

Math of Elections #4

Plurality with Elimination Method

Definition

The **plurality with elimination method** (or **instant run-off voting**) works as follows. Check if there is a *majority candidate*—if so, they win; if not, remove the candidate(s) with the least first place votes and shift the remaining candidates up to fill the gaps. Repeat: if there is a majority candidate they win; if not, again remove the candidate(s) with the least first place votes. Repeat until there is a majority candidate.

Exercise

There is an election with 4 candidates: Alejandro (A), Baobao (B), Corrina (C), and Destiney (D). Let's find the winner using the *plurality with elimination method*.

Ranking	Ballot								
1st	A	A	A	A	B	B	B	B	B
2nd	B	C	C	D	A	C	C	C	C
3rd	C	B	D	C	C	A	A	A	D
4th	D	D	B	B	D	D	D	D	A

Ranking	Ballot								
1st	B	C	C	C	D	D	D	D	D
2nd	D	A	D	D	A	B	C	C	C
3rd	C	D	A	A	C	C	A	A	A
4th	A	B	B	B	B	A	B	B	B

- **Round 1.** Show there is *not* a majority candidate. Who received the least amount of first place votes? Cross them off the ballots.
- **Round 2.** Imagine shifting the candidates up on the ballots to fill the gaps left by the one who was eliminated in Round 1. Show there still is *not* a majority candidate. Who received the least amount of first place votes? Cross them off the ballots.
- **Round 3.** Again imagine shifting the candidates up to fill the gaps. Show that there is now a majority candidate. Who is it? They are the winner.

Exercise

Back to the Club Election Example. The preference schedule is below. We saw Candy wins using the Plurality method, and Emma wins using a Borda count. Determine the winner using plurality with elimination. How many rounds did it take to determine the winner?

Number of Voters	14	10	8	4	1
1st	C	L	N	E	L
2nd	E	E	L	N	N
3rd	L	N	E	L	E
4th	N	C	C	C	C

Exercise

This election has many candidates: Alejandro (A), Baobao (B), Corrina (C), Destiney (D), Ernie (E), Frankie (F)

Ranking	Ballot								
1st	A	A	A	A	A	A	B	B	B
2nd	F	F	F	F	E	E	C	D	D
3rd	E	E	E	E	F	F	D	C	C
4th	C	C	C	D	D	D	E	E	E
5th	D	D	D	C	C	C	F	F	F
6th	B	B	B	B	B	B	A	A	A
Ranking	Ballot								
1st	B	C	C	C	D	D	E	E	F
2nd	E	B	B	D	B	C	C	D	E
3rd	C	D	D	B	C	E	F	B	A
4th	D	E	E	E	E	B	A	F	C
5th	F	A	F	F	F	A	B	C	D
6th	A	F	A	A	A	F	D	A	B

1. Who would win using (basic) plurality? What percent of the total first-place votes did they get?
2. Who wins using plurality with elimination. How many rounds did it take?