Hamilton's Apportionment Algorithm

The Hamilton's Apportionment Algorithm is explained using an example where there are only 5 states and 25 representatives. However, the algorithm applies to any number of states for any number of representatives.
Let's assume we have the following 5 states with the listed population:

Name	Population
Delaware	989948
Maryland	6177224
Pennsylvania	13002700
Virginia	8631393
West Virginia	1793716

First, we calculate the **total population** by getting the sum of every state. In this example, the total population is 30594981.
Second, we calculate the **average population per representative**, which is the **total population** divided by the **number of representatives** (in this case 25). This gives us, approximately, 1223799

Third, we divide each state's population by the **average population per representative,** and then round down. This gives us a minimum number of representatives for each state, and a remainder (that is, what comes after the decimal place).

Name	Population	Divide	Floor	Remain
Delaware	989948	0.81	0	0.81
Maryland	6177224	5.05	5	0.05
Pennsylvania	13002700	10.62	10	0.62
Virginia	8631393	7.05	7	0.05
West Virginia	1793716	1.47	1	0.47

From this, we can see that so far, we have given 10 representatives to Pennsylvania, 7 to Virginia, 5 to Maryland, 1 to West Virginia, and 0 to Delaware (in this version of Hamilton's algorithm, it is possible for a state to have 0 representatives). This means of the **25 total representatives**, we have only allocated 23 (10+7+5+1+0), meaning we have 2 representatives left over. These left-over representatives are allocated to the states with the **largest remainder first.** This means, in our above example, the two states with the largest remainders (Delaware at 0.81 and Pennsylvania at 0.62) **each get 1 additional representative.** Maryland, Virginia, and West Virginia do not get any additional representatives.

If this were our input population file, our program would print as output:

```
Delaware 1
Maryland 5
Pennsylvania 11
Virginia 7
West Virginia 1
```