UNIT 3: PROGRAMMING BASIC

UNIT STRUCTURE

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3.1 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- learn about Java token, keywords, constant, and about data types
- learn how to declare a Java variable
- describe the input and output system of Java
- learn to use decision and loop statements in Java

3.2 INTRODUCTION

In the previous unit, you have already learned how to run a simple Java program. To write programs in a particular programming language, it is always necessary to learn all the elements of the language.

In this unit, you will be acquainted with the basic elements of Java programing language. The unit starts with the discussion of basic elements like tokens, keywords, constants of Java programming language. It also

includes how to declared variables in Java, different data types, operators, input/output statements, and about scope and lifetime of variables. This unit also discusses the most important decision making and control statements. Loop control statements with their types are also discussed at the end with examples.

3.3 TOKEN, KEYWORDS, AND CONSTANT

Tokens are the smallest discrete unit of a Java program. Tokens are the series of smallest units of the source program which the compiler reads by grouping one character at a time. A Java program is a collection of tokens, comments, and whitespaces. There are five types of tokens:

- Reserved keywords
- Identifiers
- Literals
- Operators
- Separators

Keywords are predefined words having specific meanings for the compiler to understand. Keywords are reserved words defining specific features and they are one of the most essential parts of a language. All keywords must be written in lower-case letters. A basic definition of the Java language is formed using these keywords along with operators and separators according to syntax. There are 50 reserved keywords in Java. A few examples keywords are:

abstract, assert, boolean, break, if,

while, int, float, return, switch, for, etc.

Constants are the fixed entity in the Java program. The value of a constant cannot be changed after it is assigned. Constants are used in programming because it makes the program easy and more understandable to other than the programmer. Several constants supported by Java are:

- Integer constants
- Real constants
- Character constants

- String constants
- Backslash character constants

3.4 DATA TYPES

Data types state the type and size of a variable. Each variable has its data type in Java. There is a wide variety of data types available in Java, making it easy and smooth for a programmer to choose one according to the application and use. Data types are divided into two types:

- Primitive data types: It includes int, long, short, byte, float, double, char and boolean.
- Non-primitive data types: It includes string, array, interface, class, etc.

3.5 VARIABLE DECLARATION

Variables are declared before they are used. The basic structure to declare a variable is:

Syntax: **type identifier;**

where type is the data type and the name of the variable is the identifier. For example: int x;

The same type of variable can be declared by using a comma-separated list:

Syntax: **type identifier1, identifier2, ... identifiers;**

Example: int x, y, z;

Variable can also be declared by initializing with a value:

Syntax: **type identifier = value;**

Example: int x = 5;

3.6 THE SCOPE AND LIFETIME OF VARIABLES

Scope of a variable means where in a program the variable can be accessed. The lifetime of a variable means the period in which the variable exists. Lifetime determines when a variable is created and destroyed.

Java variables are divided into three kinds:

- **instance variables:** Instance variables are declared inside a class and outside all the methods and blocks. The scope of an instance variable is all over the class excluding static methods. The lifetime of an instance variable is upto until the object stays in memory.
- **Class variables:** Class variables are declared inside a class, outside all the blocks, and are marked static. The scope of a class variable is all over the class. The lifetime of a class variable is up until the program ends or until the class is loaded in memory.
- **Local variables:** Local variables are all those variables that are neither instance nor class variables including parameters in a method. The scope of a local variable is within the block where it is declared. The lifetime of a local variable is up until the control leaves the block where it is declared.

3.7 OPERATORS

Operators are symbols that ask to perform certain specific operations like mathematical or logical manipulation between data items. Java operators are classified into the following categories:

- **Arithmetic operators:**

  Examples of arithmetic operators are +(addition), -(subtraction), *(multiplication), /(division) and %(modulus).

- **Arithmetic Assignment operators:** '+=' is an arithmetic assignment operator.

  Syntax: variable operator = expression

  or

  variable = variable operator expression

  Example: x+=5

  Equivalent expression: x=x+5

- **Assignment operators:** '=' is an assignment operator.

  Syntax: variable = value

  Example: x=7;

- **Increment and decrement operators:**

'++' is the increment operator and '--' is the decrement operator. The increment operator increases the operand by 1 and the decrement operator decreases the operand by 1.

- **Relational operators:**

The relationship between two operands is determined by relational operators. '==' is a relational operator which means 'equal to'.

Example: X==Y

- **Logical operators:**

Logical operators check the condition between two or more relational expressions. Types of Logical operators are:

Logical AND &&

Logical OR ||

Logical NOT !

- **Conditional operators:**

Conditional operator is a decision operator. '?:' are conditional operators.

Syntax: test condition? expression1: expression2

Example: max =(x>y)? x:y;

- **Bitwise operators:**

Examples of bitwise operator are: ~, &, |, ^, >>, <<, |=, ^=, >>=, <<=.



CHECK YOUR PROGRESS

Q 1: State True or False:

i. int myNum = 5;

ii. String myText = "Hello";

iii. boolean myBool = true;

Q 2: What is the assignment operator in Java?

.....

Q 3: What are the types of Java datatypes? Give Examples.

.....

3.8 THE SCOPE OF VARIABLES

The input/output control is contained by a class called 'System' in java.lang package. To take any information from the keyboard and display it on the screen, Java uses a Stream object.

`System.in` - refers to the input stream.

`System.out` - refers to the output stream.

The System.out class contains two methods to print the strings and values on screen :

`print(): Syntax: System.out.print(list);`

This prints the value of the variable name specified in the list of output units .

Example :
```
System.out.print("java ");
System.out.print("programming");
```

Output will be: java programming

`println(): Syntax: System.out.println(list);`

This will print the variable name in the list, the cursor is moved by one line and the next statement is printed in the next line.

Example :
```
System.out.println("java");
System.out.println("programming");
```

Output will be: java
programming

3.9 DECISION MAKING AND CONTROL STATEMENTS

Depending on the result of assessment of an expression, a statement or block of statements are executed having the boolean conditions either true or false is called decision control statements.

The following decision control statements are provided by Java:

- if statement
- if-else statement
- else-if statement
- switch statement

- **if statement:** The syntax of if statement is as follows:

```
if(condition)
{
    //block of statements
 }
```

Example:

```
if (20 > 18)
{
   System.out.println("20 is greater than 18");
}
```

- **if-else statement:** The syntax of if-else statement is as follows:

```
if(condition)
{
    //true block statements
}
else
{
    //false block statements
}
```

Example:

```
int a=2,b=4;
if (a>b)
{
     System.out.println("a is greater");
}
else
{
     System.out.println("b is greater");
}
```

- **else-if statement:** The syntax of else-if statement is as follows:

```
if (condition1)
 {
```

```
// block of statement to be executed if condition1 is true
  }
  else if (condition2)
  {
      // block of statement to be executed if the condition1 is
      //  false and condition2 is true
   }
  else
  {
       // block of statement to be executed if both the
        //conditions are false
    }
```

Example:

```
int time = 20;
if (time < 10)
{
      System.out.println("Good morning.");
}
else if (time < 15)
{
      System.out.println("Good day.");
}
else
 {
            System.out.println("Good evening.");
 }
```

- **switch statement:** The syntax of switch statement is as follows:

```
switch(expression)
{
     case x:  code block
           break;
```

```
    case y: code block;
            break;
            ……..
            ……..
     default: code block;
}
```

Example:

```
int day = 2;
switch (day)
{
     case 1:
           System.out.println("Monday");
          break;
   case 2:
          System.out.println("Tuesday");
          break;
   case 3:
          System.out.println("Wednesday");
          break;
   case 4:
          System.out.println("Thursday");
          break;
   case 5:
          System.out.println("Friday");
          break;
   case 6:
          System.out.println("Saturday");
         break;
   case 7:
          System.out.println("Sunday");
         break;
}
```

3.10 LOOP CONTROL STATEMENTS

A block of statements is allowed to run for a certain number of times repeatedly. The following loop control statements are provided by Java:

- **for statement**
- **while statement**
- **do-while statement**

➢ **for statement:**

Syntax:

for (statement 1; statement 2; statement 3)
{
// code block to be executed
}

Example:

```
for (int i = 0; i < 10; i++)
{
    System.out.println(i);
}
```

➢ **while statement:**

Syntax: **while (condition)**
{
// code block to be executed
}

Example: int i = 0;

```
while (i < 10)
 {
     System.out.println(i);
      i++;
   }
```

- **do-while statement:**

  Syntax:

  do

  {

  // code block to be executed

  }

  while (condition);

  Example:

```
int i = 0;
do
{
  System.out.println(i);
  i++;
}
while (i < 10);
```



CHECK YOUR PROGRESS

Q 4: What is the output of the following program segment?

```
if (20 > 18)
{
   System.out.println("20 is greater than 18");
}
```

Q 5: What are the primitive data types in Java?

.....

Q 6: What is the size of float and double in Java?

.....

Q 7: What is the output of the following program

```
class increment {
    public static void main(String args[]){
        int g = 3;
        System.out.print(++g * 8);     }
  }
```



3.11 LET US SUM UP

- Tokens are the smallest discrete unit of a Java program.
- Keywords are predefined words having specific meaning for the compiler to understand.
- Constants are the fixed entity in the Java program. The value of a constant cannot be changed after it is being assigned.
- Several constants supported by Java are:
  - Integer constants
  - Real constants
  - Character constants
  - String constants
  - Backslash character constants
- Variables are declared before they are being used. The basic structure to declare a variable is Syntax: type identifier; where type is the data type and identifier is the name of the variable.
- Scope of a variable means where in a program the variable can be accessed. Lifetime of a variable means the period in which the variable exists.
- Operators are symbols that ask to perform certain specific operations like mathematical or logical manipulation between data items.
- The input/output control is contained by a class called 'System' in the java.lang package. To take any information from the keyboard and display it on the screen, Java uses a Stream object.
  - System.in refers to the input stream.
  - System.out refers to the output stream.

  Depending on the result of assessment of an expression a statement or block of statements are executed having the boolean conditions either true or false is called decision control statements.

The following decision control statements are provided by Java :

- if statement
- if-else statement
- else-if statement

- switch statement

A block of statements is allowed to run for a certain number of times repeatedly. The following loop control statements are provided by Java:

- for statement
- while statement
- do-while statement



3.12 FURTHER READINGS

1) Schildt, H. (2020). The complete reference Java.



3.13 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: i) True ii) True iii) True

Ans to Q No 2: Assignment operators:

'=' is an assignment

Syntax: variable=value

Example: x=7;

Ans to Q No 3: Data types state the type and size of a variable. Each and every variable has its own data type in Java. There is a wide variety of data types available in Java , making it easy and smooth for a programmer to choose one according to the application and use. Basically data types are divided into two types :-

Primitive data type : It includes int,long,short,byte,float,double,char and boolean.

Non-primitive data type : It includes string,array,interface,class, etc.

Ans to Q No 4: 20

Ans to Q No 5: There are 8 types of primitive data types- int, char, boolean, byte, long, float, short, double.

Ans to Q No 6: The size of float and double in java is 32 and 64.

Ans to Q No 7: 32



3.14 MODEL QUESTIONS

Q 1: Explain the difference between Java Token, Keywords, and Constant

Q 2: Explain about Java datatypes.

Q 3: Explain the process of variable declaration in Java.

Q 4: What are the different operators in Java? Explain.

Q 5: Write a Program in Java to find the biggest of 2 number.

Q 6: Write a Program in Java to check whether a no is even or odd.

Q 7: Write a Program in java to find the sum of first 10 numbers.

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