Basis of Computer Programming (java A)
Lab Exercise 4

[Experimental Objective]

1. Learn how to use the *if* and *if…else* selection statements to choose among alternative actions.
2. Learn how to use the *while* repetition statement to execute statements in a program repeatedly.
3. Learn how to use the *for* repetition statements to execute statements in a program repeatedly.

[Exercises]

1. Write an application which can convert the grades on 100 point scale into GPA according to the following table.

Grade	GPA
100~90	4.0
89~80	3.0
79~70	2.0
69~60	1.0
59~0	0

Here is a sample run:

```
Please input a grade:
90.0
Your grade is 90.0, the cooresponding GPA is 4.0
```

2. Create a class called GuessingNumber. In the main method, you should generate a random integer magicNum between 0 and 9, then keep asking the user to input an integer between 0 and 9 until the input number is equal to the attribute magicNum. When the input number is greater than the attribute magicNum, the method should output “Too high!Please try again:”.When the input number is less than the attribute magicNum, the method should output “Too low!Please try again:”. Then the method wait for the user to input a new integer. When the input number is equal to the attribute magicNum, the method should output “Congratulations!” and terminate.

Here is a sample run:

```
Please input an integer between 0 and 9:
1
Too low!Please try again:
3
Too high!Please try again:
2
Congratulations!
```

3. Calculate the value of π from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \cdots$$

Input a double which present a precision threshold from the console. Then use the *do…while* or *while* repetition statements to show the value of π when the difference between two successive values being smaller than the precision threshold and the iterations.

Here is a sample run:

```
Please input a precision:
0.0000000001
3.141592653638396
20000042754 iterations
```

4. Write an application to calculate and display the following multiplication table by using the *for* repetition statement.

Here is a sample run:

```
1 * 1 = 1
1 * 2 = 2  2 * 2 = 4
1 * 3 = 3  2 * 3 = 6  3 * 3 = 9
1 * 4 = 4  2 * 4 = 8  3 * 4 = 12 4 * 4 = 16
1 * 5 = 5  2 * 5 = 10 3 * 5 = 15 4 * 5 = 20 5 * 5 = 25
1 * 6 = 6  2 * 6 = 12 3 * 6 = 18 4 * 6 = 24 5 * 6 = 30 6 * 6 = 36
1 * 7 = 7  2 * 7 = 14 3 * 7 = 21 4 * 7 = 28 5 * 7 = 35 6 * 7 = 42 7 * 7 = 49
1 * 8 = 8  2 * 8 = 16 3 * 8 = 24 4 * 8 = 32 5 * 8 = 40 6 * 8 = 48 7 * 8 = 56 8 * 8 = 64
1 * 9 = 9  2 * 9 = 18 3 * 9 = 27 4 * 9 = 36 5 * 9 = 45 6 * 9 = 54 7 * 9 = 63 8 * 9 = 72 9 * 9 = 81
```

5. In Lab Exercise 2, you wrote a program to help a primary school mathematics teacher to automate generate mental arithmetic questions. Now the teacher asks you to challenge another task that your program can generate a math test paper and its corresponding answer. The program reads two command-line arguments: N and V. N means you should generate random integers between 0 and N-1. V means you should generate V questions. For every two random integers, you should random select an operation from sum, product, difference, quotient(division) and mod. If the operation is quotient(division) or mod and the second integer is 0, just skip the two integers and go on.
You can print the questions and answers according the following rules:

1) Four questions in a row
2) First print out all questions then answers

Here is a sample run when command-line arguments are 10 and 60:

Questions:

5 - 0 =	7 + 4 =	9 + 5 =	9 / 1 =
8 * 4 =	9 / 3 =	3 / 3 =	8 % 9 =
7 - 5 =	5 / 3 =	0 - 9 =	4 - 9 =
2 * 3 =	2 / 3 =	2 / 1 =	6 + 5 =
6 / 3 =	9 % 5 =	5 - 0 =	7 + 9 =
1 - 6 =	2 % 1 =	8 / 2 =	3 % 9 =
6 - 0 =	7 + 7 =	7 / 7 =	4 * 3 =
1 - 3 =	1 * 2 =	8 * 2 =	1 / 5 =
4 % 4 =	3 - 4 =	4 * 8 =	6 % 4 =
6 * 1 =	4 * 2 =	7 * 1 =	1 / 3 =
0 / 2 =	2 - 6 =	7 - 7 =	5 + 8 =
2 + 1 =	8 * 8 =	1 * 0 =	5 / 4 =
7 + 5 =	4 * 9 =	6 / 2 =	6 % 3 =
0 + 0 =	6 + 6 =	0 % 4 =	8 + 8 =
0 + 1 =	4 - 8 =	2 * 2 =	0 % 5 =

Answer:

5 - 0 = 5	7 + 4 = 11	9 + 5 = 14	9 / 1 = 9
8 * 4 = 32	9 / 3 = 3	3 / 3 = 1	8 % 9 = 8
7 - 5 = 2	5 / 3 = 1	0 - 9 = -9	4 - 9 = -5
2 * 3 = 6	2 / 3 = 0	2 / 1 = 2	6 + 5 = 11
6 / 3 = 2	9 % 5 = 4	5 - 0 = 5	7 + 9 = 16
1 - 6 = -5	2 % 1 = 0	8 / 2 = 4	3 % 9 = 3
6 - 0 = 6	7 + 7 = 14	7 / 7 = 1	4 * 3 = 12
1 - 3 = -2	1 * 2 = 2	8 * 2 = 16	1 / 5 = 0
4 % 4 = 0	3 - 4 = -1	4 * 8 = 32	6 % 4 = 2
6 * 1 = 6	4 * 2 = 8	7 * 1 = 7	1 / 3 = 0
0 / 2 = 0	2 - 6 = -4	7 - 7 = 0	5 + 8 = 13
2 + 1 = 3	8 * 8 = 64	1 * 0 = 0	5 / 4 = 1
7 + 5 = 12	4 * 9 = 36	6 / 2 = 3	6 % 3 = 0
0 + 0 = 0	6 + 6 = 12	0 % 4 = 0	8 + 8 = 16
0 + 1 = 1	4 - 8 = -4	2 * 2 = 4	0 % 5 = 0