Homework #1
Due Tu. 9/12

Please prepare a report including the source code, captures of output and send it along with related source files as a zip file to my blackboard. The zip file should be named by your family name. Please print the report and bring the hard copy by the due date to the class. The selective grading will be used for homeworks of this course.

1. Write a program that prompts the user to enter an integer and determines whether it is divisible by 5 and 6, whether it is divisible by 5 or 6, and whether it is divisible by 5 or 6, but not both. Here is a sample run of this program:

```
Enter an integer: 10 Enter
Is 10 divisible by 5 and 6? false
Is 10 divisible by 5 or 6? true
Is 10 divisible by 5 or 6, but not both? true
```

2. After the break statement in (a) is executed in the following loop, which statement is executed? Show the output. After the continue statement in (b) is executed in the following loop, which statement is executed? Show the output.

```
for (int i = 1; i < 4; i++) {
  for (int j = 1; j < 4; j++) {
    if (i * j > 2)
      break;

    System.out.println(i * j);
  }

  System.out.println(i);
}
```

(a)

```
for (int i = 1; i < 4; i++) {
  for (int j = 1; j < 4; j++) {
    if (i * j > 2)
      continue;

    System.out.println(i * j);
  }

  System.out.println(i);
}
```

(b)

3. Write a method that displays an n-by-n matrix using the following header:

```
public static void printMatrix(int n)
```

Each element is 0 or 1, which is generated randomly. Write a test program that prompts the user to enter n and displays an n-by-n matrix. Here is a sample run:

```
Enter n: 3 Enter
0 1 0
0 0 0
1 1 1
```

4. What is pass-by-value? Show the result of the following programs.

```java
public class Test {
  public static void main(String[] args) {
    int max = 0;
    max(1, 2, max);
    System.out.println(max);
  }

  public static void max(
      int value1, int value2, int max) {
    if (value1 > value2)
      max = value1;
    else
      max = value2;
  }
}
```

(a)

```java
public class Test {
  public static void main(String[] args) {
    int i = 1;
    while (i <= 6) {
      method1(i, 2);
      i++;
    }
  }

  public static void method1(
      int i, int num) {
    for (int j = 1; j <= i; j++) {
      System.out.print(num + " ");
      num *= 2;
    }

    System.out.println();
  }
}
```

(b)

5. For (a) in the question 4, show the contents of the activation records in the call stack just before the method max is invoked, just as max is entered, just before max is returned, and right after max is returned.

6. Some websites impose certain rules for passwords. Write a method that checks whether a string is a valid password. Suppose the password rules are as follows:

   - A password must have at least eight characters.
   - A password consists of only letters and digits.
   - A password must contain at least two digits.

   Write a program that prompts the user to enter a password and displays Valid Password if the rules are followed or Invalid Password otherwise.

7. Write the methods with the following headers

```java
// Return the reversal of an integer, i.e., reverse(456) returns 654
public static int reverse(int number)

// Return true if number is a palindrome
public static boolean isPalindrome(int number)
```

   Use the reverse method to implement isPalindrome. A number is a palindrome if its reversal is the same as itself. Write a test program that prompts the user to enter an integer and reports whether the integer is a palindrome.

8. What are the differences between a while loop and a do-while loop? Convert the following while loop into a do-while loop.

```java
Scanner input = new Scanner(System.in);
int sum = 0;
System.out.println("Enter an integer " +
  "(the input ends if it is 0)");
int number = input.nextInt();
while (number != 0) {
  sum += number;
  System.out.println("Enter an integer " +
    "(the input ends if it is 0)");
  number = input.nextInt();
}
```