**DAY - 2 SOLUTIONS**

**Lab Exercise No:**14

**Exercise Objective(s):**Construction of an object

**Exercise:**Create a class called Calculator which has 4 different methods add, diff, mul and div which accepts two numbers as parameters. Create an object to access these methods and invoke these methods with two numbers and display the result in the corresponding methods.

**Solution:**

import java.util.Scanner;

public class Calculator {

public int add(int a, int b) {

return (a+b);

}

public int diff(int a, int b) {

return (a-b);

}

public int mul(int a, int b) {

return (a\*b);

}

public int div(int a, int b) {

try {

int c = a/b;

return c;

}

catch(ArithmeticException e)

{

System.out.println("Message: " + e);

}

}

public static void main(String[] args) {

Calculator c = new Calculator();

Scanner sc = new Scanner(System.in);

int a = sc.nextInt();

int b = sc.nextInt();

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

System.out.println("1. Addition");

System.out.println("2. Subtraction");

System.out.println("3. Multiplication");

System.out.println("4. Division");

System.out.println("Select the option for operation:");

int opt = sc.nextint();

switch(opt) {

case 1:

System.out.println("The addition is" + c.add(a,b));

break;

case 2:

System.out.println("The difference is" + c.diff(a,b));

break;

case 3:

System.out.println("The multiplication is" + c.mul(a,b));

break;

case 4:

System.out.println("The division is" + c.div(a,b));

break;

default:

System.out.println("Wrong option!!");

}

}

}

**Lab Exercise No:**15

**Exercise Objective(s):**Construction of an object, constructors

**Exercise:**Create a class called Sample. Write a program to display the no of objects created for that class or the no of times that class is instantiated.

**Solution:**

public class Sample {

static int cnt = 0;

public Sample() {

cnt += 1;

}

public static void main(String[] args) {

Sample a = new Sample();

Sample b = new Sample();

Sample c = new Sample();

System.out.println("The number of instances of Sample until now are: " + cnt);

}

}

**Lab Exercise No:**16

**Exercise Objective(s):**Construction of an object, this keyword, accessors(getters) and mutators(setters),public and private access specifiers, instance and class member variables

**Exercise:**Create a class called Student with the following details: RollNo, StudName, MarksInEng, MarksInMaths and MarksInScience. Write getters and setters for all the variables. RollNo should be automatically generated whenever a new student is added. Create a class called Standard with 8 students’ details and write a separate method for each of the following tasks and invoke the same.

1. To display the entire roll no and the name of the students in the class in the ascending order of roll no.
2. To display the roll no and the name of the student who has got the highest percentage.
3. To display the roll no and the name of the student who scored highest mark in mathematics.
4. To display the roll no and the name of the student in the ascending order of the total marks in mathematics and science alone.
5. To display the roll no, name, total marks, percentage and rank of all the students in the descending order of rank.

**Solution:**

package com.hsbc.pack;

class Student {

private static int ctr = 0;

private int rollNo, marksInEng, marksInMaths ,marksInScience;

private String studName;

public Student() {

ctr++;

this.rollNo = ctr;

}

public int getRollNo() {

return rollNo;

}

public int getMarksInEng() {

return marksInEng;

}

public void setMarksInEng(int marksInEng) {

this.marksInEng = marksInEng;

}

public int getMarksInMaths() {

return marksInMaths;

}

public void setMarksInMaths(int marksInMaths) {

this.marksInMaths = marksInMaths;

}

public int getMarksInScience() {

return marksInScience;

}

public void setMarksInScience(int marksInScience) {

this.marksInScience = marksInScience;

}

public String getStudName() {

return studName;

}

public void setStudName(String studName) {

this.studName = studName;

}

}

public class Standard {

public static void func1(Student[] s) {

System.out.println("Roll No. & Name credentials(ascending based on roll no.)");

for(int i=0;i<s.length;i++) {

System.out.println(s[i].getRollNo() + " | " + s[i].getStudName());

}

}

public static void func2(Student[] s) {

System.out.println("Topper:");

int[] tot = new int[8];

for(int i=0;i<tot.length;i++)

{

tot[i] = s[i].getMarksInEng() + s[i].getMarksInMaths() + s[i].getMarksInScience();

}

int max = tot[0];

int v=0;

for(int i=1;i<tot.length;i++) {

if(tot[i]>max) {

max = tot[i];

v = i;

}

}

System.out.println("Roll No. : " + s[v].getRollNo() + " | Name : " + s[v].getStudName());

}

public static void func3(Student[] s) {

System.out.println("Topper in Maths:");

int[] m = new int[8];

for(int i=0;i<m.length;i++) {

m[i] = s[i].getMarksInMaths();

}

int max = m[0];

int v = 0;

for(int i=0;i<m.length;i++) {

if(m[i]>max) {

max = m[i];

v = i;

}

}

System.out.println("Roll No. : " + s[v].getRollNo() + " | Name : " + s[v].getStudName());

}

public static void func4(Student[] s) {

System.out.println("List of Maths & Science sum marks (Ascending order based on marks):");

System.out.println("Roll No. | Name | Sum marks in Maths & Science ");

int[] ms = new int[8];

for(int i=0;i<ms.length;i++) {

ms[i] = s[i].getMarksInMaths() + s[i].getMarksInScience();

}

int[] r = {1,2,3,4,5,6,7,8};

for(int i=0;i<ms.length;i++)

{

for(int j=i+1;j<ms.length;j++)

{

if(ms[i]>ms[j]) {

ms[i] = ms[i]+ms[j];

ms[j] = ms[i]-ms[j];

ms[i] = ms[i]-ms[j];

r[i] = r[i]+r[j];

r[j] = r[i]-r[j];

r[i] = r[i]-r[j];

}

}

}

for(int i=0;i<r.length;i++) {

System.out.println(r[i] + " | " + s[r[i]-1].getStudName() + " | " + ms[i]);

}

}

public static void func5(Student[] s) {

System.out.println("Marklist with percentage(descending based on rank):");

System.out.println("Rank | Roll No. | Name | Total Marks | Percentage ");

int[] tot = new int[8];

for(int i=0;i<tot.length;i++)

{

tot[i] = s[i].getMarksInEng() + s[i].getMarksInMaths() + s[i].getMarksInScience();

}

int[] r = {1,2,3,4,5,6,7,8};

for(int i=0;i<tot.length;i++)

{

for(int j=i+1;j<tot.length;j++)

{

if(tot[i]>tot[j]) {

tot[i] = tot[i]+tot[j];

tot[j] = tot[i]-tot[j];

tot[i] = tot[i]-tot[j];

r[i] = r[i]+r[j];

r[j] = r[i]-r[j];

r[i] = r[i]-r[j];

}

}

}

float[] perc = new float[8];

for(int i=0;i<perc.length;i++) {

perc[i] = (float)tot[i]/3;

}

for(int i=0;i<tot.length;i++) {

System.out.println(i + " | " + s[r[i]-1].getRollNo() + " | " + s[r[i]-1].getStudName() + " | " + tot[i] + " | " + perc[i]);

}

}

public static void main(String[] args) {

Student[] s = new Student[8];

Student s1 = new Student();

s1.setStudName("Jayesh");

s1.setMarksInEng(89);

s1.setMarksInMaths(95);

s1.setMarksInScience(94);

s[0] = s1;

Student s2 = new Student();

s2.setStudName("Ashish");

s2.setMarksInEng(92);

s2.setMarksInMaths(96);

s2.setMarksInScience(84);

s[1] = s2;

Student s3 = new Student();

s3.setStudName("Mayuresh");

s3.setMarksInEng(91);

s3.setMarksInMaths(90);

s3.setMarksInScience(94);

s[2] = s3;

Student s4 = new Student();

s4.setStudName("Tanmay");

s4.setMarksInEng(88);

s4.setMarksInMaths(98);

s4.setMarksInScience(94);

s[3] = s4;

Student s5 = new Student();

s5.setStudName("Sanket");

s5.setMarksInEng(98);

s5.setMarksInMaths(91);

s5.setMarksInScience(94);

s[4] = s5;

Student s6 = new Student();

s6.setStudName("Srushti");

s6.setMarksInEng(99);

s6.setMarksInMaths(97);

s6.setMarksInScience(94);

s[5] = s6;

Student s7 = new Student();

s7.setStudName("Vishakha");

s7.setMarksInEng(98);

s7.setMarksInMaths(95);

s7.setMarksInScience(99);

s[6] = s7;

Student s8 = new Student();

s8.setStudName("Saurabh");

s8.setMarksInEng(98);

s8.setMarksInMaths(100);

s8.setMarksInScience(84);

s[7] = s8;

func1(s);

func2(s);

func3(s);

func4(s);

func5(s);

}

}

**Lab Exercise No:**17

**Exercise Objective(s):**String class, String immutability

**Exercise:**Write class that declares the following String.

**“The quick brown fox jumps over the lazy dog”.**

Perform the following modifications to the above string using appropriate methods.

1. Print the character at the 12th index.
2. Check whether the String contains the word “is”.
3. Add the string “and killed it” to the existing string.
4. Check whether the String ends with the word “dogs”.
5. Check whether the String is equal to “The quick brown Fox jumps over the lazy Dog”.
6. Check whether the String is equal to “THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG”.
7. Find the index position of the character “a”.
8. Find the last index position of the character “e”.
9. Find the length of the String.
10. Check whether the String matches to “The quick brown Fox jumps over the lazy Dog”.
11. Replace the word “The” with the word “A”.
12. Split the above string into two such that two animal names do not come together.
13. Print the animal names alone separately from the above string.
14. Print the above string in completely lower case.
15. Print the above string in completely upper case.

**Solution :**

package com.hsbc.pack;

public class Solution17 {

public static void main(String[] args) {

String s = "The quick brown fox jumps over the lazy dog";

System.out.println("The character at 12th place is " + s.charAt(11));

System.out.println("'is' exists in the string 's' : " + s.contains("is"));

s = s + " and killed it";

System.out.println("The new string is :" + s);

System.out.println("The string ends with 'dogs' :" + s.endsWith("dogs"));

String s1 = "The quick brown Fox jumps over the lazy Dog";

if(s1.equals(s))

System.out.println("The strings are equal");

else

System.out.println("The strings are not equal");

String s2 = "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG";

if(s2.equals(s))

System.out.println("The strings are equal");

else

System.out.println("The strings are not equal");

System.out.println("The index position of first occurence of 'a' is: " + s.indexOf("a"));

System.out.println("The index position of last occurence of 'e' is: " + s.lastIndexOf("e"));

System.out.println("Length of string 's' is: " + s.length());

String s3 = "The quick brown Fox jumps over the lazy Dog";

if(s3.equals(s))

System.out.println("The strings are equal");

else

System.out.println("The strings are not equal");

s = s.replaceAll("The","A");

System.out.println("The new string is: " + s);

String sp1 = s.substring(0, 28);

String sp2 = s.substring(28);

System.out.println(sp1 + " | " + sp2);

String[] sl = s.split(" ");

System.out.println("The animal names are : " + sl[3] + " and " + sl[8]);

System.out.println(s.toLowerCase());

System.out.println(s.toUpperCase());

}

}

**Lab Exercise No:**18

**Exercise Objective(s):**String class, String immutability

**Exercise:**Write a program to demonstrate the difference between equals and == operator with appropriate example.

**Solution:**

package com.hsbc.pack;

public class StringCheck {

public static void main(String[] args) {

String s1 = "abc";

String s2 = "abc";

String s3 = new String("abc");

String s4 = new String("abc");

if(s1==s2)

System.out.println("1 The strings are equal");

if(s1.equals(s2))

System.out.println("2 The strings are equal");

if(s3==s2)

System.out.println("3 The strings are equal");

if(s3.equals(s2))

System.out.println("4 The strings are equal");

if(s3==s4)

System.out.println("5 The strings are equal");

if(s3.equals(s4))

System.out.println("6 The strings are equal");

}

}

**Lab Exercise No:**19

**Exercise Objective(s):**Arrays

**Exercise:**Write a program to declare an array with 8 elements and copy the 8 elements into another array and display the same.

**Solution:**

package com.hsbc.pack;

public class ArrayCopy {

public static void main(String[] args) {

int[] arr = {45, 56, 23, 78, 12, 67, 45, 31};

int[] arr2 = arr;

for(int i=0;i<arr.length;i++)

System.out.print(arr[i] + " ");

System.out.println();

for(int i=0;i<arr2.length;i++)

System.out.print(arr2[i] + " ");

}

}

**Lab Exercise No:**20

**Exercise Objective(s):**Arrays

**Exercise:**Write a program to display the sum and the average of elements in the array.

**Solution:**

package com.hsbc.pack;

public class Solution20 {

public static void main(String[] args) {

int[] arr = {45, 56, 23, 78, 12, 67, 45, 33};

int sum = 0;

for(int i:arr)

sum += i;

float avg = (float)sum/arr.length;

System.out.println("The sum is " + sum + " and the average is " + avg);

}

}

**Lab Exercise No:**21

**Exercise Objective(s):**Arrays

**Exercise:**Write a program to construct two matrices and display the sum of those.

**Solution:**

package com.hsbc.pack;

public class Solution21 {

public static void main(String[] args) {

int[][] mat1 = {{1,2,3},{4,5,6},{7,8,9}};

int[][] mat2 = {{3,4,5},{2,6,3},{5,7,1}};

int[][] mat3 = new int[3][3];

System.out.println("Matrix 1: ");

for(int i=0;i<3;i++) {

for(int j=0;j<3;j++){

System.out.print(mat1[i][j] + " ");

}

System.out.println();

}

System.out.println("Matrix 2: ");

for(int i=0;i<3;i++) {

for(int j=0;j<3;j++){

System.out.print(mat2[i][j] + " ");

}

System.out.println();

}

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

mat3[i][j] = mat1[i][j] + mat2[i][j];

System.out.println("Final Sum Matrix :");

for(int i=0;i<3;i++) {

for(int j=0;j<3;j++){

System.out.print(mat3[i][j] + " ");

}

System.out.println();

}

}

}

**Lab Exercise No:**22

**Exercise Objective(s):**Arrays

**Exercise:**Write a program to display the square of the elements of a two dimensional array.

**Solution:**

package com.hsbc.pack;

public class Solution22 {

public static void main(String[] args) {

int[][] mat = {{1,2,3},{4,5,6},{7,8,9}};

int[][] sqmat = new int[3][3];

System.out.println("Matrix : ");

for(int i=0;i<3;i++) {

for(int j=0;j<3;j++){

System.out.print(mat[i][j] + " ");

}

System.out.println();

}

for(int i=0;i<3;i++)

for(int j=0;j<3;j++)

sqmat[i][j] = mat[i][j]\*mat[i][j];

System.out.println("Squared Matrix : ");

for(int i=0;i<3;i++) {

for(int j=0;j<3;j++){

System.out.print(sqmat[i][j] + " ");

}

System.out.println();

}

}

}

**Lab Exercise No:**23

**Exercise Objective(s):**Arrays

**Exercise:**Write a program to construct an array with 10 elements and to find the number of occurrences of each element in the Array.

**Solution:**

package com.hsbc.pack;

public class Solution23 {

public static void main(String[] args) {

int[] arr = {2,3,4,5,2,1,3,2,4,5};

int[] freq = new int[arr.length];

int visited = -1;

for(int i=0;i<arr.length;i++)

{

int cnt = 1;

for(int j=i+1;j<arr.length;j++)

{

if(arr[i]==arr[j])

{

cnt++;

freq[j] = visited;

}

}

if(freq[i]!=visited)

{

freq[i] = cnt;

}

}

System.out.println("Element | Frequency");

for(int i=0;i<freq.length;i++)

{

if(freq[i]!=visited)

{

System.out.println(arr[i] + " | " + freq[i]);

}

}

}

}

**Lab Exercise No:**24

**Exercise Objective(s):**Overloading

**Exercise:**Create a class called shape with the following methods

1. area
2. perimeter

Overload the area and perimeter method to calculate for both square and rectangle.

Create a main class and invoke the area method to calculate the area of the square and rectangle. Also invoke the perimeter method to calculate the perimeter of the square and rectangle.

**Solution:**

package com.hsbc.pack;

class Shape {

public void area(int side)

{

System.out.println("Area of Square is " + (side\*side) + " sq. units");

}

public void area(int length, int breadth)

{

System.out.println("Area of Rectangle is " + (length\*breadth) + " sq. units");

}

public void perimeter(int side) {

System.out.println("Perimeter of Square is " + (4\*side) + " units");

}

public void perimeter(int length, int breadth)

{

System.out.println("Perimeter of Square is " + (2\*length + 2\*breadth) + " units");

}

}

public class Main {

public static void main(String[] args) {

int sqSide = 14;

int rectLen = 25;

int rectWid = 13;

Shape s = new Shape();

s.area(sqSide);

s.area(rectLen, rectWid);

s.perimeter(sqSide);

s.perimeter(rectLen, rectWid);

}

}

**Lab Exercise No:**25

**Exercise Objective(s):**Overloading

**Exercise:** Create a class called employee with the following data members

1. empName
2. empId
3. empAge
4. empdesgn
5. empLocation
6. empExpInYrs

All these data members should be initialized using constructors. Use constructor overloading and demonstrate by creating different employee objects with

1. Employee name alone
2. Employee name and id
3. Employee name, id and age
4. Employee name, id and designation
5. Employee name, id, age and designation
6. Employee name, id, age and location
7. Employee name, id, age and experience
8. Employee name, id, designation and experience
9. Employee name, id, designation, location and experience
10. Employee name, id, age, designation, location and experience

**Solution:**

package com.hsbc.pack;

class Employee {

private String empName,empDesgn,empLocation;

private int empId,empAge,empExpInYrs;

public Employee(String empName) {

this.empName = empName;

}

public Employee(String empName, int empId) {

this.empId = empId;

this.empName = empName;

}

public Employee(String empName, int empId, int empAge) {

this.empId = empId;

this.empName = empName;

this.empAge = empAge;

}

public Employee(String empName, int empId, String empDesgn) {

this.empId = empId;

this.empName = empName;

this.empDesgn = empDesgn;

}

public Employee(String empName, int empId, int empAge, String empDesgn) {

this.empId = empId;

this.empName = empName;

this.empAge = empAge;

this.empDesgn = empDesgn;

}

public Employee(String empName, int empId, String empLocation, int empAge) {

this.empId = empId;

this.empName = empName;

this.empAge = empAge;

this.empLocation = empLocation;

}

public Employee(String empName, int empId, int empAge, int empExpInYrs) {

this.empId = empId;

this.empName = empName;

this.empAge = empAge;

this.empExpInYrs = empExpInYrs;

}

public Employee(int empId, String empName, int empExpInYrs, String empDesgn) {

this.empId = empId;

this.empName = empName;

this.empDesgn = empDesgn;

this.empExpInYrs = empExpInYrs;

}

public Employee(int empId, String empName, String empDesgn, String empLocation, int empExpInYrs) {

this.empId = empId;

this.empName = empName;

this.empDesgn = empDesgn;

this.empExpInYrs = empExpInYrs;

this.empLocation = empLocation;

}

public Employee(int empId, String empName, String empDesgn, String empLocation, int empExpInYrs, int empAge) {

this.empId = empId;

this.empName = empName;

this.empDesgn = empDesgn;

this.empExpInYrs = empExpInYrs;

this.empLocation = empLocation;

this.empAge = empAge;

}

}

public class Solution25 {

public static void main(String[] args) {

Employee e1 = new Employee("Jayesh");

Employee e2 = new Employee("Ajay",2);

Employee e3 = new Employee("Anish",3,24);

Employee e4 = new Employee("Anagha",4,"Software Engineer");

Employee e5 = new Employee("Rutuja",5,31,"Manager");

Employee e6 = new Employee("Kanika",6,"Mumbai",22);

Employee e7 = new Employee("Ronak",7,30,6);

Employee e8 = new Employee(8,"Ganesh",5,"Senior Consultant");

Employee e9 = new Employee(9,"Tara","Consultant","Pune",2);

Employee e10 = new Employee(10,"Pratik","Freelancer","Kolkata",9,36);

System.out.println(e1.toString());

System.out.println(e2.toString());

System.out.println(e3.toString());

System.out.println(e4.toString());

System.out.println(e5.toString());

System.out.println(e6.toString());

System.out.println(e7.toString());

System.out.println(e8.toString());

System.out.println(e9.toString());

System.out.println(e10.toString());

}

}

**Lab Exercise No:**26

**Exercise Objective(s):**Overloading

**Exercise:**Create a class called Calculator which has 4 different methods add, diff, mul and div which accepts two numbers as parameters. Overload the methods such that the parameters can be of the following pattern.

1. Both are of int data type.
2. Both are of double data type.
3. First parameter is of int data type and second parameter is of double data type.
4. First parameter is of double data type and second parameter is of int data type.

Create an object to access these methods and invoke these methods with different type of numbers and display the result in the corresponding methods.

**Solution:**

package com.hsbc.pack;

class Calculator {

public void add(int a, int b) {

System.out.println("The sum of a and b is " + (a+b));

}

public void add(double a, double b) {

System.out.println("The sum of c and d is " + (a+b));

}

public void add(double a, int b) {

System.out.println("The sum of c and a is " + (a+(double)b));

}

public void add(int a, double b) {

System.out.println("The sum of b and d is " + (b+(double)a));

}

public void diff(int a, int b) {

System.out.println("The difference of a and b is " + (a-b));

}

public void diff(double a, double b) {

System.out.println("The difference of c and d is " + (a-b));

}

public void diff(double a, int b) {

System.out.println("The difference of c and a is " + (a-(double)b));

}

public void diff(int a, double b) {

System.out.println("The difference of b and d is " + ((double)a-b));

}

public void mul(int a, int b) {

System.out.println("The product of a and b is " + (a\*b));

}

public void mul(double a, double b) {

System.out.println("The product of c and d is " + (a\*b));

}

public void mul(double a, int b) {

System.out.println("The product of c and a is " + (a\*(double)b));

}

public void mul(int a, double b) {

System.out.println("The product of b and d is " + ((double)a\*b));

}

public void div(int a, int b) {

try {

float c = (float)a/b;

System.out.println("The division of a and b is " + c);

}

catch(ArithmeticException e)

{

System.out.println("Message: " + e);

}

}

public void div(double a, double b) {

try {

double c = a/b;

System.out.println("The division of c and d is " + c);

}

catch(ArithmeticException e)

{

System.out.println("Message: " + e);

}

}

public void div(int a, double b) {

try {

double c = (double)a/b;

System.out.println("The division of b and d is " + c);

}

catch(ArithmeticException e)

{

System.out.println("Message: " + e);

}

}

public void div(double a, int b) {

try {

double c = a/(double)b;

System.out.println("The division of c and a is " + c);

}

catch(ArithmeticException e)

{

System.out.println("Message: " + e);

}

}

}

public class Solution26 {

public static void main(String[] args) {

int a = 4;

int b = 8;

double c = 34.567;

double d = 56.234;

Calculator cal = new Calculator();

cal.add(a, b);

cal.add(c, d);

cal.add(c, a);

cal.add(b, d);

cal.diff(a, b);

cal.diff(c, d);

cal.diff(c, a);

cal.diff(b, d);

cal.mul(a, b);

cal.mul(c, d);

cal.mul(c, a);

cal.mul(b, d);

cal.div(a, b);

cal.div(c, d);

cal.div(c, a);

cal.div(b, d);

}

}

**Lab Exercise No:**27

**Exercise Objective(s):**Initializers

**Exercise:**Write a class called Computer such that the object of that class should be created only when the class is loaded.

**Solution:**

package com.hsbc.pack;

class Computer {

String name;

public Computer(String name) {

System.out.println("Name of computer company is " + name);

}

public static void main(String[] args) {

Computer c1 = new Computer("Apple");

Computer c2 = new Computer("Lenovo");

}

}

**Lab Exercise No:**28

**Exercise Objective(s):**Var-args

**Exercise:**In the calculator (Lab exercise - 14) program, make the add and diff method to accept var-args and demonstrate.

**Solution:**

package com.hsbc.pack;

public class Solution28 {

static void sum(int ...a) {

int tot = 0;

for(int i:a)

tot+=i;

System.out.println("The sum of all elements is " + tot);

}

static void diff(int ...a) {

int diff = a[0];

for(int i=1;i<a.length;i++)

{

diff-=a[i];

}

System.out.println("The difference of elements is "+ diff);

}

public static void main(String[] args) {

sum(4,5,6);

diff(5,3,4);

}

}