Notes from 1.21.10

The marching band is deciding which bowl to play at (Rose, Fiesta, Hula, Orange, Sugar). Here is the preference schedule summarizing the ballots.

Preference Schedule: Which Bowl?

Number of voters	**49**	**48**	**3**
First choice	**R**	**H**	**F**
Second choice	**H**	**S**	**H**
Third choice	**F**	**O**	**S**
Fourth choice	**O**	**F**	**O**
Fifth choice	**S**	**R**	**R**

Where do you think the Marching Band should go?

A)Rose, B) Fiesta, C)Hula, D)Orange, E)Sugar

How many people want to go to the Rose Bowl?

How many people do NOT want to go to the Rose Bowl?

Majority- more than half of the votes

Plurality- the most first place votes

The Majority Criterion

> If a choice receives a majority of the first-place votes in an election, then that choice should be the winner of the election.

Consider another election: The Math Appreciation Society is voting for president. The **candidates** are **A**lisha, **B**oris, **C**armen, and **D**ave. 37 club members vote, using a preference ballot.

Summary of the 37 ballots:

Preference Schedule: MAS Election

Number of voters	**14**	**10**	**8**	**4**	**1**
First choice	**A**	**C**	**D**	**B**	**C**
Second choice	**B**	**B**	**C**	**D**	**D**
Third choice	**C**	**D**	**B**	**C**	**B**
Fourth choice	**D**	**A**	**A**	**A**	**A**

How many people voted?

How many votes are needed for a majority?

How many first place votes does each candidate receive?

Does any candidate have a majority?

Clicker Question:

A) A wins with a majority

B) A wins with a plurailty

C) C wins with a majority

D) C wins with a plurality

Preference Schedule: Which Bowl?

Number of voters	**49**	**48**	**3**
First choice	**R**	**H**	**F**
Second choice	**H**	**S**	**H**
Third choice	**F**	**O**	**S**
Fourth choice	**O**	**F**	**O**
Fifth choice	**S**	**R**	**R**

Head-to-head comparison: Compare two candidates, then another two, until all candidates have been considered. Is there one candidate that is always preferred?

Condorcet Criterion

> If there is a choice that in a head-to-head comparison is preferred by the voters over every other choice, then that choice should be the winner of the election.

✦Plurality Method for chosing winner picks the candidate with the most first place votes.

✦The Plurality Method satisfies the Majority Criterion.

✦The Plurality Method can violate the Condorcet Criterion.

✦Insincere Voting

Arrow's Impossibility Theorem

A method for determining election results that is democratic and always fair is a mathematical impossibility.

Borda Count

- ✦ looks at all positions, not just first place
- ✦ compromise candidate
- ✦ preference schedule

The Borda Count works by assigning points for places. Four places:

first place gets 4 points,

second place gets 3 points,

third place gets 2 points and

fourth place gets 1 point.

Add up all the points for each candidate and the winner is the candidate with the most points.

School Principal Example

A school needs to elect a new principal. Candidates: Mrs. Amaro, Mr. Burr, Mr. Castro, and Ms. Dunbar

Preference Schedule: Principal

Number of voters	**6**	**2**	**3**
First choice	**A**	**B**	**C**
Second choice	**B**	**C**	**D**
Third choice	**C**	**D**	**B**
Fourth choice	**D**	**A**	**A**

Use (#voters) $\times$ (points for the position) for each column and then add.

Use the Borda Count Method to determine the winner of the MAS Election.

Preference Schedule: MAS Election

Number of voters	**14**	**10**	**8**	**4**	**1**
First choice	**A**	**C**	**D**	**B**	**C**
Second choice	**B**	**B**	**C**	**D**	**D**
Third choice	**C**	**D**	**B**	**C**	**B**
Fourth choice	**D**	**A**	**A**	**A**	**A**

A: $14 \times 4 + 10 \times 1 + 8 \times 1 + 4 \times 1 + 1 \times 1 = 79$

B: $14 \times 3 + 10 \times 3 + 8 \times 2 + 4 \times 4 + 1 \times 2 = 106$

C: $14 \times 2 + 10 \times 4 + 8 \times 3 + 4 \times 2 + 1 \times 4 = 104$

D: $14 \times 1 + 10 \times 2 + 8 \times 4 + 4 \times 3 + 1 \times 3 = 81$

Boris is winner!

Summary

✦Two Ballot Types, Top Choice and Preference

✦Preference Schedule summarizes the ballots

✦Arrow's Impossibility Theorem: It is impossible to fairly and democratically pick a winner.

✦Plurality Method for chosing winner picks the candidate with the most first place votes.

✦The Plurality Method satisfies the Majority Criterion.

✦The Plurality Method can violate the Condorcet Criterion.

✦Insincere Voting

✧ Borda Count- In an election with N candidates we give 1 point for last place, 2 points for second from last place,..., and N points for first place. The choice with the highest total wins.

✧ Can violate the Majority Criterion

✧ Can violate the Condorcet Criterion

✧ Finds the best compromise candidate.

✧ Used for the Heisman Award, American and National Baseball MVP, Country Music Vocalist of the Year