

D3-D4: Apportionment, Gerrymandering and the Efficiency Gap

Group Activity**D3: Apportionment**

It's very important to acknowledge that when Hamilton, Jefferson and others were making the rules for apportionment, black people were owned and enslaved in the United States. The 3/5 rule counted the black population as only 3/5 of the white population. This is often omitted from textbooks, but we need to remember why we still have racism and systemic inequality now and continue to make our systems fair for everyone.

1. A college offers tutoring in Math, English, Chemistry, and Biology. The number of students enrolled in each subject is listed below. If the college can only afford to hire 15 tutors, determine how many tutors should be assigned to each subject. Examples adapted from David Lippman, <http://www.opentextbookstore.com/mathinsociety/index.html>

a. Hamilton's Method

<u>Subject</u>	<u>Students</u>	<u>Standard Quota</u>
Math	330	
English	265	
Chemistry	130	
Biology	70	
Total		
Divisor		

b. Jefferson's Method

<u>Subject</u>	<u>Students</u>	<u>Standard Quota</u>
Math	330	
English	265	
Chemistry	130	
Biology	70	
Total		
Divisor		

c. Webster's Method

<u>Subject</u>	<u>Students</u>	<u>Standard Quota</u>
Math	330	
English	265	
Chemistry	130	
Biology	70	
Total		
Divisor		

d. Hill-Huntington Method

<u>Subject</u>	<u>Students</u>	<u>Standard Quota</u>
Math	330	
English	265	
Chemistry	130	
Biology	70	
Total		
Divisor		

Quota Rule

The Quota Rule says that the final number of representatives a state gets should be within one of that state's quota. Since we're dealing with whole numbers for our final answers, that means that each state should either go up to the next whole number above its quota, or down to the next whole number below its quota.

Do any of our examples violate the quota rule?

D4 Gerrymandering and Solutions

Azavea, a data analytics organization, has calculated the efficiency gap for all 50 states. We will first look at the infographics together.

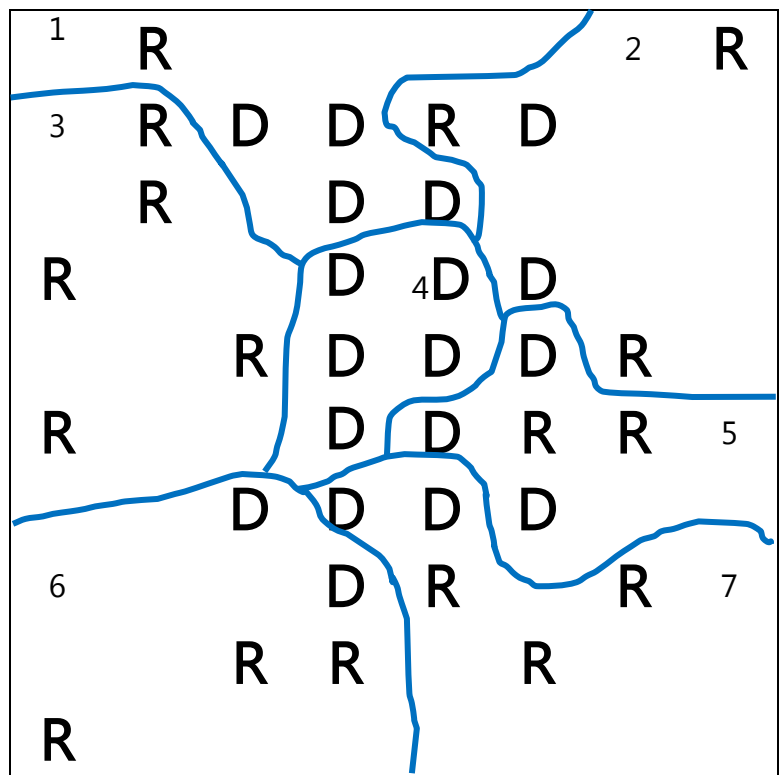
<https://www.azavea.com/blog/2017/07/19/gerrymandered-states-ranked-efficiency-gap-seat-advantage/>

2. a. You have just been hired as consultants to your state legislature in the re-districting of the state. To assess the current map below, tally the voters and calculate the efficiency gap.

Election Results:	District	D Votes	R Votes	D Surplus or Wasted Votes	R Surplus or Wasted Votes
Democrats win	1				
_____ seats	2				
	3				
	4				
Republicans win	5				
_____ seats	6				
	7				
	Total				

Efficiency Gap

$$\frac{\text{Party A Wasted Votes} - \text{Party B Wasted Votes}}{\text{Total Votes}}$$



b. Calculate the percentage of voters that each seat represents.

c. Compare the efficiency gap with the percentage for each seat. Is the efficiency gap worth less than one seat or more than one? How many seats?

d. Is this a fair map? Why or why not?

3. Now it is time for re-districting and you get to draw the lines. There are three rules:

Rules

1. All legislative districts must contain the same number of people.
2. Districts must not be drawn according to race or ethnicity.
3. District must be contiguous – no split districts allowed

a. Use packing and cracking to win as many seats as possible for the **Democrats** and calculate the efficiency gap.

Election Results:	District	D Votes	R Votes	D Surplus or Wasted Votes	R Surplus or Wasted Votes
Democrats win	1				
_____ seats	2				
	3				
Republicans win	4				
_____ seats	5				
	6				
	7				
	Total				

Efficiency Gap

$$\frac{\text{Party A Wasted Votes} - \text{Party B Wasted Votes}}{\text{Total Votes}}$$

	R					R
	R	D	D	R	D	
	R		D	D		
R			D	D	D	
		R	D	D	D	R
R			D	D	R	R
		D	D	D	D	
			D	R		R
		R	R		R	
R						

b. Use packing and cracking to win as many seats as possible for the Republicans and calculate the efficiency gap.

Election Results:	District	D Votes	R Votes	D Surplus or Wasted Votes	R Surplus or Wasted Votes
Democrats win	1				
_____ seats	2				
	3				
	4				
Republicans win	5				
_____ seats	6				
	7				
	Total				

Efficiency Gap

$$\frac{\text{Party A Wasted Votes} - \text{Party B Wasted Votes}}{\text{Total Votes}}$$

	R					R
	R	D	D	R	D	
	R		D	D		
R			D	D	D	
		R	D	D	D	R
R			D	D	R	R
		D	D	D	D	
			D	R		R
		R	R		R	
R						

More Practice

4. A small country consists of three states, whose populations are listed below.

A: 6,000 B: 6,000 C: 2,000

- If the legislature has 10 seats, use Hamilton's method to apportion the seats.
- If the legislature grows to 11 seats, use Hamilton's method to apportion the seats
- Does the new apportionment seem fair? Why or why not?

<u>State</u>	<u>Population</u>	<u>Standard Quota</u>
A	6,000	
B	6,000	
C	2,000	
Total		
Divisor		

5. Repeat the previous problem using Jefferson's method. A small country consists of three states, whose populations are listed below.

A: 6,000 B: 6,000 C: 2,000

- If the legislature has 10 seats, use Jefferson's method to apportion the seats. What happens?
- If the legislature grows to 11 seats, use Jefferson's method to apportion the seats
- Does the new apportionment seem fair? Why or why not?

<u>State</u>	<u>Population</u>	<u>Standard Quota</u>
A	6,000	
B	6,000	
C	2,000	
Total		
Divisor		

6. A small country consists of six states, whose populations are listed below. If the legislature has 200 seats, apportion the seats using each method.

A: 3,411 B: 2,421 C: 11,586 D: 4,494 E: 3,126 F: 4,962

a. Hamilton's Method

<u>State</u>	<u>Population</u>	<u>Standard Quota</u>
A	3,411	
B	2,421	
C	11,586	
D	4,494	
E	3,126	
F	4,962	
Total		
Divisor		

b. Jefferson's Method

<u>State</u>	<u>Population</u>	<u>Standard Quota</u>
A	3,411	
B	2,421	
C	11,586	
D	4,494	
E	3,126	
F	4,962	
Total		
Divisor		

You can try the other 2 methods if you like and I will post the solutions.