



VOTING METHODS

Majority – receiving more than half of the first place votes

Plurality Method – receiving the most first place votes

Plurality with Elimination – Check first place votes for a majority. If candidate has a majority, then declared winner. If not, eliminate the candidate with the fewest first place votes and recount. Recount. Continue until a candidate wins by a majority.

Borda Count Method – Voters rank candidates on ballot. Assign 1 point to last place, 2 points to next, etc. Total points for each candidate. Candidate with the most points wins.

Pairwise Comparison (Head-to-Head) Method – Voters rank candidates on ballot. Pair up candidates so each is compared with every other. Column by column see who is closer to the top. That candidate gets those votes. A T-table is good for this. The candidate who wins in the pair gets 1 point. If a tie, then each gets $\frac{1}{2}$ point. Candidate with the most points is the winner.

Finding the number of Comparisons (C) to be made between (n) candidates, when using the Pairwise Comparison (or Head-to-Head) Method

$$C = \frac{n(n-1)}{2}$$



FAIRNESS CRITERIA

Majority Criterion – If a candidate wins by a majority, then that candidate should win the election by another method. **Evaluation** – If the majority winner does not win by another method, then this criterion is violated. If majority winner does win by another method, then it is not violated.

Head-to-head Criterion – If a candidate wins by head-to-head (pairwise) over every other candidate, then that candidate should win the election. **Evaluation** – If one candidate wins over all others when paired up and does not win by another method, then the criterion is violated. If by another method, the head-to-head winner still wins, then the criterion is not violated.

Irrelevant Alternatives Criterion – A candidate wins. In a recount the only changes are that one or more of the candidates are removed. Original winner should win. **Evaluation** – A candidate drops out. Look at the 1st place votes. If another candidate wins, then it is violated. If original winner still wins, then the criterion is not violated.

Monotonicity Criterion – A candidate wins a *straw vote*. Voter preference changes before the actual election only favor the winner; the winner should still win the election. **Evaluation** – *Straw vote* and election winner different, it is violated. *Straw vote* and election winner the same, it is not violated.

Arrow's Impossibility Theorem – No voting method will satisfy all four fairness criteria.