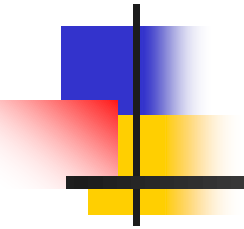
Object Oriented Programming (CSE 2202)



Chapter 01 Part II

Control Statements, Arrays and Strings

Control Statements

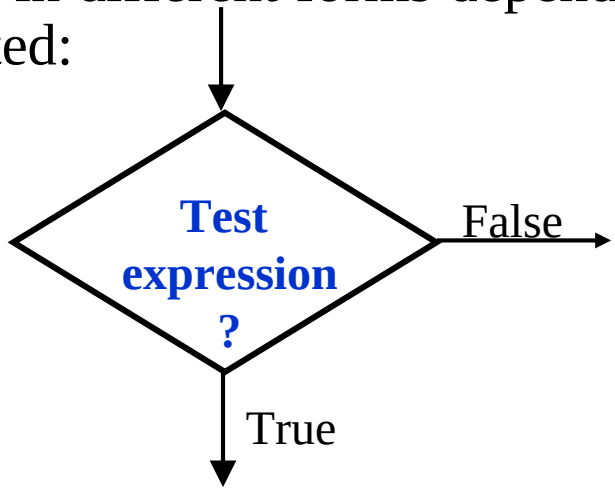
- Generally, the statements inside source programs are executed from top to bottom, in the order that they appear.
- *Control flow statements*, however, alter the flow of execution and provide better control to the programmer on the flow of execution.
- In Java control statements are categorized into 3 groups:
  1. **Selection or Decision Making Statements :** allow the program to choose different parts of the execution based on the outcome of an expression
  2. **Iteration Statements** enable program execution to repeat one or more statements
  3. **Jump Statements** enable your program to execute in a non-linear fashion

Selection Statements

- These statements allow us to control the flow of program execution based on condition.
- Java supports 2 selection statements:
  - if statements
  - switch statements

If statement:

- It performs a task depending on whether a condition is true or false.
- It is basically a two-way decision making statement and is used in conjunction with an expression.
- The if statement may be implemented in different forms depending on the complexity of conditions to be tested:



1. Simple if Statement

- An if statement consists of a Boolean expression followed by one or more statements.
- The syntax of an if statement is:

```
if (expression)
{
    statement-block;
}
rest_of_program;
```

- If `expression` is `true`, `statement-block` is executed and then `rest_of_program`.
- If `expression` is `false`, `statement-block` will be skipped & the execution will jump to the `rest_of_program`

2. if … else Statement

- The syntax of an if…else statement is:

```
if (expression)
{
   True-block statement(s);
}
else
{
   False-block statement(s);
}
rest_of_program;
```

- If *expression* is *true*, *True-block statement* is executed and followed by *rest_of_program* block.

- If *expression* is *false*, *False-block Statement* is executed followed by *rest_of_program* block.

3. if … else if (else if Ladder) Statement

Java Programming

- Is used when multiple decisions are involved.
- A multiple decision is a chain of *ifs* in which the which the statement associated with each else is an if.
- The conditions are evaluated from the top(of the ladder), downwards.
- As soon as the true condition is found, the statement associated with it is executed and the control will skip the rest of the ladder.
- When all the conditions become false, then the final *else* containing the default statement will be executed.
- The syntax of an *if …. else* if statement is:

```
if (expression 1)
{
   statement(s)-1;
}
else if (expression 2)
{
   statement(s)-2;
}
...
else if (expression n)
{
   statement(s)-n;
}
else
  default-statement;

rest_of_program;
```

4. Nested if … else Statement

- if…else statements can be put inside other if…else statements. such statements are called nested if … else statements.
- Is used whenever we need to make decisions after checking a given decision.
- The syntax of a *nested if…else* statement is shown in the next slide.
- *True-block statement 1.1* is executed if both *expression 1* and *expression 1.1 are true. But if expression 1 is true and if expression 1.1 is false, then it is False-block statement 1.1 which is going to be executed.*

```
if (expression 1)
{
   statement(s)-1;
   if (expression 1.1)
   {
     True-block Statement 1.1
   }
   else
   {
     False-block Statement 1.1
   }

}
else if (expression 2)
{
   statement(s)-2;
}
...
else if (expression n)
{
   statement(s)-n;
}
else
  default-statement;
rest_of_program;
```

Nested if statement

Switch statement

- We can design a program with multiple alternatives using if statements to control the selection.
- But the complexity of such programs increases dramatically when the number alternatives increases.
- Java has a multi-way decision statement called switch statement.
- The switch statement tastes the value of a given variable(expression) against a list of case values and when a match is found, a block of statements associated with that case is executed.

Switch syntax

Java Programming

```
switch (expression)
{
   case value-1:
        statement-block 1;
        break;
   case value-2:
        statement-block 2;
        break;
        ......
        ......
   default:
        default_statement;
        break;
}
rest_of_program
```

Contd…

- The expression must evaluate to a char, short or int, but not long, float or double.
- The values value-1, value-2, value-3, … are constants or constant expressions (evaluable to an integral constant) and are known as *case labels*.
- Each of the case labels should be unique within the switch statement.
- statement-block1, statement-block2, …. Are statement lists and may contain zero or more statements.

Contd…

- There is no need to put braces around the statement blocks of a switch statement but it is important to note that case labels end with a colon (:).
- When the switch is executed, the value of the expression is successfully compared against the values value-2, value-2, ….
- If a case is found whose value matches with the value of the expression, then the block of the statement(s) that follows the case are executed; otherwise the default-statement will be executed.
- The break statement at the end of each block signals the end of a particular case and causes an exit from the switch statement.

The ?: (Conditional) Operator

- Is useful for making a two-way decisions.
- This operator is a combination of ? and : and takes three operands.

General formula:

conditional expression ? Expression1:expression2;

- The conditional expression is evaluated first. If the result is *true*, *expression1* is evaluated and is returned as the value of the conditional expression. Otherwise, *expression2* is evaluated and its value is returned.

Contd…

- For example:

```
if (x<=40)
   if(x<40)
    slary=4*x+100;
   else
     salary=300;
else
   slary=4.5*x+100;
```

Can be written as:

```
salary=(x!=40)? (x<40)?
(4*x+100):(4.5*x+100)):300;
```

- When the conditional operator is used, the code becomes more concise and perhaps, more efficient. However, the reliability is poor.
- It is better to use if statement when more than a single nesting of conditional operator is required.

Exercise

Java Programming

1. Find out Errors in the following program and discuss ways for correction.

a) //Errors.java

```
public Class Errors{
        public void main(String [] args){
        int i, j = 32768;
        short s = j;
        double m = 5.3f, n = 2.1f;
        float x = 5.3, y = 2.1;
        byte z = 128;
        System.out.println("x % y = "+x % y);
        boolean b = 1 ;
        if (b) System.out.println(“b is true”);
        else System.out.println(“b is false”);
        }
}
```

2. Write a Java application program that asks the user to enter two numbers obtains the numbers from the user and prints the sum, product, difference and quotient of the numbers?

3. Write a Java application program that asks the user to enter two integers, obtains the numbers from the user and displays the larger number followed by the words "is larger than " the smaller number in the screen. If the numbers are equal, print the message "These numbers are equal."

4. Write four different Java statements that each add 1 to integer variable x.

5. Rewrite each of the following without using compound relations:

a)
```
if(grade<=59 && grade>=50)
   second+=1;
```

b)
```
if(num>100 || num<0)
  System.out.prinln("Out of Range");
else
   sum+=num;
```

c)
```
If((M>60 && N>60)||T>200)
    y=1;
 else
    y=0;
```

6. Write a Java application program that reads the coefficients of a quadratic equation ($ax^2+bx+c=0$), generates and display the roots.

Note:

An appropriate message should be generated when the user types an invalid input to the equation.

Iterative/Loop Statements

- The process of repeatedly executing a block of statements is known as looping.
- A loop allows you to execute a statement or block of statements repeatedly until a termination condition is met.
- The statements in the block may be executed any number of times, from zero to infinite number.
- If a loop continues forever, it is called an infinite loop.
- A program loop consists of two statements:
  - Body of the loop.
  - Control statements.
- A looping process, in general, would include the four steps:
  1. Setting and initialization of a counter .
  2. Execution of the statements in the loop.
  3. Test for a specified condition for execution of the loop.
  4. Increment/Decrement the counter.

Contd…

- Depending on the position of the control statement in the loop, a control structure can be either as the entry-controlled loop or as exit-controlled loop.
- In entry-controlled loop, the control conditions are tested before the start of the loop execution.
- In exit-controlled loop, the test is performed at the end of the body of the loop and therefore the body is executed unconditionally for the first time.
- Three types of loops in java:
  1. while loops
  2. do …while loops
  3. for loops

1. The while loop

- Is the simplest of all the looping structures in Java.
- The while loop is an entry-controlled loop statement.
- The while loop executes as long as the given logical expression between parentheses is true. When expression is false, execution continues with the statement immediately after the body of the loop block.
- The expression is tested at the beginning of the loop, so if it is initially false, the loop will not be executed at all.
- The basic format of the while statement is:

```
initialization;
while (expression)
{
    Body of the loop;
}
```

Example:

```
int sum=0,n=1;
while(n<=100)
{
   sum+=n;
   n++;
}
System.out.println("Sum="+sum;
```

Contd…

- The body of the loop may have one or more statements.
- The braces are needed only if the body contains two or more statements. However it is a good practice to use braces even if the body has only one statement.

2. The do…while loop

- Unlike the while statement, the do… while loop executes the body of the loop before the test is performed.

Syntax:

```
initialization;
do
{
    Body of the loop;
}
while (expression);
```

Contd…

- On reaching the do statement, the program proceeds to evaluate the body of loop first.
- At the end of the loop, the test condition in the while statement is evaluated. If it is true, the program continues to evaluate the body of the loop once again.
- When the condition becomes false, the loop will be terminated and the control goes to the statement that appears immediately after the while statement.
- The do while loop is an exit-controlled loop statement.

Example:

```
int sum=0,n=1;
do
{
    sum+=n;
    n++;
} while(n<=100);
System.out.println("Sum="+sum;
```

3. The for loop

- Is another entry-controlled loop that provides a more concise loop controlled structure.
- Syntax for the for loop is:

```
for(initialization; test condition; increment)
{
    Body of the loop;
}
```

- We use the for loop if we know in advance for how many times the body of the loop is going to be executed.
- But use do…. while loop if you know the body of the loop is going to be executed at least once.

Contd…

- The execution of the for loop statement is as follows:

1. *Initialization* of the *control variable(s)* is done first, using assignment statement.
2. The value of the *control variable is tested* using the test condition. The test condition is a relation operation that determines when the loop will exit.
   - If the condition is *true*, the body of the loop is executed; otherwise the loop is terminated and the execution continues with the statement that immediately follows the loop.
3. When the body of the loop is executed, the control is transferred back to the for statement after evaluating the last statement in the loop.
   - Now the new value of the control variable is again tested to see whether it satisfies the loop condition; if it does, the body of the loop is again executed.

Contd…

Example

```
int sum=0;
for(n=1; n<=100; n++)
{
    sum=sum+n;
}
System.out.println("Sum is:"+sum);
```

Additional Features of for loop

A. More than one variable, separated by comma, can be initialized at a time in the for statement.

Example:

```
for(sum=0, i=1; i<=100; i++)
{
        sum=sum+i;
}
```

Contd…

B. Increment section may also have more than one part.

Example:

```
for(i=0, j=0; i*j < 100; i++, j+=2)
{
        System.out.println(i * j);
}
```

C. The test condition may have any compound relation and the testing need not be limited only to the loop control variable.

Example:

```
for(sum=0, i=1; i<20 && sum<100; ++i)
{
        sum=sum+i;
}
```

Contd…

D. You do not have to fill all three control sections, one or more sections can be omitted but you must still have two semicolons.

Example:

```
int n = 0;
for(; n != 100;) {
    System.out.println(++n);
}
```

Nesting of for loops

- You can nest loops of any kind one inside another to any depth.

Example:

```
for(int i = 10; i > 0; i--)
{
     while (i > 3)
     {
          if(i == 5){
              break;
          }
            System.out.println(i);
            i--;
      }
       System.out.println(i*2);
  }
```

Inner Loop

Outer Loop

Jumps in Loops

- Jump statements are used to unconditionally transfer the program control to another part of the program.
- Java has three jump statements: break, continue, and return.

1. The break statement

- A break statement is used to abort the execution of a loop. The general form of the break statement is given below:

  break label;

- It may be used with or without a label.
- When it is used without a label, it aborts the execution of the innermost switch, for, do, or while statement enclosing the break statement. When used with a label, the break statement aborts the execution of any enclosing statement matching the label.
- A label is an identifier that uniquely identifies a block of code.

Examples

1. **Outer:** for(int k=1; k< 10; k++){

```
        int i=k;
      while ( i < 5) {
            if(i%5==0) break Outer; // jump out of both loops
            System.out.print(" "+i);
            i++;
       }
      Syetem.out.println("Outer Loop");
   }
```

2.
```
int i=1;
while ( i < 10) {
   if(i%2==0) break;
    System.out.println("  "+i);
   }
     System.out.println("Out of the while loop");
```

2. The continue statement

- is used to alter the execution of the for, do, and while statements.
- The general form of the continue statement is:

  continue label;

- It may be used with or without a label. When used without a label, it causes the statement block of the innermost for, do, or while statement to terminate and the loop's boolean expression to be re-evaluated to determine whether the next loop repetition should take place.

Contd…

- When it is used with a label, the continue statement transfers control to an enclosing for, do, or while statement matching the label.

Example:

```
int sum = 0;
for(int i = 1; i <= 10; i++){
    if(i % 3 == 0) {
        continue;
    }
    sum += i;
}
```

What is the value of `sum`?

1 + 2 + 4 + 5 + 7 + 8 + 10 = 37

3. The return Statement

- A return statement is used to transfer the program control to the caller of a method.
- The general form of the return statement is given below:

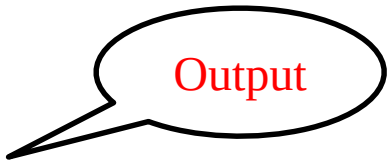
  return expression;

- If the method is declared to return a value, the expression used after the return statement must evaluate to the return type of that method. Otherwise, the expression is omitted.

Contd…

```
//Use of Continue and break Statements
class ContinueBreak
{
     public static void main(String [ ]args)
  {
Loop1: for(int i=1; i<100; i++)
       {
            System.out.println(" ");
            if (i>=8) break;
            for (int j=1; j<100; j++)
            {
                System.out.print("*");
                 if (j==i) continue Loop1;
            }
       }
       System.out.print("Termination by BREAK");
     }
}
```

```
*
**
***
****
*****
******
*******
Termination by BREAK
```



Exercise

1. What do the following program print?

```
public class Mystery3{
    public static void main(String args[]){
        int row = 10, column;
        while(row >= 1){
                column = 1;
                while(column <= 10){
                        System.out.print(row % 2 == 1 ? "<" : ">");
                        ++column;
                }
                --row;
                System.out.println();
                }
        }
}
```

Contd…

2. Write a Java application program that asks the user to enter an integer number from the keyboard and computes the sum of the digits of the number. [**Hint**: if the user types 4567as input , then the output will be 22]
3. Given a number, write a program using while loop to reverse the digits of the number. [**Hint**: Use Modulus Operator to extract the last digit and the integer division by 10 to get the n-1 digit number from the n digit]
4. Using a two-dimensional array, write codes that could print the following outputs?

a)

```
$ $ $ $ $
  $ $ $ $
    $ $ $
      $ $
        $
```

b)

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

c)

```
        5
      4 5 4
    3 4 5 4 3
  2 3 4 5 4 3 2
1 2 3 4 5 4 3 2 1
```

d)

```
1 2 3 4 5 4 3 2 1
  1 2 3 4 3 2 1
    1 2 3 2 1
      1 2 1
        1
```

Arrays

Java Programming

- An array is a group of contiguous or related data items that share a common name.
- is a container object that holds a fixed number of values of a single type.
- Unlike C++ in Java arrays are created dynamically.
- ***An array can hold only one type of data!***

Example:

`int[]` can hold only integers

`char[]` can hold only characters

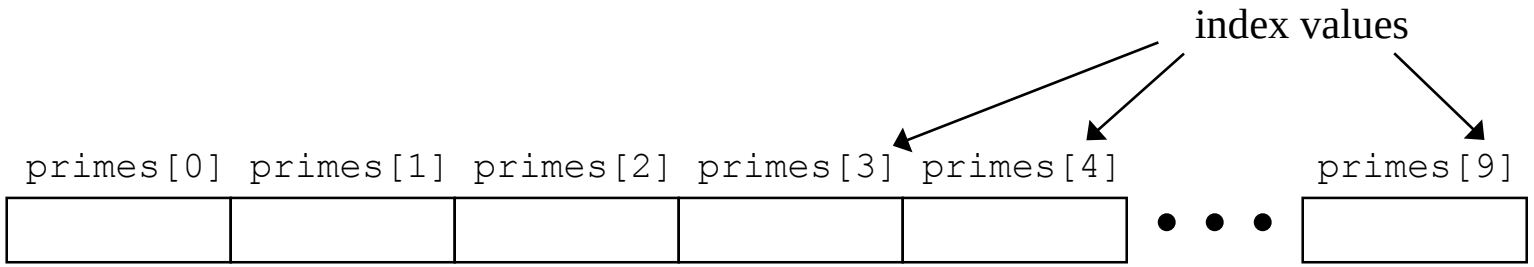
- A particular values in an array is indicated by writing a number called *index* number or *subscript* in brackets after the array name.

Example:

`slaray[10]` represents salary of the 10^{th} employee.

Contd…

- The length of an array is established when the array is created. After creation, its length is fixed.
- Each item in an array is called an *element*, and each element is accessed by its numerical *index*.
- Array indexing *starts from 0 and ends at n-1*, where n is the size of the array.



One-Dimensional Arrays

- A list of items can be given one variable name using only one subscript and such a variable is called a single-subscripted variable or a one-dimensional array.

Creating an Array

- Like any other variables, arrays must be declared and created in the computer memory before they are used.
- Array creation involves three steps:
  1. Declare an array Variable
  2. Create Memory Locations
  3. Put values into the memory locations.

1. Declaration of Arrays

- Arrays in java can be declared in two ways:
  i. ***type arrayname [ ];***
  ii. ***type[ ]arrayname;***

Example:

```
int number[];
float slaray[];
float[] marks;
```

- when creating an array, each element of the array receives a default value zero (for numeric types) ,false for boolean and null for references (any non primitive types).

2. Creation of Arrays

- After declaring an array, we need to create it in the memory.
- Because an array is an object, you create it by using the new keyword as follows:

arrayname =new type[size];

Example:

```
number=new int(5);
marks= new float(7);
```

- It is also possible to combine the above to steps , declaration and creation, into on statement as follows:

type arrayname =new type[size];

Example: `int num[ ] = new int[10];`

3. Initialization of Arrays

- Each element of an array needs to be assigned a value; this process is known as initialization.
- Initialization of an array is done using the array subscripts as follows:
  - ***arrayname [subscript] = Value;***

Example:

```
number [0]=23;
number[2]=40;
```

- Unlike C, java protects arrays from *overruns* and *underruns*.
- Trying to access an array beyond its boundaries will generate an error.

Contd.

- Java generates an *ArrayIndexOutOfBoundsException* when there is underrun or overrun.
- The Java interpreter checks array indices to ensure that they are valid during execution.
- Arrays can also be initialized automatically in the same way as the ordinary variables when they are declared, as shown below:

type arrayname [] = {list of Values};

Example:

```
int number[]= {35,40,23,67,49};
```

Contd.

- It is also possible to assign an array object to another array object.

Example:

```
int array1[]= {35,40,23,67,49};
int array2[];
array2= array1;
```

Array Length

- In Java, all arrays store the allocated size in a variable named ***length***.
- We can access the length of the array array1using *array1.length*.

  Example:

```
int size = array1.length;
```

```
//sorting of a list of Numbers
class Sorting
{
  public static void main(String [ ]args)
  {
       int num[ ]= {55, 40, 80, 12, 65, 77};
       int size = num.length;
       System.out.print("Given List: ");
       for (int i=0; i<size; i++)
      {
        System.out.print("  " + num[ i ] );
      }
     System.out.print("\n");
     //Sorting Begins
     for (int i=0; i<size; i++)
      {
        for (int j=i+1; j<size; j++)
        {
          if (num[i] < num [j])
          {
            //Interchange Values
             int temp = num[i];
            num [i] = num [j];
            num [j] = temp;
          }
        }
      }
      System.out.print("SORTED LIST" );
      for (int i=0; i<size; i++)
      {
         System.out.print("  "  + num [i]);
      }
     System.out.println("  ");
    }
}
```

Two-Dimensional Arrays

- A 2-dimensional array can be thought of as a grid (or matrix) of values.
- Each element of the 2-D array is accessed by providing two indexes: a *row index* and a *column index*
- A 2-D array is actually just an array of arrays.
- A multidimensional array with the same number of columns in every row can be created with an array creation expression:

Example:

```
int myarray[][]= int [3][4];
```

Contd…

- Like the one-dimensional arrays, two-dimensional arrays may be initialized by following their declaration with a list of initial values enclosed in braces. For example,

```
int myarray[2][3]= {0,0,0,1,1,1};
```

or

```
int myarray[][]= {{0,0,0},{1,1,1}};
```

- We can refer to a value stored in a two-dimensional array by using indexes for both the column and row of the corresponding element. For Example,

```
int value = myarray[1][2];
```

Contd…

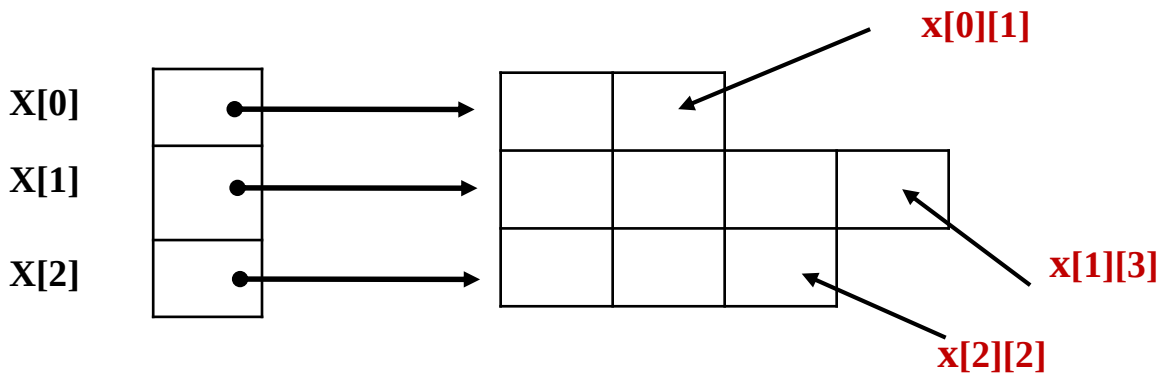

```
 //Application of two-dimensional Array
class MulTable{
  final static int ROWS=12;
  final static int COLUMNS=12;
  public static void main(String [ ]args)  {
   int pro [ ] [ ]= new int [ROWS][COLUMNS];
   int i=0,j=0;
   System.out.print("MULTIPLICATION TABLE");
   System.out.println("    ");
   for (i=1; i<ROWS; i++)
   {
     for (j=1; j<COLUMNS;  j++)
       {
          pro [i][j]= i * j;
          System.out.print("  "+ pro [i][j]);
       }
       System.out.println("    " );
      }
     }
}
```

Variable Size Arrays

- Java treats multidimensional array as “array of arrays”.
- It is possible to declare a two-dimensional array as follows:

```
int x[][]= new int[3][];
x[0] = new int[2];
x[1] = new int[4];
x[2] = new int[3];
```

- This statement creates a two-dimensional array having different length for each row as shown below:



Strings

- Strings represent a sequence of characters.
- The easiest way to represent a sequence of characters in Java is by using a character:

```
char ch[ ]= new char[4];
ch[0] = 'D';
ch[1] = 'a';
ch[2] = 't;
ch[3] = 'a;
```

- This is equivalent to `String ch="Hello";`
- Character arrays have the advantage of being able to query their length.
- But they are not good enough to support the range of operations we may like to perform on strings.

Contd…

- In Java, strings are class objects and are implemented using two classes:
  - ***String class***
  - **StringBuffer**
- Once a String object is created it cannot be changed. Strings are Immutable.
- To get changeable strings use the **StringBuffer** class.
- A Java string is an instantiated object of the String class.
- Java strings are more reliable and predictable than C++ strings.
- A java string is not a character array and is not NULL terminated.

Contd…

- In Java, strings are declared and created as follows:

```
String stringName;
stringName= new String("String");
```

Example:

```
String firstName;
firstName = new String("Jhon");
```

- The above two statements can be combined as follows:

```
String firstName= new String("Jhon");
```

- The `length()` method returns the length of a string.

```
Example: firstName.length(); //returns 4
```

String Arrays

- It is possible to create and use arrays that contain strings as follows:

```
String arrayname[] = new String[size];
```

Example:

```
String item[]= new String[3];
item[0]= "Orange";
item[1]= "Banana";
item[2]= "Apple";
```

- It is also possible to assign a string array object to another string array object.

String Methods

Java Programming

1. The **length();** method returns the length of the string.

   Eg: System.out.println("Hello".length()); // prints 5

- The + operator is used to concatenate two or more strings.

  Eg: String myname = "Harry"

  String str = "My name is" + myname+ ".";

2. The **charAt();** method returns the character at the specified index.

Syntax : public char **charAt**(int index)

Ex: char ch;

ch = "abc".charAt(1); // ch = "b"

Contd…

3. The **equals();** method returns 'true' if two strings are equal.

   Syntax : *public boolean equals(Object anObject)*

   Ex: String str1="Hello",str2="hello";

   (str1.equals(str2))? System.out.println("Equal"); : System.out.println("Not Equal"); // prints Not Equal

4. The **equalsIgnoreCase();** method returns 'true' if two strings are equal, ignoring case consideration.

   Syntax : *public boolean equalsIgnoreCase(String str)*

   Ex: String str1="Hello",str2="hello";

```
if (str1.equalsIgnoreCase(str2))
  System.out.println("Equal");
   System.out.println("Not Equal");  // prints Equal as an output
```

Contd…

5. The **toLowerCase();** method converts all of the characters in a String to lower case.

   Syntax : *public String toLowerCase( );*

   Ex: String str1="HELLO THERE";

   System.out.println(str1.toLowerCase()); // prints **hello there**

6. The **toUpperCase();** method converts all of the characters in a String to upper case.

   Syntax : : *public String toUpperCase( );*

   Ex: System.out.println("wel-come".toUpperCase()); // prints **WEL-COME**

7. The **trim();** method removes white spaces at the beginning and end of a string.

   Syntax : *public String trim( );*

   Ex: System.out.println(" wel-come ".trim()); //prints **wel-come**

Contd…

8. The **replace();** method replaces all appearances of a given character with another character.

Syntax : *public String replace('ch1', 'ch2');*

Ex: String str1="Hello";

System.out.println(str1.replace('l', 'm')); // prints H**emmo**

9. **comparetTo();** method Compares two strings lexicographically.

- The result is a negative integer if the first String is less than the second string.
- It returns a positive integer if the first String is greater than the second string. Otherwise the result is zero.

Syntax : *public int compareTo(String anotherString);*

public int compareToIgnoreCase(String str);

Ex: ("hello".compareTo("Hello")==0) ? System.out.println("Equla");
: System.out.println("Not Equal"); //prints **Not Equal**

Contd…

10. The **concat();** method concatenates the specified string to the end of this string.

Syntax : *public String concat(String str)*

Ex: System.out.println(*"to".concat("get").concat("her"*)); // returns together

11. The **substring();** method creates a substring starting from the specified index (n^{th} character) until the end of the string or until the specified end index.

Syntax : *public String substring(int beginIndex);*

public String substring(int beginIndex, int endIndex);

Ex:
```
"smiles".substring(2); //returns "ile"
"smiles".substring(1,5);//returns "mile"
```

Contd…

12. The **startsWith();** Tests if this string starts with the specified prefix.

Syntax: *public boolean startsWith(String prefix);*

Ex:
```
"Figure".startsWith("Fig"); // returns true
```

13. The **indexOf();** method returns the position of the first occurrence of a character in a string either starting from the beginning of the string or starting from a specific position.

- *public int indexOf(int ch);* Returns the index of the first occurrence of the character within this string starting from the first position.
- *public int indexOf(String str);* - Returns the index of the first occurrence of the specified substring within this string.
- *public int indexOf(char ch, int n);* - Returns the index of the first occurrence of the character within this string starting from the n^{th} position.

Contd.

Ex:
```
String str = "How was your day today?";
  str.indexOf('t'); // prints 17
  str.indexOf('y', 17); // prints 21
  str.indexOf("was"); // Prints 4
  str.indexOf("day",10)); //Prints 13
```

14. The **lastIndexOf();** method Searches for the last occurrence of a character or substring.

- The methods are similar to indexOf() method.

15. **valueOf();** creates a string object if the parameter or converts the parameter value to string representation if the parameter is a variable.

Syntax: *public String valueOf(variable);*

public String valueOf(variable);

Ex:
```
char x[]={'H','e', 'l', 'l','o'};
```
System.out.println(String.valueOf(x));//prints Hello

System.out.println(String.valueOf(48.958)); // prints 48.958

Contd…

16. endsWith(); Tests if this string ends with the specified suffix.

Syntax: *public boolean endsWith(String suffix);*

Ex: *"Figure".endsWith("re"); // true*

Exercise

1. Consider a two-by-three integer two-dimensional array named array3.
   a) Write a statement that declares and creates array3.
   b) Write a single statement that sets the elements of array3 in row 1 and column 2 as zero.
   c) Write a series of statements that initializes each element of array3 to 1.
   d) Write a nested **for** statement that initializes each element of array3 to two.
   e) Write a nested **for** statement that inputs the values for the elements of array3 from the user.
   f) Write a series of statements that determines and prints the smallest value in array3.
   g) Write a statement that displays the elements of the first row of array3.
   h) Write a statement that totals the elements of the third column array3.

Contd…

2. Write a Java application program which adds all the numbers , except those numbers which are multiples of three, between 1 and 100. (Hint: use continue statement)
3. Write a program which reads the values for two matrices and displays their product.
4. Write a program, which will read a string and rewrite it in alphabetical order.
5. Write a java application program which reads a paragraph and displays the number of words within the paragraph.