 Name _____

12B,C: Apportionment and Voting Power

Class Prep Assignment Due at the beginning of next class

12C: Apportionment

Apportionment is the problem of dividing up a fixed number of people or items among groups of different sizes. For example, we use apportionment to determine the number of representatives for each state in the US House of Representatives, or to divide school busses among districts.

Rules of Apportionment

1. The people/items can only be divided into _____.

2. We must use the _____of people/items being divided.

3. Each group must get _____ of the people/items being divided up.

4. The number of people/items assigned to each group should be _____ to the size of the group. (Exact is rarely possible so get as close as possible).

Apportionment Methods and Steps

1. Find the divisor: The number of people each person should represent (decimal)

2. Divide the population by the divisor to get the standard quota.

Hamilton's Method (vetoed in 1792, used from 1850-1900): Cut off decimal to find initial or minimum number. Then give any extra seats in order of the highest decimal remainders

Jefferson's Method (used from 1792-1830): Cut off the decimal to find the initial or minimum number. Lower the divisor so that there are no leftover seats

Webster's Method (used in 1840): Instead of cutting off the decimal, round it to find the initial or minimum number. Then lower the divisor if needed so there are no leftover seats.

Hill-Huntington Method (used 1941-present): Instead of rounding using 0.5 or higher, use the geometric mean $\sqrt{x(x+1)}$ to round the initial or minimum number.

Part of U.S. history is the 3/5 compromise between the North and the South in 1787, in which slaves were counted as 3/5 of a person for representation. When the slaves were freed in 1863 they were counted as whole people. Black men were given the right to vote in 1870, and all women in 1920. http://www.aaregistry.org/historic_events/view/three-fifths-compromise

Example 1. PCC has four campuses and 45 full-time math instructors. The number of students at each campus is given in terms of full-time equivalency (FTE). How can we divide up the math instructors fairly?

2016-17 Academic Year Data: https://www.pcc.edu/ir/factsheet/Factbook/201617/swr5yrt2012-2016.pdf

a. Use Hamilton's method to apportion the math instructors.

Campus	Students (FTE)	Standard Quota	Initial or Minimum	Final
Sylvania	8871			
Cascade	4841			
Rock Creek	6797			
Southeast	2722			
Total				
Divisor:				

b. Use Jefferson's method to apportion the math instructors.

Campus	Students (FTE)	Standard Quota
Sylvania	8871	
Cascade	4841	
Rock Creek	6797	
Southeast	2722	
Total	**23,231**	
Divisor:		

c. Use Webster's method to apportion the math instructors.

Campus	Students (FTE)	Standard Quota
Sylvania	8871	
Cascade	4841	
Rock Creek	6797	
Southeast	2722	
Total	**23,231**	
Divisor:		

d. Use Hill-Huntington's method to apportion the math instructors.

Campus	Students (FTE)	Standard Quota
Sylvania	8871	
Cascade	4841	
Rock Creek	6797	
Southeast	2722	
Total	**23,231**	
Divisor:		

12B: Voting Power

Example 2. Let's look at the actual number of full-time math instructors per campus and compare the voting power of each campus. Decisions about math curriculum and textbooks are made in a democratic process. Note, there are also many talented part-time faculty that vote as well, so this is an oversimplified example.

Campus	Students (FTE)	FT Math Instructors	Students (FTE) per FT math instructor
Sylvania	8871	18	
Cascade	4841	8	
Rock Creek	6797	13	
Southeast	2722	6	
Total	**23,231**	**45**	