Voting method = way to pick a winner

- Plurality (most 1st place votes wins)
- Borda (weighted sum)
- Pairwise comparison
- Plurality with elimination

-for each method, we can find the winner, or find the ranking

Plurality with elimination: today’s method
- also called plurality with instant runoff
- eliminate the candidates with the weakest support

Plurality with elimination
1. List # of 1st place votes for each candidate
A=14   B=4   C=11   D=8

<table>
<thead>
<tr>
<th># of voters</th>
<th>14</th>
<th>10</th>
<th>8</th>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>A</td>
<td>C</td>
<td>D</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>2nd</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>3rd</td>
<td>C</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>4th</td>
<td>D</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>
2. Remove candidate(s) with fewest 1\textsuperscript{st} place votes.
   -remove B (no one else has only 4 votes so only B is removed)

3. Transfer the votes from the removed candidate to the candidate below them in the preference schedule.
   -B had 4 votes from column 5, D is next below B so D gets those 4 votes. New scores: A= 14, C=11, D=12

4. Repeat until have only one candidate – the winner.

Repeat process: Now C has fewest votes, B is out of the game. C got points from column 3 and 6, gives the votes to next candidate below in each column, so D.
New scores: A=14, D=23
We can interrupt the process at any time once some candidate achieves a majority = More than half the first place votes. Whoever achieves a majority will always end up the winner at the end of the process.

D wins plurality with elimination!

Notice that a different candidate won in each of the four methods.

Example: (Hiring committee, 11 voters, 4 candidates)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>D</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

A majority requires more than 11/2=5.5, so a majority requires at least 6 votes

-therefore A is a majority candidate

-According to the majority criterion, A should win
Plurality: Winner = A

Plurality can only give one majority candidate. If there were two candidates with a majority (more than half the 1st place votes) the total votes would exceed the number of voters, so this is impossible. Therefore a majority candidate will always have the most votes, and will win in the plurality method.

Because the **plurality** method **always agrees** with the majority criterion, we say this method **satisfies** the majority criterion.

- The same is true for plurality by elimination.

- Pairwise comparison also satisfies the majority criterion
  - this is because a majority candidate is always a Condorcet candidate (wins every head-to-head comparison)

Plurality,
Plurality with elimination,
Pairwise comparison
Borda method?

\[
\begin{align*}
A &= 4(6) + 3(0) + 2(0) + 1(5) = 29 \\
B &= 4(2) + 3(6) + 2(3) + 1(0) = 32 \\
C &= 4(3) + 3(2) + 2(6) + 1(0) = 30 \\
D &= 4(0) + 3(3) + 2(2) + 1(6) = 19
\end{align*}
\]

Borda winner is B

B is NOT the majority candidate, so Borda method violates the majority criterion.

-since we found at least one example of an election where a majority candidate is not the Borda winner, Borda violates the majority criterion which says if a candidate has more than half of the first place votes then he should win.