

CC 123 – Computer Programming 2

Project Number 1

Instruction:

- ✓ Write the **problem analysis** and **draw the program flowchart** for each problem by hand (handwritten) on a long bond paper.
- ✓ Write also the **Java program** for each problem, create a Google Drive folder named *CC123Project1_<YourFamilyName>* and upload your Java files there. Don't forget to include your name, section, and creation date in each program.

Submission Date: March 26, 2025

What to submit?

- ✓ Submit a LONG RED FOLDER with fastener, containing the **problem analysis** and **flowchart**, on or before **March 26, 2025**. (Physical submission)
- ✓ Submit the link of your *CC123Project1_<FamilyName>* folder. (Online submission)

Problem 1

An employee is paid at a rate of Php 68.75 per hour for regular hours worked in a week (regular hours per week is 40 hours). Any hours over that are paid at the overtime rate of one-and-one-half times that. From the worker's gross pay 7% is withheld for social security tax, 11% is withheld for federal income tax, 6% is withheld for state income tax, and Php 100 per week is withheld for union dues. If the worker has three or more dependents, then an additional Php 350 is withheld to cover the extra cost of health insurance beyond what the employer pays. Write a program that inputs the number of hours worked in a week and the number of dependents and will then output the worker's gross pay, each withholding amount, and the net take-home pay for the week.

Problem 2

Ten employees in a company are up for a special pay increase. You are given a file, say **EmployeeData.txt**, with the following input line of data: last name, first name, salary, and rank (rank value can be 'A', 'B', 'C', 'D', or 'E'). For rank 'A' the salary increase is 10%, 'B' is 8.5%, 'C' is 7.5%, 'D' is 5%, and 'E' is 4%.

For example, if the first input line the last name is Miller, the first name is Andrew, the current salary is 65789.87, and rank is 'A'. Write a program that reads data from the specified file and stores the output in the file **EmployeeOutput.dat**. For each employee, the data must be output in the following form: first name, last name, updated salary. Format the output of decimal numbers to two decimal places.

Problem 3

Write a program that calculates and prints the bill for a cellular telephone company. The company offers two types of service: regular and premium. Rates vary based on the type of service and are computed as follows:

Regular service: \$10.00 plus first 50minutes are free. Charges for over 50 minutes are \$0.20 per minute.

Premium service: \$25.00 plus:

CC 123 – Computer Programming 2

Project Number 1

- a) For calls made from 6:00 a.m. to 6:00 p.m., the first 75 minutes are free; charges for over 75 minutes are \$0.10 per minute.
- b) For calls made from 6:00 p.m. to 6:00 a.m., the first 100 minutes are free; charges for over 100 minutes are \$0.05 per minute.

Your program should prompt the user to enter an account number, a service code (type char), and the number of minutes the service was used. A service code of r or R means regular service; a service code of p or P means premium service. Treat any other character as an error.

Your program should output the account number, type of service, number of minutes the telephone service was used, and the amount due from the user. For the premium service, the customer may be using the service during the day and the night. Therefore, to calculate the bill, you must ask the user to input the number of minutes the service was used during the day and the number of minutes the service was used during the night. Prompt the user whether to repeat the execution or terminate the program.

Problem 4

Write a menu driven program that allows the user to select from the following options:

- a) Odd numbers
 - Prompt the user to input two integers (first integer must be less than second integer.) Output all the odd numbers between first and second integers inclusive.
- b) Even numbers
 - Prompt the user to input two integers (first integer must be less than second integer.) Output the sum and average of all the even integers between first and second integer inclusive.
- c) Factorial
 - Input a positive integer and output its factorial.
- d) Sum of Squares
 - Input an integer. If the input is negative, make it positive. Output the sum of the squares of the integer from 1 to itself.
- e) Uppercase and lowercase letters
 - Input first and second letter. Output all the uppercase and lowercase letters from first letter to the second letter.
- f) Exit
 - The program will terminate.

Repeat the operations until the user decided to terminate it.

Problem 5

Suppose that **m** and **n** are integers and **m** is nonzero. Recall that **m** is called a divisor of **n** if **n = mt** for some integer **t**; that is, when **m** divides **n**, the remainder is 0. The number **m** is called a proper divisor of **n** if **m < n** and **m** divides **n**. A positive integer is called perfect if it is the sum of its positive proper divisors. For example, the positive proper divisors of 28 are 1, 2, 4, 7, and 14, and $1 + 2 + 4 + 7 + 14 = 28$. Therefore, 28 is perfect. Write a program that inputs a number and outputs all perfect integers from 1 to the number entered. Repeat the operation as often as possible.

CC 123 – Computer Programming 2
Project Number 1

Problem 6

A prime number whose reversal is also a prime is called *emirp*. For example, 11, 13, and 79 are *emirps*. Write a program that input an integer and determine if it is “prime only” or “both prime and emirp”. Repeat the operation as often as possible.

Problem 7

The population of town A is less than the population of town B. However, the population of town A is growing faster than the population of town B. Write a program that prompts the user to enter the population and growth rate of each town. The program outputs after how many years the population of town A will be greater than or equal to the population of town B and the populations of both the towns at that time. (A sample input is: Population of town A=5,000, growth rate of town A=4%, population of town B=8,000; and growth rate of town =2%.) Repeat the operation as often as possible.

Problem 8

Write a program that mimics a calculator. The program should take as input three decimals and two arithmetic operators (+,-,*,or/). It should then output the numbers, the operator, and the result. (For division, if the denominator is zero, output an appropriate message.) Some sample outputs follow:

3 + 5/2.0 =5.50

2.5 - 2.2 * 3.1= -4.32

Format the output to two decimal places.

Problem 9

A bank in your town updates its customers’ accounts at the end of each month. The bank offers two types of accounts: savings and checking. Every customer must maintain a minimum balance. If a customer’s balance falls below the minimum balance, there is a service charge of \$10.00 for savings accounts and \$25.00 for checking accounts. If the balance at the end of the month is at least the minimum balance, the account receives interest as follows:

- a. Savings accounts receive 4% interest.
- b. Checking accounts with balances of up to \$5000 more than the minimum balance receive 3% interest; otherwise, the interest is 5%.

Write a program that reads a customer’s account number (int type), account type (char type; 's' or 'S' for savings, 'c' or 'C' for checking), minimum balance that the account should maintain, and current balance. The program should then output the account number, account type, current balance, and an appropriate message. Test your program by running it five times, using the following data:

| | | | |
|-------|---|------|------|
| 46728 | S | 1000 | 2700 |
| 87324 | C | 1500 | 7689 |
| 79873 | S | 1000 | 800 |

CC 123 – Computer Programming 2

Project Number 1

| | | | |
|-------|---|------|------|
| 89832 | C | 2000 | 3000 |
| 98322 | C | 1000 | 750 |

Problem 10

Example 5-6 in the book implements the Guessing the Number game program. If the guessed number is not correct, the program outputs a message indicating whether the guess is low or high. Modify the program as follows: Suppose that the variables `num` and `guess` are as declared in Example 5-6 and `diff` is an `int` variable. Let `diff` = the absolute value of (`num` – `guess`). If `diff` is 0, then guess is correct and the program outputs a message indicating that the user guessed the correct number. Suppose `diff` is not 0. Then, the program outputs the message as follows:

- a) If `diff` is greater than or equal to 50, the program outputs the message indicating that the guess is "very high" (if guess is greater than `num`) or "very low" (if guess is less than `num`).
- b) If `diff` is greater than or equal to 30 and less than 50, the program outputs the message indicating that the guess is "high" (if guess is greater than `num`) or "low" (if guess is less than `num`).
- c) If `diff` is greater than or equal to 15 and less than 30, the program outputs the message indicating that the guess is "moderately high" (if guess is greater than `num`) or "moderately low" (if guess is less than `num`).
- d) If `diff` is greater than 0 and less than 15, the program outputs the message indicating that the guess is "somewhat high" (if guess is greater than `num`) or "somewhat low" (if guess is less than `num`).

Give the user, at most, five tries to guess the number. (To find the absolute value of `num`– `guess`, use the expression `Math.abs(num– guess)`.)