OOP's Using JAVA

Subject Code :BT21ITE33

Module 2

Topics Covered

- Data Types
- Operators
- Control Statements
- Variables & Arrays
- String Handling
  - The String Constructors
  - String Length
  - Special String Operations
  - Character Extraction
  - String Comparison
  - Modifying a String
  - String Buffer

Data Types

- Data types specify the different sizes and values that can be stored in the variable. There are **two** types of data types in Java

  1. **Primitive data types:** The primitive data types include Boolean, char, byte, short, int, long, float and double.

  2. **Non-primitive data types:** The non-primitive data types include Classes, Interfaces, and Arrays,Strings.

- In Java language, primitive data types are the building blocks of data manipulation. These are the most basic data types available in Java language.

Data Type	Size	Description
byte	1 byte	Stores whole numbers from -128 to 127
short	2 bytes	Stores whole numbers from -32,768 to 32,767
int	4 bytes	Stores whole numbers from -2,147,483,648 to 2,147,483,647
long	8 bytes	Stores whole numbers from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	4 bytes	Stores fractional numbers. Sufficient for storing 6 to 7 decimal digits
double	8 bytes	Stores fractional numbers. Sufficient for storing 15 decimal digits
boolean	1 bit	Stores true or false values
char	2 bytes	Stores a single character/letter or ASCII values

Operators in Java

- **Operator** in Java is a symbol that is used to perform operations.
- Java divides the operators into the following groups:

✔ Arithmetic operators

✔ Assignment operators

✔ Comparison operators

✔ Logical operators

✔ Conditional operators

Arithmetic Operator

- Arithmetic operators are used to perform common mathematical operations.

Operator	Name	Description	Example
+	Addition	Adds together two values	x + y
-	Subtraction	Subtracts one value from another	x - y
*	Multiplication	Multiplies two values	x * y
/	Division	Divides one value by another	x / y
%	Modulus	Returns the division remainder	x % y

Comparison operators

- comparison operators are used to compare two values

Operator	Name	Example
==	Equal to	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Assignment operators

- Assignment operators are used to assign values to variables
- For example, we use the assignment operator (=) to assign the value to variable x:
- in x=10

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3

Logical operators

- Logical operators are used to determine the logic between variables or values

Operator	Name	Description	Example
&&	Logical and	Returns true if both statements are true	x < 5 && x < 10
||	Logical or	Returns true if one of the statements is true	x < 5 || x < 4

```
public class Main {
  public static void main(String[] args) {
    int x = 5;
    System.out.println(x > 3 && x < 10);
    // returns true because 5 is greater than 3 AND 5 is less than 10
  }
}
```

```
public class Main {
  public static void main(String[] args) {
    int x = 5;
    System.out.println(x > 3 || x < 4);
    // returns true because one of the conditions are true (5 is greater than 3, but 5 is not less than 4)
  }
}
```

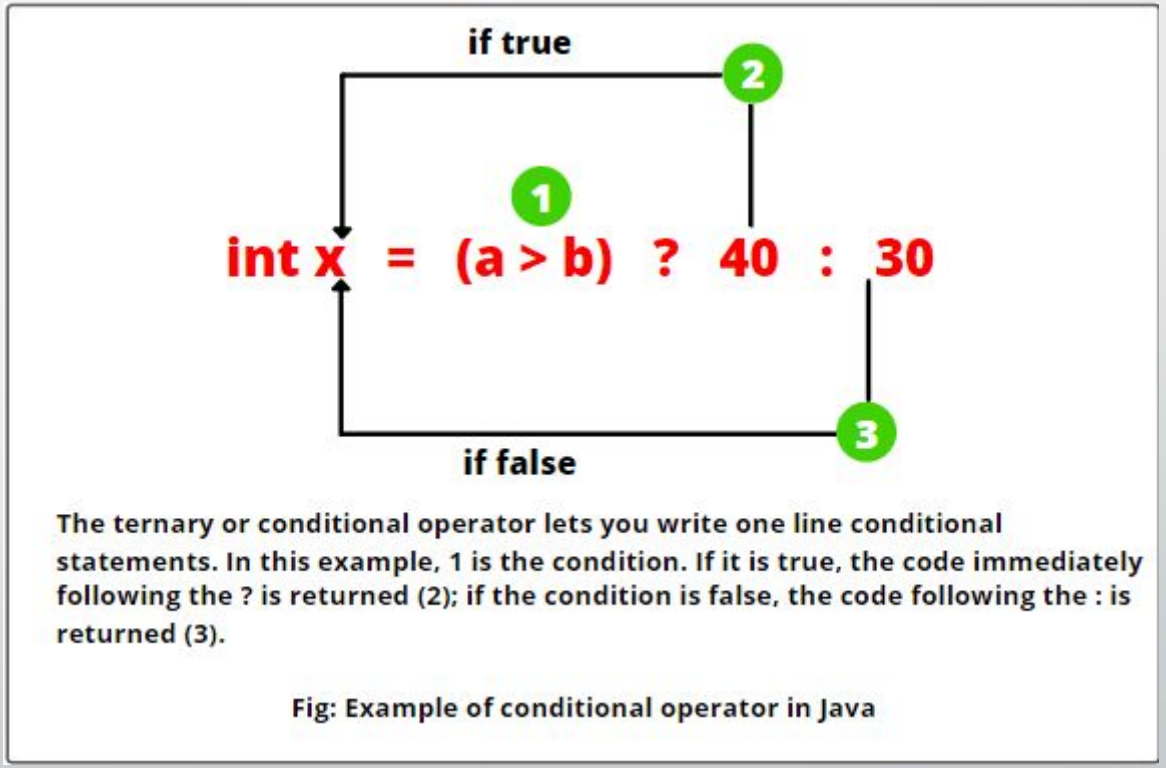
Conditional operators

- Consider this example

Int a=30;

Int b=40;

In x=(a>b)?a:b;



The ternary or conditional operator lets you write one line conditional statements. In this example, 1 is the condition. If it is true, the code immediately following the ? is returned (2); if the condition is false, the code following the : is returned (3).

Fig: Example of conditional operator in Java

Control Statements

- There are three types of control flow statements.

1. Conditional statements: based on particular condition the selected block will be executed

   if

   if –else

   else-if

   Switch

2. Loop statements: The same code will be Repeated multiple times

   for

   while

   do-while

3. Transfer statements: The control is transfer from one location to another location is called transfer statements

   break

   continue

Control Statement

Conditional statements
If Statement

- To take only one option
- Syntax of if statement is given below.

```
if(condition) {
True body; //executes when condition is true
}
```

Example of “if” statement Program 1

```
1. class Student {
2. public static void main(String[] args) {
3. int x = 20;
4. int y = 10;
5. if(x>y) {    //if Condition
6. System.out.println("x  is greater than y");
7. }
8. }
9. }
```

Control Statement
Decision-Making statements

"if-else" statement

- Two option available.
- The if-else statement is an extension to the if-statement, which uses another block of code, i.e., else block.
- The else block is executed if the condition of the if-block is evaluated as false.
- **Syntax:**

```
if(condition) {
True body; //executes when condition is true
}
else{
False body; //executes when condition is false
}
```

Example of “if else” statement Program 2

```
1.  class Student {
2.  public static void main(String[] args) {
3.  int x = 20;
4.  if(x> 18) {
5.  System.out.println(“Eligible for marriage….");
6.  }  else {
7.  System.out.println(“Not eligible for marriage try after some time….");
8.  }
9.  }
10. }
```

Control Statement
Decision-Making statements

"if-else-if" statement

- The if-else-if statement contains the if-statement followed by multiple else-if statements.
- In other words, we can say that it is the chain of if-else statements that create a decision tree where the program may enter in the block of code where the condition is true.
- **Syntax**

```
if(condition 1) {
statement 1; //executes when condition 1 is true
}
else if(condition 2) {
statement 2; //executes when condition 2 is true
}
else {
statement 2; //executes when all the conditions are false
}
```

Example of “if else if” statement Program 3

```
class Positive {
public static void main(String[] args) {
   int number=-13;
   if(number>0){
   System.out.println("POSITIVE");
   }else if(number<0){
   System.out.println("NEGATIVE");
   }else{
   System.out.println("ZERO");
  }
}
}
```

Example of "if else if" statement Program 3

```
class Sleep {
public static void main(String[] args) {
   int a=10;
    if(a==10){
      System.out.println("Aslam don't sleep");
   }
   else if(a==20){
      System.out.println(" Amar don't sleep ");
   }
   else if(a==30){
      System.out.println("Umar don't sleep");
   }
    else{
      System.out.println(" Bharath don't sleep ");
   }
}
}
```

Control Statement
Decision-Making statements

switch statement

- The Java *switch statement* executes one statement from multiple conditions. It is like if-else-if ladder statement. The switch statement works with byte, short, int.
- Points to be noted about switch statement:
  - The case variables can be int, short, byte, char. String type is also supported since version 7 of Java
  - Cases cannot be duplicate
  - Default statement is executed when any of the case doesn't match the value of expression. It is optional.

- The syntax to use the switch

```
switch(argument){
case value1:  Statements;
 break;  //optional
case value2:  Statements;
 break;  //optional
.....

default:
  code to be executed if all cases are not matched;
}
```

Example of "Switch" statement Program 5

```
   int  a=20;
   //Switch expression
   switch(a){
   //Case statements
   case 10: System.out.println("10");
   break;
   case 20: System.out.println("20");
   break;
   case 30: System.out.println("30");
   break;
   //Default case statement
   default:System.out.println("Not in 10, 20 or 30");
   }
}
}
```

EX:

```
class SwitchExample2 {
public static void main(String[] args) {
   int  a=20;
   //switch expression with int value
   switch(a){
   //switch cases without break statements
   case 10: System.out.println("10");
   case 20: System.out.println("20");
```

Loop Statements

- Loop statements: The same code will be Repeated multiple times

for

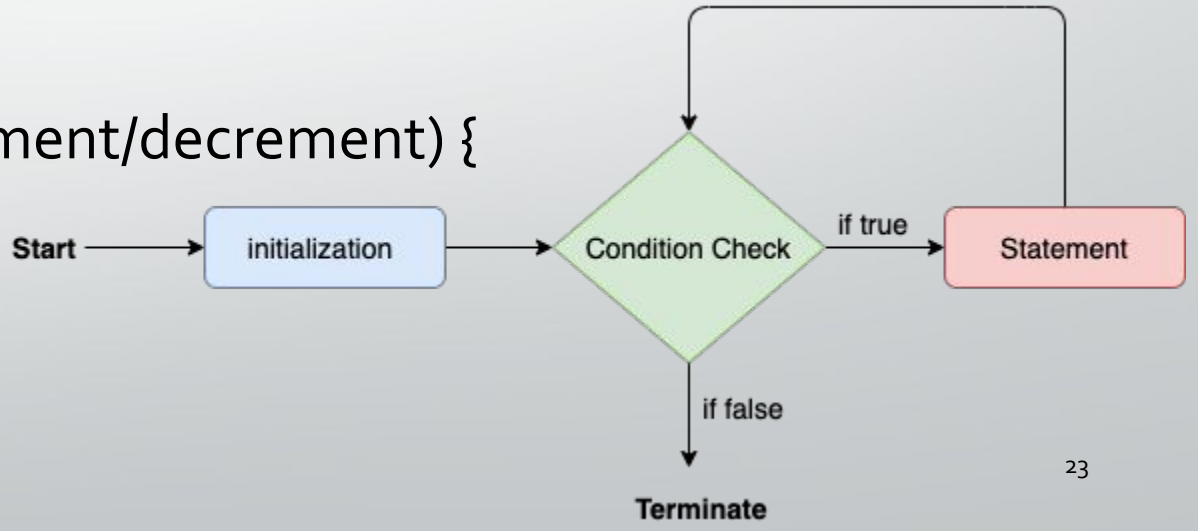
while

do-while

Loop Statements
for

- In Java, for loop is similar to C and C++
- It enables us to initialize the loop variable, check the condition, and increment/decrement in a single line of code.
- We use the for loop only when we exactly know the number of times, we want to execute the block of code.
- Syntax

```
for(initialization, condition, increment/decrement) {
//block of statements
}
```



Example of “for loop” Program 5

```
1. class Test {
2. public static void main(String[] args) {
3. for(int i= 0; i<=10; i++) {
4. System.out.println(“Good Morning….” );
5. }
6. }
7. }
```

While

- The while loop is also used to iterate over the number of statements multiple times.

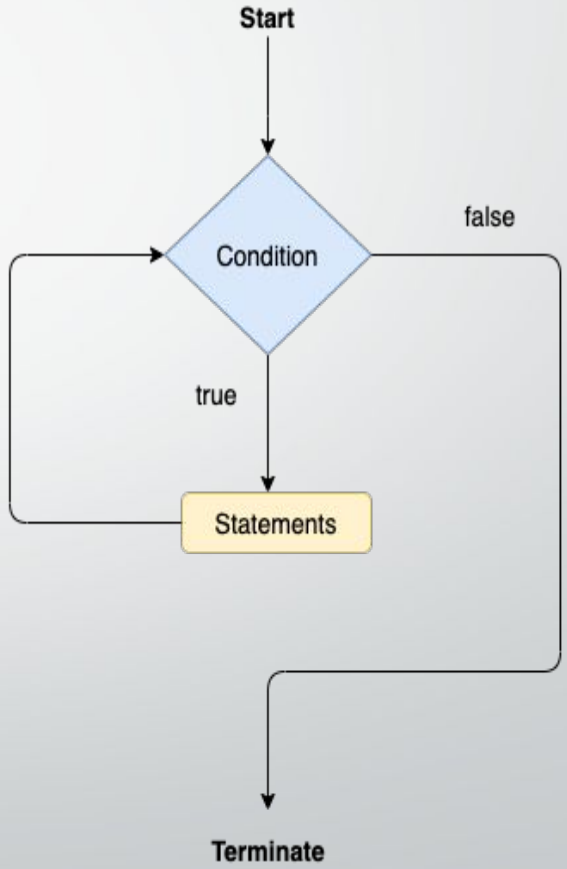
- For loop is recommended when we have :(start;end_cond;incre_decre)
- while loop is recommended when we have the only condition check.
- **syntax** :

  while(condition){

  body

  }

  The body will be executed until the condition is fail



Example of “while” Program 6

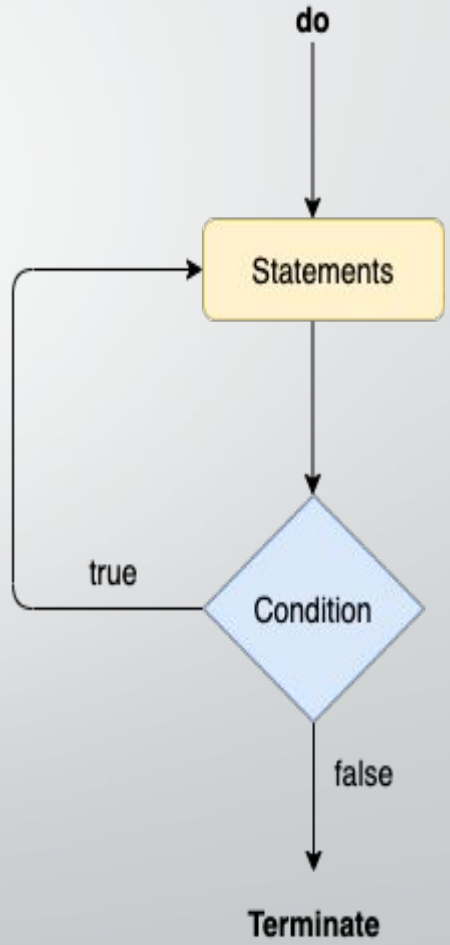
```
1.  class Test {
2.  public static void main(String[] args) {
3.  // for loop to printing the data 10 times
4.  for(int j=0;j<10;j++)
5.  {
6.  System.out.println(“Good Morning..”);
7.  }
8.  // while loop to printing the data 10 times
9.  Int i=0;
10. while(i<10) {
11. System.out.println(“Good Evening..”);
12. i++;
13. }
14. }
15. }
```

- //To print the data 10-time it is recommended to use for loop.

do While

- If you want execute the body first without condition check then use do while.
- The syntax

```
do
{
//body
} while (condition);
```



do While

```
do {
System.out.println("Good Morning");
}while(20<10);
}
}
```

EX:

```
class Test {
public static void main(String[] args) {
Int i=0;
do {
System.out.println("Good Morning");
i++;
}while(i<10);
}
```

Jump Statement

- Jump statements are used to transfer the control of the program to the specific statements.
- There are two types of jump statements in Java, i.e., break and continue.
  - break statement- As the name suggests, the break statement is used to break the current flow of the program and transfer the control to the next statement outside a loop or switch statement
  - continue statement –The continue statement break one iteration(in the loop),if a specified condition occurs and continues next iteration in the loop.

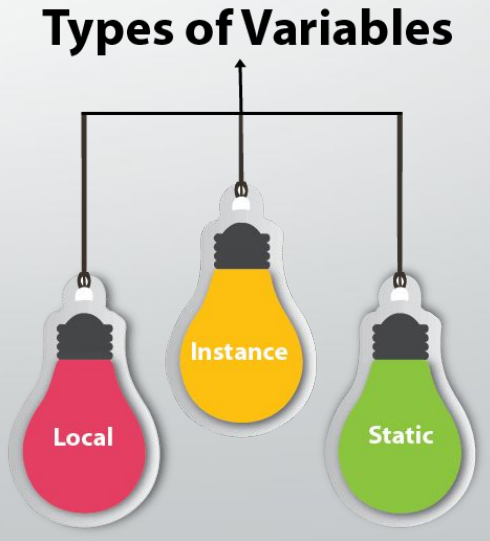
Jump Statement

```
class Test
{    public static void main(String[] args)
     {
          for (int i=0;i<=10 ;i++)
          {    if (i==5)
               {    break;
               }
               System.out.println(i);
          }

          System.out.println("******");

          for (int i=0;i<=10 ;i++)
          {    if (i==5)
               {    continue;
               }
               System.out.println(i);
          }
     }
}
```

```
E:\>java Test
0
1
2
3
4
******
0
1
2
3
4
6
7
8
9
10

E:\>
```

Variables in JAVA

- A variables are used to store the values by using that value we are achieving the project requirements.
- A variable is assigned with a data type.
- There are three types of variables in java:
  - local
  - instance
  - static



Variables in JAVA

1) Local Variable

- A variable declared inside the method is called local variable.
- You can use this variable only within that method
- other methods in the class aren't even aware that the variable exists.

```
Void m1()
{
Int a=10; // Local variables
System.out.println(a); //Possible
}
Void m2()
{
System.out.println(a); //Not Possible
}
```

2) Instance Variable

- A variable declared inside the class but outside the method.
- Accessing done through object .
- Direct access.

EX:

```
class  variable
{
   int a=10;//instance variable
   public static void main(String args[])
   {
         variable obj=new variable(); /* object creation*/
         System.out.println(obj.a); ------//10
   }
}
```

3) Static variable

- A variable that is declared as static is called a static variable.
- Memory allocation for static variables happens only once.
- Direct access.

2. **EX:**

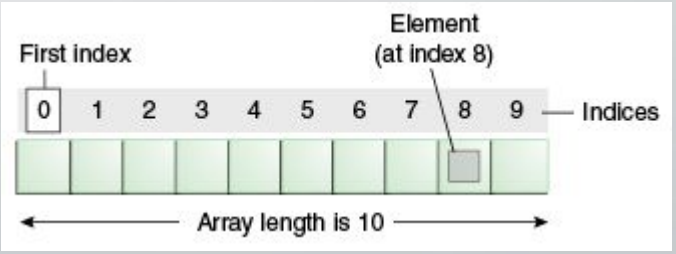
```
3. class  variable
4. {
5.    static int a=10;//static variable
6.    public static void main(String args[])
7.    {
8.          System.out.println(a); ------//10
9.    }
10. }
```

Example of "Variables" Program 9

```
1.  EX:
2.  class  variable
3.  {
4.     int a=10;//instance variable
5.     static int b=10;//static variable
6.     public static void main(String args[])
7.     {
8.           int c=10;//Local variable
9.           System.out.println(b);
10.          System.out.println(c);
11.          variable obj=new variable(); /* object creation*/
12.          System.out.println(obj.a); ------//10
13.    }
   }
```

ARRAY in JAVA

- Arrays are used to store the group of elements and these elements are homogenous & fixed number
- int[] a={10,20,30,40};
- double [] d={10.2,20.6,2.5};
- Arrays are indexed based, index start from zero.



EX:

```
class Test
{
   int[] a={10,20,30,40};
   public static void main(String args[])
   {
         System.out.println(a[0]);
         System.out.println(b[1]);
         System.out.println(c[2]);
         System.out.println(d[3]);

      for(int i=0;i<a.length;i++)
     {
      System.out.println(a[i]);
       }
    }
}
```

ARRAY in JAVA

- **Advantages**
  - **Code Optimization:** It makes the code optimized, we can retrieve or sort the data efficiently.
  - **Random access:** We can get any data located at an index position.
- **Disadvantages**
  - **Size Limit:** We can store only the fixed size of elements in the array. It doesn't grow its size at runtime.
- There are **two** types of array.
  - Single Dimensional Array
  - Multidimensional Array

String in JAVA

- Generally, String is a sequence of characters.
- But in Java, string is an object that represents a sequence of characters.
- The java.lang.String class is used to create a string object.
- There are two ways to create String object:
  - By string literal (String s="welcome";)
  - By new keyword (String s=**new** String("Welcome");

Example of “String” Program 10

```
1.  public class StringExample{
2.  public static void main(String args[]){
3.  String s1="java";//creating string by Java string literal
4.  char ch[]={'s','t','r','i','n','g','s'};
5.  String s2=new String(ch);//converting char array to string
6.  String s3=new String("example");//creating Java string by new keyword
7.  System.out.println(s1);
8.  System.out.println(s2);
9.  System.out.println(s3);
10. }}
```

String Handling

- The **Java String class length()** method finds the length of a string. The length of the Java string is the same as the Unicode code units of the string.

Syntax

public int length()

Example of "String Length"
Program 11

```
1. public class LengthExample{
2. public static void main(String args[]){
3. String s1="javatpoint";
4. String s2="python";
5. System.out.println("string length is: "+s1.length());//10 is the length of javatpoint stri
   ng
6. System.out.println("string length is: "+s2.length());//6 is the length of python string
7. }}
```

Special String Operations

- There are 4 types of special string Operations
  - String Literals
  - String Concatenation
  - String Concatenation with Other Data Types
  - String Conversion and *toString( )*
- **String literal** is created by using double quotes.
- For Example:

```
String s="javaguides";
```

- **String Concatenation** can be done using + operator, which concatenates two strings, producing a String object.
- For Example:

```
String age = "9";
String s = "He is " + age + " years old.";
System.out.println(s);
```

- You can concatenate strings with **other types of data**.
- For example

```
int age = 9;
String s = "He is " + age + " years old.";
System.out.println(s);
```

String Conversion and *toString( ) :* valueOf() method

For Example

valueOf( )(The valueOf( ) method converts data from its internal format into a human-readable form.)

```
public static String valueOf(boolean b)
public static String valueOf(char c)
public static String valueOf(char[] c)
public static String valueOf(int i)
public static String valueOf(long l)
```

Character Extraction

- String is treated as an object in Java so we can't directly access the characters that comprise a string.
- There are several ways by which characters can be extracted from String class object.
- **charAt() --** method is used to extract a single character at an index.
  - **char** charAt(**int** index)
- **getChars() --** used to extract more than one character.
  - **void** getChars(**int** stringStart, **int** stringEnd, **char** arr[], **int** arrStart)
- **getBytes() --** extract characters from String object and then convert the characters in a byte array.
  - **byte** [] getBytes()
- **toCharArray() --** alternative of getChars() method.
  - **char** [] toCharArray()

Example of "Character Extraction" Program 11

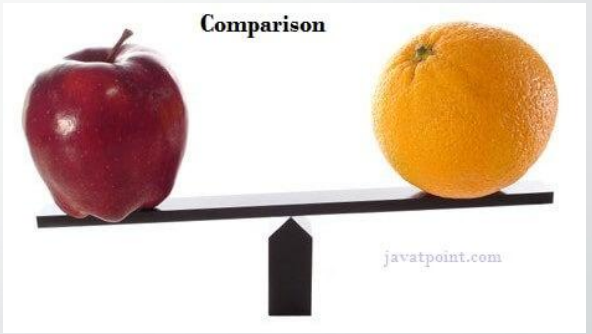
```
1. class temp
2. {
3. public static void main(String...s)
4. {
5. String str="Hello";
6. char ch=str.charAt(2);
7. System.out.println(ch);
8. }
9. }
```

```
1. class temp
2. {
3. public static void main(String...s)
4. {
5. String str="Hello World";
6. char ch[]=new char[4];
7. str.getChars(1,5,ch,0);
8. System.out.println(ch);
9. }
10. }
```

```
class temp
{
public static void main(String...s)
{
String str="Hello World";
char ch[]=str.toCharArray();
System.out.println(ch);
}
}
```

String Comparison

- We can compare String in Java on the basis of **content a**
- It is used in
  - **authentication** (by equals() method),
  - **sorting** (by compareTo() method),
  - **reference matching** (by == operator)**.**
- There are three ways to compare String in Java:
  - By Using equals() Method
  - By Using == Operator
  - By compareTo() Method



Example of "String Comparision" Program 12

```
class Teststringcomparison1{
public static void main(String args[]){

 String s1="Sachin";
 String s2="Sachin";
 String s3=new String("Sachin");
 String s4="Saurav";
 System.out.println(s1.equals(s2));//true
 System.out.println(s1.equals(s3));//true
 System.out.println(s1.equals(s4));//false
}
}
```

```
1.class Teststringcomparison3{
2. public static void main(String args[]){
3.  String s1="Sachin";
4.  String s2="Sachin";
5.  String s3=new String("Sachin");
6.  System.out.println(s1==s2);//true (because both refer to same instance)
7.  System.out.println(s1==s3);//false(because s3 refers to instance created in nonpool)
8. }
9.}
```

```
1.class Teststringcomparison4{
2. public static void main(String args[]){
3.  String s1="Sachin";
4.  String s2="Sachin";
5.  String s3="Ratan";
6.  System.out.println(s1.compareTo(s2));//0
7.  System.out.println(s1.compareTo(s3));//1(because s1>s3)
8.  System.out.println(s3.compareTo(s1));//-1(because s3 < s1 )
9. }
10.}
```

Modifying a String

- Methods for modifying a String objects.
  - *substring()*
    - susubstring(int beginIndex)
    - bstring(int beginIndex, int endIndex)
  - *concat()* -- We can concatenate two strings using concat( )
  - *replace()*
    - String replace(char original, char replacement)
    - String replace(CharSequence original, CharSequence replacement)
  - *replaceAll() – Replaces each substring of this string that matches the given regular expression with the given replacement.*
    - *replaceAll(String regex, String replacement)*
  - *replaceFirst()* -- Replaces the first substring of this string that matches the given regular expression with the given replacement.
    - replaceFirst(String regex, String replacement)
  - *trim()* -- The trim( ) method returns a copy of the invoking string from which any leading and trailing whitespace has been removed.
    - String trim( )

StringBuffer

- A string buffer is like a String, but can be modified
  - append()
  - insert()
  - replace()
  - delete()
  - reverse()
  - capacity()

Example of "String Buffer" Program 13

- StringBuffer Class append() Method

```
1. class StringBufferExample1{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer("Hello ");
4. sb.append("Java");
5. System.out.println(sb);
6. } }
```

StringBuffer insert() Method

```
1. class StringBufferExample2{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer("Hello ");
4. sb.insert(1,"Java");//now original string is changed
5. System.out.println(sb);//prints HJavaello
6. }
7. }
```

StringBuffer replace() Method

```
1. class StringBufferExample3{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer("Hello");
4. sb.replace(1,3,"Java");
5. System.out.println(sb);//prints HJavalo
6. }
7. }
```

StringBuffer delete() Method

```
1. class StringBufferExample4{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer("Hello");
4. sb.delete(1,3);
5. System.out.println(sb);//prints Hlo
6. }
7. }
```

StringBuffer capacity() Method

```
1. class StringBufferExample5{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer();
4. System.out.println(sb.capacity());//default 16
5. sb.append("Hello");
6. System.out.println(sb.capacity());//now 16
7. sb.append("java is my favourite language");
8. System.out.println(sb.capacity());//now (16*2)+2=34 i.e (oldcapacity*2)+2
9. }
10. }
```

StringBuffer reverse() Method

```
1. class StringBufferExample6{
2. public static void main(String args[]){
3. StringBuffer sb=new StringBuffer("Hello");
4. sb.reverse();
5. System.out.println(sb);//prints olleH
6. }
7. }
```

Assignment-2

1. List out 4 primitive and 3 non primitive data types in java
2. What is “if” statement, Explain 4 types of decision making statements with syntax
3. Write a brief note on “Switch Statement”, Explain 3 types of switch Statements with syntax
4. What are variables? Write note on 3 types of variables
5. What are the 3 ways to compare the string? Write java program for all the 3 ways to compare the string.