

# Chapter 3 Section 1

## MA1020 Quantitative Literacy

Sidney Butler

Michigan Technological University

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# Voting Systems

- Plurality method
- Borda count method
- Plurality with elimination method
- Pairwise comparison method

# Plurality

## Definition

Voters vote for one candidate. The candidate receiving the most votes is selected.

- US to elect senators, representatives, governors, judges and mayors.
- UK and Canada to elect member of parliament.

# Borda Count

## Definition

Voters rank the  $m$  candidates. A voter's last choice gets one point, next-to-last choice gets two points, and so on, until the voter's first choice gets  $m$  points. The candidate receiving the most points is selected.

- Heisman trophy

# Borda Count

**Table 3.1**

	First-Place Votes	Second-Place Votes	Third-Place Votes	Fourth-Place Votes
Aaron	2359	1368	2786	3145
Bonnie	2457	3499	2474	1228
Charles	2554	2367	1734	3003
Dion	2288	2424	2664	2282

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# Plurality with Elimination

## Definition

Voters vote for one candidate. if a candidate receives a majority of votes that candidate is selected. If no candidate receives a majority, eliminate the candidate(s) receiving the fewest votes, and do another round of voting.

- Olympic games location
- President of France

# Plurality with Elimination

**Table 3.4**

Ranking	Number of Ballots								
	3	2	2	2	2	2	1	2	1
1st	C	A	B	D	B	A	D	A	C
2nd	D	D	A	C	C	B	A	C	D
3rd	A	C	D	B	D	C	B	B	B
4th	B	B	C	A	A	D	C	D	A

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# Pairwise Comparison

## Definition

Voters rank all the candidates. For each pair of candidates,  $X$  and  $Y$ , determine how many voters prefer  $X$  to  $Y$  and vice versa. If  $X$  is preferred to  $Y$  by more voters, then  $X$  receives 1 point. If  $Y$  is preferred to  $X$  by more voters, then  $Y$  receives 1 point. If the candidates tie, then each receives  $\frac{1}{2}$  point. The candidate who receives the most points is selected.



# Pairwise Comparison

Table 3.10

ALICE VS. BOB									
Ranking	Number of Ballots								
	3	2	2	2	2	2	1	2	1
1st	A	A	B	B	B	A	A	A	B
2nd	B	B	A	A	A	B	B	B	A

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Table 3.11

ALICE VS. CARLOS									
Ranking	Number of Ballots								
	3	2	2	2	2	2	1	2	1
1st	C	A	A	C	C	A	A	A	C
2nd	A	C	C	A	A	C	C	C	A

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Table 3.12

BOB VS. CARLOS									
Ranking	Number of Ballots								
	3	2	2	2	2	2	1	2	1
1st	C	C	B	C	B	B	B	C	C
2nd	B	B	C	B	C	C	C	B	B

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# Tie Breaking

Method should be chosen before the election.

- Arbitrary Choice
- Another Voter