University of Bahrain

College of Information Technology
Department of Computer Science

ITCS111/ITCS113
Introduction to Computer Programming

1 Basic Problems

1. Write a program that converts a distance measure from inches to cents. Note that one inch is equal to 2.54 centimeters?

2. The area of a *triangle* is computed by taking half the product of its base and height.

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

   Write a program that reads the base and height of a triangle and displays the area.

3. Students are awarded points toward their grades based upon the addition of the average of three quizzes (Q_1, Q_2, Q_3), the midterm exam (MT), and the final exam $(FINAL)$. Quizzes are marked out of 5, the midterm is out of 30, and the final is out of 70. Compute the total points using a Java program and print the result out of 100 according to the following percentages: Quizzes: 25%, Midterm: 35%, and Final: 40%.

4. Write a program that reads a student name followed by his/her id. The program should then display on screen the student's name followed by his/her academic year. For example, the academic year for the id 20102323 is 2010.

5. Write a program that calculates the energy needed to heat water from an initial temperature to a final temperature. Your program should prompt the user to enter the amount of water in kilograms and the initial and final temperature of the water. The formula to compute the energy is

$$Q = M \times (\textit{final temperature} - \textit{initial temperature}) \times 4184$$

   Where M is the weight of water in kilograms, temperatures are in degrees Celsius, and energy Q is measured in joules. Format your output to three decimal places.

Sample Input/Output

```
Enter water amount:  55.5
Enter initial temperature:  3.5
Enter final temperature:  10.8
The energy needed is 1695147.600
```

6. Write a Java program that will predict tomorrow's temperature given today's temperature readings. The program will first ask the user to enter two values: the temperature *median* value and *current* temperature reading. The program will calculate and display the expected temperature according to the following equation:

$$\textit{Expected temperature} = 2 \times \textit{median temperature} - \textit{current temperature}$$

   Format your output to two decimal places.

Sample Input/Output

```
Enter temperature median value and temperature reading:
39.61  36.92
Expected Temperature: 42.30
```

7. Write a program that reads an **employee name** and **two amount of sales** in Bahraini Dinar (BD) that represent the total sales of the employee in each day over the weekend (Friday and Saturday). Your program is then required to print the employee name followed by the percentages of sales on Friday and Saturday using the below equations. Format the output so that all numbers are printed with 2 decimal places.

$$\textit{Friday Percentage} = \frac{\textit{Friday Sales}}{\textit{Friday Sales + Saturday Sales}} \times 100$$

$$\textit{Saturday Percentage} = \frac{\textit{Saturday Sales}}{\textit{Friday Sales + Saturday Sales}} \times 100$$

Sample Input/Output

Enter your name: *Mustafa Ebrahim* Enter Friday and Saturday Sales: *1500.500 2000.780* Sales percentages of Mustafa Ebrahim are: Friday is 42.86% and Saturday is 57.14%.

8. Write a program that reads three floating point numbers N_1, N_2, and N_3 from the user. It is required to find and print the value of the following formula:

$$F = N_1 + \frac{N_1 \times N_2}{4} - N_3$$

9. Write a program to read three resistance values R_1, R_2, and R_3 in Ohms and compute their combined resistance R_c when they are arranged in parallel. The value of R_c is computed using the following formula.

$$R_c = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

   Your program should print the values of R_1, R_2, R_3 and R_c.

   For example, if $R_1 = 2.3$ Ohms, $R_2 = 6.21$ Ohms, and $R_3 = 4.58$ Ohms, then $R_c = 1.228269131$ Ohms.

10. One large chemical company pays its salespeople on a commission basis. The salespeople receive BD. 75/600 per week plus 9% of their gross sales for that week. For example, a salesperson who sells BD. 1890/— worth of chemicals in a week receives BD. 75/600 plus 9% of 1890/—, or a total of 75/600 + 170/100 = 245/700. Develop a program that will input each salesperson's gross sales for last week and will calculate and display that salesperson's earnings?

11. Write a program that reads two currency codes, exchange rate from first currency to second and the amount of money to be converted. Your program should display the converted amount for each currency using the following equations:

    First Currency Amount = Currency Amount × Exchange Rate
    Second Currency Amount = Currency Amount / Exchange Rate

    Format the output to 4 decimal places.

Sample Input/Output

Enter currency codes: USD BD *Enter Exchange rate:* 0.3774 *Enter the amount:* 125.0 USD 125.0000 = BD 47.1750 BD 125.0000 = USD 331.2136

12. Write a program that reads from the keyboard the following input:

    - Person Full Name written in a single line.
    - Person CPR number (9-Digits) written in the next.

    Your program should find and print on screen the birth year of this person. The birth year can be extracted from the first two digits of the CPR. Assume all persons were born before the year 2000 and after the year 1910.

Sample Input/Output

Enter your name: Jassim Ali Ahmed *Enter your CPR:* 740707573 Jassim Ali Ahmed was born in year 1974

13. ABC Phone Company, Inc., charges for phone calls by *distance* (miles) and length of *time* (minutes). The cost of a call (in Bahrain Dinar) is computed as 30% of the *call weight*, where the call weight is computed by adding the time with 5% of the distance.

    Design a JAVA program that reads the distance and length of time for three phone calls. The program must calculate and display the cost for each of the three calls and the total cost of all three calls.

    A sample Input/Output of your program is shown below.

    Call 1: How many miles and minutes? **3 20**
    Call 2: How many miles and minutes? **2 15**
    Call 3: How many miles and minutes? **6 4**

    Call 1 costs BD. 6.045
    Call 2 costs BD. 4.53
    Call 3 costs BD. 1.29

    Total cost is BD. 11.865

14. The Perimeter, Surface Area, and Volume of an in-ground pool are given by the following formulas:

$$\begin{aligned} \text{Perimeter} &= 2(\text{length} + \text{width}) \\ \text{Volume} &= \text{length} \times \text{width} \times \text{depth} \\ \text{Surface Area} &= 2(\text{length} + \text{width}) \times \text{depth} + \text{length} \times \text{width} \end{aligned}$$

    Using these formulas as a basis, write a JAVA program that accepts the length, width, and depth measurements and then calculates the perimeter, volume, and surface area of the pool.

15. The volume of oil stored in an underground 200-foot-deep cylindrical tank is determined by measuring the distance from the top of the tank to the surface of the oil. Knowing this distance and the radius of the tank the volume of oil in the tank can be determined using the formula:

$$volume = \pi \times radius^2 \times (200 - distance)$$

    Using this formula, write a JAVA program that accepts the radius and the distance measures, calculates the volume of the oil in the tank, and displays the two input values and calculates the volume.

16. The curriculum of any bachelor degree program consists of credit points which must be completed by all students enrolled in the program. Write a program that will ask the user to enter his/her ***name***, program ***credit***, and ***expected*** credits to be completed yearly. The program will then calculate degree duration in years. The ***duration*** in years is calculated by:

    Degree ***duration*** in years = program ***credits*** ÷ ***expected*** credits to be completed yearly

    The program will display the student name, degree duration in years, and expected graduation year formatted similar to the below sample output. Expected graduation year equals the year 2015 plus degree duration.

Sample Input/Output

Enter your name, program credits and expected credits:	
Ali 130 30	
Name:	Ali
Degree duration:	4 years
Expected graduation year:	2019

17. Write a Java program that will perform some calculations regarding a cyclist coasting on a road. The program will ask the user to enter the cyclist's initial speed V_{initial}, the duration (in minutes), and the final speed V_{final}. The program will then calculate the rate of acceleration using the formula:

$$\text{acceleration} = (V_{\text{final}} - V_{\text{initial}}) \div \text{duration}$$

    Next, calculate how long it will take for the cyclist to stop (given the initial speed and the calculated acceleration.) The necessary formula is:

$$\text{time} = V_{\text{initial}} \div \text{acceleration}$$

    Display the acceleration and time on screen formatted to the below samples.

Sample Input/Output

```
Enter initial speed, final speed and duration
18.0    36.0    4.0

Acceleration = 4.5
4.0 minutes to stop
```

18. Write a program that reads from the keyboard two integers representing hours and minutes. The program should convert the time (hours and minutes) to seconds. Your program should write the result on screen as shown in the sample I/O below. the sample below:

Sample Input/Output

```
Hours?   10
Minutes?   15

Time in Seconds = 36900
```

19. The manager of a football stadium wants you to write a program that calculates the total ticket sales for a game. There are four types of tickets – Box, Sideline, Premium, and general Admission. Data is stored as shown below:

```
250    5750
100    28000
 50    35750
 25    18750
```

The first line indicates the ticket price is $250 and that 5750 tickets were sold at that price. Output the number of tickets sold and the total sale amount. Format your output with two decimal places.

20. Write a program that reads three salaries from the keyboard and displays their average on screen formatted with 3 decimal places as shown below in the sample I/O.

Sample Input/Output:

```
Salary1 ...........456.400
Salary2 ..........1230.520
Salary3 ...........650.550
Average ...........779.157
```

21. Two employees in a company are up for special pay increase. Write a program that reads the last name, first name, current salary and percent pay increase for both employees. Your program should display their salaries after the increase.

22. Write a program that calculates and prints the monthly paycheck for an employee. The net pay is calculated after the following deductions:

- Medicare/Medicaid Tax: 2.75%
- Pension Plan: 6%
- Health Insurance: BD. 75

Your program should prompt the user to enter the *gross amount* and print the *net pay.* A sample Input/Output is shown below:

```
Enter gross amount (BD): 650

---------- Paycheck -----------
Gross amount:           650.000
Medicare/Medicaid Tax:   17.875

Pension Plan:            39.000
Health Insurance:        75.000
-------------------------------
Net Pay:                518.125
```