To: Interested persons in Virginia

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This memo documents how to calculate the individual and final letter grades that the Princeton Gerrymandering Project's Redistricting Report Card would issue for a given plan in Virginia. These report cards have been cited favorably by both political parties across the nation. For implementations in Virginia, see gerrymander.princeton.edu for the redistricting commission's publicly released maps.

To use this memo, we assume that you are normally skilled in the ability to estimate district-level parameters: shape parameters, partisan tendency, and racial composition. We describe PGP's metrics for fairness and performance levels, and describe how to use those thresholds to calculate letter grades. Letter grades, while a simplification, can be used for rapid communication to nontechnical audiences.

For best results and the most meaningful grades, we highly recommend that you use the chamber-specific Python script with your hypothetical Virginia plan as input. The script aggregates this plan with a PGP-provided precinct shapefile and PGP chamber-specific precinct-level voting estimates, both of which are freely available on Github at https://github.com/PrincetonUniversity/PGP-Virginia-2021. The output is a JSON-format file which contains a variety of numeric scores.

It is also possible to score districts using your own evaluation tools (*e.g.* Maptitude or Dave's Redistricting). However, note that results may sometimes come out differently because of differences in precinct-level inputs.[1] For example, the commission's state Senate map A5 gives 21 Democratic-leaning seats using PGP estimates, but 23 Democratic seats using Dave's Redistricting App composite election estimates. In this case, the likely reason is that three Republican-leaning districts have margins smaller than 2 percentage points.

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[1] This is a significant caveat because of both spatial differences and election-to-election swings in Virginia. PGP's partisan-performance estimates are calculated by averaging precinct-level returns for three races: President 2016 (52.8% Democratic of the two-party vote share), Governor 2017 (54.5% Democratic), and Senate 2018 (58.2% Democratic). The average two-party vote share for these races is 55.2% Democratic, 44.8% Republican. As a comparison, Dave's Redistricting App composite 2012-2020 election average has a statewide estimate of 54.0% Democratic, 44.0% Republican, 2.0% other. As another comparison, the two-party vote shares in the recent governor's race are 49.0% Democratic, 51.0% Republican in the most recent tabulation.

Numeric scores (either in the JSON file or your own estimates) can be compared to these thresholds. Grading thresholds were generated by making comparisons to millions of computer simulated maps (an "ensemble") as well as maps drawn by a corps of experienced community mappers.

Note that this report-card approach does not include racial fairness, an area sufficiently complex that PGP has not established a grading scale. PGP's approach has been to calculate and display potential ability-to-elect districts as districts that are 30-40%, 40-50%, or >50% Black Voting Age Population (BVAP), Hispanic (HVAP), Asian (AVAP), or total minority (MVAP, defining a potential coalition district). Example racial-minority metrics for Commission maps can be seen at gerrymander.princeton.edu.

Competitiveness:

The "ActualCompetitive" entry gives the estimated number of competitive districts, defined as districts whose difference between Democratic and Republican vote share is less than 7 percentage points. The grade is determined using the following table.

ActualCompetitive	"A"	"B"	"C"	"F"
Congress	4 or more	3	1 to 2	0
State Senate	10 or more	8 to 9	4 to 7	0 to 3
House of Delegates	19 or more	15 to 18	9 to 14	0 to 8

Partisan Fairness:

The "DemWins" entry gives the estimated most-likely number of Democratic wins, defined as all districts where the Democratic candidate would be favored by any margin. The starting grade is determined using the following table.

DemWins	"A"	"B"	"C"	"F"
Congress	7-8	N/A	6	0-5, 9-11
State Senate	24-26	23, 27-28	N/A	0-22, 29-40
House of Delegates	59-62	56-58, 63-72	N/A	0-55, 73-100

Next, modify the grade based on the Competitiveness score. If Competitiveness received an "F", bump down the partisan fairness grade by one letter grade (*e.g.* "B" becomes "C"). If Competitiveness received an "A", bump up the partisan fairness grade by one letter grade (*e.g.* "B" becomes "A"). Other Competitiveness grades do not affect this grade.

Geography:

The Geography grade uses both geometric compactness and county splits. The "avgReock" entry is the average Reock score, a measure of geometric compactness. The starting grade is determined using the following table.

avgReock	"A"	"C"	"F"
Congress	≥ 0.4184	0.3241 ≤ avgReock < 0.4184	< 0.3241
State Senate	≥ 0.4370	0.3622 ≤ avgReock < 0.4370	< 0.3622
House of Delegates	≥ 0.4309	0.4018 ≤ avgReock < 0.4309	< 0.4018

Using the "countySplits" entry to grade county splits[2], the grade is determined using the following table.

countySplits	"A"	"C"	"F"
Congress	≤ 5	6 to 16	> 16
State Senate	≤ 16	17 to 46	> 46
House of Delegates	≤ 42	43 to 80	> 80

Finally, to determine the Geography Overall Grade:

"A": if both county splits and compactness received an "A"
"B": if one of county splits and compactness received an "A" and the other a "C"
"F": if both county splits and compactness received an "F"
"C": otherwise

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[2] In our Python script, a county split is defined as a county that is divided between at least two districts. This definition does not give special treatment to combinations of splits within a county.

Final Letter Grade:

Take the partisan fairness grade (which incorporates any changes due to competitiveness as described above). This is the final letter grade unless the overall geography grade is an "F", in which case the final letter grade is bumped down by one letter grade.