Introduction to Gerrymandering

OPENING QUESTION

Suppose a state has thirty seats in Congress and there are exactly two parties, Party A and Party B. If Party A wins 70 percent of the popular vote and Party B wins 30 percent of the popular vote, what number of seats should Party A win if the election is fair? What number of seats should Party B win?

1. **Fifty-Fifty State**

    a. Consider the state depicted to the right, where voters vote for either Party A (◯) or Party B (♦). What percentage of congressional seats should go to Party A and Party B? Explain your reasoning.

    b. Suppose our state gets to elect twelve congressional representatives (as New Jersey does). We divide our state into four districts (the regions enclosed by bold lines) as follows:

        i. How many districts are won by Party A? Party B?

State 1

        ii. What percentage of districts is won by each party?

District Plan 1A

        iii. How many of the twelve seats are won by each party?

c. Suppose we use a new districting plan, Plan 1B. In what ways does this plan look fair? In what ways is it unfair?

District Plan 1B

_____

_____

_____

d. Suppose we are considering two new districting plans, Plans 1C and 1D below. Is either plan fair? Which plan is less fair? Explain your reasoning (include numerical evidence).

District Plan 1C

District Plan 1D

2. A More Skewed State

Consider State 2, pictured to the right. Assume this state also sends twelve representatives to Congress.

    a. What percentage of voters does each party get?

Party A: _____   Party B: _____

    b. What number of seats should each party get, in a fair system?

Party A: _____   Party B: _____

State 2

    c. Draw as fair a district map as you can. Use the maps below to try different alternatives and then circle the district map that is most fair. Quantify how fair your district map is using a numerical quantity of your own choosing (number of seats won by party, average area of district, population range of districts, etc.).

3. Equally (?) Skewed

Consider State 3, pictured to the right. Assume this state also sends twelve representatives to Congress.

    a. In what other ways is State 3 similar to State 2?

    b. In what way(s) is State 3 different from State 2?

State 3

    c. Draw a district map as fairly as you can. Use the maps below to try different alternatives and then circle the district map that is most fair. Quantify how fair your district map is using a numerical quantity of your own choosing (number of seats won by party, average area of district, population range of districts, etc.).

4. The Definition of Contiguous—An Interlude

In the United States, it is customary to make congressional districts *contiguous* or *connected*. For example, the district map below would be opposed:
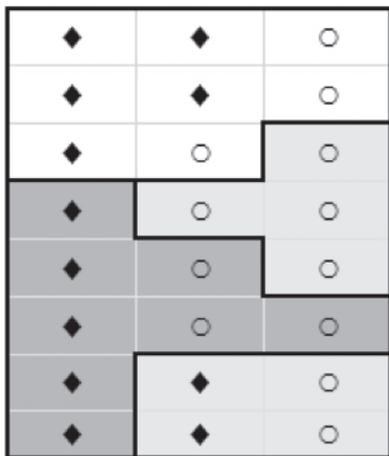
District Plan 4A

In this district map, there are three districts (white, light grey, dark grey) of equal size. However, the light grey district is not contiguous, so the map would be opposed.

For contrast, the district map below has four districts that are all contiguous. (You may also notice features such as unequal population sizes, a desirable average district area of six square units, etc.)
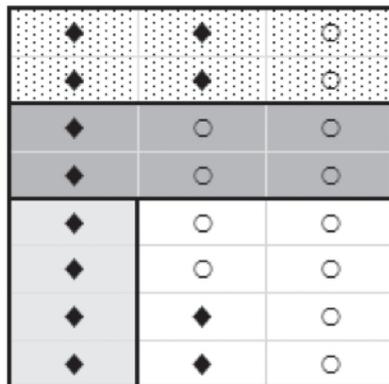
District Plan 4B

Given what you now know, write a definition of **contiguous** that does not include the words *connected*, *adjacent*, or *broken up* (or related synonyms).

_____

_____

_____

5. Change of Plan: Gerrymander—Party A

a. Now suppose you'd like to make a district map of State 3 that is as unfair as possible, in favor of Party A. Your constraint is that your districts must be connected (contiguous). How would you district it? *Circle your most unfair district map.*

District Plan 5A

District Plan 5B

b. Now make a district map as unfair as possible, in favor of Party A, but use disconnected (noncontiguous) districts. *Circle your most unfair district map.*

District Plan 5C

District Plan 5D

c. In reality, most people oppose using disconnected districts. What are some reasons that they might think this way?

_____

_____

_____

6. **Gerrymander—Party B**

   a. Now suppose you'd like to make a district map of State 3 that is as unfair as possible, in favor of Party B. Your constraint is that your districts must be connected (contiguous). How would you district it? *Circle your most unfair district map.*

   District Plan 6A

   District Plan 6B

   b. Now make a district map as unfair as possible, in favor of Party B, but use disconnected (noncontiguous) districts. *Circle your most unfair district map.*

   District Plan 6C

   District Plan 6D

7. Compactness

Another concept people use to evaluate how fairly a state is districted is the idea of **compactness**.

Using your intuition, reasoning, and existing vocabulary, make your best guess as to what the following statement might mean.

District G is more compact than District E

_____

_____

_____

Whereas mathematicians use very precise definitions about terms they use, the popular discussion of compactness does not include a precise definition yet. To get a sense of what the term connotes, please use the following casual definition and complete the example.

Definition: I can call District G compact if the smallest circle that can cover my district isn't unreasonably large (in terms of radius).

Example: Assume each square in the district map below has an area of one square mile. The districts have been numbered for your convenience. Now pretend you are placing a disk (like a quarter or a dime) on the map in order to fully cover a district.
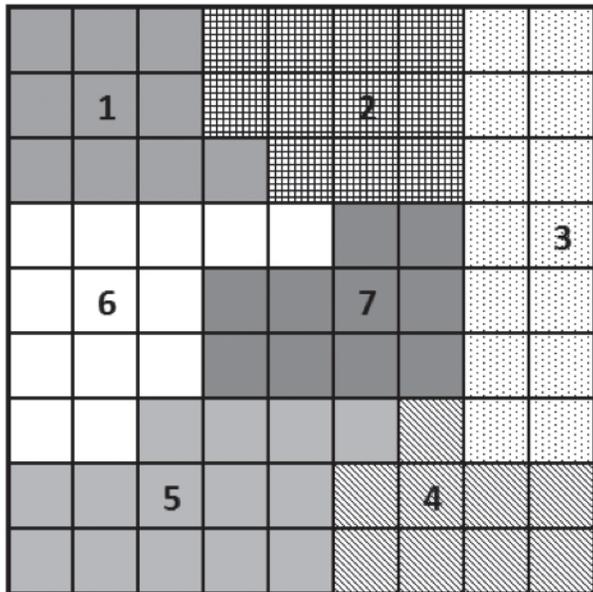
District Map W

a. What is the radius of the smallest circle that could fully cover District 1? District 3? District 7?

b. Arrange Districts 1, 3, and 7 in order from least compact to most compact. Explain your reasoning. Based on what criteria are you making your judgment?

_____

_____

_____

c. What is the radius of the circle that has an area equal to that of District 3?

d. By what percentage is the radius you gave in (a) larger than the radius you gave in (c)? Does this seem reasonable or unreasonable to you? Why? (Note: Assume your standard for reasonableness is perfectly reasonable for this question; you do not have to justify, just explain.)

_____

_____

_____

8. Number of Districts—Is More Better?

Go back to Question 3 and your most fair district map of State 3. Reproduce it below.

a. Now redistrict your map to have one less district but to be as fair as possible. *Circle your fairest.*

8A　　　　　　　　　　8B　　　　　　　　　　8C

b. What is the drop/gain in fairness because of losing one district?

c. Agree or disagree with the following statement and explain your reasoning:

It is better to have more districts.

_____

_____

_____