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Experiment No.	9-B

PROBLEM STATEMENT :	*Write a program to calculate the percentage of marks obtained in three subjects (each out of 100) by student A and in four subjects (each out of 100) by student B.* *Create an abstract class 'Marks' with an abstract method 'getPercentage'.* *It is inherited by two other classes 'A' and 'B' each having a method with the same name which returns the percentage of the students.* *The constructor of student A takes the marks in three subjects as its parameters and the marks in four subjects as its parameters for student B.* *Input to be taken from the user. Display the marks in highest order of student A and B.*
THEORY:	**<u>Abstract Keyword:</u>** The \`abstract\` keyword in Java is used to declare classes and methods as abstract. It is a fundamental element of abstraction in object-oriented programming. Here's a brief note on how the \`abstract\` keyword is used: 1. Abstract Classes: - An abstract class is declared using the \`abstract\` keyword. It serves as a blueprint for other classes and cannot be instantiated directly. - Abstract classes can have both abstract and non-abstract methods. - Abstract methods are declared without a body and are meant to be implemented by the subclasses. - Abstract classes can also contain concrete methods with a body that can be inherited by the subclasses. - Subclasses of an abstract class must either provide an implementation for all the abstract methods or be declared as abstract themselves. - Abstract classes are useful when you want to define a common interface and provide some default implementations.

2. Abstract Methods:
  - An abstract method is declared using the `abstract` keyword and does not have a method body.
  - Abstract methods are meant to be overridden by the subclasses, providing their own implementation.
  - Classes that have one or more abstract methods must be declared as abstract classes.
  - Abstract methods define a contract that the subclasses must follow.

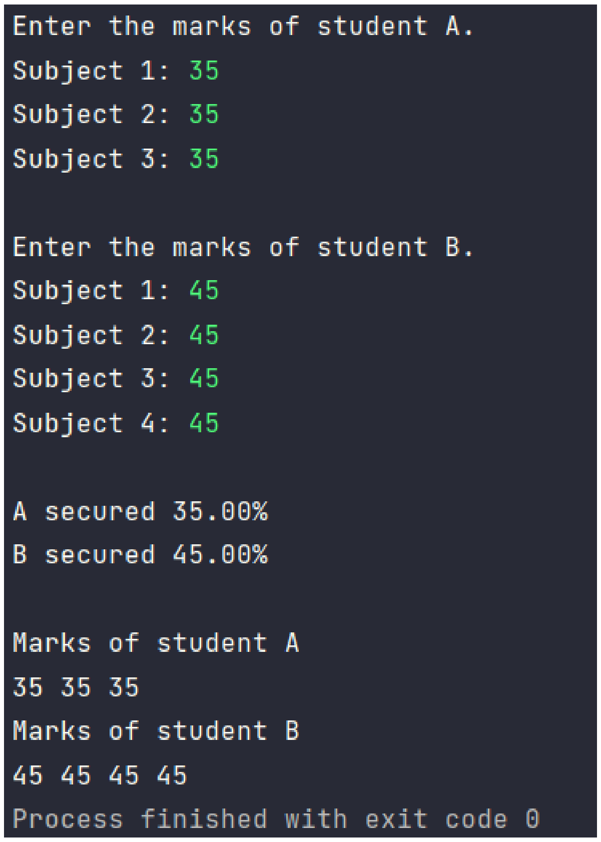
The `abstract` keyword allows you to create abstract classes and methods that serve as a foundation for creating specialized subclasses. It helps in achieving abstraction, encapsulation, and modularity in your Java programs.

PROGRAM:

```java
import java.util.*;
//creating an abstract class
abstract class Marks {
    public abstract double getPercentage();
}

class A extends Marks {
    private int m1,m2,m3;
    public A(int m1, int m2, int m3) {
        this.m1 = m1;
        this.m2 = m2;
        this.m3 = m3;
    }

    @Override
    public double getPercentage() {
        return (m1+m2+m3)/3.0;
    }

    //method prints the marks of student A from highest to
lowest
    public void displayMarks() {
        int[] m = {m1,m2,m3};
        //sorting the array
        Arrays.sort(m);
        //using collection framework to reverse an array
        Collections.reverse(Arrays.asList(m));
        System.out.println("\nMarks of student A");
        for (int j : m) {
            System.out.printf("%d ", j);
        }
    }
}

class B extends Marks {
    private int m1,m2,m3,m4;

    public B(int m1, int m2, int m3,int m4) {
        this.m1 = m1;
        this.m2 = m2;
        this.m3 = m3;
        this.m4 = m4;
    }

    @Override
    public double getPercentage() {
        return (m1+m2+m3+m4)/4.0;
    }

    //method prints the marks of student A from highest to
lowest
    public void displayMarks() {
        int[] m = {m1,m2,m3,m4};
        Arrays.sort(m);
        Collections.reverse(Arrays.asList(m));
        System.out.println("\nMarks of student B");
        for (int j : m) {
            System.out.printf("%d ", j);
        }
    }
}

public class percentmarks {
    public static void main(String[] args) {
        int[] m = new int[4];
        Scanner sc = new Scanner(System.in);
        //inputting the marks of Student A
        System.out.println("Enter the marks of student A.");
        for(int i=0;i<3;i++) {
            System.out.printf("Subject %d: ",i+1);
            m[i] = sc.nextInt();
        }
        A a = new A(m[0],m[1],m[2]);

        //inputting the marks of Student B
        System.out.println("\nEnter the marks of student
B.");
        for(int i=0;i<4;i++) {
            System.out.printf("Subject %d: ",i+1);
            m[i] = sc.nextInt();
        }
        B b = new B(m[0],m[1],m[2],m[3]);

        //printing how much %age they got
        System.out.printf("\nA secured
%.2f%c\n",a.getPercentage(),'%');
        System.out.printf("B secured
%.2f%c\n",b.getPercentage(),'%');

        //printing their marks in descending order
        a.displayMarks();
        b.displayMarks();
```

```
        }
}
```

RESULT:



```
Enter the marks of student A.
Subject 1: 35
Subject 2: 35
Subject 3: 35

Enter the marks of student B.
Subject 1: 45
Subject 2: 45
Subject 3: 45
Subject 4: 45

A secured 35.00%
B secured 45.00%

Marks of student A
35 35 35
Marks of student B
45 45 45 45
Process finished with exit code 0
```