Student Record Management System Documentation

1. Introduction

The Student Record Management System is a Java-based application designed for universities to efficiently manage student records. It allows administrators to perform tasks such as adding new students, updating student information, and viewing student details. This documentation provides a comprehensive overview of the project, including class and method descriptions, access modifiers, and instructions for running and interacting with the program.

2. Class and Method Documentation

2.1. Student Class

The **Student** class represents a student entity with the following private instance variables:

- **private String name**: Stores the name of the student.
- **private int id**: Stores the unique ID of the student.
- **private int age**: Stores the age of the student.
- **private String grade**: Stores the grade of the student.

Methods:

- **public Student(String name, int id, int age, String grade)**: Constructor method to initialize a new student object with the provided information.
- Getter and Setter methods are provided for accessing and updating student information. These include **getName()**, **setName(String name)**, **getId()**, **getAge()**, **setAge(int age)**, **getGrade()**, and **setGrade(String grade)**.

2.2. Student Management Class

The **StudentManagement** class is responsible for managing the list of students and their information. It includes the following private static variables:

- **private static List<Student> studentList**: A list to store student objects.
- **private static int totalStudents**: A count of the total number of students.

Methods:

- **public static void addStudent(String name, int id, int age, double grade)**: Adds a new student to the **studentList** with the provided information and updates the **totalStudents** count.

- **public static void updateStudent(int studentId, String name, int age, double grade)**: Updates the information of an existing student identified by their ID.
- **public static Student getStudentDetails(int studentId)**: Retrieves and returns the details of a student based on their ID.
- **public static int getTotalStudents()**: Getter method to retrieve the total number of students.

2.3. Administrator Class

The **Administrator** class provides a command-line interface for administrators to interact with the system. It displays a menu with options to add a new student, update student information, view student details, and exit the program.

3. Access Modifiers

Access modifiers are used in this project to control access to class members (variables and methods). The following access modifiers are used:

- **public**: Indicates that a member is accessible from any other class.
- **private**: Restricts access to the member only within the class it is declared in.

These modifiers are crucial for maintaining data encapsulation and ensuring that sensitive information is not accessed or modified unintentionally.

4. Interacting with the Administrator Interface

Upon running the program, you will be presented with a menu-driven interface. Follow the on-screen prompts to perform the following tasks:

- Add a new student by selecting option 1 and providing student information.
- Update student information by selecting option 2 and providing the student's ID and new information.
- View student details by selecting option 3 and providing the student's ID.
- Check the total number of registered student by selecting option 4.
- Exit the program by selecting option 5.

Administrator Class:

```
public class Administrator {

  public static void main(String[] args) {
    CommonFunctions fn = new CommonFunctions();
    int choice;

    do {
      System.out.println(
          "\n\n\t\t\t\t############***************Student Record Management 
System   ***************############");
      System.out.println(
          "\t\t\t\t############***************1. Add 
Student                     ***************############");
      System.out.println(
          "\t\t\t\t############***************2. Update 
Student                  ***************############");
      System.out.println(
          "\t\t\t\t############***************3. View Student 
Details            ***************############");
          System.out.println(
          "\t\t\t\t############***************4. Check Total 
Student             ***************############");
      System.out.println(
          "\t\t\t\t############***************5. 
Exit                            ***************############");
      // System.out.print("\t\t\t\t############***************Enter your choice: 
\t");
      choice = fn.getNumberFromUser(
          "\t\t\t\t############***************Enter your choice: \t");

      switch (choice) {
        case 1:
          // Add Student
          String name = fn.getStringFromUser("Enter student name: ");
          int id = fn.getNumberFromUser("Enter student ID: ");
          int age = fn.getNumberFromUser("Enter student age: ");
          String grade = fn.getStringFromUser("Enter student grade: ");
          Student stdExist =  SMS.getStudentDetails(id);
          if(stdExist == null){
            SMS.addStudent(name, id, age, grade);
            System.out.println(
              "\n\t\t\t###*******  Student added successfully.\n");
          }else{
```

```java
            System.out.println(
              "\n\t\t\t Error! Student Already Exists.\n");
          }

          break;
        case 2:
          // Update Student
          int stdID = fn.getNumberFromUser("Enter student ID to update: ");
          Student std = SMS.getStudentDetails(stdID);
          if (std != null) {
            String newName = fn.getStringFromUser("Enter new student name: ");
            int newAge = fn.getNumberFromUser("Enter new student age: ");
            String newGrade = fn.getStringFromUser("Enter new student grade: ");
            SMS.updateStudent(stdID, newName, newAge, newGrade);
            System.out.println(
                "\n\t\t\t###*******  Student updated successfully.\n");
          } else {
            System.out.println(
                "\n\t\t Student Record not found with ID: " + stdID + " \n");
          }
          break;
        case 3:
          // View Student Details
          stdID = fn.getNumberFromUser("Enter student ID to view details: ");
          std = SMS.getStudentDetails(stdID);
          if (std != null) {
            System.out.println(
                "\t\t\t\t############***************  Student Detail  :");
            System.out.println(
                "\t\t\t\t############***************  Name              : " +
                    std.getStudentName());
            System.out.println(
                "\t\t\t\t############***************  ID                : " +
                    std.getStudentID());
            System.out.println(
                "\t\t\t\t############***************  Age               : " +
                    std.getStudentAge());
            System.out.println(
                "\t\t\t\t############***************  Grade             : " +
                    std.getStudentGrade());
          } else {
            System.out.println("Student Record not found with ID: " + stdID);
          }
          break;
        case 4:
          System.out.println("Total number of Student =
"+SMS.getTotalStudents());
          break;
        case 5:
          System.out.println("############***************    Quiting........");
          break;
        default:
          System.out.println("Invalid choice! Please try again.");
      }
    } while (choice != 5);
  }
}
```

Student Class:

```
public class Student {
    private String StudentName;
    private int StudentID;
    private int StudentAge;
    private String StudentGrade;

    public Student(String StudentName, int StudentID, int StudentAge, String
StudentGrade) {
        this.StudentName = StudentName;
        this.StudentID = StudentID;
        this.StudentAge = StudentAge;
        this.StudentGrade = StudentGrade;
    }

    // Getter and Setter methods for all instance variables
    public String getStudentName() {
        return StudentName;
    }

    public void setStudentName(String StudentName) {
        this.StudentName = StudentName;
    }

    public int getStudentID() {
        return StudentID;
    }

    public int getStudentAge() {
        return StudentAge;
    }
    public void setStudentAge(int StudentAge) {
        this.StudentAge = StudentAge;
    }

    public String getStudentGrade() {
        return StudentGrade;
    }

    public void setStudentGrade(String StudentGrade) {
        this.StudentGrade = StudentGrade;
    }
}
```

SMS (Student Management System) Class:

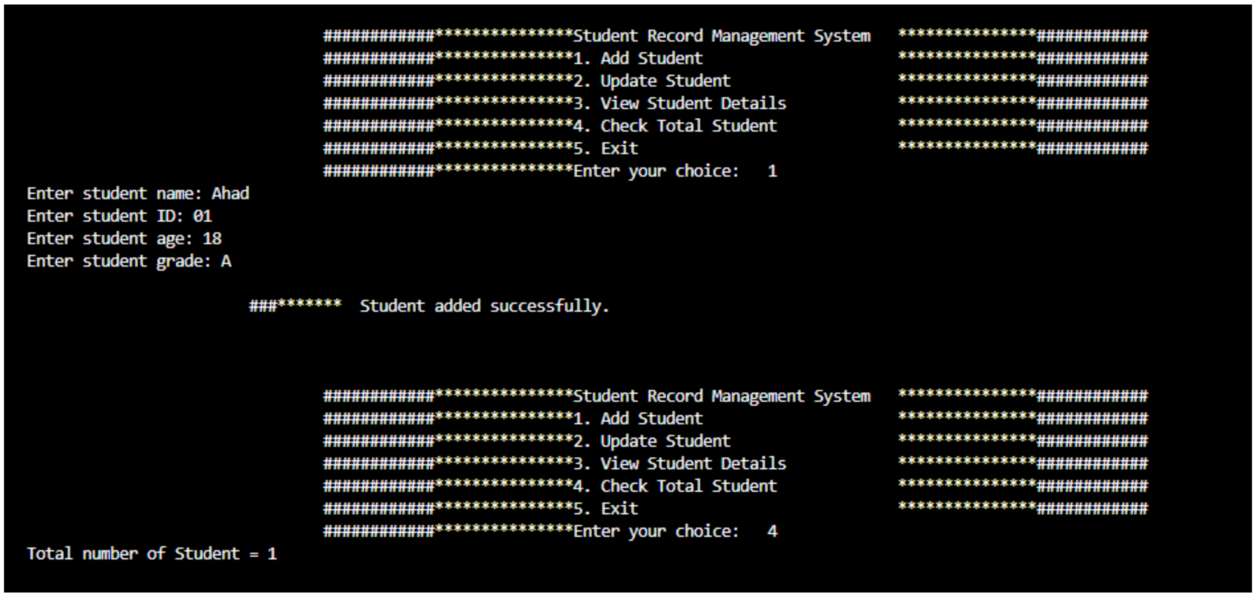
```
import java.util.ArrayList;
import java.util.List;

public class SMS {
    private static List<Student> studentList = new ArrayList<>();
    private static int TotalStudentNumber = 0;

    // Method to add a new student to the list
    public static void addStudent(String StudentName, int StudentID, int
StudentAge, String StudentGrade) {
        Student std = new Student(StudentName, StudentID, StudentAge,
StudentGrade);
        studentList.add(std);
        TotalStudentNumber++;
    }

    // Method to update student information
    public static void updateStudent(int StudentID, String StudentName, int
StudentAge, String StudentGrade) {
        for (Student std : studentList) {
            if (std.getStudentID() == StudentID) {
                std.setStudentName(StudentName);
                std.setStudentAge(StudentAge);
                std.setStudentGrade(StudentGrade);
                return;
            }
        }
    }
```

```java
    // Method to get student details by ID
    public static Student getStudentDetails(int StudentID) {
        for (Student std : studentList) {
            if (std.getStudentID() == StudentID) {
                return std;
            }
        }
        return null; // Return null if student not found
    }

    // Getter method for TotalStudentNumber
    public static int getTotalStudents() {
        return TotalStudentNumber;
    }
}
```

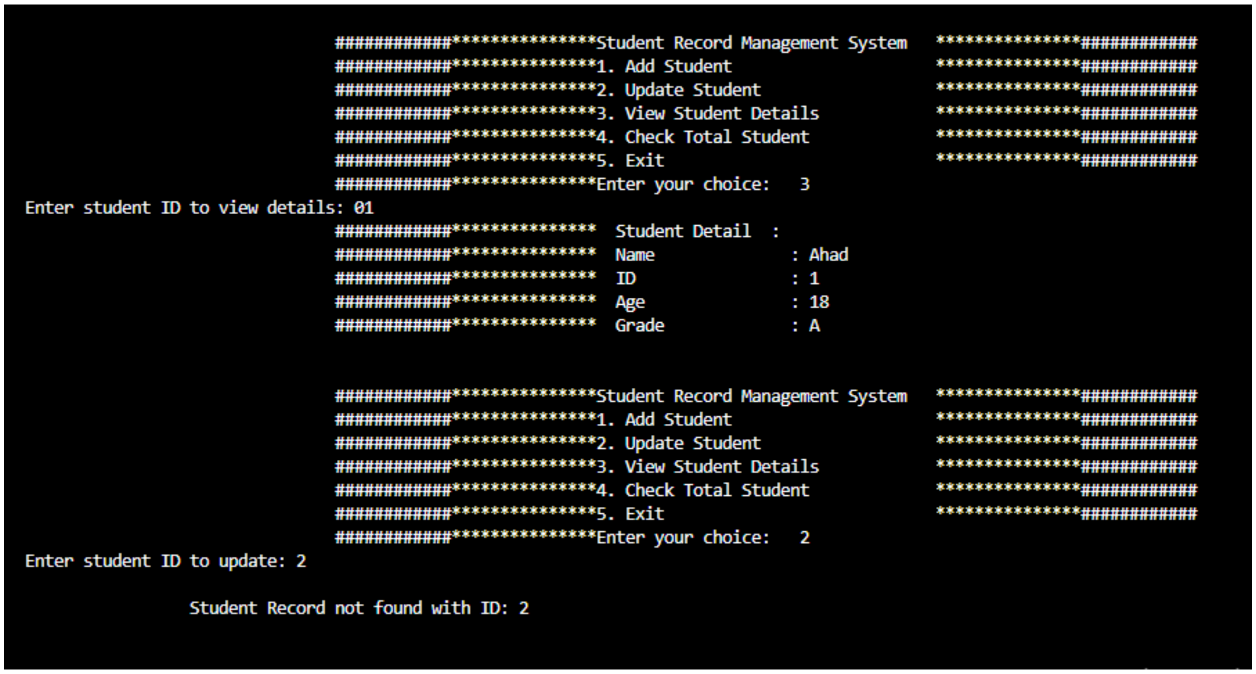
Common Class:

```java
import java.util.Scanner;

public class CommonFunctions {
    private static Scanner scan = new Scanner(System.in);

    int getNumberFromUser(String message) {
        System.out.print(message);
        while (!scan.hasNextInt()) {
            System.out.print("Invalid! Please Enter any Number: ");
            scan.nextLine();
          }
          int number = scan.nextInt();
        scan.nextLine(); // Consume the newline character
        return number;
    }

    String getStringFromUser(String message) {
        System.out.print(message);
        try {
            return scan.nextLine();
        } catch (Exception e) {
            System.err.println("Invalid input: ");
            return getStringFromUser(message);
        }
    }
}
```

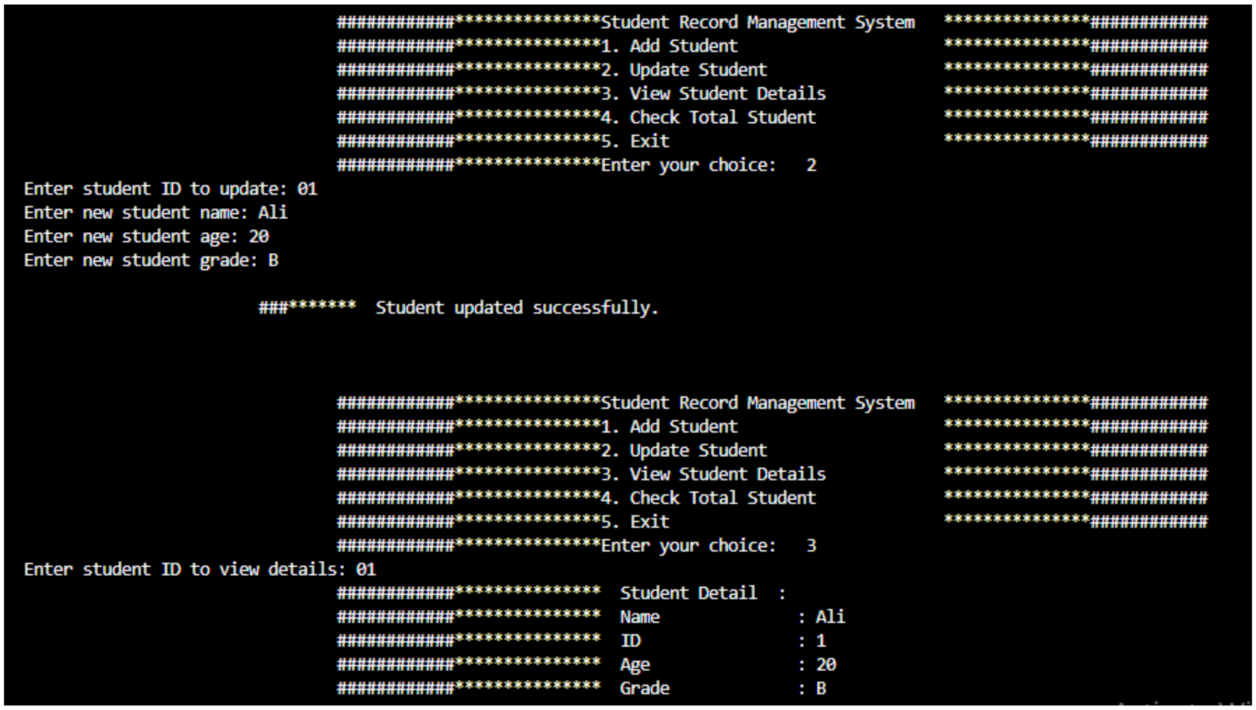
Output:



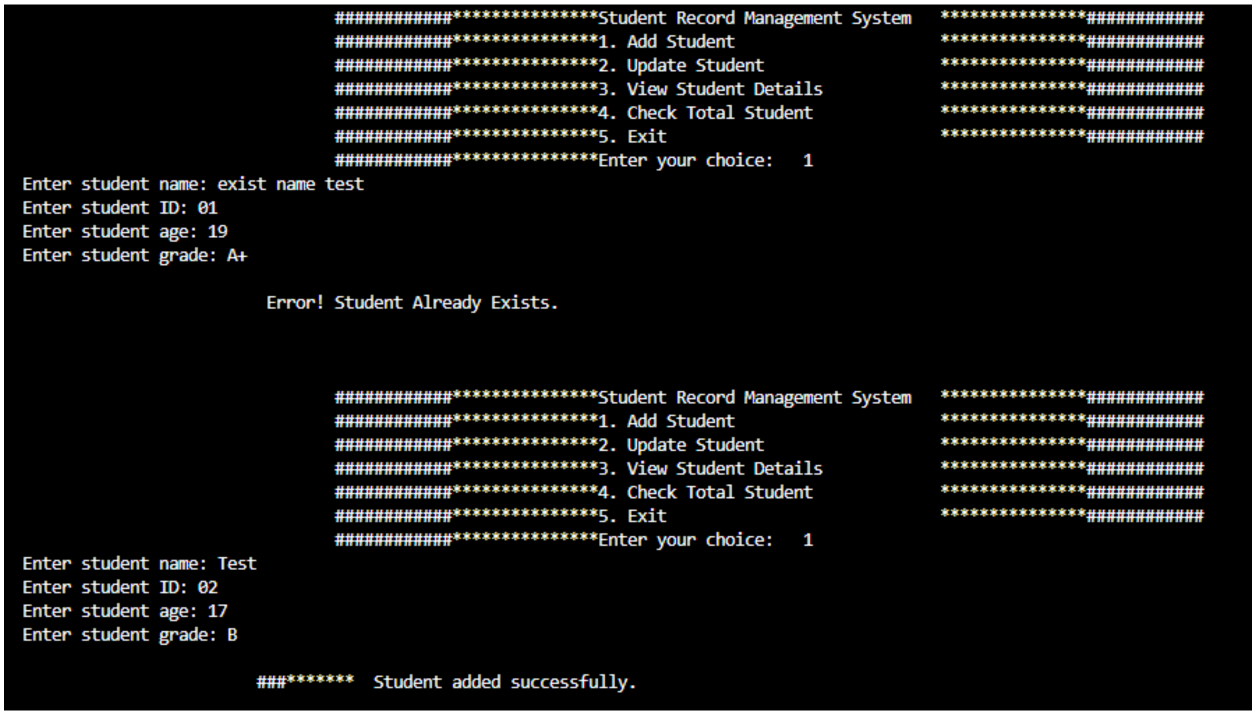
```
                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                      ***************############
                                  ############***************2. Update Student                   ***************############
                                  ############***************3. View Student Details             ***************############
                                  ############***************4. Check Total Student              ***************############
                                  ############***************5. Exit                             ***************############
                                  ############***************Enter your choice:   1
 Enter student name: Ahad
 Enter student ID: 01
 Enter student age: 18
 Enter student grade: A

                          ###*******  Student added successfully.



                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                      ***************############
                                  ############***************2. Update Student                   ***************############
                                  ############***************3. View Student Details             ***************############
                                  ############***************4. Check Total Student              ***************############
                                  ############***************5. Exit                             ***************############
                                  ############***************Enter your choice:   4
 Total number of Student = 1
```



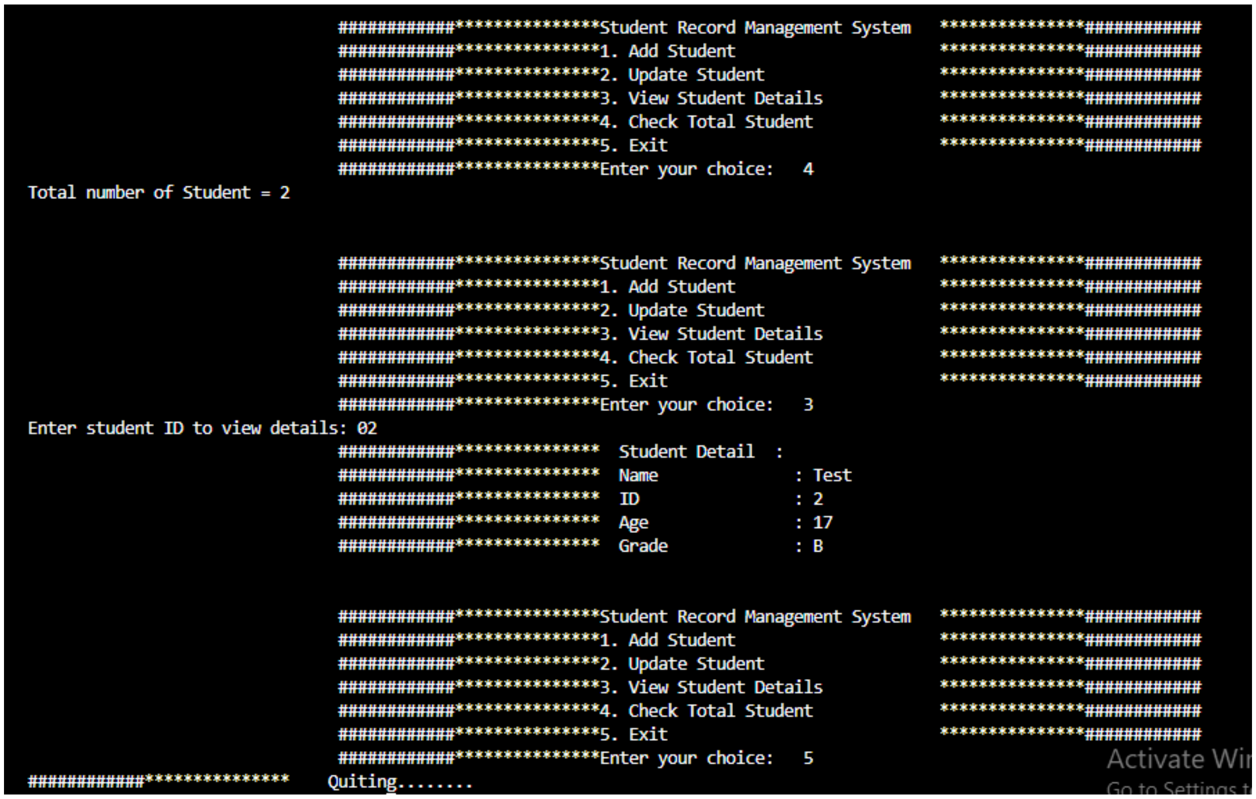
```
                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                      ***************############
                                  ############***************2. Update Student                   ***************############
                                  ############***************3. View Student Details             ***************############
                                  ############***************4. Check Total Student              ***************############
                                  ############***************5. Exit                             ***************############
                                  ############***************Enter your choice:   3
 Enter student ID to view details: 01
                                  ############***************  Student Detail  :
                                  ############***************  Name              : Ahad
                                  ############***************  ID                : 1
                                  ############***************  Age               : 18
                                  ############***************  Grade             : A


                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                      ***************############
                                  ############***************2. Update Student                   ***************############
                                  ############***************3. View Student Details             ***************############
                                  ############***************4. Check Total Student              ***************############
                                  ############***************5. Exit                             ***************############
                                  ############***************Enter your choice:   2
 Enter student ID to update: 2

                  Student Record not found with ID: 2
```



```
                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                     ***************############
                                  ############***************2. Update Student                  ***************############
                                  ############***************3. View Student Details            ***************############
                                  ############***************4. Check Total Student             ***************############
                                  ############***************5. Exit                            ***************############
                                  ############***************Enter your choice:   2
Enter student ID to update: 01
Enter new student name: Ali
Enter new student age: 20
Enter new student grade: B

                          ###*******  Student updated successfully.



                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                     ***************############
                                  ############***************2. Update Student                  ***************############
                                  ############***************3. View Student Details            ***************############
                                  ############***************4. Check Total Student             ***************############
                                  ############***************5. Exit                            ***************############
                                  ############***************Enter your choice:   3
Enter student ID to view details: 01
                                  ############***************  Student Detail  :
                                  ############***************  Name               : Ali
                                  ############***************  ID                 : 1
                                  ############***************  Age                : 20
                                  ############***************  Grade              : B
```



```
                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                     ***************############
                                  ############***************2. Update Student                  ***************############
                                  ############***************3. View Student Details            ***************############
                                  ############***************4. Check Total Student             ***************############
                                  ############***************5. Exit                            ***************############
                                  ############***************Enter your choice:   1
Enter student name: exist name test
Enter student ID: 01
Enter student age: 19
Enter student grade: A+

                           Error! Student Already Exists.



                                  ############***************Student Record Management System   ***************############
                                  ############***************1. Add Student                     ***************############
                                  ############***************2. Update Student                  ***************############
                                  ############***************3. View Student Details            ***************############
                                  ############***************4. Check Total Student             ***************############
                                  ############***************5. Exit                            ***************############
                                  ############***************Enter your choice:   1
Enter student name: Test
Enter student ID: 02
Enter student age: 17
Enter student grade: B

                          ###*******  Student added successfully.
```



```
                                ############***************Student Record Management System   ***************############
                                ############***************1. Add Student                     ***************############
                                ############***************2. Update Student                  ***************############
                                ############***************3. View Student Details            ***************############
                                ############***************4. Check Total Student             ***************############
                                ############***************5. Exit                            ***************############
                                ############***************Enter your choice:   4
Total number of Student = 2


                                ############***************Student Record Management System   ***************############
                                ############***************1. Add Student                     ***************############
                                ############***************2. Update Student                  ***************############
                                ############***************3. View Student Details            ***************############
                                ############***************4. Check Total Student             ***************############
                                ############***************5. Exit                            ***************############
                                ############***************Enter your choice:   3
Enter student ID to view details: 02
                                ############***************  Student Detail  :
                                ############***************  Name              : Test
                                ############***************  ID                : 2
                                ############***************  Age               : 17
                                ############***************  Grade             : B


                                ############***************Student Record Management System   ***************############
                                ############***************1. Add Student                     ***************############
                                ############***************2. Update Student                  ***************############
                                ############***************3. View Student Details            ***************############
                                ############***************4. Check Total Student             ***************############
                                ############***************5. Exit                            ***************############
                                ############***************Enter your choice:   5
############***************    Quiting........
```

The End