**12C,D: Apportionment and Gerrymandering**

Group Activities

**12C Apportionment**

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

Subject Students Standard Quota

Math 330

English 265

Chemistry 130

Biology 70

Total

Divisor

b. Jefferson’s Method

Subject Students Standard Quota

Math 330

English 265

Chemistry 130

Biology 70

Total

Divisor

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

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

* 1. If the legislature has 10 seats, use Hamilton’s method to apportion the seats.
	2. If the legislature grows to 11 seats, use Hamilton’s method to apportion the seats
	3. Does the new apportionment seem fair? Why or why not?

State Population Standard Quota

A 6,000

B 6,000

C 2,000

Total

Divisor

3. Repeat problem 2 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

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

State Population Standard Quota

A 6,000

B 6,000

C 2,000

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?

**12D Gerrymandering and Solutions**

Group Activities

1. 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. 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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **District** | **D Votes** | **R Votes** | **D Surplus or Wasted Votes** | **R Surplus or Wasted Votes** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| **Total** |  |  |  |  |

**Election Results:**

Democrats win

\_\_\_\_\_\_\_\_\_\_ seats

Republicans win

\_\_\_\_\_\_\_\_\_\_ seats

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | **R** |  |  |  |  | 2 | **R** |
| 3 | **R** | **D** | **D** | **R** | **D** |  |  |
|  | **R** |  | **D** | **D** |  |  |  |
| **R** |  |  | **D** | 4**D** | **D** |  |  |
|  |  | **R** | **D** | **D** | **D** | **R** |  |
| **R** |  |  | **D** | **D** | **R** | **R** | 5 |
|  |  | **D** | **D** | **D** | **D** |  |  |
| 6 |  |  | **D** | **R** |  | **R** | 7 |
|  |  | **R** | **R** |  | **R** |  |  |
| **R** |  |  |  |  |  |  |  |

**Efficiency Gap**

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

4. 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?

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

6. 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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **District** | **D Votes** | **R Votes** | **D Surplus or Wasted Votes** | **R Surplus or Wasted Votes** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| **Total** |  |  |  |  |

**Election Results:**

Democrats win

\_\_\_\_\_\_\_\_\_\_ seats

Republicans win

\_\_\_\_\_\_\_\_\_\_ seats

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **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** |  |  |  |  |  |  |  |

**Efficiency Gap**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **District** | **D Votes** | **R Votes** | **D Surplus or Wasted Votes** | **R Surplus or Wasted Votes** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| **Total** |  |  |  |  |

**Election Results:**

Democrats win

\_\_\_\_\_\_\_\_\_\_ seats

Republicans win

\_\_\_\_\_\_\_\_\_\_ seats

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **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** |  |  |  |  |  |  |  |

**Efficiency Gap**

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