

Voting Theory Homework

Math 111

1. Students at one school held a class election. Five candidates, Alice, Bob, Carmen, and Dave ran for class president. The preference schedule for the election is shown below.

Class President Preferences					
Number of voters	4	1	9	8	5
1st choice	A	B	C	A	C
2nd choice	B	A	D	D	D
3rd choice	C	D	A	B	B
4th choice	D	C	B	C	A

- (a) Who will win this election using the Borda count method? How many points does each candidate receive?
- (b) Is there a Condorcet candidate? Is there a majority candidate? What flaw(s) in the Borda count method does this election illustrate?
2. Use the comparison matrix below to answer the following questions.

Comparison Matrix			
	...vs. Alice	...vs. Bob	...vs. Carmen
# voters who prefer Alice...	0	13	7
# voters who prefer Bob...	0	0	5
# voters who prefer Carmen...	6	8	0

- (a) Does this election have a Condorcet candidate?
- (b) Who would win this election using the Method of Pairwise Comparisons?
3. Here is a preference schedule for an election with four candidates.

Class President Preferences					
Number of voters	28	20	16	8	2
1st choice	A	B	C	A	C
2nd choice	B	A	D	D	D
3rd choice	C	D	A	B	B
4th choice	D	C	B	C	A

- (a) Who will win the election above using the Plurality method?
- (b) Who will win the election above using the Borda count method?
- (c) Who will win the election about using Instant Runoff Voting?
- (d) Who will win the election using Pairwise Comparisons?
- (e) Who do you think should win the election, and why?

4. Suppose that John, Edward, and Taylor are running for class office. It looks like John is going to win the election, but then Taylor is suspended and is no longer eligible to run. If Edward ends up winning the election, this is probably an example of a violation of which fairness criterion?
5. The 17 members of a town council are voting on which contractor to hire, Anderson, Bailey, Cowen, or Davenport. The results of a preliminary straw poll are shown below.

Town Council Preferences				
Number of voters	4	5	6	2
1st choice	A	B	C	A
2nd choice	D	C	A	C
3rd choice	B	A	D	D
4th choice	C	D	B	B

- (a) Which candidate would win the straw-poll using Instant Runoff Voting?
- (b) Suppose that in the official vote, everyone votes the same, except for the two voters in the last column of the table - they switch their votes and move Clinton ahead of Anderson in their ballots. Use Instant Runoff Voting to find the winner of the official vote.
- (c) The results of (a) and (b) imply a violation of which fairness criterion?