

Ch 1 The Mathematics of Elections.

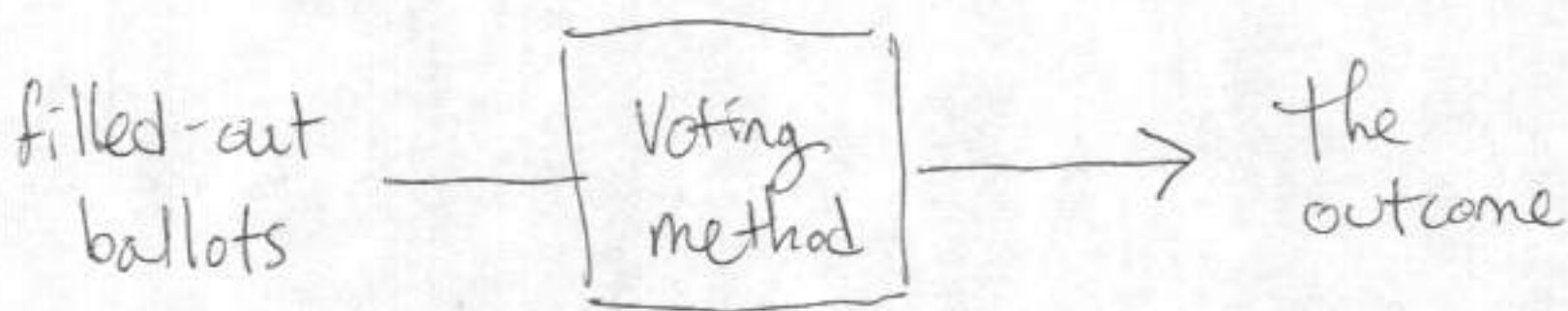
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Today: 1.1, 1.2 (preference schedules,
plurality method)

Basic elements of an election:

- the voters
- the candidates
- the ballots
- the voting method
- the outcome

We'll look at:



We'll discuss 4 voting methods.

"The outcome" can be either a sole winner, or
a ranking of candidates, 1st place/2nd place/...

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Examples of ballots:

single choice
ballot

Choose 1:
- Alice
- Bob
- Charles
- Diane

preference
ballot #1

List in order of pref.	
1	
2	
3	
4	

preference
ballot #2

Rank in order of pref.	
Alice	
Bob	
Charles	
Diane	

Most common voting method: "Plurality Method".

Here the outcome is "winner-only".

The method declares that the candidate with the most number of votes wins.

top-preference

The candidates do not have to be people running for some position. (5)

Suppose there is a class with 30 students that are deciding where to go on a class trip.

The candidates:

- (A) Aquarium
- (B) Botanical Garden
- (C) Civil War Reenactment
- (D) Don't go anywhere

A — 10 votes

B — 6 votes

C — 11 votes

D — 3 votes

— plurality method → C wins.

6) Suppose instead that there are preference ballots.

1 A	1 A	1 B	}
2 B	2 D	2 D	
3 C	3 C	3 A	
4 D	4 B	4 C	
2	8	6	

1 C	1 D	}
2 D	2 B	
3 B	3 A	
4 A	4 C	
11	3	

30 total

Preference Schedule:

#Votes	2	8	6	11	3
1	A	A	B	C	D
2	B	D	D	D	B
3	C	C	A	B	A
4	D	B	C	A	C

We can easily see from the table that C wins with 11 votes.

Issues with the plurality method:

(7)

- if a voter doesn't think their preferred candidate has a chance of winning, they might vote for someone else with higher chances
- there might be a candidate preferred by all voters over the winner

Example: In the above election, C won.

However, we can count how many voters put C ahead of D, versus how many put D ahead of C.

$$\# \text{ voters preferring C over D} = 2 + 11 = 13$$

$$\# \text{ voters preferring D over C} = 8 + 6 + 3 = 17.$$

So more preferred D over C. If A and B were not in the election, D would have won.

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Finally, we show another way of writing a preference schedule:

# voters	2	8	6	11	3
A	1	1	3	4	3
B	2	4	1	3	2
C	3	3	4	1	4
D	4	2	2	2	1