

**Lab 6: Loops and Files**

20 pts

*Distribute on October 28, 2024**Due before November 3, 2024 (Sunday) at 11:59 pm before 12:00 midnight***Learning Outcomes** ((CLO) vs (SO) Mapping)

- Recognize the software and hardware components of a computer system (1)vs(6)
- Utilize Java syntax in fundamental programming algorithms (3)vs(1)
- Recognize and apply the various input and output devices in programming (4)vs(2)
- Recognize and apply the various control structures (5)vs(1)
- Write data to a file (5, 4, 1)vs((1, 2, 6)
- Recognize and apply the basic debugging strategies in programming (8)vs(1)

**Requirements**

This lab will help you gain experience with fundamental Java constructs, including variables, assignment statements, if-else selection structures, iteration structures, Random numbers, and writing data to a file.

**Preliminaries**

0. Create a Java project. The name of the project must be **lab06\_<your FirstNameLastName>**. For example, my project would be named lab06\_PeterNg.
1. Add a class named **LoopsFilesPennies** to the project. Declare the class as your **main class** when the project is set up with Eclipse
2. Make sure you have the usual comment block at the beginning of your class. The comments must include the following lines:

```

/*
 * <your name>
 * CS 16000-01 02/03, Fall Semester 2024
 * (Note: Write either 02 or 03, depending on which your section is.)
 * Lab 6
 *
 */

```

**Exercises**

In this exercise, you solve Problem 4 of Programming Challenges in Chapter 4, Loops and Files of your textbook, and do more.

1. Employer hires two students, a CS major and an XX major, to do handyman work under the following conditions:
  - The job duration is between 21 and 30 days; each choice is equally likely.
  - There are two options of payment offered to the workers: the employer pays
    - (i) \$1,000.00 for each day of work

- (ii) 1 penny for the first day, and for each other day, the payment is twice as many pennies as paid for the previous day. (If the students work 22 days, under this option, the pay will be the pay rate computed for this 22<sup>nd</sup> day.

The XX major took option 1, and the CS major chose the second (II) option. You have to write a program to help answer the question, who made the better deal?

2. The main method has the following responsibilities:

- Creates the Scanner object to read from the console. (Use the statement to consume the remaining newline character to avoid problems.
- Solicits to enter an integer number between 21 and 30 as the days worked.
- Validates the required bounds for the input. Use a loop for solicitation until input is admissible (without restarting the program. Recommend using while\_loop.)
- Input is saved in a variable named **days**
- Declares an integral type variable **pennies**
- Declares a double type variable **wages**
- Runs a for\_loop that iterates **days** many times
- For the first day, **pennies** are assigned 1; for each subsequent day, **pennies** are doubled; you must not use the Math.pow( ) method to compute the values for the pennies variable.;
- At each turn of the iteration, the day index and the **pennies** value are displayed on the console according to the template (notice the comma separation),

day 20: ddd,ddd d,ddd.dd

to form a table which is as follows:

Pay Rate for Option II vs Option I:			
Days Worked	Option II Cents	Option I \$	
day 1:	1	1,000.00	
day 2:	2	2,000.00	
day 3:	4	3,000.00	
day 4:	8	4,000.00	
	...		
day 29:	268,435,456	29,000.00	
day 30:	536,870,912	30,000.00	

Use the printf( ) method with the comma separator for the display. The combined use of the printf() method and formatting string or String.format() method is also recommended. Hint: see (3.10 Display Formatted Output with System.out.printf and String.format) for using the comma separator flag, formatting string, and String.format method.

- When the iteration is finished, declare a double type variable **wages** and assign it the dollar value that corresponds to **pennies**
- Display the dollar total on the console. Follow the template

For 10 days worked, the CS major earned \$5.12, and the XX major earned \$10,000.00.

Use the comma separator again.

3. Create a testing plan (it does not have to be documented): the input validation must work correctly as well as the penny iteration (during the penny iteration for option II, computes also pay for option I); run the program for various input values to see that it is free of bugs
4. Sum up your experience in a comment attached to the code. In this comment, analyze if the choice made by the CS major was justifiable, which may depend on the number of days worked.
5. Save your comments (the whole text) in a String variable named **comment**
6. Use Notepad to create a file named wages.txt and save it in your project folder. Type into the file a title line as follows: **My Comments on the Exponential Penny Pay Project**
7. Declare and instantiate a PrintWriter object (choose a name for it) such that it can write to the file wages.txt. The PrintWrite class allows using print, println, and printf methods to write data in the file. Do not forget the necessary import and the exception clause in the main header (See 4.10: Introduction to File Input and Output).
8. Use your PrintWriter to write the **comment** to the file and close the file.
9. Use Windows Explorer to open the file wages.txt and verify that the title line has disappeared. (Why has the title line disappeared?)
10. Open the file and restore the title line manually. (Or modify your program, which will allow you to write the title line only once when the file is first created and write a comment on the file.)
11. Instantiate your PrintWriter object again so that it can write to the file wages.txt in the append mode.
12. Write the comment string to the file and close the file.
13. Open the file and verify that the title line is there.
14. Re-run your program to verify whether the comment is written to the file and is also appended to the existing file.
15. Expand your program to include writing the following table and a summary string to the file according to the template:

Pay Rate for Option II vs Option I:

Days Worked	Option II Cents	Option I \$
day 21:	1,048,576	21,000.00
day 22:	2,097,152	22,000.00
day 23:	4,194,304	23,000.00
day 24:	8,388,608	24,000.00
day 25:	16,777,216	25,000.00
day 26:	33,554,432	26,000.00
day 27:	67,108,864	27,000.00
day 28:	134,217,728	28,000.00
day 29:	268,435,456	29,000.00
day 30:	536,870,912	30,000.00

In 30 days, the CS major earned \$ 5,368,709.12, while the XX major earned \$30,000.00. Then followed by writing the comment.

16. Re-run your program to verify whether the table and the comment are written and appended to the existing file.
17. Notice that Notepad ignores the `\n` characters you may have written in your text; however, after a call of the `println` method, the next printing goes in a new line. Using `doc` extension rather than `txt`, the `\n` character works as expected. Use Window Explore to open up your `wages.txt` file. It should give you a good view of the contents in your `wages.txt`.

**Ask your TA to verify you are working in the lab.**

### **What to Submit**

- Submit your zipped project folder containing the source codes to Bridgespace.