

Criteria for judging these systems.

Some simple criteria based on choosing the winner if there is a clear favorite.

The Majority Criterion If there is a candidate ranked 1st place by a majority (more than 50%), then this candidate should win the election.

Do our 4 systems obey this property?
(hopefully)

Plurality: Plurality does satisfy the majority criterion

Explain why: Imagine X is ranked 1st by a majority.

Then X get more 1st place rankings than anybody else, so they have a plurality.

specific to plurality

So X wins the election.

	Majority	Unanimity	CWC
Plurality	✓	✓	✗
RCV	✓ ↑ on HW	✓	✗
Condorcet	✓	✓	✓
Borda	✗	✓ HW	✗

Explain why Condorcet satisfies Majority.

Imagine X is ranked 1st place by a majority.

Then X wins in any pairwise comparison X vs Y.

Thus X wins the election (using Condorcet)

A vs B.

A vs C

To explain why some system does not satisfy majority, we need to invent a particular example in which X is majority 1st place, but X loses.

Borda does not satisfy majority

2	3	2	A is ranked 1 st by a majority of voters (3 out of 5)
	A	B	
1	B	C	
0	C	A	

$$A: 3 \cdot 2 + 2 \cdot 0 = 6$$

$$B: 3 \cdot 1 + 2 \cdot 2 = 7 \leftarrow B \text{ wins!}$$

$$C: 3 \cdot 0 + 2 \cdot 1 = 2$$

An even simpler one is:

The Unanimity criterion

If X is ranked above Y by all voters, then Y should not win.

(X might not win if there is some other more popular option)

Plurality does satisfy unanimity:

Imagine X is ranked above Y by all voters.

∴ Then Y gets 0 first-place rankings.

So Y does not win using plurality.

Try RCV does satisfy unanimity.

Imagine all voters rank X above Y .

∴ Then Y gets no rankings in 1st place,

∴ so Y is eliminated in the first round.
Then Y does not win w/ RCV.

X:

Y: 0

Z:

W:

The Condorcet Winner Criterion (CWC)

If there is a Condorcet Winner, then
(wins all their pairwise comparisons)

that candidate should win the election.

Plurality and CWC

if someone wins all their pairwise comparisons, will they win the election with plurality? NO

In Bush - Gore - Nader,
G was the Condorcet winner,
but G lost with plurality.

Handout example:

Plurality: A

Borda: B

Condorcet: C

RCV: D

C was Condorcet winner,
but C did not win
with plurality
or RCV
or Borda.

R: 112

D: 76