Exam 4 Review

April 15, 2018

Problem 1 - What is the first step that you must do on any apportionment problem?

Problem 2 - Suppose between three countries, call them A, B, and C, that we have 9 seats in an international legislature to apportion. Country A has a population of 235000, Country B has a population of 185000, and Country C has a population of 80000. Given this data, give a valid apportionment of the legislature seats for the countries using the Hamilton method.

Problem 3 - What kind of event would we call an example of the Alabama Paradox? *Hint: Page 234, and Examples 1 and 2 in section 4.4 may help you.*

Problem 4 - What kind of event would we call an example of the Population Paradox? *Hint: Page 235 and Examples 1 and 3 in section 4.4 may help you.*

Note - These last 3 problems are all going to use divisor methods. To fully answer these questions, you must product a valid divisor (show me what number you picked) and use the divisor to give a valid apportionment (finish the problem).

Problem 5 - Suppose now in Country A there are four districts, Blue, Green, Yellow, and Red. Country A has enough funding to support 35 schools, based on the number of teachers in each district. If district Blue has 339 teachers, district Green has 230, district Yellow has 190, and district red has 116, how many schools will each district get? Use the Jefferson Method to determine a valid apportionment of schools.

Problem 6 - Repeat the above problem using the Webster method instead.

Problem 7 - What is the formula for the average constituency of a state? *Hint: Page 263 in your book may help.*

Problem 8 - Give the average constituency of each district in problem 5. Give the absolute and relative unfairness between the districts Red and Blue.

Informative Aside - Okay, here we've reached the part of the review where you will do the Huntington Hill method. It may seem strange at first, but it is actually very similar to the Jefferson and Webster methods.

Recall that the Jefferson and Webster methods really only differ in how we round the standard quotas. Jefferson rounds down, always, while Webster rounds 'naturally' or at least how we've all been taught to round. The Huntington Hill method is also only different from these two methods in that the only thing that changes is that you have to round differently.

In Huntington Hill, each Standard Quota you obtain will be rounded differently. Let's see an example. Say that you obtain a standard quota of 13.45 while using the HH method. Well, to decide if you should round up or down you have to calculate what is called the Huntington Hill cutoff. So, we calculate $\sqrt{13 * 14} = \sqrt{182} = 13.49$. This number means that if your standard quota is above 13.49, you round up. If it is below, you round down. In our example of 13.45, we would note that $13.45 < 13.49$ and round down to 13.

Not too terrible right? After all, it's only about 1 more calculation than the Jefferson and Webster method. The other difficulty comes up when your standard quotas do not produce a valid apportionment and you need to find a new divisor. Recall that when this happens, we set up a bunch of inequalities to find a new divisor based on if we need to increase or decrease seats.

With the HH method, you will want to set up your inequalities based on the Hunting Hill Cutoff that you calculate while determining how to round your standard quotas. Hope this helps.

Problem 9 - Let's say you have 3 very small city states (think almost Rhode Island-esque) and call them A, B, and C. There are 9 Representative seats available total. State A has a population of 621, B has a population of 255, and C has a population of 771. Use the Huntington Hill method to produce a valid apportionment.