# Programming Assignment:
# Nim Game

## Topics

Method, Random number

## Problem

Nim is a number game of strategy in which two players take turns removing objects from different piles. One of the different variations of a Nim game is available at https://www.archimedes-lab.org/game_nim/play_nim_game.html.

In this project, two players alternately take marbles from a pile. In each move, a player chooses how many marbles to take. The player must take at least one but at most half of the marbles. The other player takes a turn. The player who takes the last marble loses.

Write a program to simulate a game of computer vs. human being.

- Generate a random number between 10-100 to denote the initial size of the pile.
- Simulate a coin toss to determine who goes first, the computer or the human.
- Simulate a coin toss to decide if the computer plays smart or stupid mode.
  - In stupid mode, the computer simply takes a random legal number between 1 and n/2 whenever it has a turn.
  - In smart mode the computer takes off enough marbles to make the size of the pile a power of two minus 1 (that is, 3, 7, 15, 31, or 63). That is always a legal move, except if the size of the pile is currently one less than a power of 2. In that case, the computer makes a random legal move.

Note that the computer cannot be beaten in smart mode when it has the first move, unless the pile size happens to be 15, 31, or 63. If the human player knows the winning strategy and takes the first turn, he can win against the computer.

## Program Requirements

The program (java file) represents the game and the play. It must include and use the following methods.

- int StupidMoveMarbleNum (int num)
  // return number of marbles to be moved in stupid mode if current marble number is num.
- int SmartMoveMarbleNum (int num)
  // return number of marbles to be moved in smart mode if current marble number is num.
- boolean computerMove ( )
  // return true if it is computer's turn and false if human player's turn
- boolean isSmart ()
  // return true if it is in smart mode and false if in stupid mode

## Sample Output

Sample 1:

```
You have 16 elements to start
================================================
Coin toss result for computer mode: smart mode
================================================
It's computer's turn
Computer takes 1
Now there are 15 left.
================================================
What's your move?
10
10 is not a legal number.  You can only take a number between 1 and 7!
What's your move?
6
Now there are 9 left.
Computer takes 2
Now there are 7 left.
================================================
What's your move?
3
Now there are 4 left.
Computer takes 1
Now there are 3 left.
================================================
What's your move?
1
Now there are 2 left.
Computer takes 1
Now there are 1 left.

Computer won!
```

Sample 2:

```
You have 30 elements to start
================================================
Coin toss result for computer mode: stupid mode
================================================
It's computer's turn
Computer takes 10
Now there are 20 left.
================================================
What's your move?
5
Now there are 15 left.
Computer takes 5
Now there are 10 left.
================================================
What's your move?
3
Now there are 7 left.
Computer takes 2
Now there are 5 left.
================================================
What's your move?
2
Now there are 3 left.
Computer takes 1
Now there are 2 left.
================================================
What's your move?
1
Now there are 1 left

You won!
```

## Grading Criteria - 100pts

1. Header [5pts]: Author, Date, Purpose, Honor Code, etc.
2. Good Programming Practices [5pts]: commenting, white space, indentation, etc.
3. Topic Knowledge [10]: Variable - naming, declaration and initialization, assignment, operators, expressions, if else, while/for loops, method and random number.
4. Pseudocode [5]
5. Errors Encountered [5]: minimum of 5 different errors and explanation of errors
6. Test Cases [10]: minimum of 5 different test runs (direct screenshots only)
7. Code [60]: 40pts - four required methods, 20pts - main method.
8. Note: If your code does not compile, your score will be an automatic zero regardless of other assignment sections (no partial credits), with the exception of contacting me beforehand.

## Deliverables

1. NimLastName.java, refer to the template
2. Pseudocode, Screenshots of Test runs, and Errors Encountered in one PDF file and name it LastName-FirstName-Report.pdf

Create a folder with these two files in it and name it LastName-FirstNamePA2, and compress the folder. Submit the zip file online. Name of the zip file should be LastName-FirstName-PA2.zip