**MATHEMATICAL**

**THEORY OF ELECTIONS**

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INTRODUCTION

Jefferson’s method was the first method used to apportion the seats in the U.S. House of Representatives in 1792. It was used through 1832. That year, New York had a standard quota of 38.59 but was granted 40 seats by Jefferson’s method. At that time, John Quincy Adams, and Daniel Webster each proposed new apportionment methods, but the proposals were defeated, and Jefferson’s method was still used. Webster’s method was later chosen to be used in 1842 but Adams’s method was never used. Webster’s method and Hamilton’s method often give the same result. For many of the years between 1852 and 1901, Congress used a few seats for the House that would result in the same apportionment by either Webster’s or Hamilton’s methods. After Hamilton’s method was finally scrapped in 1901, Webster’s method was used in 1901, 1911, and 1931. There were irregularities in the process in 1872 and just after the 1920 census. In 1941, the House size was fixed at 435 seats and the Huntington-Hill method became the permanent method of apportionment.

Jefferson’s, Adams’s, and Webster’s methods are all based on the idea of finding a divisor that will apportion all the seats under the appropriate rounding rule. There should be no seats left over after the number of seats are rounded off. For this to happen we must adjust the standard divisor either up or down. The difference between the three methods is the rule for rounding off the quotas. Jefferson’s method rounds the quotas down to their lower quotas, Adams’ method rounds the quotas up to their upper quotas, and Webster’s method rounds the quotas either up or down following the usual rounding rule.

Jefferson’s Method

Jefferson’s method divides all populations by a modified divisor and then rounds the results down to the lower quota. Sometimes the total number of seats will be too large and other times it will be too small. We keep guessing modified divisors until the method assigns the correct total number of seats. Dividing by a larger modified divisor will make each quota smaller so the sum of the lower quotas will be smaller. It is easy to remember which way to go. If the sum is too large, make the divisor larger. If the sum is too small, make the divisor smaller. All the quotas are rounded down so using the standard divisor will give a sum that is too small. Our guess for the first modified divisor should be a number smaller than the standard divisor.

Summary of Jefferson’s Method:

1. Find the standard divisor,  .
2. Pick a modified divisor, d, that is slightly less than the standard divisor.
3. Divide each state’s population by the modified divisor to get its modified quota.
4. Round each modified quota down to its lower quota.
5. Find the sum of the lower quotas.

If the sum is the same as the number of seats to be apportioned, you are done. If the sum is too large, pick a new modified divisor that is larger than d. If the sum is too small, pick a newly modified divisor that is smaller than d. Repeat steps three through six until the correct number of seats are apportioned.