North South University
Department of Electrical and Computer Engineering

CSE 215 (Both Theory and Lab): Assignment 01 (Problem Set)
Course Instructor: Dr. Mohammad Rezwanul Huq

Problem Solving on Basic Programming Logic, Conditional Branching, Looping and Methods

Important Instructions:

a. Class name of the solution of the problems should be like Problem1, Problem2 and so on.

b. Create a zip/rar file which contains the solution **(.java file only)** of the problems only. As an example, only include Problem1.java, Problem2.java and so on.

c. The file name must follow the format:
<section number>_<assignment number>_<student number>.
Example: 13_01_1710000042. Files with incorrect naming will not be accepted.

d. Use the link below to upload the zip/rar file.
http://bit.ly/cse215codesubmit

Submission Deadline:

12 June 2019 11:59PM.

Problem Set

1. (*Display three messages*) Write a program that displays **Welcome to Java**, **Welcome to Computer Science**, and **Programming is fun**.

2. (*Area and perimeter of a circle*) Write a program that displays the area and perimeter of a circle that has a radius of **5.5** using the following formula:

   perimeter = 2 * *radius* * π

   area = *radius* * *radius* * π

3. *(Average speed in miles*) Assume a runner runs **14** kilometers in **45** minutes and **30** seconds. Write a program that displays the average speed in miles per hour. (Note that **1** mile is **1.6** kilometers.)

4. (*Population projection*) The U.S. Census Bureau projects population based on the following assumptions:

   - One birth every 7 seconds
   - One death every 13 seconds
   - One new immigrant every 45 seconds

   Write a program to display the population for each of the next five years. Assume the current population is 312,032,486 and one year has 365 days. *Hint*: In Java, if two integers perform division, the result is an integer. The fractional part is truncated. For example, **5** / **4** is **1** (not **1.25**) and **10** / **4**

is 2 (not 2.5). To get an accurate result with the fractional part, one of the values involved in the division must be a number with a decimal point. For example, 5.0 / 4 is 1.25 and 10 / 4.0 is 2.5.

5. (*Convert Celsius to Fahrenheit*) Write a program that reads a Celsius degree in a double value from the console, then converts it to Fahrenheit and displays the result. The formula for the conversion is as follows:

   fahrenheit = (9 / 5) * celsius + 32

   Hint: In Java, 9 / 5 is 1, but 9.0 / 5 is 1.8.

```
Enter a degree in Celsius: 43 Enter
43 Celsius is 109.4 Fahrenheit
```

6. (*Financial application: calculate tips*) Write a program that reads the subtotal and the gratuity rate, then computes the gratuity and total. For example, if the user enters 10 for subtotal and 15% for gratuity rate, the program displays $1.5

   as gratuity and $11.5 as total. Here is a sample run:

```
Enter the subtotal and a gratuity rate: 10 15 Enter
The gratuity is $1.5 and total is $11.5
```

7. (*Find the number of years*) Write a program that prompts the user to enter the minutes (e.g., 1 billion), and displays the number of years and days for the minutes. For simplicity, assume a year has 365 days. Here is a sample run:

```
Enter the number of minutes: 1000000000 Enter
1000000000 minutes is approximately 1902 years and 214 days
```

8. (*Health application: computing BMI*) Body Mass Index (BMI) is a measure of health on weight. It can be calculated by taking your weight in kilograms and dividing by the square of your height in meters. Write a program that prompts the user to enter a weight in pounds and height in inches and displays the BMI. Note that one pound is 0.45359237 kilograms and one inch is 0.0254 meters. Here is a sample run:

```
Enter weight in pounds: 95.5 Enter
Enter height in inches: 50 Enter
BMI is 26.8573
```

9. (*Geometry: distance of two points*) Write a program that prompts the user to enter two points (x1, y1) and (x2, y2) and displays their distance between them. The formula for computing the distance is 2(*x*2 - *x*1)2 + (*y*2 - *y*1)2. Note that

   you can use Math.pow(a, 0.5) to compute 2*a*. Here is a sample run:

```
Enter x1 and y1: 1.5 -3.4 Enter
Enter x2 and y2: 4 5 Enter
The distance between the two points is 8.764131445842194
```

10. (*Cost of driving*) Write a program that prompts the user to enter the distance to drive, the fuel efficiency of the car in miles per gallon, and the price per gallon, and displays the cost of the trip. Here is a sample run:

```
Enter the driving distance: 900.5 Enter
Enter miles per gallon: 25.5 Enter
Enter price per gallon: 3.55 Enter
The cost of driving is $125.36
```

11. (*Sum the digits in an integer*) Write a program that reads an integer between 0 and 1000 and adds all the digits in the integer. For example, if an integer is 932, the sum of all its digits is 14. *Hint*: Use the % operator to extract digits and use the / operator to remove the extracted digit. For instance, 932 % 10 = 2 and 932 / 10 = 93. Here is a sample run:

```
Enter a number between 0 and 1000: 999 Enter
The sum of the digits is 27
```

12. (*Print a table*) Write a program that displays the following table. Cast floating point numbers into integers.

    a b pow(a, b)

    1 2 1

    2 3 8

    3 4 81

    4 5 1024

    5 6 15625

13. (*Financial application: calculate future investment value*) Write a program that reads in investment amount, annual interest rate, and number of years, and displays the future investment value using the following formula:

    futureInvestmentValue = investmentAmount * (1 + monthlyInterestRate)^{numberOfYears*12}

    For example, if you enter amount 1000, annual interest rate 3.25%, and number of years 1, the future investment value is 1032.98.

    Here is a sample run:

```
Enter investment amount: 1000.56 Enter
Enter annual interest rate in percentage: 4.25 Enter
Enter number of years: 1 Enter
Accumulated value is $1043.92
```

14. (*Game: add three numbers*) Write a program to generate three single-digit integers randomly and prompt the user to enter the sum of these three integers. If the user is right, display 'You are right'; otherwise, display 'You are wrong'.

15. (*Sort three integers*) Write a program that prompts the user to enter three integers and display the integers in non-decreasing order.

16. (*Find future dates*) Write a program that prompts the user to enter an integer for today's day of the week (Sunday is 0, Monday is 1, …, and Saturday is 6). Also prompt the user to enter the number of days after today for a future day and display the future day of the week. Here is a sample run:

```
Enter today's day: 1 Enter
Enter the number of days elapsed since today: 3 Enter
Today is Monday and the future day is Thursday
```

```
Enter today's day: 0 Enter
Enter the number of days elapsed since today: 31 Enter
Today is Sunday and the future day is Wednesday
```

17. (*Palindrome number*) Write a program that prompts the user to enter a three-digit integer and determines whether it is a palindrome number. A number is palindrome if it reads the same from right to left and from left to right. Here is a sample

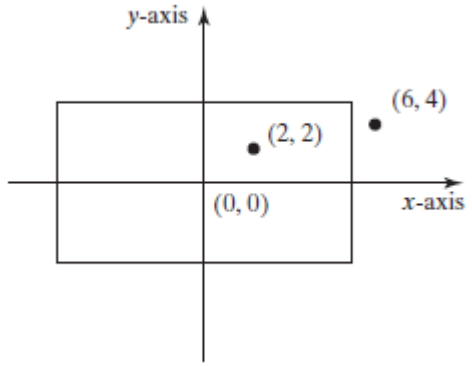
    run of this program:

```
Enter a three-digit integer: 121 
121 is a palindrome
```

```
Enter a three-digit integer: 123 
123 is not a palindrome
```

18. (*Geometry: point in a rectangle?*) Write a program that prompts the user to enter a point (x, y) and checks whether the point is within the rectangle centered at (0, 0) with width 10 and height 5. For example, (2, 2) is inside the rectangle and (6, 4) is outside the rectangle, as shown in Figure 3.7b. (*Hint*: A point is in the rectangle if its horizontal distance to (0, 0) is less than or equal to 10 / 2 and its vertical distance to (0, 0) is less than or equal to 5.0 / 2. Test your program to

    cover all cases.) Here are two sample runs.




```
Enter a point with two coordinates: 2 2 Enter
Point (2.0, 2.0) is in the rectangle
```

```
Enter a point with two coordinates: 6 4 Enter
Point (6.0, 4.0) is not in the rectangle
```

19. (*Game: scissor, rock, paper*) Write a program that plays the popular scissor-rockpaper game. (A scissor can cut a paper, a rock can knock a scissor, and a paper can wrap a rock.) The program randomly generates a number 0, 1, or 2 representing scissor, rock, and paper. The program prompts the user to

enter a number 0, 1, or 2 and displays a message indicating whether the user or the computer wins, loses, or draws. Here are sample runs:

```
scissor (0), rock (1), paper (2): 1 Enter
The computer is scissor. You are rock. You won
```

```
scissor (0), rock (1), paper (2): 2 Enter
The computer is paper. You are paper too. It is a draw
```

20. (*Science: day of the week*) Zeller's congruence is an algorithm developed by Christian Zeller to calculate the day of the week. The formula is

$$h = \left(q + \frac{26(m+1)}{10} + k + \frac{k}{4} + \frac{j}{4} + 5j\right) \% 7$$

where

- h is the day of the week (0: Saturday, 1: Sunday, 2: Monday, 3: Tuesday, 4: Wednesday, 5: Thursday, 6: Friday).
- q is the day of the month.
- m is the month (3: March, 4: April, …, 12: December). January and February are counted as months 13 and 14 of the previous year.
- j is the century (i.e., *year*/100).
- k is the year of the century (i.e., *year* % 100).

Note that the division in the formula performs an integer division. Write a program that prompts the user to enter a year, month, and day of the month, and displays the name of the day of the week. Here are some sample runs:

```
Enter year: (e.g., 2012): 2015 Enter
Enter month: 1-12:  1 Enter
Enter the day of the month: 1-31: 25 Enter
Day of the week is Sunday
```

```
Enter year: (e.g., 2012): 2012 Enter
Enter month: 1-12: 5 Enter
Enter the day of the month: 1-31: 12 Enter
Day of the week is Saturday
```