PROBLEM SET 4

Repetition Statements

1. Convert each for loop to while loop.

a)
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for (x = 2; x < 10; x += 3)
    …
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b)
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for (j = 10; j >= 2; j -= 2)
    …
```

c)
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for (m = 3; m < 19; m += 2)
    …
```

d)
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for (k = 20; k > 2; k -= 5)
    …
```

2. Analyze the following problems and write a Java program for each of them.

a) Calculate the result of the sum of the following series, until a term that is less than 0.00025 is reached.

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots$$

b) Given a group of non-negative numbers, display each number together with its square and square root as a table. Display also the sum of the numbers, the sum of their squares and the sum of their square roots below that table.

c) Given some numbers other than 0, find the percentage of negative numbers, using the above formula.

$$\frac{\text{Number of data items fitting the given condition}}{\text{Total number of data items}} \times 100$$

d) Given a set of double numbers where the lowest one is -250, output a list of those numbers, and the number of negative values and the number of positive values whose fractional part is greater than 0.25 at the bottom of the list, with proper messages.

e) A student passes a course if his overall grade is 50 or more. Given a set of students in a class and their overall grades from a course, find how many of them passed, how many of them failed.

f) In Fibonacci's sequence,

1, 1, 2, 3, 5, 8, 13, …

the first two terms are 1 and each successive term is found by adding the previous two terms. Given n, output the terms of the Fibonacci's sequence until a term greater than or equal to n is reached.

g) In a biology experiment, a student finds that a sample of an organism triples in population every 5 hour. If she starts with 100 organisms, after how many hours will she have more than 10 million organisms?

h) Given a set of input pairs of X and Y values, find the number of pairs satisfying the condition |X| > |2Y| and the number of pairs satisfying |X| < |2Y|. The program should terminate when a pair satisfying |X| = |2Y| is entered.

i) Resolve the previous problem, so that it also finds the minimum and maximum X and Y values.

j) Given a value for x, compute y from:

$$y = \frac{x^2}{3!} + \frac{x^4}{5!} + \frac{x^6}{7!} + \cdots\cdots\cdots + \frac{x^{14}}{15!}$$

k) Modify the program in (j), to compute the sum until the value of the last term is less than 0.000001.

m) Compute the sum of squares of numbers from 1 to 100 with increments of 0.2,

i) with a for loop
ii) with a while loop

n) Given a set of student grades, find the highest and lowest grade. Also find the class average excluding grades below 10 and above 95.

o) Given a set of positive integers, find and output separately how many times the numbers 25, 67, and 78 occur.

p) Assume that the world population in 2004 is 6 billion, and estimated population increase is:

3% between 2004 and 2014
5% after 2014

Write a program to perform the following:

- The user enters a year.
- If the year is less than 2004 or greater than 2050 the program terminates.
- Compute and output the estimated population for the given year.

q) In a certain theatre where tickets normally cost 15 YTL each, there is a 10% discount if one person buys more than 15 tickets. Input a set of data (the person's ID and how many tickets he has bought), knowing that 900 tickets have been sold. Output the person's ID and the total amount he must pay for each case, and the total income of the theatre.

r) In a certain university, students are classified according to the range into which their final grade falls. The ranges are:

0 – 39, 40 – 69, and 70 – 100.

Given a set of final grades, determine how many students fall into each range.

s) Write a program to produce a table of factorial of numbers up to 20.