory of the variable on the left”

**THIS IS ILLEGAL:**

3 = 1 + 2;

( because 3 is not a piece of the computer’s memory)

**THIS IS ILLEGAL:**

1 + 2 = x;

## Strings in Expression

- A String can be used in an expression.
  - but the only operator Strings understand is + , and its meaning is different.
  - A + operator on a String and another value causes the other value to be attached to the String, creating a longer String. This is called **concatenation**.

**Note:** In Java, String data values are enclosed by **double quotes**.

Example:	"hello" + 42	evaluates to	"hello42"
Example:	1 + "abc" + 2	evaluates to	"1abc2"
Example:	"abc" + 1 + 2	evaluates to	"abc12"
Example:	1 + 2 + "abc"	evaluates to	"3abc"
Example:	"abc" + 9 * 3	evaluates to	"abc27"
Example:	"1" + 1	evaluates to	"11"

## Printing Strings in Expression

- String expressions with + are useful so that we can print more complicated messages that involve computed values.

Example:

```
double grade = ( 95.1 + 71.9 + 82. 6) / 3.0;
System.out.println("Your grade is" + grade);
```

```
int students = ( 11 + 17 + 4 + 19 + 14) / 3.0;
```

```
System.out.println("There are" + students + "students in the course.");
```

### NOTE:

**double** data type is use as a default data type for float (numbers that use decimal points).

Output:

```
Command Prompt
Your grade is83.2
There are65students in the course.
```

## Application.

Direction. Copy and label which part of the Java program code below is a **variable declaration** and **assignment statement**.

### Activity 2. Labelling program code

```
char letter = 'M';
String title = "Java in easy steps";
int number = 365;
float decimal = 98.6f;
boolean result = true;
int a, b, c
number = number + 4
a = number + 10;
b = number - 20;
c = number * 2;
System.out.println(number);
System.out.println(a);
System.out.println(b);
System.out.println(c);
```



### Reflect

**Complete the statements below.**

I understand \_\_\_\_\_

I don't understand \_\_\_\_\_

I need more information about \_\_\_\_\_



### Reinforcement & Enrichment

Directions .

1. Write a program code that stores the following data:
  - Section Lavoisier has 45 learners.
  - Section Curie has 38 learners.
  - Section Falcon has 40 learners.
  - The average number of learners per section.
2. Prints the following:

There are 45 learners in Lavoisier section.

There are an average of 41 learners per section.



## Assess Your Learning

A. Based on the program code in Activity 2. What are the values hold by the following variables?

1. variable a.
2. variable b.
3. variable number
4. variable c.

B. What is the output of the following program codes?

5.  
`double average;  
average = (10 + 15 + 45) / 3;  
System.out.println(average);`

9.  
`double b;  
float c;  
System.out.println(a);`

6.  
`int number;  
number = 5 + 2 * 3;  
System.out.println(number - 1);`

10.  
`String word = "HELLO";  
String text = "WORD"  
System.out.println(word + "WORLD");`

7.  
`int y;  
y = y + 3;  
System.out.println(y);`

8.  
`String name = "CARMELA";  
int age = 18;  
System.out.println("You are" + name + " and you are" + age + " years old");`



## References & Photo Credits

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<https://www.kidscodecs.com/variables/>  
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