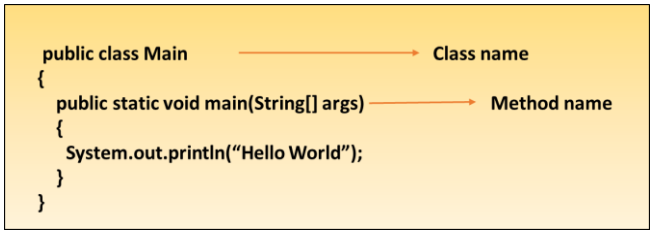
Vellore Institute of Technology, Amaravati Campus
First Semester 2020-2021

Problem Solving using Java [CSE 1004]

Lab 1

Anatomy of Java Code

- A Java source file contains Java classes.
- Every executable Java program must have a function called **public static void main (String[] args)**
- **Class Header**
  - This part tells the compiler the nature of the class,i.e., public or private and the name of class,i.e., Main.
- **Curly braces**
  - Curly braces define the scope of the class and method respectively.
- **Main method**
  - Every Java code must have this method.
  - Public indicates that the method can be accessed by anyone.
  - Static instructs that this is a subroutine that is part of the class and not a method for any one instance of the class.
  - Void tells the JDK that the associated main method would not return a value.
  - (String[] args): This is a conventional way to refer to the arguments of the method. In this case, the method takes an array of strings as its input parameter.



Naming Conventions

IDENTIFIER	CONVENTION	CORRECT REPRESENTATION	INCORRECT REPRESENTATION
Class	UpperCamelCase : The first letter of each word is capitalized	BMICalculator Student MyDemoProgram	BmiCalculator STUDENT myDemoProgram

Variable	LowerCamelCase : The first letter is lowercase and the first letters of all following words are capitalized.	myHeight; myWeight; height; weight;	MyHeight; MyWeight; Height; WEIGHT;

In VPROPEL, we use **Main** as class name only.

Data Types in Java

Java is a strongly typed language. This means that every variable should first be carefully declared upfront before it can be used.
Java supports eight built-in primitive data types. The following table defines each of these and specifies the range and default value.

char: The char data type is a single 16-bit Unicode character and most basic data type. It stores a single character and requires a single byte of memory in almost all compilers.

int: The int data type is a 32-bit signed two's complement integer. Its value-range lies between - 2,147,483,648 (-2^31) to 2,147,483,647 (2^31 -1) (inclusive). Its minimum value is - 2,147,483,648and maximum value is 2,147,483,647. Its default value is 0.
The int data type is generally used as a default data type for integral values unless if there is no problem about memory.

short: The short data type is a 16-bit signed two's complement integer. Its value-range lies between -32,768 to 32,767 (inclusive). Its minimum value is -32,768 and maximum value is 32,767. Its default value is 0. The short data type can also be used to save memory just like byte data type. A short data type is 2 times smaller than an integer.

byte: The byte data type is an example of primitive data type. It isan 8-bit signed two's complement integer. Its value-range lies between -128 to 127 (inclusive).

long: The long data type is a 64-bit two's complement integer. Its value-range lies between -9,223,372,036,854,775,808(-2^63) to 9,223,372,036,854,775,807(2^63 -1)(inclusive). Its minimum value is - 9,223,372,036,854,775,808and maximum value is 9,223,372,036,854,775,807. Its default value is 0. The long data type is used when you need a range of values more than those provided by int.

float: The float data type is a single-precision 32-bit IEEE 754 floating point.Its value range is unlimited. It is recommended to use a float (instead of double) if you need to save memory in large arrays of floating point numbers. The float data type should never be used for precise values, such as currency. Its default value is 0.0F.

double: The double data type is a double-precision 64-bit IEEE 754 floating point. Its value range is unlimited. The double data type is generally used for decimal values just like float. The double data type also should never be used for precise values, such as currency. Its default value is 0.0d.

Data Type	Memory (bytes)	Format Specifier
short int	2	**%hd**
int	4	**%d**
long int	4	**%ld**
long long int	8	**%lld**
signed char	1	**%c**
float	4	**%f**
double	8	**%lf**
long double	**1**	**%Lf**

Arithmetic operators

The symbols of the arithmetic operators are:-

Operation	Operator	Comment	Value of Sum Before	Value of sum after
Multiply	*	**sum=sum*2;**	**4**	**8**
Divide	/	**sum=sum/2;**	**4**	**2**
Addition	+	**Sum=sum+2;**	**4**	**6**
Subtraction	-	**sum=sum-2;**	**4**	**2**
Increment	++	**++sum;**	**4**	**5**
Decrement	--	**--sum;**	**4**	**3**
Modulus	%	**sum=sum%3;**	**4**	**1**

In VPROPEL, for successful execution of test cases do not use prompt messages with System.out.println().

Example Questions **(Non-Evaluative)**

1. *Write a program in Java to find the volume (pi*r*r*h) and surface area (2*pi*r*h) of a right circular cylinder with radius r and height h, where pi = 3.14.*

Vpropel code

```
import java.util.*;
public class Main
{
    public static void main(String [] args)
    {
        Scanner sc = new Scanner(System.in);
        double pi=3.14;
        double r=sc.nextDouble();
        double h=sc.nextDouble();
        double area= (2*pi*r*h);
        double volume= (pi*r*r*h);
        System.out.println(area);
        System.out.println(volume);
    }
}
```

Successful Code Completion

```
Success your code has passed all test cases!!
```

In VPROPEL, please check the datatypes and give corresponding datatypes for execution.

2. *Write a program in Java to input the radius to find the volume of a sphere (Volume = 4/3 * pi * r * r * r, pi = 3.14).*

Vpropel Code

```java
import java.util.*;
class Main
{
   public static void main(String args[])
    {
            Scanner s= new Scanner(System.in);
            double r=s.nextDouble();
            double pi = 3.14;
            double  volume = (4/3)*pi*r*r*r;
            System.out.println(volume);
      }
}
```

Successful Execution Output

```
Success your code has passed all test cases!!
```

In VPROPEL specifying public keyword in class declaration is optional.

3. *Write a Java program to convert temperature from Fahrenheit to Celsius degree.*

Vpropel Code

```java
import java.util.*;
public class Main
{
  public static void main(String[] args)
  {
    float temperature;
    Scanner in = new Scanner(System.in);
    temperature = in.nextFloat();
    temperature = ((temperature - 32)*5)/9;
    System.out.printf("%.2f",temperature);
  }
}
```

Successful Execution Output

```
Success your code has passed all test cases!!
```

4. *Write a Java program to calculate the area and perimeter of the rectangle and display the results. Take the values of length and breadth from the users.*
   *(Area = length * breadth, and perimeter = 2 * (length + breadth))*

VPropel Code

```java
import java.util.Scanner;

public class Main
{

    public static void main(String[] args)
    {

        int length, width, area, perimeter;
        // Create scanner class object
        Scanner in = new Scanner(System.in);
        // Input length and width of rectangle
        length = in.nextInt();
        width  = in.nextInt();
        // Calculate perimeter  of rectangle
        perimeter = 2 * (length + width);
        // Calculate area of rectangle
        area = length * width;
        // Print perimeter and area of rectangle
        System.out.println(area);
        System.out.println(perimeter);
    }
}
```

Successful Execution Output

```
Success your code has passed all test cases!!
```

Questions for Evaluation :

a. Write a Java program to swap two numbers without using auxillary variable. **(take int datatype)**

b. Write a Java program to calculate area pf triangle.(**take float datatype**)
Area of Triangle = ½(b × h) where b is base and h is height.

**********Best of Luck**********