Practice Exercise #31: Hourglass

http://www.comp.nus.edu.sg/~cs1010/4_misc/practice.html

Reference: Week 8

Date of release: 6 October 2014

Objectives: Function with pointer parameters, problem solving.

Task statement:

Write a program **hourglass.c** to read in 3 positive integers: a and b which are durations of two hourglasses, and c which is the duration you want to measure. All values are in minutes. The program then determines if you can measure c exactly using the hourglasses, and if so, the **number of times** you need to flip the two hourglasses such that the total number of flips is the **minimum**.

You may assume that $a < b < c$, and that you can only use one hourglass at a time, as the desk is too small to accommodate two hourglasses at the same time.

For example, if you have 4-minute and 7-minute hourglasses, and you want to measure 28 minutes, you need only flip the 7-minute hourglass 4 times. If you want to measure 29 minutes, the solution is to flip the 4-minute hourglass twice and the 7-minute hourglass thrice, giving a total of 5 flips. If you want to measure 9 minutes, then it is impossible to solve.

As another example, if you have 6-minute and 9-minute hourglasses, and you want to measure 42 minutes. There are two ways: flip the 6-minute hourglass once and the 9-minute hourglass four times, hence a total of 5 flips; or flip the 6-minute hourglass four times and the 9-minute hourglass twice, hence a total of 6 flips. The first solution is better as it gives the minimum total number of flips.

Your program should include a function **int compute_flips(int, int, int, int *, int *)**. It returns 1 (true) if it is possible to measure the given duration c, or 0 (false) if impossible. The first 3 parameters are a, b, and c. The function passes back the number of flips for the two hourglasses through the last two parameters, if it is possible to measure. (If it is not possible to measure, then the values in these last two parameters are immaterial.)

(The above description uses symbols such as a, b, and c. In your program, you should use more descriptive variable names.)

Sample runs:

```
Enter 3 inputs: 4 7 29
Possible!
2 flip(s) for 4-minute hourglass and 3 flip(s) for
7-minute hourglass.
```

```
Enter 3 inputs: 4 7 9
Impossible!
```

```
Enter 3 inputs: 6 9 42
Possible!
1 flip(s) for 6-minute hourglass and 4 flip(s) for
9-minute hourglass.
```