

# Quiz 2A, Math of Democracy

Fall 2018, Dr. Adam Graham-Squire

Name: \_\_\_\_\_

Below is a list of pairs of voting methods and fairness criteria. You should choose 3 out of the 4 pairs to answer (you can also answer all 4 and I will grade all four and give you your highest 3 scores). For each pair you answer, you need to decide if the voting method *satisfies* or *violates* the given voting criterion, and then support your conclusion in whatever way is appropriate.

- Borda Count method and the Monotonicity Criterion
- Top-two Runoff method and the Independence of Irrelevant Alternatives Criterion
- Instant Runoff method and the Majority Criterion
- Plurality method and the Clone-proof Criterion



## Description of Methods:

- Plurality: the candidate with the highest number of first-place votes wins the election
- Top-two runoff: Eliminate all candidates *except* the two candidates with the most first-place votes. Whoever wins a head-to-head between the top two candidates is the winner of the election.
- Pairwise Comparison: Each candidate does a head-to-head contest against each other candidate. Winning a head-to-head gives a candidate 1 point. Whoever has the most points wins the election.
- Borda Count: Each candidate receives points (in descending order) based on their ranking, for example: 2 points for a first-place vote, 1 point for a second-place vote, and no points for a 3rd-place vote. All the points are totaled and whoever has the most points wins the election.
- Instant Runoff: If no candidate has a majority of first-place votes, the candidate with the fewest first-place votes is eliminated and then there is another round of voting. Rounds continue with candidates being eliminated until one candidate has a majority of the first-place votes.

## Description of Fairness Criteria:

- Majority Criterion: If a candidate wins a majority of the first-place votes, then that candidate should win the election.
- (upward) Monotonicity Criterion: If you raise a candidate's ranking on some ballots, that should never hurt the candidate (in particular, it should never make the candidate LOSE an election that they otherwise would have won).
- Independence of Irrelevant Alternatives Criterion: Removing a losing candidate from the ballot should never change the winner of an election.
- No-show Criterion: It should never benefit a voter (or group of voters) to NOT cast their ballot.
- Clone-proof Criterion: It should never hurt a candidate to have other *similar* candidates also in the race with them (that is, you should not allow similar candidates to split their vote and end up hurting their chance of winning).