

1. A club with 17 members is holding a straw poll to figure out which flavor ice cream they will pick for their next meeting.

Ice Cream Preferences				
Number of voters	4	5	6	2
Chocolate	1st	3rd	2nd	1st
Vanilla	2nd	1st	3rd	3rd
Strawberry	3rd	2nd	1st	2nd

- (a) Which ice cream flavor will win the straw poll if we use Instant Runoff Voting?
 - (b) Suppose that when the real election is held, everyone votes the same as in the straw poll, except the two voters in the last column who switch their ballots to move Strawberry ahead of Chocolate. Which flavor will win the election using Instant Runoff Voting?
 - (c) This is an example of a violation of which fairness criterion?
2. Suppose an election for Governor were held and there were three candidates: A Democrat, a Republican, and a Libertarian. A poll before the election shows the following voter preferences.

State Governor Preferences			
Percent of voters	45%	42%	13%
1st choice	Democratic	Republican	Libertarian
2nd choice	Libertarian	Libertarian	Republican
3rd choice	Republican	Democratic	Democratic

- (a) Who would win this election using Plurality?

- (b) If the Libertarian candidate drops out, which candidate would win? Is this a fairness criterion violation? If so, which one?

3. An election is held using Approval voting with the results shown below.

Approval Voting Preferences				
Number of voters	13	6	4	2
Alice	✓			✓
Bob	✓	✓		
Carmen		✓	✓	✓
Dave				✓

Who wins this election?

4. One criticism of Approval voting is that it can let a Condorcet loser win an election. A **Condorcet loser** is a candidate who would lose against every other candidate in a head-to-head match-up. The table below shows the voter's rankings of the candidates, and whether the voters approved of the candidate or not (indicated by a ✓).

Candidate	Number of Voters				
	14	10	8	4	1
Alfred Pennyworth	1st (✓)	4th	4th	4th	4th
Bruce Wayne	2nd	2nd	3rd	1st (✓)	3rd (✓)
Selina Kyle	3rd	1st (✓)	2nd	3rd	1st (✓)
Dick Grayson	4th	3rd	1st (✓)	2nd (✓)	2nd (✓)

Show that this election has a Condorcet loser. Who is it?