CSC24400 Homework #1
Due: Thursday, 1/28/2021, 11:59PM

Consider a game involving three boxes, numbered 1 through 3. The game is played as follows:

1. The game-master first secretly (and randomly) places a prize in one of the three boxes, leaving the other two empty.

2. Then, the (only) contestant chooses one of the three boxes.

3. The game-master (who, of course, remembers which boxes were empty) then shows the contestant the (empty) contents of one empty box and removes that box from the game, Note that the game-master will *not* show the contestant the box that the contestant had chosen, even if it is empty.

4. At this point, the contestant can choose to keep their current box or switch to the only other remaining box.

Of course, at this point, the contestant opens the box they have. If the box contains a prize, they win; if the box is empty, they lose.

There is some controversy about this game. Some people claim that the contestant has a better chance of winning when they switch boxes after being shown an empty box. Others claim that the contestant has a 50% chance of winning after being shown an empty box, so it really does not matter whether they switch boxes or not … so the contestant might as well just keep the box they started with.

You are to write a C++ program that simulates repeated runs of this game to determine who is correct by displaying what the actual win percentages would be if each of the two strategies were to be followed. Your program should:

1. Prompt the user to enter a number of games to simulate. For each of those games:
    i. Place a prize into one of three boxes (randomly), leaving the other two boxes empty
    ii. Randomly choose a box for the contestant.
    iii. Have the game-master effectively remove one of the empty boxes (but not the one the contestant chose.)
    iv. If the contestant would win by switching boxes, adds 1 to a count of the number of times the contestant would win by switching boxes.
    v. If the contestant would win by keeping their original box, adds 1 to a count of the number of times the contestant would win by keeping their original box.
2. Prints out the number of times that each box (numbered 1 through 3) had a prize in it. Note that the sum of these three values should be the number of games simulated. Also, if the box with the prize in it is truly randomly chosen, the number of times each box was chosen should be roughly 1/3 of the total number of games simulated.
3. Prints out the percentage of games the contestant would have won by switching boxes.
4. Prints out the percentage of games the contestant would have won by keeping their original box.

Example Execution:

What follows is an example run of the program, with *input in italics* and `output in plain text:`

```
How many games do you want to simulate? 10000
Box #1 had the prize 3389 times.
Box #2 had the prize 3318 times.
Box #3 had the prize 3293 times.
88.66% of the time the player would have won without switching.
11.34% of the time the player would have won WITH switching.
```

Notes on the above:

- You should not attempt to make input appear in italics when running your program. It is only being shown this way here to indicate what parts are program output and what parts are user input to the program.
- The 88.6% and 11.34% are highly unlikely output, as they do not represent the expected percentage of wins that would come from the actual correct probability if winning the game for each option.

The following is another run of the program, again with highly unlikely output for the final percentages:

```
How many games do you want to simulate? 10000
Box #1 had the prize 3347 times.
Box #2 had the prize 3271 times.
Box #3 had the prize 3382 times.
1.11% of the time the player would have won without switching.
98.89% of the time the player would have won WITH switching.
```

What to submit:

You should submit a zip, tar, or tgz archive file to Canvas. This archive file should contain:

- all of your source code
- a file called read.me that contains:
  - your name
  - the date
  - the platform you developed your code on (Windows, Linux, ...)
  - any special steps needed to compile your project
  - any bugs your program has
  - a brief summary of how you approached the problem. You might also want to consider adding things like a “software engineering log” or anything else you utilized while completing the project.
  - ===> ***An answer to the question of whether or not the contestant would have better odds of winning if they switch boxes when given the opportunity to do so.***

NOTE: Unlike all other homework assignments this semester, you are ***NOT*** to hand-write your solution to this problem. *Remember, all submitted work must be of your own authorship!*