Lab1

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1 Lab 1

Deadline: **Week 2** in your respective lab session

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1.1 Question 1 [1 mark]

Write a full Java program (meaning a class that contains a main method) that asks the user for their average percentage across all modules and then prints out their classification: `1st`, `2:1`, `2:2`, `3rd`, `Pass` or `Fail`.

Click here to see the degree class boundaries.

Example runs:

```
What is your average percentage? 67
Congratulations! You are on a track to graduate with a 2:1!
```

```
What is your average percentage? 38
Unfortunately, your current classification is a Fail.
```

Write your answer below:

[1]:
```java
class Modules
{
    public static void main ()
    {
        Grades ();
        return;
    }

    public static void Grades ()
    {
        Scanner scanner = new Scanner(System.in);
        System.out.println("What is your average percentage?");
        String input = scanner.nextLine();
        int grade = Integer.parseInt(input);
```

```
        if (grade >= 70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 1st!");
        }
        else if (grade >= 60 && grade <70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 2:1!");
        }
        else if (grade >= 50 && grade <60)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 2:2!");
        }
        else if (grade >= 45 && grade <50)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 3rd!");
        }
        else if (grade >= 40 && grade <45)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a Pass!");
        }
        else
        {
            System.out.println("Unfortunately, your current classification is a␣
 ↪Fail.");
        }

    }
}
```

Run your program:

[2]:
```
Modules.main();
```

```
What is your average percentage?
 38
Unfortunately, your current classification is a Fail.
```

1.2 Question 2 [1 mark]

Write a new version of the program from Questions 2 with added input validation. Now the program should ask the user **repeatedly** for their average percentage until a user inputs a number between 0 and 100.

You may assume that the input is always an integer.

Example run:

```
What is your average percentage? -20
Invalid input. The number you provided is too low. Please give a number between 0
and 100.

What is your average percentage? 150
Invalid input. The number you provided is too high. Please give a number between
0 and 100.

What is your average percentage? 78
Congratulations! You are on a track to graduate with a 1st!
```

Write your answer below:

[1]:
```
class Modules
{
    public static void main ()
    {
        Grades ();
        return;
    }

    public static void Grades ()
    {
        Scanner scanner = new Scanner(System.in);
        boolean validInput = false;
        int grade = -1;
        while (!validInput)
        {
            System.out.println("What is your average percentage?");
            String input = scanner.nextLine();
            grade = Integer.parseInt(input);
            if (grade >=0 && grade <=100)
            {
                validInput = true;
            }
            else if (grade < 0)
            {
                System.out.println("Invalid input. The number you provided is␣
 ↪too low. Please give a number between 0 and 100.");
            }
            else if (grade > 100)
```

```
            {
                System.out.println("Invalid input. The number you provided is␣
↪too high. Please give a number between 0 and 100.");
            }
        }


        if (grade >= 70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
↪with a 1st!");
        }
        else if (grade >= 60 && grade <70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
↪with a 2:1!");
        }
        else if (grade >= 50 && grade <60)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
↪with a 2:2!");
        }
        else if (grade >= 45 && grade <50)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
↪with a 3rd!");
        }
        else if (grade >= 40 && grade <45)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
↪with a Pass!");
        }
        else
        {
            System.out.println("Unfortunately, your current classification is a␣
↪Fail.");
        }

    }
}
```

Run your program:

[2]:
```
Modules.main();
```

```
What is your average percentage?
 -20
```

```
Invalid input. The number you provided is too low. Please give a number between
0 and 100.
What is your average percentage?

 140

Invalid input. The number you provided is too high. Please give a number between
0 and 100.
What is your average percentage?

 67

Congratulations! You are on a track to graduate with a 2:1!
```

1.3 Question 3 [1 mark]

Define a class `Student` with two instance variables, `name` and `average`. Add two methods to this class: `printWelcomeMessage` and `determineDegreeClassification`.

`printWelcomeMessage` should print a welcome message that will include the student's name. `determineDegreeClassification` should print the degree classifications based on the student's average.

Then define another class called `Main3` that contains the `main` method. The program should ask the user for their name and average. It should then use the inputted information to create an instance of a `Student` and call `printWelcomeMessage` followed by `determineDegreeClassification`.

Example run:

```
What is your name? Bob
What is your average percentage? 67

Welcome Bob to OOP!
Congratulations! You are on a track to graduate with a 2:1!
```

Write your answer below:

[3]:
```java
class Student
{
    String name;
    int average;

    public void printWelcomeMessage()
    {
        System.out.println("Welcome " + name + " to OOP!");
    }
    public void determineDegreeClassification ()
    {
        if (average >= 70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 1st!");
```

```
        }
        else if (average >= 60 && average <70)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 2:1!");
        }
        else if (average >= 50 && average <60)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 2:2!");
        }
        else if (average >= 45 && average <50)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a 3rd!");
        }
        else if (average >= 40 && average <45)
        {
           System.out.println("Congratulations! You are on a track to graduate␣
 ↪with a Pass!");
        }
        else
        {
            System.out.println("Unfortunately, your current classification is a␣
 ↪Fail.");
        }

    }
}

class Main3
{
    public static void main ()
    {
        Scanner scanner = new Scanner(System.in);
        Student student = new Student();
        System.out.println("What is your name?");
        String name = scanner.nextLine();
        student.name = name;
        int average = validInput();
        student.average = average;
        student.printWelcomeMessage();
        student.determineDegreeClassification();
    }

    public static int validInput ()
    {
```

```
        Scanner scanner = new Scanner(System.in);
        boolean validInput = false;
        int grade = -1;
        while (!validInput)
        {
            System.out.println("What is your average percentage?");
            String input = scanner.nextLine();
            grade = Integer.parseInt(input);
            if (grade >=0 && grade <=100)
            {
                validInput = true;
            }
            else if (grade < 0)
            {
                System.out.println("Invalid input. The number you provided is␣
↪too low. Please give a number between 0 and 100.");
            }
            else if (grade > 100)
            {
                System.out.println("Invalid input. The number you provided is␣
↪too high. Please give a number between 0 and 100.");
            }
        }
        return grade;
    }



}
```

[22]:
```
Main3.main();
```

```
What is your name?
 Bob
What is your average percentage?
 67
Welcome Bob to OOP!
Congratulations! You are on a track to graduate with a 2:1!
```

Run your program:

[ ]:
```

```

1.4 Question 4 [1 mark]

Write a method

`int countDuplicates(int[] xs)`

which should return the number of duplicate entries in `xs`. For example if `xs = {1,1,1}`, the method should return 3 because `xs[0], xs[1]` constitutes one duplicate pair, `xs[0], xs[2]` the second, and `xs[1],xs[2]` the third. In the example `xs = {0,2,1,0,2,3,0}` the method should return 4 because the duplicate pairs are: 1. `xs[0], xs[3]`, 2. `xs[0], xs[6]`, 3. `xs[3], xs[6]`, and 4. `xs[1], xs[4]`.

Write your answer below:

[29]:
```
class countDuplicates
{
    public static void main ()
    {
        int[] xs = {0,2,1,0,2,3,0};
        System.out.println(countDuplicates(xs));
    }

    public static int countDuplicates (int[] xs)
    {
        int count = 0;
        for (int i = 0; i < xs.length-1; i++)
        {
            for (int j = i+1; j < xs.length; j++)
            {
                if (xs[i] == xs[j])
                {
                    count = count+1;
                }
            }
        }
        return count;

    }
}
```

Run your program:

[30]:
```
countDuplicates.main();
```

```
4
```

1.5 Question 5 [1 mark]

Write a method

`int[] filterAndReverse(int[] xs, int k)`

which does the following. If `k` is `0` it prints `wrong argument` and immediately returns. Otherwise, it takes only those entries in `xs` that are divisble by the number `k`, reverses them and puts them on a new array which is then returned.

For example when called on the array `{1,2,3,4}` with `k=2`, it should return the array `{4,2}`. This is because we take only the numbers that are divisible by `2`, which in this case is `{2,4}`, and we reverse this array to get `{4,2}`. If we call this method on the array `{1,2,3}` with `k=1`, it should return the array `{3,2,1}`, this is because every number is divisible by `1`.

Hint: First go through the array `xs` to see how many entries are divisble by `k`, this number will be the length of the array which you should return.

Write your answer below:

[56]:
```
class q5
{
    public static void main ()
    {
        int[] xs = {1,2,3,4,5};
        int k1 = 2;
        int[] result1 = filterAndReverse(xs, k1);
        printArray(result1);
        int k2 = 1;
        int[] result2 = filterAndReverse(xs, k2);
         printArray(result2);
        int k3 = 0;
        int[] result3 = filterAndReverse(xs, k3);

    }

    public static int[] filterAndReverse(int[] xs, int k)
    {
        if (k==0)
        {
            System.out.println("Wrong argument");
            return new int[0];
        }
        int count = 0;
        for (int x : xs)
        {
            if (x%k == 0)
            {
                count = count + 1;
            }
        }
        int[] result = new int[count];
        int index = 0;
```

```
        for (int i = xs.length - 1; i >= 0; i--)
        {
            if (xs[i] % k == 0)
            {

                result[index] = xs[i];
                index++;

            }
        }
        return result;
    }
    public static void printArray(int[] arr)
    {
        System.out.print("[");
        for (int i = 0; i < arr.length; i++) {
            System.out.print(arr[i]);
            if (i < arr.length - 1) {
                System.out.print(", ");
            }
        }
        System.out.println("]");
    }


}
```

Run your program:

[57]:
```
q5.main();
```

```
[4, 2]
[5, 4, 3, 2, 1]
Wrong argument
```

[ ]:
```

```