### Chapter 3

### **PROGRAMMING FUNDAMENTALS**

### **Brief Summary of the Chapter:**

In this chapter we well understand Basics of programming and programming environment tools.

### **Key Points:-**

#### **IDE- Integrated development Environment:**

• A programming environment, where all the tools required for programming are available under one roof is called IDE.

#### **RAD- Rapid Application Development:**

• A programming style which aims at building programs fastly through the use of tools and wizards is called RAD.

### Token:

- The smallest individual unit in a program is known as Token. Java has the following types of tokens: *keyword, Identifier, literal, punctuators and operators*.
- 1) **Keywords:** Keywords are words that have a specific predefined meaning in Java. They cannot be used as variable names. They are also known as reserve words. Eg. int, void, private, for, while etc.
- 2) Literals: These having fixed data values are referred to as Literals. They are also known as Constants. Various types of literals available in Java are :
  - o integer literals
  - Floating literals
  - Boolean literals
  - Character literals
  - String literals
  - Null literals
- **3) Identifiers:** These have various names given to the program segments. For example variable name, class name, function name.

There are four rules to create Identifers:

- i) It is a combination of alphabets, numbers, underscore and dollar sign
- ii) First character must be alphabet or underscore or dollar sign
- iii) Blank space are not allowed.
- iv) Reserve words cannot be used as variable name.
- 4) **Operators:** Operators are symbols or group of symbols, which represent a operation in java. Operators in java can be classified as Unary operator- operators that require only one operand like ++, -- etc; Binary operator operator that require two operands like +, \*, > <, == etc.; ternary operator which require three operands like?:.

Other types of operator are : Airthmetic operator, Relational operator and Logical operator.

- 5) **Punctuator or Separator:** There are nine separator in Java:
  - () {}[].;,
  - **Escape Sequence:** When a backslash is encountered in a string of characters, the next character is combined with the backslash to form an escape sequence. Escape sequences are normally used to control printed or displayed output. For example, \a, \b, \n, \t, etc.
  - **<u>Primitive Data Types:</u>** The Java programming language is statically-typed, which means that all variables must first be declared before they can be used. A primitive type is predefined by the language and is named by a reserved keyword. The eight primitive data types supported by the Java programming language are:
    - 1. **byte**: The byte data type is an 8-bit signed two's complement integer. It has a minimum

value of -128 and a maximum value of 127 (inclusive).

- 2. **short**: The short data type is a 16-bit signed two's complement integer. It has a minimum value of -32,768 and a maximum value of 32,767 (inclusive).
- 3. **int**: The int data type is a 32-bit signed two's complement integer. It has a minimum value of -2,147,483,648 and a maximum value of 2,147,483,647 (inclusive).
- 4. **long**: The long data type is a 64-bit signed two's complement integer. It has a minimum value of -9,223,372,036,854,775,808 and a maximum value of 9,223,372,036,854,775,807 (inclusive).
- 5. float: The float data type is a single-precision 32-bit IEEE 754 floating point.
- 6. **double**: The double data type is a double-precision 64-bit IEEE 754 floating point.
- 7. **boolean**: The boolean data type has only two possible values: true and false. Use this data type for simple flags that track true/false conditions.
- 8. **char**: The char data type is a single 16-bit Unicode character. It has a minimum value of '\u0000' (or 0) and a maximum value of '\uffff' (or 65,535 inclusive).
- **Reference Data Types** : These are constructed by using primitive data These are constructed by using primitive data types, as per user need. Reference data types, as per user need. Reference data types store the memory address of an object. Class, store the memory address of an object. Class, Interface and Array are the example of Interface and Array are the example of Reference Data types.



#### Scope of a Variable:

• The part of program where a variable is usable is called scope of a variable.

**Block:** 

• A group of statement enclosed in pair of parenthesis {} is called block or a compound statement.

**If Statement:** If statement helps to execute a block of statement based on the result of a condition. If the condition set evaluates to true on block of statement is executed otherwise another block is executed.

Syntax:

```
if (Expression or condition)
{
    Statement1;
    Statement2;
    .
    Statementn;
}
else
{
    Statement1;
```

Statement2;

Statementn;

}

'else' part of 'if statement' is optional, if the user doesn't provide an else part and the condition evaluates to false, then nothing would happen. Complier will not produce an error in this case.

**Switch Statement:** A Switch statement is used execute a statement from a group of statement based on the result of a expression. The expression must result in either of byte, short, integer or character. **Syntax:** 

```
Switch(Expression)
{
  case 1:
      statement(s);
      break;
  case 2:
      statement(s);
      break;
.....
case n:
      statement(s);
      break;
default:
      statement(s);
}
```

The default statement is executed when none of the above mention case matches with the result of the switch expression. Default is optional.

#### Loop/Iteration:

• loop or iterations helps to repeat a group of statements number of times under a condition. Java supports three kinds of loop: while loop, for loop, do while loop

#### Entry control loop / Pre-Tested loop/ Top-Tested loop:

• An entry control loop first test the terminating condition and then executes the loop body. If the condition is found true the loop body is execute other wise the loop terminates. In case if the condition is false in first time only then the loop will not get execute even once.

#### Exit control loop / Post-Tested loop/ Bottom-Tested loop:

• An exit control loop first executes the loop body and then test the terminating condition. If the condition is found true the loop body executed again other wise the loop terminates. In case if the condition is false in first time only then the loop will still get execute at-least once.

While loop: It is an entry control loop

```
Syntax:
Initialization;
while (condition)
{
statement(s);
increment;
}
```

for loop: It is a compact entry control loop, which all the tree parts of the loop (i.e. initialization, terminating condition, and increment/decrement of the counter variable) exists in a single line.

Syntax:

for(initialization ; terminating condition ; increment/decrement)
{
 Statement(s); (Body of the loop) }

It is to be noted that all the parts of the loop in the above statement are optional. In case if a programmer wants to specify more than one initialization or increment/decrement then it has to be separated by (,).

for(int i=1; i<= 10; i++) for(i=1, j = 10; i<j; i++, j++) // more than one initialization or increment/decrement for(i = 10, j= 20; i>= 1 && j<= 30; i--, j++) // more than one condition joined using && for(; i<= 10; i++) //initialization missing still using ; for(; i<= 10;) //initialization, inc./dec. missing still using ;

**do while loop: it** is a exit control loop **Syntax:** 

Initialization; do { statement(s); } while (condition);

#### **Break Statement:**

• break is used to terminate the current switch statement or the loop.

#### **Continue Statement:**

• Continue statement skips the remaining part of the current loop and begins the next iteration of the loop.

### Commonly available Swing Controls in Java:

jFrame:	A Frame is a container control, in which all the controls can be place.
jLabel:	JLable allows placing un-editable text on the Frame/Panel
jTextField:	JTextFiled allows placing editable text on the Frame/Pane. User can enter text in
	a textFiled during runtime.
jbutton:	is used to initiate an action when it is clicked.
jList:	is a group of values or items from which one or more selections can be made.
jComboBox:	jComboBox is similar to jList but also allow to enter editable text during run time.
	It is a combination of jTextFiled and jList.
jPanel:	Act like a frame, to group one or more controls.
jRadioButton:	Allow us to choose a single item from a group of jRadioButton options.
jCheckBox:	Allow us to choose one or more items from a group of jCheckBox options.
jPasswordField:	Allow us to enter a text during the run time but shows an encrypted text instead of
	the original text
jTextArea:	JTextArea is a multi-line text component to enter or edit text.

### **Questions and Answers**

- Q1. Name any two Object Oriented Programming languages?
- Ans. C++ and Java
- Q2. Why is java called a platform independent language?
- **Ans** Java program can be easily moved from one computer system to another, anywhere anytime. Changes and upgrade in operating system, processors and system resources will not force any change in the Java program. Hence it is called a platform independent language.
- **Q3.** Elaborate the java Compilation process.
- **Ans.** The source program is first converted into a **byte code** using a java compiler. This byte code is machine independent i.e. same for all the machines. Later the byte code is executed on the machine using an interpreter.

- **Q4.** Why do we write a comment in a program? What are the two ways of writing comment in a java Program?
- Ans. Comments are added to a program for the following purposes:-
  - 1. Make the more readable and understandable
  - 2. For future references we can add comments in a Java program in the following ways:
    - i) Adding // before the line which is to be commented. This can be used only for single line comments.
    - ii) using a pair of /\* and \*/ for multi-line comments.
- **Q5.** What is a syntax error in context of a program? Give an example.

**Ans.** Error in the way of writing a statement in a program, results in a syntax error. For e.g.

for (i=0, i<=100. i++), will result in a syntax because the program has written comma instead of a semi comma in the for loop.

- **Q6.** What is RAD programming? Why is program development in java using Netbeans IDE is RAD?
- **Ans.** RAD stands for **R**apid **A**pplication **D**evelopment. A programming style which aims at building programs fastly through the use of tools and wizards is called RAD.
  - Program development using Netbeans IDE is RAD as it
    - provides GUI
    - Provides online help and suggestions during typing of the program (using ctrl+ Spacebar key)
    - Error alerts while typing of the program.
- **Q7.** What is IDE? Name two IDE for Programming in java.
- **Ans.** A programming environment, where all the tools required for programming are available under one roof is called IDE. Two IDE for Java are Netbeans and BlueJ
- **Q8.** Name any two type of Tokens available in Java.
- Ans. Keyword, Identifier, Literal, Punctuators ad Operators.
- **Q9.** What are primitive data types? Name the various primitive data type available in Java.
- **Ans.** Data types that are directly available with java are called primitive data type. Various primitive data types available in java are byte, short, int, long, float, double, char and boolean.
- Q10. What are Reference data types?
- **Ans.** Data types created by the programmer using the primitive data type are called reference data type e.g. Classes, interfaces etc.
- **Q11**. What is type casting?
- Ans. Converting a value form one type to another is called type casting. For e.g. int a = 5. here 'a' is a integer, which can be cased to float as follows float b = (float) a;
- Q12. Name and explain the usage of any two data types used in Java to store numbers with decimals.
- Ans. Two data types available in java for storing numbers with decimals are
  - 1. *float*: for single precision floating point values for e.g. float num = 10.0F
  - 2. double: for double precision floating point value. This is the default data type

```
for decimal numbers. for e.g. double num = 10.0
```

- Q13. What are Keywords? Give two examples of keywords available in Java.
- **Ans.** Keywords are words that have a specific predefined meaning in Java. They cannot be used as variable names. Eg. void, private, if, while etc.
- Q14. Name and explain the usage of any one relational and one logical operator in Java.
- **Ans.** One relational operator in java is ==. This operator results in true if both its operands are equal otherwise false. One logical operator in java is &&. This operator is used to combine two logical values. The result of the && will be true if and only if both its operands are true otherwise false.
- **Q15.** What is the difference between = and == operator in java?
- **Ans.** Represent an assignment operator. It sets the value of the variable on its left side with the result of expression on its right side. == represent a conditional equal to operator. It checks for

the equality of both its operands. If both the operands are equal, condition evaluates to true otherwise to false.

- **Q16.** Name the two type of selection statement available in Java.
- Ans. Two selection statement available in java are 'if' and 'Switch'
- **Q17.** Write the purpose of Switch Statement with the help of an example. Which Java Statement can be used in place of switch statement? In the switch statement, what happens if every case fails and there is no default option?
- **Ans.** A Switch statement is used execute a statement from a group of statement based on the result of a expression. The expression must result in either of byte, short, integer or character.

An '*if statement*' can be used in place of switch statement. In a *switch statement* if none of the statement satisfies and even there is no default case then nothing would happen. This would not result in any sort of error.

- **Q18.** What is the purpose of 'break' statement in java?
- Ans. Break is used to terminate the current switch statement or the loop.
- Q19. What is the purpose of 'continue' statement in java?
- **Ans.** Continue statement skips the remaining part of the current loop and begins the next iteration of the loop.
- **Q20** Find the output of the following code snippet written in java public static void main(String [ ]args)

```
{
long a=78345,s1=0,s2=0,r;
while(a>0)
{
    r=a%10;
    if (r%4==0)
    s1+= r;
    else
    s2+=r;
    a/=10;
}
System.out.println("S1 ="+ s1);
System.out.println("S2 ="+ s2);
}
```

```
Ans. Output:
```

```
s1= 12
s2= 15
```

**Q21**. Correct the errors in the following program segment written in JAVA. You are just required to write the corrected code, underlying the corrections made.

```
public Static Void Main (String [] args)
```

```
{
Integer Nos = 100;
while (Nos => 45)
{
If (Nos % 5 = 0);
Nos+=10;
otherwise
Nos + = 20;
}
}
```

Ans: Corrected Code public static void main (String [] args) { int Nos = 100; while (Nos >= 45)

```
{
if (Nos % 5 == 0)_
Nos+=10;
else
Nos + = 20;
}
```

### **Unsolved Questions**

**1.** What will be output of the following code:

byte b; double d= 417.35; b= (byte) d; system.out.println(b);

- 2. Given the value of a variable, write a statement, without using if construct, which will produce the absolute value of a variable.
- **3.** What is wrong with the following code fragment?

```
Switch (x)
               {
               case 1:
               n1 = 10;
               n2=20;
               case 2:
               n3=30;
               break;
               n4 = 40;
       What will be the output of the following program code?
4.
               int m = 100;
               int n = 300;
               while (++m < --n);
               System.out.println(m+" "+ n);
5.
       What does the following fragment display
               String s = "Six:" + 3+ 3;
               System.out.println(s);
       What is the output of the following code?
6.
               String s = new string();
               System.out.println("s = " + s);
7.
       What will be the output of the following code snippet?
               int x= 10;
               int y = 20;
               if ((x < y) || (x = 5) > 10)
               System.out.println(x);
               else
               System.out.println(y);
8.
       State the output of the following program:
               public static void main(String args[ ])
               {
               int x = 10;
               int y = 15;
```

System.ou.println((x>y)? 3.14: 3);
}
9. State the output of the following program:
public static void main(String args[ ])
{
 int x = 10;
 float y = 10.0;
 System.ou.println((x>y)? true: false);
}

**10.** Given a pacakage named EDU.student, how would you import a class named Test contained in this package? Write one line statement.

```
11. Consider the following class definition:
Class Student
{
    abstract double result()
    }
    This code will not compile since a keyword is missing in the first line. What is the keyword?
12. Can an abstract method be declared final? Yes or No.
```

### **CHAPTER-4**

### JAVA GUI PROGRAMMING REVISION TOUR - II [Swing Controls]

### **Brief Summary of the Chapter:**

In this chapter we shall be revising the JAVA GUI programming concepts using Swing API through NetBeans IDE.Java GUI applications are created through RAD tools with Classes, Object and methods etc.

#### **Key Points:**

- Swing API includes graphical components for building GUIs.
- Swing components can be either container or non container component.
- Swing provide seven different Layout manager.
- Frame is a top level window with a title and a border, created through jFrame component of Swing.
- Common properties of buttons are: background, border, font, foreground, enabled, Horizontal Alignment, Vertical Alignment.
- Label control displays text, that the user can not changed directly.
- Label is created through jLabel class component.
- TextField is created through jTextField class component.
- Password field takes input without showing it on the screen, created through jPasswordField class component.
- TextArea is multiline component to display or enter text, created through jTextArea class component.