Workshop Examples

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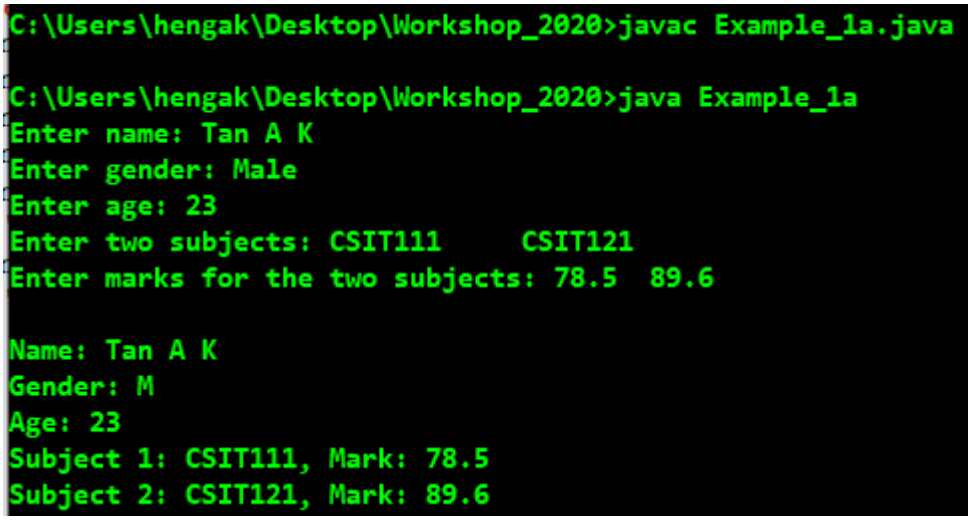
Contents

```
// What is a Java program?
//
// In this example, you will learn
// - What are variables?
// - What are data types?
// - How to display the results?

class Example_1
{
	public static void main (String [] args)
	{
		// What is a student?
		String name = "Robert Lim";
		char gender = 'M';
		int age = 23;
		String subject1 = "CSIT111";
		String subject2 = "CSIT103";
		double mark1 = 67.8;
		double mark2 = 89.9;

		// Display the results
		System.out.println ("Name: " + name);
		System.out.println ("Gender: " + gender);
		System.out.println ("Age: " + age);
		System.out.println ("Subject 1: " + subject1 + ", " +
					"Mark: " + mark1 );
		System.out.println ("Subject 2: " + subject2 + ", " +
					"Mark: " + mark2 );
	}
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1
Name: Robert Lim
Gender: M
Age: 23
Subject 1: CSIT111, Mark: 67.8
Subject 2: CSIT103, Mark: 89.9
```

```
// What is a Java program?
//
// In this example, you will learn
// - How to read information using the Scanner class?

import java.util.Scanner;

class Example_1a
{
	public static void main (String [] args)
	{
		Scanner input = new Scanner (System.in);

		// What is a student?
		String name;
		char gender;
		int age;
		String subject1, subject2 ;
		double mark1, mark2;

		// Now we do the readings
		System.out.print ("Enter name: ");
		name = input.nextLine ();

		System.out.print ("Enter gender: ");
		gender = input.next ().charAt (0);

		System.out.print ("Enter age: ");
		age = input.nextInt ();

		System.out.print ("Enter two subjects: ");
		subject1 = input.next ();
		subject2 = input.next ();

		System.out.print ("Enter marks for the two subjects: ");
		mark1 = input.nextDouble ();
		mark2 = input.nextDouble ();

		// Display the results
		System.out.println ();
		System.out.println ("Name: " + name);
		System.out.println ("Gender: " + gender);
		System.out.println ("Age: " + age);
		System.out.println ("Subject 1: " + subject1 + ", " +
				"Mark: " + mark1 );
		System.out.println ("Subject 2: " + subject2 + ", " +
				"Mark: " + mark2 );
	}
}
```


C:\Users\hengak\Desktop\Workshop_2020>javac Example_1a.java
C:\Users\hengak\Desktop\Workshop_2020>java Example_1a
Enter name: Tan A K
Enter gender: Male
Enter age: 23
Enter two subjects: CSIT111 CSIT121
Enter marks for the two subjects: 78.5 89.6
Name: Tan A K
Gender: M
Age: 23
Subject 1: CSIT111, Mark: 78.5
Subject 2: CSIT121, Mark: 89.6

```
// What is a Java program?
//
// In this example, you will learn
// - What are the assignment statements?

import java.util.Scanner;

class Example_1b
{
        public static void main (String [] args)
        {
                Scanner input = new Scanner (System.in);

                // What is a student?
                String name;
                char gender;
                int age;
                String subject1, subject2 ;
                double mark1, mark2;

                // Now we do the readings
                System.out.print ("Enter name: ");
                name = input.nextLine ();

                System.out.print ("Enter gender: ");
                gender = input.next ().charAt (0);

                System.out.print ("Enter age: ");
                age = input.nextInt ();

                System.out.print ("Enter two subjects: ");
                subject1 = input.next ();
                subject2 = input.next ();

                System.out.print ("Enter marks for the two subjects: ");
                mark1 = input.nextDouble ();
                mark2 = input.nextDouble ();

                // Other information related to students

                double average = (mark1 + mark2) / 2.0;
                int finalMark = (int) (average + 0.5);

                // Display the results
                System.out.println ();
                System.out.println ("Name: " + name);
                System.out.println ("Gender: " + gender);
                System.out.println ("Age: " + age);
                System.out.println ("Subject 1: " + subject1 + ", " +
                                                "Mark: " + mark1 );
```

```
                System.out.println ("Subject 2: " + subject2 + ", " +
                                                    "Mark: " + mark2 );
                System.out.println ("Average: " + average);
                System.out.println ("Final mark: " + finalMark);
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1b.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1b
Enter name: Lim Nancy
Enter gender: Female
Enter age: 18
Enter two subjects: CSIT113     CSIT121
Enter marks for the two subjects: 78.5  88.2

Name: Lim Nancy
Gender: F
Age: 18
Subject 1: CSIT113, Mark: 78.5
Subject 2: CSIT121, Mark: 88.2
Average: 83.35
Final mark: 83
```

```
// What is a Java program?
//
// In this example, you will learn
// - the printf method (formatted output)

import java.util.Scanner;

class Example_1c
{
	public static void main (String [] args)
	{
		Scanner input = new Scanner (System.in);

		// What is a student?
		String name;
		char gender;
		int age;
		String subject1, subject2 ;
		double mark1, mark2;

		// Now we do the readings
		System.out.print ("Enter name: ");
		name = input.nextLine ();

		System.out.print ("Enter gender: ");
		gender = input.next ().charAt (0);

		System.out.print ("Enter age: ");
		age = input.nextInt ();

		System.out.print ("Enter two subjects: ");
		subject1 = input.next ();
		subject2 = input.next ();

		System.out.print ("Enter marks for the two subjects: ");
		mark1 = input.nextDouble ();
		mark2 = input.nextDouble ();

		// Other information related to students

		double average = (mark1 + mark2) / 2.0;
		int finalMark = (int) (average + 0.5);

		// Display the results, explore the use of
		// formatted output - printf method
		System.out.println ();
		System.out.printf ("Name: %s%n",  name);
		System.out.printf ("Gender: %c%n",  gender);
		System.out.printf ("Age: %d%n",  age);
		System.out.printf ("Subject 1: %s,  Mark: %.1f%n",
					subject1,  mark1);
		System.out.printf ("Subject 2: %s,  Mark: %.1f%n",
					subject2,  mark2);
		System.out.printf ("Average: %.1f%n",  average);
		System.out.printf ("Final mark: %d%n",  finalMark);
	}
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1c.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1c
Enter name: Ang C H
Enter gender: Male
Enter age: 16
Enter two subjects: CSIT111     CSIT121
Enter marks for the two subjects: 56.9  77.2

Name: Ang C H
Gender: M
Age: 16
Subject 1: CSIT111,  Mark: 56.9
Subject 2: CSIT121,  Mark: 77.2
Average: 67.1
Final mark: 67
```

```
// What is a Java program?
//
// In this example, you will learn
// - user defined methods

import java.util.Scanner;

class Example_1d
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	public static void main (String [] args)
	{
		Scanner input = new Scanner (System.in);

		// What is a student?
		String name;
		char gender;
		int age;
		String subject1, subject2 ;
		double mark1, mark2;

		// Now we do the readings
		System.out.print ("Enter name: ");
		name = input.nextLine ();

		System.out.print ("Enter gender: ");
		gender = input.next ().charAt (0);

		System.out.print ("Enter age: ");
		age = input.nextInt ();

		System.out.print ("Enter two subjects: ");
		subject1 = input.next ();
		subject2 = input.next ();

		System.out.print ("Enter marks for the two subjects: ");
		mark1 = input.nextDouble ();
		mark2 = input.nextDouble ();
```

```
                // Other information related to students

                double average = getAverage (mark1, mark2);
                int finalMark = getFinalMark (mark1, mark2);

                // Display the results
                System.out.println ();
                System.out.printf ("Name: %s%n",  name);
                System.out.printf ("Gender: %c%n",  gender);
                System.out.printf ("Age: %d%n",  age);
                System.out.printf ("Subject 1: %s,  Mark: %.1f%n",  subject1,  mark1);
                System.out.printf ("Subject 2: %s,  Mark: %.1f%n",  subject2,  mark2);
                System.out.printf ("Average: %.1f%n",  average);
                System.out.printf ("Final mark: %d%n",  finalMark);
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1d.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1d
Enter name: Heng A A
Enter gender: Male
Enter age: 36
Enter two subjects: CSIT111     CSIT121
Enter marks for the two subjects: 66.8  99.9

Name: Heng A A
Gender: M
Age: 36
Subject 1: CSIT111,  Mark: 66.8
Subject 2: CSIT121,  Mark: 99.9
Average: 83.4
Final mark: 83
```

```
// What is a Java program?
//
// In this example, you will learn
// - user defined methods
// - selection design - if else statements

import java.util.Scanner;

class Example_1e
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	public static void main (String [] args)
	{
		Scanner input = new Scanner (System.in);

		// What is a student?
		String name;
		char gender;
		int age;
		String subject1, subject2 ;
		double mark1, mark2;

		// Now we do the readings
		System.out.print ("Enter name: ");
```

```
            name = input.nextLine ();

            System.out.print ("Enter gender: ");
            gender = input.next ().charAt (0);

            System.out.print ("Enter age: ");
            age = input.nextInt ();

            System.out.print ("Enter two subjects: ");
            subject1 = input.next ();
            subject2 = input.next ();

            System.out.print ("Enter marks for the two subjects: ");
            mark1 = input.nextDouble ();
            mark2 = input.nextDouble ();

            // Other information related to students

            double average = getAverage (mark1, mark2);
            int finalMark = getFinalMark (mark1, mark2);
            String grade = getAGrade (finalMark);

            // Display the results
            System.out.println ();
            System.out.printf ("Name: %s%n",  name);
            System.out.printf ("Gender: %c%n",  gender);
            System.out.printf ("Age: %d%n",  age);
            System.out.printf ("Subject 1: %s,  Mark: %.1f%n",  subject1,  mark1);
            System.out.printf ("Subject 2: %s,  Mark: %.1f%n",  subject2,  mark2);
            System.out.printf ("Average: %.1f%n",  average);
            System.out.printf ("Final mark: %d%n",  finalMark);
            System.out.printf ("Grade: %s%n", grade);
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1e.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1e
Enter name: Heng A A
Enter gender: Male
Enter age: 56
Enter two subjects: CSIT111     CSIT121
Enter marks for the two subjects: 78.6  99.9

Name: Heng A A
Gender: M
Age: 56
Subject 1: CSIT111,  Mark: 78.6
Subject 2: CSIT121,  Mark: 99.9
Average: 89.3
Final mark: 89
Grade: HD
```

```
// What is a Java program?
//
// In this example, you will learn
// - user defined methods
// - selection design - switch case statements

import java.util.Scanner;

class Example_1f
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	private static void displayMessage (String grade)
	{
		switch (grade)
		{
			case "HD": System.out.println ("Wow! Well done, " +
							"you scored HD");
				   break;
			case "D"   : System.out.println ("Not bad! A distinction");
				   break;
			case "C"   : System.out.println ("You had a credit");
			case "P"   : System.out.println ("You passed the subject");
			default    : System.out.println ("Keep it up for better grade");
		}
```

```
}

public static void main (String [] args)
{
        Scanner input = new Scanner (System.in);

        // What is a student?
        String name;
        char gender;
        int age;
        String subject1, subject2 ;
        double mark1, mark2;

        // Now we do the readings
        System.out.print ("Enter name: ");
        name = input.nextLine ();

        System.out.print ("Enter gender: ");
        gender = input.next ().charAt (0);

        System.out.print ("Enter age: ");
        age = input.nextInt ();

        System.out.print ("Enter two subjects: ");
        subject1 = input.next ();
        subject2 = input.next ();

        System.out.print ("Enter marks for the two subjects: ");
        mark1 = input.nextDouble ();
        mark2 = input.nextDouble ();

        // Other information related to students

        double average = getAverage (mark1, mark2);
        int finalMark = getFinalMark (mark1, mark2);
        String grade = getAGrade (finalMark);

        // Display the results
        System.out.println ();
        System.out.printf ("Name: %s%n",  name);
        System.out.printf ("Gender: %c%n",  gender);
        System.out.printf ("Age: %d%n",  age);
        System.out.printf ("Subject 1: %s,  Mark: %.1f%n",  subject1,  mark1);
        System.out.printf ("Subject 2: %s,  Mark: %.1f%n",  subject2,  mark2);
        System.out.printf ("Average: %.1f%n",  average);
        System.out.printf ("Final mark: %d%n",  finalMark);
        System.out.printf ("Grade: %s%n", grade);

        displayMessage (grade);
}
```

}

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1f.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1f
Enter name: Tan A H
Enter gender: Female
Enter age: 23
Enter two subjects: CSIT111     CSIT121
Enter marks for the two subjects: 78.6  67.9

Name: Tan A H
Gender: F
Age: 23
Subject 1: CSIT111,  Mark: 78.6
Subject 2: CSIT121,  Mark: 67.9
Average: 73.3
Final mark: 73
Grade: C
You had a credit
You passed the subject
Keep it up for better grade
```

```
// What is a Java program?
//
// In this example, you will learn
// - user defined methods
// - selection design - switch case statements
// - Use of Math.random method

import java.util.Scanner;

class Example_1g
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	private static void displayMessage (String grade)
	{
		System.out.println ("\nLecturer's remark");

		switch (grade)
		{
			case "HD": System.out.println ("\tWow! Well done,." +
                                                        "you scored HD");
                                  break;
			case "D"   : System.out.println ("\tNot bad! A distinction");
                                   break;
			case "C"   : System.out.println ("\tYou had a credit");
```

```
                case "P"    : System.out.println ("\tYou passed the subject");
                default     : System.out.println ("\tKeep it up for better grade");
        }
}

public static void main (String [] args)
{
        Scanner input = new Scanner (System.in);

        // What is a student?
        String name;
        char gender;
        int age;
        String subject1, subject2 ;
        double mark1, mark2;

        // Now we do the readings
        System.out.print ("Enter name: ");
        name = input.nextLine ();

        System.out.print ("Enter gender: ");
        gender = input.next ().charAt (0);

        System.out.print ("Enter two subjects: ");
        subject1 = input.next ();
        subject2 = input.next ();

        /* Generate some random values for age and marks */
        age = (int) (Math.random () * 10.0) + 20;
        mark1 = Math.random () * 100.0;
        mark2 =Math.random () * 100.0;

        // Other information related to students

        double average = getAverage (mark1, mark2);
        int finalMark = getFinalMark (mark1, mark2);
        String grade = getAGrade (finalMark);

        // Display the results
        System.out.println ();
        System.out.printf ("Name: %s%n",  name);
        System.out.printf ("Gender: %c%n",  gender);
        System.out.printf ("Age: %d%n",  age);
        System.out.printf ("Subject 1: %s,  Mark: %.1f%n",  subject1,  mark1);
        System.out.printf ("Subject 2: %s,  Mark: %.1f%n",  subject2,  mark2);
        System.out.printf ("Average: %.1f%n",  average);
        System.out.printf ("Final mark: %d%n",  finalMark);
        System.out.printf ("Grade: %s%n", grade);

        displayMessage (grade);
```

```
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Example_1g.java

C:\Users\hengak\Desktop\Workshop_2020>java Example_1g
Enter name: Heng A K
Enter gender: 28
Enter two subjects: CSIT111     CSIT121

Name: Heng A K
Gender: 2
Age: 23
Subject 1: CSIT111,  Mark: 18.7
Subject 2: CSIT121,  Mark: 49.4
Average: 34.1
Final mark: 34
Grade: F

Lecturer's remark
        Keep it up for better grade
```

```
// What is a Java program?
//
// In this example, you will learn
// - Repetition controlled execution
//   : Sentinel controlled while loop

import java.util.Scanner;

class Example_1h
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	private static void displayMessage (String grade)
	{
		System.out.println ("\nLecturer's remark");

		switch (grade)
		{
			case "HD": System.out.println ("\tWow! Well done, " +
                                                        "you scored HD");
                                   break;
			case "D"   : System.out.println ("\tNot bad! A distinction");
                                                        break;
			case "C"   : System.out.println ("\tYou had a credit");
			case "P"    : System.out.println ("\tYou passed the subject");
```

```
                default     : System.out.println ("\tKeep it up for better grade");
        }
}

public static void main (String [] args)
{
        Scanner input = new Scanner (System.in);

        // What is a student?
        String name;
        char gender;
        int age;
        String subject1, subject2 ;
        double mark1, mark2;

        int k = (int) (Math.random () * 3);

        // If k != 0, we read info of a Student and display his/her info

        while (k != 0)
        {
                // Now we do the readings
                System.out.print ("Enter name: ");
                name = input.nextLine ();

                System.out.print ("Enter gender: ");
                gender = input.next ().charAt (0);

                System.out.print ("Enter two subjects: ");
                subject1 = input.next ();
                subject2 = input.next ();

                /* Generate some random values for age and marks */
                age = (int) (Math.random () * 10.0) + 20;
                mark1 = Math.random () * 100.0;
                mark2 =Math.random () * 100.0;

                // Other information related to students

                double average = getAverage (mark1, mark2);
                int finalMark = getFinalMark (mark1, mark2);
                String grade = getAGrade (finalMark);

                // Display the results
                System.out.println ();
                System.out.printf ("Name: %s%n",  name);
                System.out.printf ("Gender: %c%n",  gender);
                System.out.printf ("Age: %d%n",  age);
                System.out.printf ("Subject 1: %s,  Mark: %.1f%n",
                                        subject1,  mark1);
```

```
                    System.out.printf ("Subject 2: %s,  Mark: %.1f%n",
                                        subject2,  mark2);
                    System.out.printf ("Average: %.1f%n",  average);
                    System.out.printf ("Final mark: %d%n",  finalMark);
                    System.out.printf ("Grade: %s%n", grade);

                    displayMessage (grade);

                     k = (int) (Math.random () * 3);

                     // Important statement
                     input.nextLine ();

                     System.out.println ("-----------------------------------------------");
                } // end while loop
        }
}
```

```
Enter name: Lim H H
Enter gender: Female
Enter two subjects: CSIT121     CSIT114

Name: Lim H H
Gender: F
Age: 23
Subject 1: CSIT121,  Mark: 30.2
Subject 2: CSIT114,  Mark: 24.3
Average: 27.2
Final mark: 27
Grade: F

Lecturer's remark
        Keep it up for better grade
-----------------------------------------------
Enter name: Nancy Lim
Enter gender: Male
Enter two subjects: CSIT111     CSIT121

Name: Nancy Lim
Gender: M
Age: 27
Subject 1: CSIT111,  Mark: 77.8
Subject 2: CSIT121,  Mark: 41.2
Average: 59.5
Final mark: 59
Grade: P

Lecturer's remark
        You passed the subject
        Keep it up for better grade
```

```
// What is a Java program?
//
// In this example, you will learn
// - Repetition controlled execution
//   : more types of loops
//   : enum types
//   : all info generated

import java.util.Scanner;

enum Subject {CSIT111, CSIT121, CSIT113, CSIT114}

enum Gender {MALE, FEMALE}

class Example_1i
{
	private static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	private static void displayMessage (String grade)
	{
		System.out.println ("\nLecturer's remark");

		switch (grade)
		{
			case "HD": System.out.println ("\tWow! You scored HD");
```

```
                        break;
                case "D"   : System.out.println ("\tNot bad! A distinction");
                                                        break;
                case "C"   : System.out.println ("\tYou had a credit");
                case "P"    : System.out.println ("\tYou passed the subject");
                default     : System.out.println ("\tKeep it up for better grade");
        }
}

private static Subject getSubject ()
{
        int k = (int) (Math.random () * 4);

        switch (k)
        {
                case 0: return Subject.CSIT111;
                case 1: return Subject.CSIT121;
                case 2: return Subject.CSIT113;
                default: return Subject.CSIT114;
        }
}

private static Gender getGender ()
{
        int k = (int) (Math.random () * 2);

        return (k == 0? Gender.MALE : Gender.FEMALE);
}

private static boolean equalSubjects (Subject s1, Subject s2)
{
        return (s1 == s2);
}

public static void main (String [] args)
{
        Scanner input = new Scanner (System.in);

        // What is a student?
        String name;
        Gender gender;
        int age;
        Subject  subject1, subject2 ;
        double mark1, mark2;

        int k = (int) (Math.random () * 3) + 3;

        for (int i = 1; i <= k; i++)
        {
                // Generate all values
```

```
                    name = "Heng " + String.valueOf (i);

                    gender =getGender ();

                    subject1 = getSubject ();

                    // date validation , make sure no duplicated subjects
                    do
                    {
                            subject2 =getSubject ();
                    } while (equalSubjects (subject1, subject2));

                    /* Generate some random values for age and marks */
                    age = (int) (Math.random () * 10.0) + 20;
                    mark1 = Math.random () * 100.0;
                    mark2 =Math.random () * 100.0;

                    // Other information related to students

                    double average = getAverage (mark1, mark2);
                    int finalMark = getFinalMark (mark1, mark2);
                    String grade = getAGrade (finalMark);

                    // Display the results
                    System.out.println ();
                    System.out.printf ("Name: %s%n",  name);
                    System.out.printf ("Gender: %s%n",  String.valueOf (gender));
                    System.out.printf ("Age: %d%n",  age);
                    System.out.printf ("Subject 1: %s,  Mark: %.1f%n",
                                            subject1,  mark1);
                    System.out.printf ("Subject 2: %s,  Mark: %.1f%n",
                                            subject2,  mark2);
                    System.out.printf ("Average: %.1f%n",  average);
                    System.out.printf ("Final mark: %d%n",  finalMark);
                    System.out.printf ("Grade: %s%n", grade);

                    displayMessage (grade);

                    System.out.println  ("----------------------------------------------");
                } // end for loop
        }
}
```

```
Name: Heng 1
Gender: MALE
Age: 22
Subject 1: CSIT111,  Mark: 39.8
Subject 2: CSIT121,  Mark: 0.5
Average: 20.1
Final mark: 20
Grade: F

Lecturer's remark
        Keep it up for better grade
-------------------------------------------------

Name: Heng 2
Gender: FEMALE
Age: 24
Subject 1: CSIT113,  Mark: 32.1
Subject 2: CSIT111,  Mark: 57.2
Average: 44.7
Final mark: 45
Grade: F

Lecturer's remark
        Keep it up for better grade
-------------------------------------------------

Name: Heng 3
Gender: FEMALE
Age: 29
Subject 1: CSIT114,  Mark: 99.6
Subject 2: CSIT113,  Mark: 19.7
Average: 59.6
Final mark: 60
Grade: P

Lecturer's remark
        You passed the subject
        Keep it up for better grade
-------------------------------------------------
```

```
// What is a Java program?
//
// In this example, you will learn
// - How to access non-static (instance) methods in a class?

import java.util.Scanner;

enum Subject {CSIT111, CSIT121, CSIT113, CSIT114}

enum Gender {MALE, FEMALE}

class Example_1j
{
	private double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	private int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	private String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	private void displayMessage (String grade)
	{
		System.out.println ("\nLecturer's remark");

		switch (grade)
		{
			case "HD": System.out.println ("\tWow! You scored HD");
				   break;
			case "D"   : System.out.println ("\tNot bad! A distinction");
				   break;
```

```
                case "C"   : System.out.println ("\tYou had a credit");
                case "P"   : System.out.println ("\tYou passed the subject");
                default    : System.out.println ("\tKeep it up for better grade");
        }
}

private  Subject getSubject ()
{
        int k = (int) (Math.random () * 4);

        switch (k)
        {
                case 0: return Subject.CSIT111;
                case 1: return Subject.CSIT121;
                case 2: return Subject.CSIT113;
                default: return Subject.CSIT114;
        }
}

private  Gender getGender ()
{
        int k = (int) (Math.random () * 2);

        return (k == 0? Gender.MALE : Gender.FEMALE);
}

private  boolean equalSubjects (Subject s1, Subject s2)
{
        return (s1 == s2);
}

public static void main (String [] args)
{
        Scanner input = new Scanner (System.in);

        // Create an object of this class
        Example_1j  e1j = new Example_1j ();

        // What is a student?
        String name;
        Gender gender;
        int age;
        Subject  subject1, subject2 ;
        double mark1, mark2;

        int k = (int) (Math.random () * 3) + 3;

        // If k != 0, we read info of a Student and display his/her info

        for (int i = 1; i <= k; i++)
```

```
                {
                        // Generate all values
                        name = "Heng " + String.valueOf (i);

                        gender = e1j.getGender ();

                        subject1 = e1j.getSubject ();

                        do
                        {
                                subject2 =e1j.getSubject ();
                        } while (e1j.equalSubjects (subject1, subject2));

                        /* Generate some random values for age and marks */
                        age = (int) (Math.random () * 10.0) + 20;
                        mark1 = Math.random () * 100.0;
                        mark2 =Math.random () * 100.0;

                        // Other information related to students

                        double average = e1j.getAverage (mark1, mark2);
                        int finalMark = e1j.getFinalMark (mark1, mark2);
                        String grade = e1j.getAGrade (finalMark);

                        // Display the results
                        System.out.println ();
                        System.out.printf ("Name: %s%n",  name);
                        System.out.printf ("Gender: %s%n",  String.valueOf (gender));
                        System.out.printf ("Age: %d%n",  age);
                        System.out.printf ("Subject 1: %s,  Mark: %.1f%n",
                                                subject1,  mark1);
                        System.out.printf ("Subject 2: %s,  Mark: %.1f%n",  s
                                                ubject2,  mark2);
                        System.out.printf ("Average: %.1f%n",  average);
                        System.out.printf ("Final mark: %d%n",  finalMark);
                        System.out.printf ("Grade: %s%n", grade);

                        e1j.displayMessage (grade);

                         System.out.println ("-----------------------------------------");
                } // end while loop
        }
}
```

```
// What is a Java program?
//
// In this example, you will learn
// - how to access static methods in another class?

import java.util.Scanner;

enum Subject {CSIT111, CSIT121, CSIT113, CSIT114}

enum Gender {MALE, FEMALE}


class SM
{
	public static double getAverage (double m1, double m2)
	{
		double average = (m1 + m2) / 2.0;
		return average;
	}

	public static int getFinalMark (double m1, double m2)
	{
		double average = getAverage (m1, m2);
		int finalMark = (int) (average + 0.5);
		return finalMark;
	}

	public static String getAGrade (int mark)
	{
		if (mark >= 85)
			return "HD";
		else if (mark >= 75)
			return "D";
		else if (mark >= 65)
			return "C";
		else if (mark >= 50)
			return "P";
		else
			return "F";
	}

	public static void displayMessage (String grade)
	{
		System.out.println ("\nLecturer's remark");

		switch (grade)
		{
			case "HD": System.out.println ("\tWow! You scored HD");
				   break;
			case "D"   : System.out.println ("\tNot bad! A distinction");
```

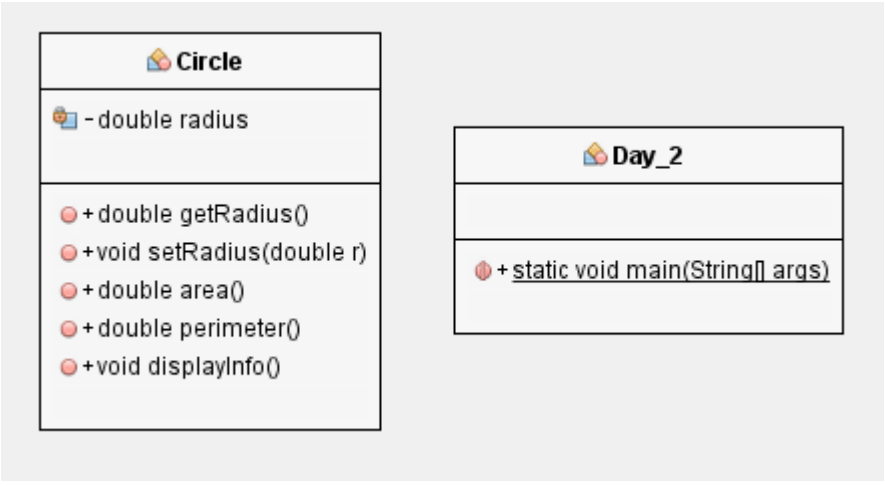
```
                                break;
                        case "C"   : System.out.println ("\tYou had a credit");
                        case "P"    : System.out.println ("\tYou passed the subject");
                        default     : System.out.println ("\tKeep it up for better grade");
                }
        }

        public static Subject getSubject ()
        {
                int k = (int) (Math.random () * 4);

                switch (k)
                {
                        case 0: return Subject.CSIT111;
                        case 1: return Subject.CSIT121;
                        case 2: return Subject.CSIT113;
                        default: return Subject.CSIT114;
                }
        }

        public static Gender getGender ()
        {
                int k = (int) (Math.random () * 2);

                return (k == 0? Gender.MALE : Gender.FEMALE);
        }

        public static boolean equalSubjects (Subject s1, Subject s2)
        {
                return (s1 == s2);
        }

}

class Example_1k
{
        public static void main (String [] args)
        {
                Scanner input = new Scanner (System.in);

                // What is a student?
                String name;
                Gender gender;
                int age;
                Subject  subject1, subject2 ;
                double mark1, mark2;

                int k = (int) (Math.random () * 3) + 3;
```

```
                for (int i = 1; i <= k; i++)
                {
                        // Generate all values
                        name = "Heng " + String.valueOf (i);

                        gender =SM.getGender ();

                        subject1 = SM.getSubject ();

                        do
                        {
                                subject2 = SM.getSubject ();
                        } while (SM.equalSubjects (subject1, subject2));

                        /* Generate some random values for age and marks */
                        age = (int) (Math.random () * 10.0) + 20;
                        mark1 = Math.random () * 100.0;
                        mark2 =Math.random () * 100.0;

                        // Other information related to students

                        double average = SM.getAverage (mark1, mark2);
                        int finalMark = SM.getFinalMark (mark1, mark2);
                        String grade = SM.getAGrade (finalMark);

                        // Display the results
                        System.out.println ();
                        System.out.printf ("Name: %s%n",  name);
                        System.out.printf ("Gender: %s%n",  String.valueOf (gender));
                        System.out.printf ("Age: %d%n",  age);
                        System.out.printf ("Subject 1: %s,  Mark: %.1f%n",
                                                subject1,  mark1);
                        System.out.printf ("Subject 2: %s,  Mark: %.1f%n",
                                                subject2,  mark2);
                        System.out.printf ("Average: %.1f%n",  average);
                        System.out.printf ("Final mark: %d%n",  finalMark);
                        System.out.printf ("Grade: %s%n", grade);

                        SM.displayMessage (grade);

                         System.out.println ("-----------------------------------------------");
                } // end while loop
        }
}
```

```
// What is a class?
// - instance variables
// - instance methods
// - how to construct objects?
// - private and public members

class Circle
{
	// Instance variable
	private double radius;

	// Accessor method
	public double getRadius ()
	{
		return radius;
	}

	// Mutator method
	public void setRadius (double r)
	{
		radius = r;
	}

	public double area ()
	{
		return Math.PI * radius * radius;
	}

	public double perimeter ()
	{
		return 2.0 * Math.PI * radius;
	}

	public void displayInfo ()
	{
		System.out.printf ("Radius: %.3f%n", radius);
		System.out.printf ("Area: %.3f%n", area ());
		System.out.printf ("Perimeter: %.3f%n", perimeter ());
		System.out.println ("-------------------------------------------");
	}
}

class Day_2
{
	public static void main (String [] args)
	{
			// Compiler invokes the default constructor to construct object
			Circle c = new Circle ();
			c.displayInfo ();
```

```
                for (int i = 1; i <= 3; i++)
                {
                        c.setRadius (Math.random () * 10 + 1.0);
                        c.displayInfo ();
                }
        }
}
```

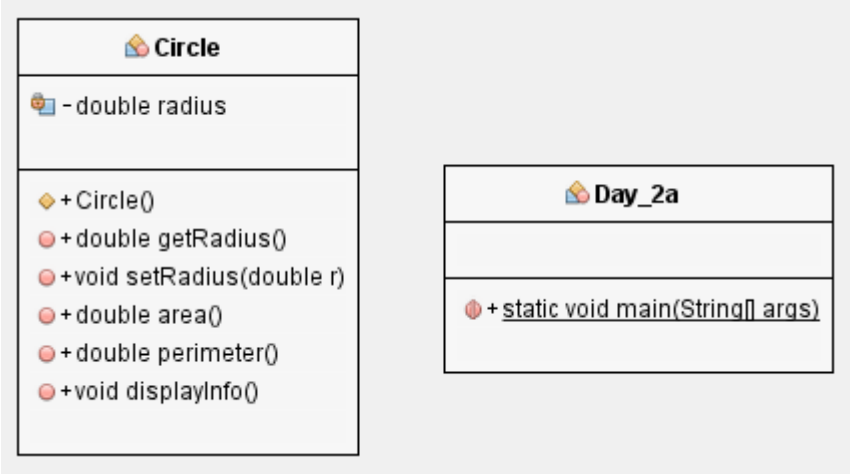
```
C:\Users\hengak\Desktop\Workshop_2020>javac Day_2.java

C:\Users\hengak\Desktop\Workshop_2020>java Day_2
Radius: 0.000
Area: 0.000
Perimeter: 0.000
-----------------------------------------------
Radius: 8.835
Area: 245.216
Perimeter: 55.511
-----------------------------------------------
Radius: 7.649
Area: 183.791
Perimeter: 48.058
-----------------------------------------------
Radius: 10.094
Area: 320.120
Perimeter: 63.425
-----------------------------------------------
```



```
// A simple class with an explicit default constructor
// - name of constructor = name of the class

class Circle
{
	// Instance variable
	private double radius;

	// default constructor, by default radius is zero
	public Circle ()
	{
		radius = 1.0;
	}

	// Accessor method
	public double getRadius ()
	{
		return radius;
	}

	// Mutator method
	public void setRadius (double r)
	{
		radius = r;
	}

	public double area ()
	{
		return Math.PI * radius * radius;
	}

	public double perimeter ()
	{
		return 2.0 * Math.PI * radius;
	}

	public void displayInfo ()
	{
		System.out.printf ("Radius: %.3f%n", radius);
		System.out.printf ("Area: %.3f%n", area ());
		System.out.printf ("Perimeter: %.3f%n", perimeter ());
		System.out.println ("-------------------------------------------");
	}
}

class Day_2a
{
	public static void main (String [] args)
	{
			// Compiler invokes the default constructor to construct object
```

```
                Circle c = new Circle ();
                c.displayInfo ();

                for (int i = 1; i <= 3; i++)
                {
                        c.setRadius (Math.random () * 10 + 1.0);
                        c.displayInfo ();
                }
        }
}
```

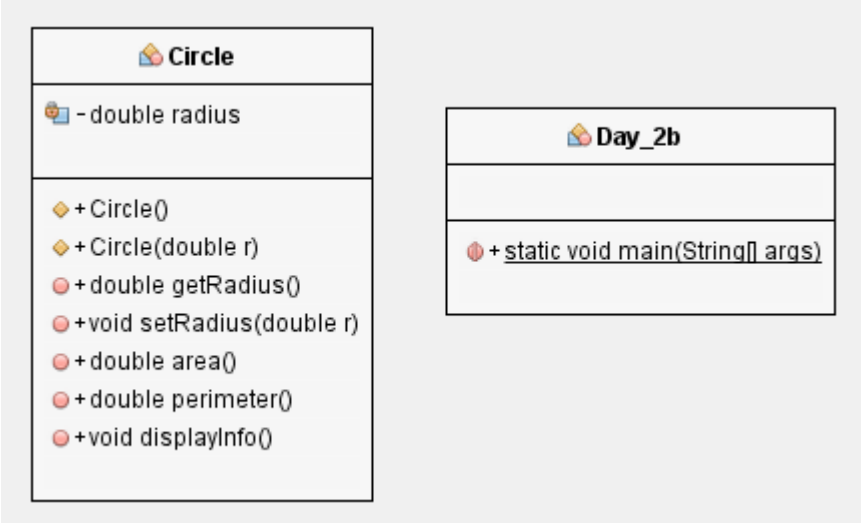
```
C:\Users\hengak\Desktop\Workshop_2020>javac Day_2a.java

C:\Users\hengak\Desktop\Workshop_2020>java Day_2a
Radius: 1.000
Area: 3.142
Perimeter: 6.283
-----------------------------------------------
Radius: 7.833
Area: 192.777
Perimeter: 49.219
-----------------------------------------------
Radius: 10.705
Area: 360.046
Perimeter: 67.264
-----------------------------------------------
Radius: 7.560
Area: 179.547
Perimeter: 47.500
-----------------------------------------------
```



```
// A simple class with other constructor
// - name of constructor = name of the class
// - overload methods

class Circle
{
	// Instance variable
	private double radius;

	// default constructor, by default radius is zero
	public Circle ()
	{
		radius = 1.0;
	}

	// Other constructor
	public Circle (double r)
	{
		radius = r;
	}

	// Accessor method
	public double getRadius ()
	{
		return radius;
	}

	// Mutator method
	public void setRadius (double r)
	{
		radius = r;
	}

	public double area ()
	{
		return Math.PI * radius * radius;
	}

	public double perimeter ()
	{
		return 2.0 * Math.PI * radius;
	}

	public void displayInfo ()
	{
		System.out.printf ("Radius: %.3f%n", radius);
		System.out.printf ("Area: %.3f%n", area ());
		System.out.printf ("Perimeter: %.3f%n", perimeter ());
		System.out.println ("-----------------------------------------");
	}
```

```
}

class Day_2b
{
	public static void main (String [] args)
	{
		for (int i = 1; i <= 3; i++)
		{
			Circle c = new Circle (Math.random () * 10 + 1.0);
			c.displayInfo ();
		}
	}
}
```

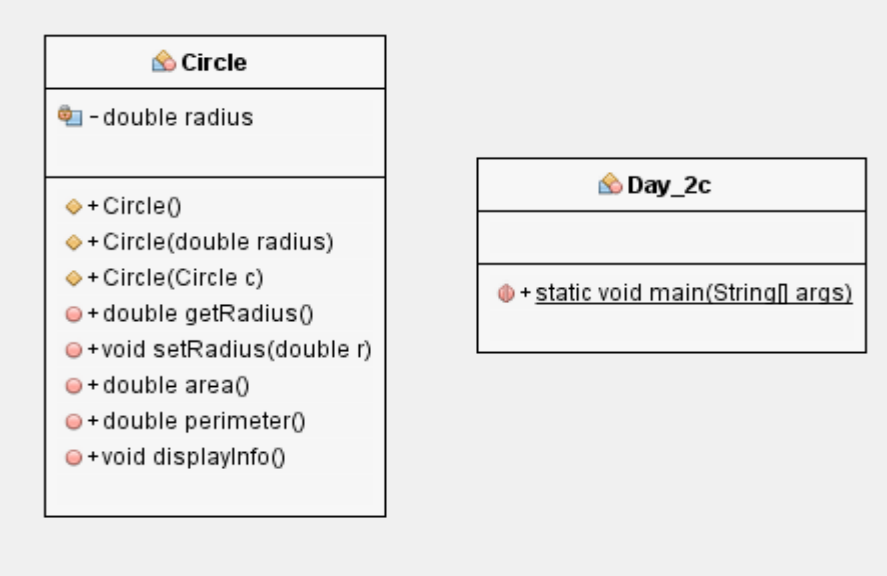
```
C:\Users\hengak\Desktop\Workshop_2020>javac Day_2b.java

C:\Users\hengak\Desktop\Workshop_2020>java Day_2b
Radius: 9.510
Area: 284.123
Perimeter: 59.753
-----------------------------------------------
Radius: 1.273
Area: 5.091
Perimeter: 7.998
-----------------------------------------------
Radius: 7.094
Area: 158.100
Perimeter: 44.573
```



```
// A simple class with other constructor
// - copy constructor
// - explore the this

class Circle
{
	// Instance variable
	private double radius;

	// default constructor, by default radius is zero
	public Circle ()
	{
		radius = 1.0;
	}

	// Other constructor
	public Circle (double radius)
	{
		this.radius = radius;	// rvalue (parameter)
	}

	// Copy constructor
	public Circle (Circle c)
	{
		this.radius = c.radius;
	}


	// Accessor method
	public double getRadius ()
	{
		return radius;
	}

	// Mutator method
	public void setRadius (double r)
	{
		radius = r;
	}

	public double area ()
	{
		return Math.PI * radius * radius;
	}

	public double perimeter ()
	{
		return 2.0 * Math.PI * radius;
	}
```

```
        public void displayInfo ()
        {
                System.out.printf ("Radius: %.3f%n", radius);
                System.out.printf ("Area: %.3f%n", area ());
                System.out.printf ("Perimeter: %.3f%n", perimeter ());
                System.out.println ("-------------------------------------------");
        }
}

class Day_2c
{
        public static void main (String [] args)
        {
                        for (int i = 1; i <= 3; i++)
                        {
                                Circle c = new Circle (Math.random () * 10 + 1.0);
                                Circle aCopy = new Circle (c);

                                c.displayInfo ();
                                aCopy.displayInfo ();
                        }
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac Day_2c.java

C:\Users\hengak\Desktop\Workshop_2020>java Day_2c
Radius: 6.706
Area: 141.291
Perimeter: 42.137
-------------------------------------------
Radius: 6.706
Area: 141.291
Perimeter: 42.137
-------------------------------------------
```



```
// A simple class with other constructor
// - more on this

class Circle
{
	// Instance variable
	private double radius;

	// default constructor, by default radius is zero
	public Circle ()
	{
		radius = 1.0;
	}

	// Other constructor
	public Circle (double radius)
	{
		this.radius = radius;	// rvalue (parameter)
	}

	// Copy constructor
	public Circle (Circle c)
	{
		this (c.radius);
	}


	// Accessor method
	public double getRadius ()
	{
		return radius;
	}

	// Mutator method
	public void setRadius (double r)
	{
		radius = r;
	}

	public double area ()
	{
		return Math.PI * radius * radius;
	}

	public double perimeter ()
	{
		return 2.0 * Math.PI * radius;
	}

	public void displayInfo ()
```

```
	{
		System.out.printf ("Radius: %.3f%n", radius);
		System.out.printf ("Area: %.3f%n", area ());
		System.out.printf ("Perimeter: %.3f%n", perimeter ());
		System.out.println ("-----------------------------------------------");
	}
}

class Day_2d
{
	public static void main (String [] args)
	{
			for (int i = 1; i <= 3; i++)
			{
				Circle c = new Circle (Math.random () * 10 + 1.0);
				Circle aCopy = new Circle (c);

				c.displayInfo ();
				aCopy.displayInfo ();
			}
	}
}
```

```
// Case study - what is an UOW student?
//  - instance variables
// - constructors
// - accessor and mutator methods

class Student
{
	private static int NO = 2020000;

	// instance variables
	private String name;
	private final int id;
	private String subject1;
	private String subject2;

	// default constructor
	public Student ()
	{
		++NO;
		id = NO;
	}

	// Other constructor
	public Student (String name, String subject1, String subject2)
	{
		this ();
		this.name = name;
		this.subject1 = subject1;
		this.subject2 = subject2;
	}

	// accessor methods
	public String getName ()
	{
		return name;
	}

	public int getID ()
	{
		return id;
	}

	public String getSubject1 ()
	{
		return subject1;
	}

	public String getSubject2 ()
	{
		return subject2;
```

```
	}

	// mutator methods
	public void setName (String name)
	{
		this.name = name;
	}

	public void setsubjects (String s1, String s2)
	{
		this.subject1 = s1;
		this.subject2 = s2;
	}

	// Display method

	public void displayInfo ()
	{
		System.out.printf ("Name: %s%n", name);
		System.out.printf ("Student id: %d%n", id);
		System.out.printf ("Subject 1: %s%n", subject1);
		System.out.printf ("Subject 2: %s%n", subject2);

		System.out.println ("-------------------------------------");
	}
}

class CaseStudy_1
{
	public static void main (String [] args)
	{
		Student s0 = new Student ();
		Student s1 = new Student ("Heng A K", "CSIT111", "CSIT121");

		s0.displayInfo ();
		s1.displayInfo ();
	}
}
```

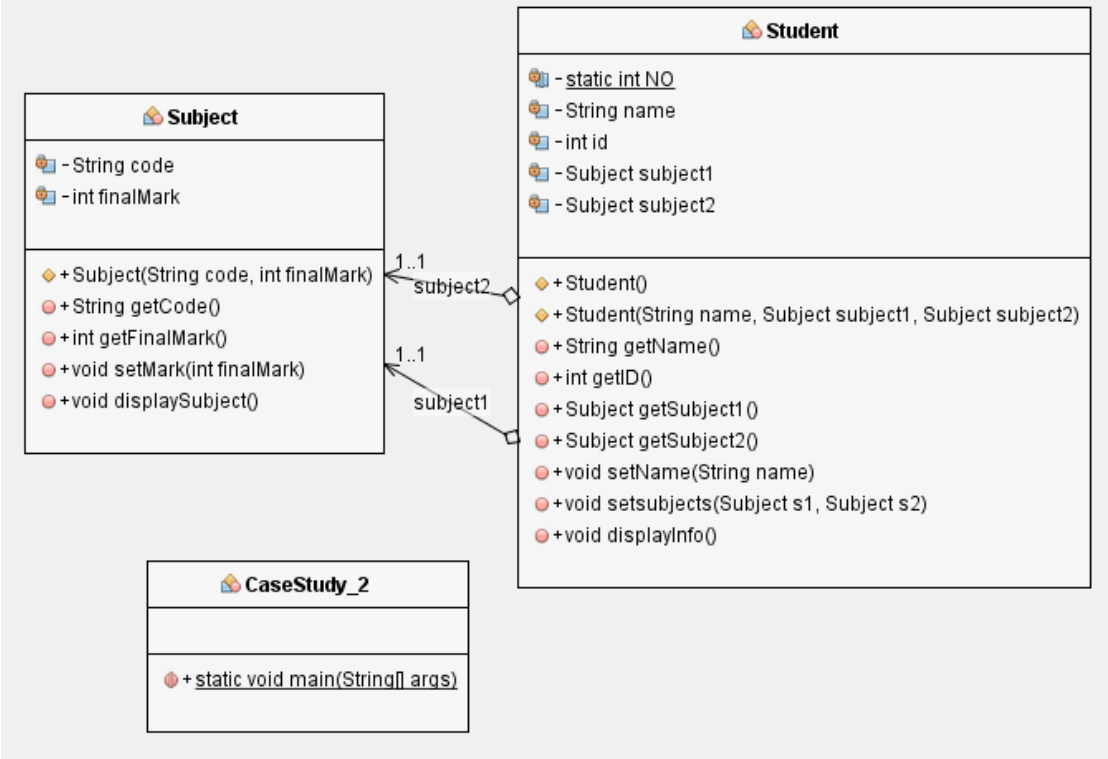
```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_1.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_1
Name: null
Student id: 2020001
Subject 1: null
Subject 2: null
-------------------------------------
Name: Heng A K
Student id: 2020002
Subject 1: CSIT111
Subject 2: CSIT121
-------------------------------------
```

```
// Case study - what is an UOW student?
//  - composition (a student takes or owns two subjects)

class Subject
{
        private final String code;
        private int finalMark;

        public Subject (String code, int finalMark)
        {
                this.code = code;
                this.finalMark = finalMark;
        }

        // accessor methods
        public String getCode ()
        {
                return code;
        }

        public int getFinalMark ()
        {
                return finalMark;
        }

        // Mutator method
        public void setMark (int finalMark)
        {
                this.finalMark = finalMark;
        }

        // Display method
        public void displaySubject ()
        {
                System.out.printf ("Subject code: %s, Final mark: %d%n",
                                        code, finalMark);
        }
}


class Student
{
        private static int NO = 2020000;

        private String name;
        private final int id;
        private Subject subject1;
        private Subject subject2;

        public Student ()
```

```
{
        ++NO;
        id = NO;
}

public Student (String name, Subject subject1, Subject subject2)
{
        this ();
        this.name = name;
        this.subject1 = subject1;
        this.subject2 = subject2;
}

// accessor methods
public String getName ()
{
        return name;
}

public int getID ()
{
        return id;
}

public Subject getSubject1 ()
{
        return subject1;
}

public Subject getSubject2 ()
{
        return subject2;
}

// mutator methods
public void setName (String name)
{
        this.name = name;
}

public void setsubjects (Subject s1, Subject s2)
{
        this.subject1 = s1;
        this.subject2 = s2;
}

// Display method

public void displayInfo ()
{
```

```
                System.out.printf ("Name: %s%n", name);
                System.out.printf ("Student id: %d%n", id);
                subject1.displaySubject ();
                subject2.displaySubject ();

                System.out.println ("-----------------------------------");
        }
}

class CaseStudy_2
{
        public static void main (String [] args)
        {
                        Subject subject1 = new Subject ("CSIT111", 89);
                        Subject subject2 = new Subject ("CSIT121", 78);
                        Student s1 = new Student ("Heng A K", subject1, subject2);
                        s1.displayInfo ();

                        subject1 = new Subject ("CSIT121", 78);
                        subject2 = new Subject ("CSIT114", 88);
                        Student s2 = new Student ("Tan K K", subject1, subject2);
                        s2.displayInfo ();
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_2.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_2
Name: Heng A K
Student id: 2020001
Subject code: CSIT111, Final mark: 89
Subject code: CSIT121, Final mark: 78
-----------------------------------
Name: Tan K K
Student id: 2020002
Subject code: CSIT121, Final mark: 78
Subject code: CSIT114, Final mark: 88
-----------------------------------
```

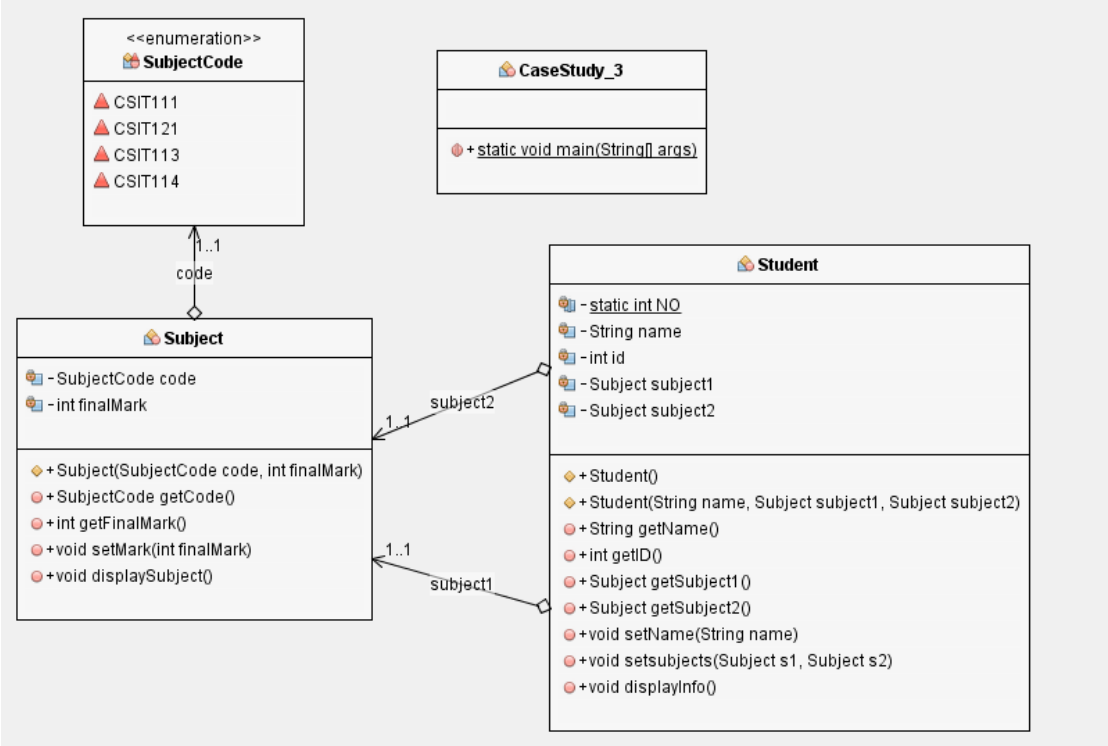

Student
- static int NO
- String name
- int id
- Subject subject1
- Subject subject2
+ Student()
+ Student(String name, Subject subject1, Subject subject2)
+ String getName()
+ int getID()
+ Subject getSubject1()
+ Subject getSubject2()
+ void setName(String name)
+ void setsubjects(Subject s1, Subject s2)
+ void displayInfo()
Subject
- String code
- int finalMark
+ Subject(String code, int finalMark)
+ String getCode()
+ int getFinalMark()
+ void setMark(int finalMark)
+ void displaySubject()
1..1
subject2
1..1
subject1
CaseStudy_2
+ static void main(String[] args)

```
// Case study - what is an UOW student?
//  - composition
// - subject codes are of enum class

enum SubjectCode {CSIT111, CSIT121, CSIT113, CSIT114}

class Subject
{
        private final SubjectCode code;
        private int finalMark;

        public Subject (SubjectCode code, int finalMark)
        {
                this.code = code;
                this.finalMark = finalMark;
        }

        // accessor methods
        public SubjectCode getCode ()
        {
                return code;
        }

        public int getFinalMark ()
        {
                return finalMark;
        }

        // Mutator method
        public void setMark (int finalMark)
        {
                this.finalMark = finalMark;
        }

        // Display method
        public void displaySubject ()
        {
                System.out.printf ("Subject code: %s, Final mark: %d%n",
                                        String.valueOf (code), finalMark);
        }
}

class Student
{
        private static int NO = 2020000;

        private String name;
        private final int id;
        private Subject subject1;
        private Subject subject2;
```

```
public Student ()
{
        ++NO;
        id = NO;
}

public Student (String name, Subject subject1, Subject subject2)
{
        this ();
        this.name = name;
        this.subject1 = subject1;
        this.subject2 = subject2;
}

// accessor methods
public String getName ()
{
        return name;
}

public int getID ()
{
        return id;
}

public Subject getSubject1 ()
{
        return subject1;
}

public Subject getSubject2 ()
{
        return subject2;
}

// mutator methods
public void setName (String name)
{
        this.name = name;
}

public void setsubjects (Subject s1, Subject s2)
{
        this.subject1 = s1;
        this.subject2 = s2;
}

// Display method
```

```
        public void displayInfo ()
        {
                System.out.printf ("Name: %s%n", name);
                System.out.printf ("Student id: %d%n", id);
                subject1.displaySubject ();
                subject2.displaySubject ();

                System.out.println ("-------------------------------------");
        }
}

class CaseStudy_3
{
        public static void main (String [] args)
        {
                        Subject subject1 = new Subject (SubjectCode.CSIT111, 89);
                        Subject subject2 = new Subject (SubjectCode.CSIT121, 78);

                        Student s1 = new Student ("Heng A K", subject1, subject2);

                        s1.displayInfo ();


                        subject1 = new Subject (SubjectCode.CSIT121, 78);
                        subject2 = new Subject (SubjectCode.CSIT114, 88);

                        Student s2 = new Student ("Tan K K", subject1, subject2);
                        s2.displayInfo ();
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_3.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_3
Name: Heng A K
Student id: 2020001
Subject code: CSIT111, Final mark: 89
Subject code: CSIT121, Final mark: 78
-------------------------------------
Name: Tan K K
Student id: 2020002
Subject code: CSIT121, Final mark: 78
Subject code: CSIT114, Final mark: 88
-------------------------------------
```


<<enumeration>>
SubjectCode
CSIT111
CSIT121
CSIT113
CSIT114
CaseStudy_3
+ static void main(String[] args)
1..1
code
Subject
- SubjectCode code
- int finalMark
+ Subject(SubjectCode code, int finalMark)
+ SubjectCode getCode()
+ int getFinalMark()
+ void setMark(int finalMark)
+ void displaySubject()
subject2
1..1
1..1
subject1
Student
- static int NO
- String name
- int id
- Subject subject1
- Subject subject2
+ Student()
+ Student(String name, Subject subject1, Subject subject2)
+ String getName()
+ int getID()
+ Subject getSubject1()
+ Subject getSubject2()
+ void setName(String name)
+ void setsubjects(Subject s1, Subject s2)
+ void displayInfo()

```
// Case study - what is an UOW student?
//  - more features on Subject class, the grade.

enum SubjectCode {CSIT111, CSIT121, CSIT113, CSIT114}

enum UOWGrade {HD, D, C, P, F}

class Subject
{
        private final SubjectCode code;
        private int finalMark;

        public Subject (SubjectCode code, int finalMark)
        {
                this.code = code;
                this.finalMark = finalMark;
        }

        // accessor methods
        public SubjectCode getCode ()
        {
                return code;
        }

        public int getFinalMark ()
        {
                return finalMark;
        }

        // To compute and return a grade
        private UOWGrade getAGrade ()
        {
                if (finalMark >= 85)
                        return UOWGrade.HD;
                else if (finalMark >= 75)
                        return UOWGrade.D;
                else if (finalMark >= 65)
                        return UOWGrade.C;
                else if (finalMark >= 50)
                        return UOWGrade.P;
                else
                        return UOWGrade.F;
        }

        // Mutator method
        public void setMark (int finalMark)
        {
                this.finalMark = finalMark;
        }
```

```
        // Display method
        public void displaySubject ()
        {
                System.out.printf ("Subject code: %s, Final mark: %d, Grade: %s%n",
                                        String.valueOf (code), finalMark,
                                        String.valueOf (getAGrade ()));
        }
}

class Student
{
        private static int NO = 2020000;

        private String name;
        private final int id;
        private Subject subject1;
        private Subject subject2;

        public Student ()
        {
                ++NO;
                id = NO;
        }

        public Student (String name, Subject subject1, Subject subject2)
        {
                this ();
                this.name = name;
                this.subject1 = subject1;
                this.subject2 = subject2;
        }

        // accessor methods
        public String getName ()
        {
                return name;
        }

        public int getID ()
        {
                return id;
        }

        public Subject getSubject1 ()
        {
                return subject1;
        }

        public Subject getSubject2 ()
        {
```

```
		return subject2;
	}

	// mutator methods
	public void setName (String name)
	{
		this.name = name;
	}

	public void setsubjects (Subject s1, Subject s2)
	{
		this.subject1 = s1;
		this.subject2 = s2;
	}

	// Display method

	public void displayInfo ()
	{
		System.out.printf ("Name: %s%n", name);
		System.out.printf ("Student id: %d%n", id);
		subject1.displaySubject ();
		subject2.displaySubject ();

		System.out.println ("-------------------------------------");
	}
}

class CaseStudy_4
{
	public static void main (String [] args)
	{
			Subject subject1 = new Subject (SubjectCode.CSIT111, 89);
			Subject subject2 = new Subject (SubjectCode.CSIT121, 78);

			Student s1 = new Student ("Heng A K", subject1, subject2);

			s1.displayInfo ();

			subject1 = new Subject (SubjectCode.CSIT121, 78);
			subject2 = new Subject (SubjectCode.CSIT114, 88);

			Student s2 = new Student ("Tan K K", subject1, subject2);
			s2.displayInfo ();
	}
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_4.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_4
Name: Heng A K
Student id: 2020001
Subject code: CSIT111, Final mark: 89, Grade: HD
Subject code: CSIT121, Final mark: 78, Grade: D
-------------------------------------
Name: Tan K K
Student id: 2020002
Subject code: CSIT121, Final mark: 78, Grade: D
Subject code: CSIT114, Final mark: 88, Grade: HD
```

```
// Case study - what is an UOW student?
//  - More features on Subject class
//  - The use of array
enum SubjectCode {CSIT111, CSIT121, CSIT113, CSIT114}

enum UOWGrade {HD, D, C, P, F}

class Subject
{
        private final int NO = 5;
        private final SubjectCode code;
        private double [ ] assignment ;
        private double exam;
        private int finalMark;

        public Subject (SubjectCode code)
        {
                this.code = code;

                //  construct the array inside the constructor
                assignment = new double [NO];
                processAssignment ();

                processExam ();
                processFinalMark ();
        }

        private double getMark ()
        {
                return Math.random () * 100.0;
        }

        private void processAssignment ()
        {
                for(int i = 0; i < assignment.length; i++)
                        assignment [i] = getMark ();
        }

        private void processExam ()
        {
                exam = getMark ();
        }

        // Assume weight for assignments is 50% and the
  /     //  the weight for exam is also 50%
        private void processFinalMark ()
        {
                double sum = 0.0;
                for (double d : assignment)
                        sum += d;
```

```
        double average = sum / assignment.length;
        finalMark = (int)  ((average + exam) / 2.0 + 0.5);
}

// accessor methods
public SubjectCode getCode ()
{
        return code;
}

public int getFinalMark ()
{
        return finalMark;
}

// To compute and return a grade
private UOWGrade getAGrade ()
{
        if (finalMark >= 85)
                return UOWGrade.HD;
        else if (finalMark >= 75)
                return UOWGrade.D;
        else if (finalMark >= 65)
                return UOWGrade.C;
        else if (finalMark >= 50)
                return UOWGrade.P;
        else
                return UOWGrade.F;
}

// Mutator method
public void setMark (int finalMark)
{
        this.finalMark = finalMark;
}

// Display method
private void displayAssignment ()
{
        for (int i = 0; i < assignment.length; i++)
        {
                System.out.printf ("A%d = %.1f  ",  (i + 1), assignment [i]);
        }

        System.out.println ();
}

public void displaySubject ()
{
```

```
                System.out.printf ("Subject code: %s%n",  String.valueOf (code));
                displayAssignment ();

                System.out.printf ("Exam: %.1f%n", exam);
                System.out.printf ("Final mark: %d, Grade: %s%n",
                                finalMark, String.valueOf (getAGrade ()));
                System.out.println ();
        }
}

class Student
{
        private static int NO = 2020000;

        private String name;
        private final int id;
        private Subject subject1;
        private Subject subject2;

        public Student ()
        {
                ++NO;
                id = NO;
        }

        public Student (String name, Subject subject1, Subject subject2)
        {
                this ();
                this.name = name;
                this.subject1 = subject1;
                this.subject2 = subject2;
        }

        // accessor methods
        public String getName ()
        {
                return name;
        }

        public int getID ()
        {
                return id;
        }

        public Subject getSubject1 ()
        {
                return subject1;
        }

        public Subject getSubject2 ()
```

```
	{
		return subject2;
	}

	// mutator methods
	public void setName (String name)
	{
		this.name = name;
	}

	public void setsubjects (Subject s1, Subject s2)
	{
		this.subject1 = s1;
		this.subject2 = s2;
	}

	// Display method

	public void displayInfo ()
	{
		System.out.printf ("Name: %s%n", name);
		System.out.printf ("Student id: %d%n", id);
		subject1.displaySubject ();
		subject2.displaySubject ();

		System.out.println ("-------------------------------------------------------");
	}
}

class CaseStudy_5
{
	public static void main (String [] args)
	{
			Subject subject1 = new Subject (SubjectCode.CSIT111);
			Subject subject2 = new Subject (SubjectCode.CSIT121);

			Student s1 = new Student ("Heng A K", subject1, subject2);

			s1.displayInfo ();


			subject1 = new Subject (SubjectCode.CSIT121);
			subject2 = new Subject (SubjectCode.CSIT114);

			Student s2 = new Student ("Tan K K", subject1, subject2);
			s2.displayInfo ();
	}
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_5.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_5
Name: Heng A K
Student id: 2020001
Subject code: CSIT111
A1 = 19.5  A2 = 86.6  A3 = 31.0  A4 = 45.7  A5 = 7.9
Exam: 96.2
Final mark: 67, Grade: C

Subject code: CSIT121
A1 = 62.9  A2 = 5.5  A3 = 32.6  A4 = 88.1  A5 = 55.8
Exam: 26.1
Final mark: 38, Grade: F

------------------------------------------------------------
Name: Tan K K
Student id: 2020002
Subject code: CSIT121
A1 = 69.3  A2 = 10.3  A3 = 72.2  A4 = 83.1  A5 = 8.6
Exam: 14.8
Final mark: 32, Grade: F

Subject code: CSIT114
A1 = 46.3  A2 = 75.3  A3 = 64.7  A4 = 47.3  A5 = 73.3
Exam: 9.8
Final mark: 36, Grade: F

------------------------------------------------------------
```

```
// Case study - what is an UOW student?
// - A complete study, use os Arrays, ArrayList etc

import java.util.Arrays;
import java.util.ArrayList;

enum SubjectCode {CSIT111, CSIT121, CSIT113, CSIT114}

enum UOWGrade {HD, D, C, P, F}

// Add in an array of assignments

class Subject
{
	private final int NO = 5;
	private final SubjectCode code;
	private double [ ] assignment ;
	private double exam;
	private int finalMark;

	public Subject (SubjectCode code)
	{
		this.code = code;

		//  all processing are done inside the class
		assignment = new double [NO];
		processAssignment ();
		processExam ();
		processFinalMark ();
	}

	// copy constructor
	public Subject (Subject s)
	{
		this (s.code);
	}

	// return an array
	public double [] getAssignmentArray ()
	{
		return assignment;
	}


	private double getMark ()
	{
		return Math.random () * 100.0;
	}

	private void processAssignment ()
```

```
{
        for(int i = 0; i < assignment.length; i++)
                assignment [i] = getMark ();

        Arrays.sort (assignment);
}

private void processExam ()
{
        exam = getMark ();
}

// Assume weight for assignments is 50% and weight for exam is also 50%
private void processFinalMark ()
{
        double sum = 0.0;
        for (double d : assignment)
                sum += d;

        double average = sum / assignment.length;
        finalMark = (int)  ((average + exam) / 2.0 + 0.5);
}

// accessor methods
public SubjectCode getCode ()
{
        return code;
}

public int getFinalMark ()
{
        return finalMark;
}

// To compute and return a grade
private UOWGrade getAGrade ()
{
        if (finalMark >= 85)
                return UOWGrade.HD;
        else if (finalMark >= 75)
                return UOWGrade.D;
        else if (finalMark >= 65)
                return UOWGrade.C;
        else if (finalMark >= 50)
                return UOWGrade.P;
        else
                return UOWGrade.F;
}

// Mutator method
```

```
	public void setMark (int finalMark)
	{
		this.finalMark = finalMark;
	}

	// Display method
	private void displayAssignment ()
	{
		for (int i = 0; i < assignment.length; i++)
		{
			System.out.printf ("A%d = %.1f  ",  (i + 1), assignment [i]);
		}

		System.out.println ();
	}

	public void displaySubject ()
	{
		System.out.printf ("Subject code: %s%n",  String.valueOf (code));
		displayAssignment ();
		System.out.printf ("Exam: %.1f%n", exam);
		System.out.printf ("Final mark: %d, Grade: %s%n",
					finalMark, String.valueOf (getAGrade ()));
		System.out.println ();
	}
}

class Student
{
	private static int NO = 2020000;

	private String name;
	private final int id;
	private Subject subject1;
	private Subject subject2;

	public Student ()
	{
		++NO;
		id = NO;
	}

	public Student (String name, Subject subject1, Subject subject2)
	{
		this ();
		this.name = name;
		this.subject1 = subject1;
		this.subject2 = subject2;
	}
```

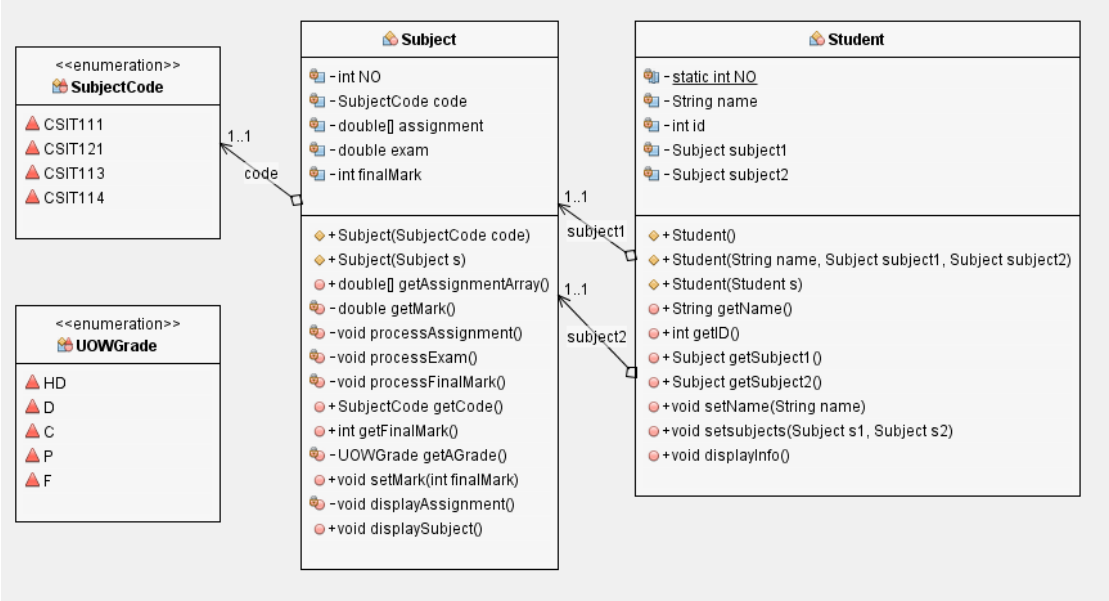
```
// copy constructor
public Student (Student s)
{
	this (s.name, s.subject1, s.subject2);
}

// accessor methods
public String getName ()
{
	return name;
}

public int getID ()
{
	return id;
}

public Subject getSubject1 ()
{
	return subject1;
}

public Subject getSubject2 ()
{
	return subject2;
}

// mutator methods
public void setName (String name)
{
	this.name = name;
}

public void setsubjects (Subject s1, Subject s2)
{
	this.subject1 = s1;
	this.subject2 = s2;
}

// Display method

public void displayInfo ()
{
	System.out.printf ("Name: %s%n", name);
	System.out.printf ("Student id: %d%n", id);

	subject1.displaySubject ();
	subject2.displaySubject ();

	System.out.println ("-----------------------------------------------------");
```

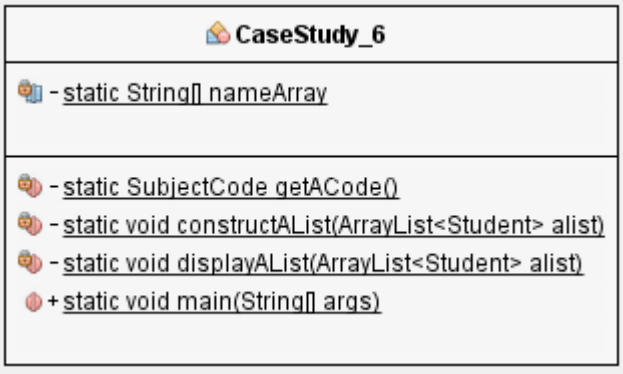
```
	}
}

class CaseStudy_6
{
	private static String [] nameArray = {"Heng 1", "Heng 2", "Heng 3"};

	private static SubjectCode getACode ()
	{
		int k = (int) (Math.random () * 4);

		switch (k)
		{
			case 0: return SubjectCode.CSIT111;
			case 1: return SubjectCode.CSIT113;
			case 2: return SubjectCode.CSIT114;
			default: return SubjectCode.CSIT121;
		}
	}

	private static void constructAList (ArrayList <Student> alist)
	{
		SubjectCode sc1, sc2;

		for (String name : nameArray)
		{
			// construct a Student object

			sc1 = getACode ();

			do
			{
				sc2 = getACode ();
			} while (sc1 == sc2);

			Subject subject1 = new Subject (sc1);
			Subject subject2 = new Subject (sc2);

			Student st = new Student (name, subject1, subject2);
			alist.add (st);
		}
	}

	private static void displayAList (ArrayList <Student> alist)
	{
		for (Student s : alist)
			s.displayInfo ();
	}

	public static void main (String [] args)
```

```
        {
                ArrayList <Student> alist = new ArrayList <Student> ();

                constructAList (alist);
                displayAList (alist);
        }
}
```

```
C:\Users\hengak\Desktop\Workshop_2020>javac CaseStudy_6.java

C:\Users\hengak\Desktop\Workshop_2020>java CaseStudy_6
Name: Heng 1
Student id: 2020001
Subject code: CSIT111
A1 = 5.5  A2 = 23.2  A3 = 63.6  A4 = 83.5  A5 = 99.8
Exam: 80.9
Final mark: 68, Grade: C

Subject code: CSIT121
A1 = 27.2  A2 = 55.0  A3 = 58.8  A4 = 64.2  A5 = 82.4
Exam: 33.6
Final mark: 46, Grade: F

------------------------------------------------------------
Name: Heng 2
Student id: 2020002
Subject code: CSIT121
A1 = 7.3  A2 = 10.0  A3 = 19.7  A4 = 28.7  A5 = 98.7
Exam: 14.7
Final mark: 24, Grade: F

Subject code: CSIT111
A1 = 24.8  A2 = 27.8  A3 = 47.0  A4 = 73.3  A5 = 97.6
Exam: 90.6
Final mark: 72, Grade: C

------------------------------------------------------------
```

```
Name: Heng 3
Student id: 2020003
Subject code: CSIT113
A1 = 1.1  A2 = 17.2  A3 = 17.4  A4 = 68.3  A5 = 78.0
Exam: 86.8
Final mark: 62, Grade: P

Subject code: CSIT114
A1 = 34.8  A2 = 56.9  A3 = 67.2  A4 = 71.9  A5 = 80.9
Exam: 34.0
Final mark: 48, Grade: F
```





```
// Case study: What is an UOW Student?
//  - A complete case study: Arrays, ArrayList;
//
// - Multiple constructors
//
// File name: CaseStudy_7.java

import java.util.Arrays;
import java.util.ArrayList;

enum SubjectCode {CSIT111, CSIT121, CSIT114, CSIT103}

enum UOWGrade {HD, D, C, P, F}

class Subject
{
	private final int NO = 5;

	private final SubjectCode code;
	private double [] assignment;
	private double exam;
	private int finalMark;

	public Subject (SubjectCode code)
	{
		this.code = code;

		// Construct the array assignment
		assignment = new double [NO];
		processAssignment ();

		processExam ();
		processFinalMark ();
	}

	public Subject (Subject s)
	{
		this (s.code);
	}

	// accessor methods
	public SubjectCode getCode ()
	{
		return code;
	}

	public int getFinalMark ()
	{
		return finalMark;
	}
```

```
// mutator method
public void setFinalMark (int finalMark)
{
	this.finalMark = finalMark;
}

// Other method
private UOWGrade getAGrade ()
{
	if (finalMark >= 85)
		return UOWGrade.HD;
	else if (finalMark >= 75)
		return UOWGrade.D;
	else if (finalMark >= 65)
		return UOWGrade.C;
	else if (finalMark >= 50)
		return UOWGrade.P;
	else
		return UOWGrade.F;
}

private double getMark ()
{
	return Math.random () * 100.0;
}

private void processAssignment ()
{
	for (int i = 0; i < assignment.length; i++)
		assignment [i] = getMark ();

	Arrays.sort (assignment);
}

private void processExam ()
{
	exam = getMark ();
}

// Weight for assignments is 50%
// Exam is also 50%
private void processFinalMark ()
{
	// compute for the assignments
	double sum = 0.0;

	for (double d : assignment)
		sum += d;
```

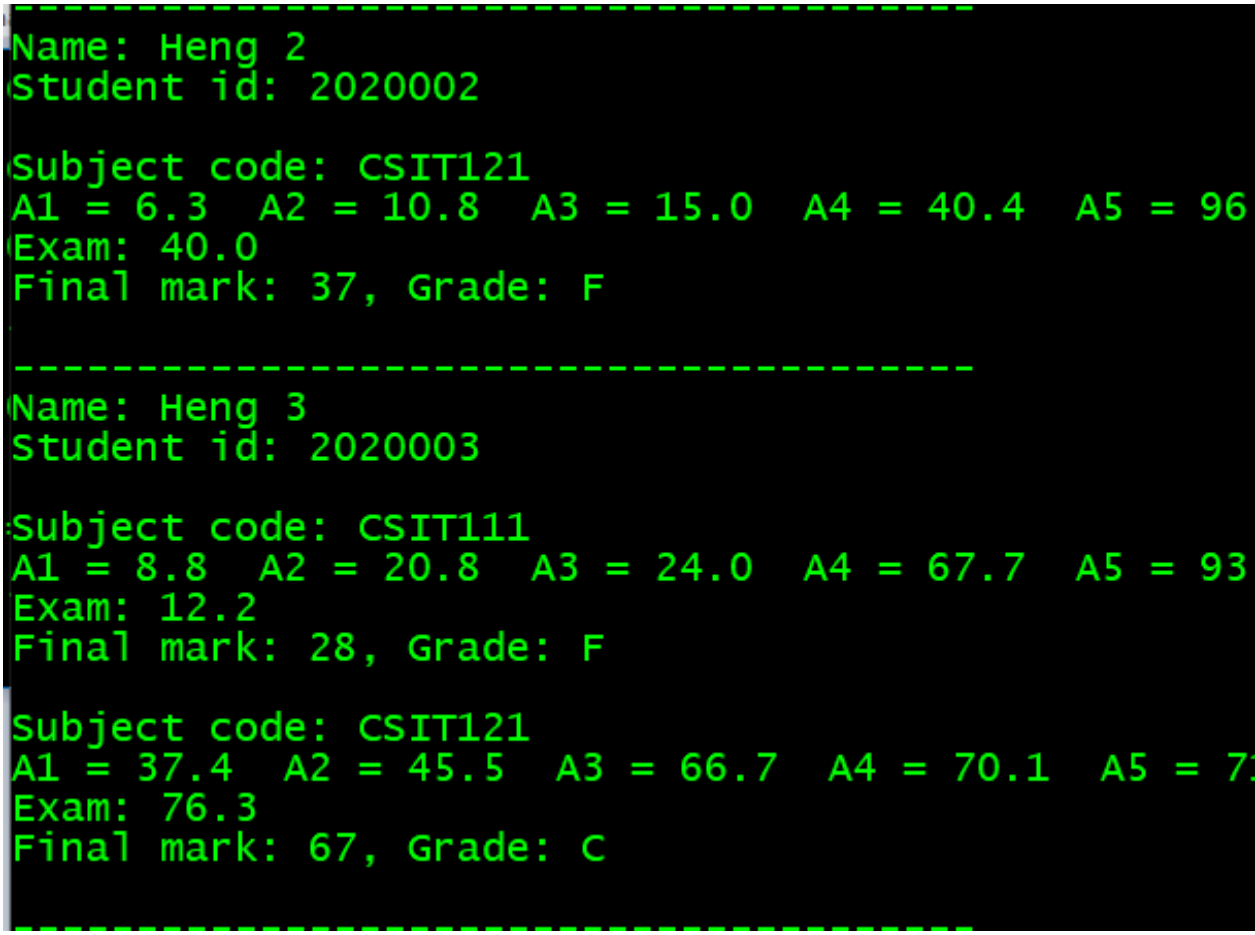
```
            double average = sum / assignment.length;

            finalMark =  (int)((average + exam) / 2.0 + 0.5);
        }

        // Display method

        private void displayAssignment ()
        {
            for (int i = 0; i < assignment.length; i++)
            {
                System.out.printf ("A%d = %.1f  ", (i + 1), assignment [i]);
            }

            System.out.println ();
        }

        public void displaySubject ()
        {
            System.out.printf ("Subject code: %s%n", String.valueOf (code));
            displayAssignment ();

            System.out.printf ("Exam: %.1f%n", exam);
            System.out.printf ("Final mark: %d, Grade: %s%n",
                                                    finalMark, String.valueOf
(getAGrade ()));

            System.out.println ();
        }
} // end of subject class

class Student
{
   private static int NO = 2020000;

        // instance variables
        private String name;
        private final int id;
        private Subject subject1;
        private Subject subject2;

        // default constructors
        public Student ()
        {
            NO++;
            id = NO;
        }

        // other constructors
```

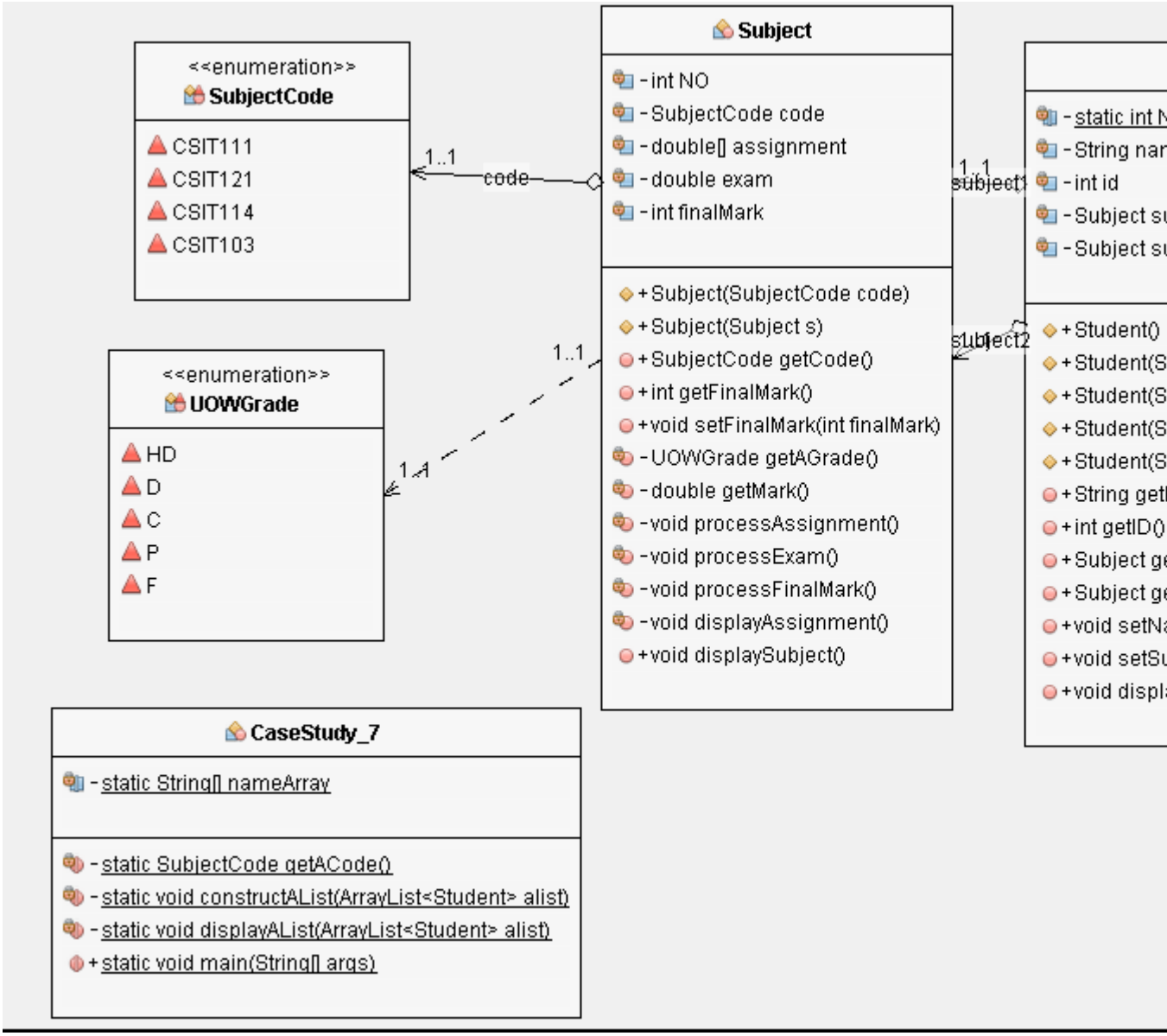
```
public Student (String name)
{
	this ();
	this.name = name;
}

public Student (String name, Subject subject1)
{
	this (name);
	this.subject1 = subject1;
	// subject2 is null be default
}

public Student (String name, Subject subject1, Subject subject2)
{
	this (name, subject1);

	this.name = name;
	this.subject1 = subject1;
	this.subject2 = subject2;
}

// copy constructor
public Student (Student s)
{
	this (s.name, s.subject1, s.subject2);
}

// accessor methods
public String getName ()
{
	return name;
}

public int getID ()
{
	return id;
}

public Subject getSubject1 ()
{
	return subject1;
}

public Subject getSubject2 ()
{
	return subject2;
}

// mutator methods
```

```
	public void setName (String name)
	{
		this.name = name;
	}

	public void setSubjects (Subject subject1, Subject subject2)
	{
		this.subject1 = subject1;
		this.subject2 = subject2;
	}

	// Display method
	public void displayInfo ()
	{
		System.out.printf ("Name: %s%n", name);
		System.out.printf ("Student id: %d%n", id);
		System.out.println ();

		if (subject1 == null && subject2 == null)
		{

		}
		else if (subject2 == null)
			subject1.displaySubject ();
		else
		{
			subject1.displaySubject ();
			subject2.displaySubject ();
		}

		System.out.println ("---------------------------------------");
	}
} // end of Student class

class CaseStudy_7
{
	private static String [] nameArray = {"Heng 1", "Heng 2", "Heng 3"};

	private static SubjectCode getACode ()
	{
		int k = (int) (Math.random () * 4);

		switch (k)
		{
			case 0: return SubjectCode.CSIT111;
			case 1: return SubjectCode.CSIT121;
			case 2: return SubjectCode.CSIT114;
			default: return SubjectCode.CSIT103;
		}
	}
```

```
        private static void constructAList (ArrayList <Student> alist)
        {
                alist.add (new Student (nameArray [0]));

                alist.add (new Student (nameArray [1],  new Subject
(SubjectCode.CSIT121)));
                alist.add (new Student (nameArray [2],  new Subject
(SubjectCode.CSIT111),
                                                        new Subject
(SubjectCode.CSIT121)));


        }

        private static void displayAList (ArrayList <Student> alist)
        {
                for (Student s : alist)
                        s.displayInfo ();
        }

        public static void main (String [] args)
        {
                ArrayList <Student> alist = new ArrayList <Student> ();

                constructAList (alist);
                displayAList (alist);
        }
}
```

```
C:\Users\aikko\Desktop\Day_2_WS>javac CaseStudy_7.java

C:\Users\aikko\Desktop\Day_2_WS>java CaseStudy_7
Name: Heng 1
Student id: 2020001

---------------------------------------
Name: Heng 2
Student id: 2020002

Subject code: CSIT121
A1 = 6.3  A2 = 10.8  A3 = 15.0  A4 = 40.4  A5 = 96.1
Exam: 40.0
Final mark: 37, Grade: F
```


Name: Heng 2
Student id: 2020002
Subject code: CSIT121
A1 = 6.3 A2 = 10.8 A3 = 15.0 A4 = 40.4 A5 = 96
Exam: 40.0
Final mark: 37, Grade: F
Name: Heng 3
Student id: 2020003
Subject code: CSIT111
A1 = 8.8 A2 = 20.8 A3 = 24.0 A4 = 67.7 A5 = 93
Exam: 12.2
Final mark: 28, Grade: F
Subject code: CSIT121
A1 = 37.4 A2 = 45.5 A3 = 66.7 A4 = 70.1 A5 = 7
Exam: 76.3
Final mark: 67, Grade: C


<<enumeration>>
SubjectCode
CSIT111
CSIT121
CSIT114
CSIT103
1..1
code
Subject
- int NO
- SubjectCode code
- double[] assignment
- double exam
- int finalMark
+ Subject(SubjectCode code)
+ Subject(Subject s)
+ SubjectCode getCode()
+ int getFinalMark()
+ void setFinalMark(int finalMark)
- UOWGrade getAGrade()
- double getMark()
- void processAssignment()
- void processExam()
- void processFinalMark()
- void displayAssignment()
+ void displaySubject()
1..1
subject1
subject2
<<enumeration>>
UOWGrade
HD
D
C
P
F
1..1
1..1
CaseStudy_7
- static String[] nameArray
- static SubjectCode getACode()
- static void constructAList(ArrayList<Student> alist)
- static void displayAList(ArrayList<Student> alist)
+ static void main(String[] args)


Thank