

CS102A Introduction to Computer Programming

Fall 2020

Lab 4

Objectives

1. Learn how to use the `do...while` loop to repeatedly execute code blocks in a program.
2. Learn how to use the `switch` selection statement to choose one of multiple code blocks to be executed.
3. Learn how to use the `break` and `continue` statements in a program.

1 Exercises

1.1 Exercise 1

Just like Exercise 5 in Lab 3, you are asked to write a program that approximates the value of π using the infinite series $\pi = 4 - 4/3 + 4/5 - 4/7 + 4/9 - 4/11 + \dots$. This time, use `for` loops to estimate the value of π according to the specified number of iterations and precision threshold.



Think

When is it more suitable to use `for` rather than `while` loops? Similarly, when would the latter be better?

The user will input:

- An integer `n` representing the number of terms in the above formula. The estimated value of π is more precise when `n` is bigger.

- A double value representing a precision threshold. Your program should terminate when the difference between two successive iterations is smaller than the precision threshold. Print the value of π and the number of iterations.

1.2 Exercise 2

Recall Exercise 2 in Lab 3. You are asked to write a program that calculates a student's GPA according to the method used by SUSTech:

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

Concretely, the user will input the number of credits and score for each course. The data entry process should continue until the user inputs **-1**. Based on the input data, the program will output the student's final GPA; use **switch** to compute the GPA.

Sample output:

```
3 95
2 89
3 77
3 67
1 95
-1
The final GPA is 2.6
```



Think

When could **if...else** be replaced by **switch**?

1.3 Exercise 3

There are 30 or 31 days in a month, except February. There are 28 days in February in a common year, and 29 days in a leap year. Write a program where the user will input the year and month via the command line, and the program will print how many days this month has using `switch`.

Recall that a year is a leap year if it is:

1. Divisible by 4, but not divisible by 100; or
2. Divisible by 400.

You are asked to use `DaysOfYearMonth` as the class name and `DaysOfYearMonth.java` as the file name. The following code template is provided to you:

```
1 public class DaysOfYearMonth {
2     public static void main(String[] args) {
3         int year = Integer.parseInt(args[0]);
4         int month = Integer.parseInt(args[1]);
5         String monthName = "";
6         int days = 0;
7         boolean isLeapYear = false;
8         if ( /*fill in the control statement here */ ) {
9             isLeapYear = true;
10        } else {
11            isLeapYear = false;
12        }
13        switch (month) {
14            /* fill in the cases below */
15            case 1:
16                days = 31;
17                monthName = "January";
18                break;
19            case 2:
20            case 3:
21            case 4:
```

```

22         case 5:
23         case 6:
24         case 7:
25         case 8:
26         case 9:
27         case 10:
28         case 11:
29         case 12:
30         default:
31             System.out.println("Error!");
32             break;
33     }
34     System.out.printf("%s of %d has %d days.\n", monthName,
35                       year, days);
36 }

```

Sample inputs and outputs:

```

> java DaysOfYearMonth 2019 3
March of 2019 has 31 days.

> java DaysOfYearMonth 2019 2
February of 2019 has 28 days.

> java DaysOfYearMonth 1900 2
February of 2019 has 28 days.

> java DaysOfYearMonth 2000 2
February of 2019 has 28 days.

```

1.4 Exercise 4

Recall the 9×9 multiplication table in Exercise 3 from Lab 3. Modify the program so that it:

1. Can display a multiplication table of any given size in $\{1, \dots, 9\}$;
2. Keeps running until the user inputs 0; and
3. Warns the user in case of invalid input.

You are asked to use `break` and `continue` statements to complete this exercise.

Sample output:

```
Please input a number to print the Multiplication Table [0 to
terminate]:
-4
Please input a number between [1,9]
Please input a number to print the Multiplication Table [0 to
terminate]:
1
1 * 1 = 1
Please input a number to print the Multiplication Table [0 to
terminate]:
3
1 * 1 = 1
1 * 2 = 2  2 * 2 = 4
1 * 3 = 3  2 * 3 = 6  3 * 3 = 9
Please input a number to print the Multiplication Table [0 to
terminate]:
9
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
```

Please input a number to print the Multiplication Table [0 to
terminate]:

0