Knight Foundation School of Computing and Information Sciences

COP 3337: Computer Programming II
Assignment – VIII: Recursion
Due Date & Time: Monday, Nov 14, 2022, 11:59 pm
Instructor: Ahmad Waqas, PhD

Instructions:

- Create a separate java class file for each class.
- Zip the complete project and submit the .zip file.
- The general rubrics are given below:

Description	Max. Marks
Coding style Use the best practices for writing the code. The code is well organized and very easy to follow.	20%
Logic Student has used the effective programming logic for solution and demonstrates the appropriate concept in respective task.	60%
Results The program is error-free and generates the expected results as per the specifications.	20%

Task I:

There are `n` people in a room, where `n` is an integer greater than or equal to 1. Each person shakes hands once with every other person. What is the total number, `h(n)`, of handshakes? Write a recursive function to solve this problem. To get you started, if there are only one or two people in the room, then

```
handshake(1) = 0
handshake(2) = 1
```

If a third person enters the room, he or she must shake hands with each of the two people already there. This is two handshakes in addition to the number of handshakes that would be made in a room of two people, or a total of three handshakes.

If a fourth person enters the room, he or she must shake hands with each of the three people already present. This is three handshakes in addition to the number of handshakes that would be made in a room of three people, or six handshakes.

If you can generalize this to `n` handshakes, then it should help you write the recursive solution.

Following picture represents the sample output.

```
How many people are in the room?
12
If everyone shakes hands once, there will be 66 handshakes.
```

Task II:

The formula for computing the number of ways of choosing r different things from a set of n things is the following:

$$C(n,r) = \binom{n}{r} = \frac{n!}{r!\,(n-r)!}$$

Discover a recursive version of the formula for $C(n,r)$ and write a recursive method that computes the value of the formula. Place the method in a class that has a main that test the method.

PS: The value of n should be greater than r.

Sample output is shown in the following screenshot:

```
Enter value for n:
12
Enter value for r:
5
There are 792 possible combinations.
```