Willy Husted

4/2/13

Changemaker

1. **Problem Statement**:

 **Overview**

* For this assignment you will develop a Java program that solves the *general* problem of making change, namely:

Make program *Changemaker* which inputs an arbitrary amount of money (expressed as a non-negative, whole number of cents), followed by a sequence of coin denominations (distinct positive integers), which outputs the optimal way of making change for the given amount **or** the message **IMPOSSIBLE**, whichever is appropriate.

* Some examples:
  + *java Changemaker 3* should output **INSUFFICIENT DATA**
  + *java Changemaker -4 3 12* should output **IMPROPER AMOUNT**
  + *java Changemaker 63 0 12 3* should output **IMPROPER DENOMINATION**
  + *java Changemaker 63 10 12 3 12* should output **DUPLICATED DENOMINATION**
  + *java Changemaker 14 8 13 4 9* should output **IMPOSSIBLE**
  + *java Changemaker 14 3 1 9 8* should output **3 COINS: 2 x 3 cent, 0 x 1 cent, 0 x 9 cent, 1 x 8 cent**

2. **Major design and implementation issues**:

The Tuple class was where I spent a lot of my time and energy because creating working and useful methods in the Tuple class was the crux of this problem. For example, I made a couple additional methods besides the required ones (such as usefulAdd) to make the logic of the two-dimensional array a little easier for me.

One thing I would change if I were to do this problem again is not make Tuples two-dimensional arrays but rather one-dimensional with just the number of coins and not the denominations as well. Although it didn’t get in the way, it was just more work to do.

3. **Problems**:

One deviation from the specification is how the final string of optimal coins is displayed. I call my toString method to print out the optimal combination. Another issue is that bad input such as letters instead of numbers is not handled. Large numbers that can’t be parsed as integers also break the program.