CS171 Introduction to Computer Science

Loop Gymnastics

1. Write a loop that prints the first ten natural numbers $(1, 2, ...)$ with each number on its own line.
2. Write a loop that prints the first eight natural numbers $(1, 2, ...)$ with all the numbers on a single line. There should be a space between each pair of numbers.
3. Write a loop that prints the integers 10 down to 0 (i.e. backwards), and on separate lines.
4. Write a loop that prints the even integers from 22 through 36 inclusive on separate lines
5. Write a loop that prints the first ten multiples of 17. (17, 34, 51, ...)
6. Write a loop that prints all 26 capital letters of the alphabet. Hint: Recall that we can use a char-type variable and can manipulate as an integer (and add one to it) and still display as a character.
7. Write a loop that prints the first ten numbers on one line (with spaces in between) and then repeats this 5 times, so that we have 5 rows of the numbers 1 through 10. Hint: think about putting one look inside another – nesting loops as we did for nesting if statements.
8. Write a loop that prints the following:

```
1 1 1 1
2 2 2 2
3 3 3 3
4 4 4 4
5 5 5 5
```

9. Write a loop that prints the following:

```
1 2 3 4 5
5 4 3 2 1
1 2 3 4 5
5 4 3 2 1
1 2 3 4 5
5 4 3 2 1
```

10. Write a loop that prints the following:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

11. Write a loop that prints the multiplication table for numbers 1 through 9, so there will be 9 rows and 9 columns. You should print an initial row with column headers and each row should start with the number of that row. Don't worry about fine-tuning the spacing.

12. Write a loop that prints the first 16 powers of 2, all on one line and with space in between adjacent values.

13. Write a loop that prints the following:

```
1 2 3 4 5
  2 3 4 5
    3 4 5
      4 5
        5
```

14. Write a loop that prints the following:

```
      3
    2 3 4
  1 2 3 4 5
    2 3 4
      3
```

15. Write a program that inputs a positive integer n from the user and then uses a loop to compute the sum of the first n integers. So if a user specified n of 4, the program computes $1 + 2 + 3 + 4$. Print the result (10 in this case).

16. Write a program that inputs a positive integer n from the user and then uses a loop to compute the product of the first n integers. So if a user specified n of 4, the program computes $1 * 2 * 3 * 4$. Print the result (24 in this case).

17. Write a program that computes and prints 10 random numbers, one per line. Hint: The Java API provides a class called `Random` that we can use. We create an object of class Random with a constructor that has no arguments. Once we create an object, there is a method `nextInt(int limit)` whose argument gives the exclusive upper limit, so that `nextInt` invoked on the random object returns an integer from 0 up to (but not including) `limit`.

18. Write a set of loops that prints all permutations of the digits 1, 2, 3, and 4, one per line. Your output would begin as follows:

```
1 1 1 1
1 1 1 2
1 1 1 3
1 1 1 4
1 1 2 1
1 1 2 2
.
.
.
```