Basis of Computer Programming (java)
Lab Exercise 6

[Experimental Objective]

1. Learn how to use the *for* repetition statements to execute statements in a program repeatedly.
2. Learn how to use the *do…while* repetition statements to execute statements in a program repeatedly.
3. Learn how to implement multiple selection using the *switch* selection statement.
4. Learn how to use the logical operators to form complex conditional expressions in control statements.

[Exercises]

1. Write an application that inputs one integer *n* from the user, then calculate the sums of all the odd numbers and even numbers in 1, 2, 3, …… , n. Try to use the *for* and *do…while* repetition statements to calculate of the sums.

2. Write an application to find all the numbers which are multiples of 7 (e.g., 14, 21, 70, ……) or contain the digit '7' (e.g., 17，27，70, ……) between 1 and 100. Each row of the output should contain at most ten such numbers, i.e., the output should be

```
7    14   17   21   27   28   35   37   42   47
49   56   57   63   67   70   71   72   73   74
75   76   77   78   79   84   87   91   97   98
```

3. Write an application which uses the ***switch*** selection statement to convert the grades on 100 point scale into GPA according to the following table.

Grade	GPA
100~90	4.0
89~80	3.0
79~70	2.0
69~60	1.0
59~0	0

4. (Book P150, 5.13, Modified Compound-Interest Program) Modify the compound-interest application of Fig. 5.6 to repeat its steps for interest rates of 5%, 6%, 7%, 8%, 9% and 10%. Use a *for* loop to vary the interest rate.

```java
// Fig. 5.6: Interest.java
// Compound-interest calculations with for.

public class Interest
{
   public static void main( String[] args )
   {
      double amount; // amount on deposit at end of each year
      double principal = 1000.0; // initial amount before interest
      double rate = 0.05; // interest rate

      // display headers
      System.out.printf( "%s%20s\n", "Year", "Amount on deposit" );

      // calculate amount on deposit for each of ten years
      for ( int year = 1; year <= 10; year++ )
      {
         // calculate new amount for specified year
         amount = principal * Math.pow( 1.0 + rate, year );

         // display the year and the amount
         System.out.printf( "%4d%,20.2f\n", year, amount );
      } // end for
   } // end main
} // end class Interest
```

```
Year   Amount on deposit
   1           1,050.00
   2           1,102.50
   3           1,157.63
   4           1,215.51
   5           1,276.28
   6           1,340.10
   7           1,407.10
   8           1,477.46
   9           1,551.33
  10           1,628.89
```

5. A narcissistic number (水仙花数) refers to a number that is the sum of its own digits each raised to the power of the number of digits. For example,

$$153=1^3 + 5^3 + 3^3.$$

Write an application to find all the narcissistic numbers between 100-999 by using the *do…while* repetition statement.

6. Write an application to calculate and display the following multiplication table by using the for repetition statement.

```
1*1 = 1
1*2 = 2  2*2 = 4
1*3 = 3  2*3 = 6  3*3 = 9
1*4 = 4  2*4 = 8  3*4 = 12  4*4 = 16
1*5 = 5  2*5 = 10  3*5 = 15  4*5 = 20  5*5 = 25
1*6 = 6  2*6 = 12  3*6 = 18  4*6 = 24  5*6 = 30  6*6 = 36
1*7 = 7  2*7 = 14  3*7 = 21  4*7 = 28  5*7 = 35  6*7 = 42  7*7 = 49
1*8 = 8  2*8 = 16  3*8 = 24  4*8 = 32  5*8 = 40  6*8 = 48  7*8 = 56  8*8 = 64
1*9 = 9  2*9 = 18  3*9 = 27  4*9 = 36  5*9 = 45  6*9 = 54  7*9 = 63  8*9 = 72  9*9 = 81
```

7. (Book P151, 5.19, Calculating the Value of π) Calculate the value of π from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \cdots$$

   Please use the *do...while* repetition statements to show the value of π approximated by computing the first 200,000 terms of this series.

8. Write an application that inputs one integer n from the user and output the sum of all the prime numbers(质数) between 1 and n.

[Assignments]

Question 5、6、7、8 of [Exercises]