

RCV for

<u>14</u>	<u>10</u>	<u>8</u>	<u>4</u>	<u>1</u>
A	C	D	B	C
B	B	C	D	D
C	D	B	C	B
D	A	A	A	A

Rd 1
 A: 14
~~B: 4~~
 C: 11
 D: 8

Rd 2
 A: 14
~~C: 11~~
 D: 8+4=12

<u>14</u>	<u>10</u>	<u>8</u>	<u>4</u>	<u>1</u>
A	D	D	D	D
D	A	A	A	A

Rd 3
 A: 14
 D: 23

D wins!

A wins with plurality
 D wins with RCV.

Bush - Gore - Nader

<u>2.9M</u>	<u>2.9M</u>	<u>.1M</u>	do RCV
B	G	N	
G	B	G	
N	N	B	

Rd 1
 B: 2.9
 G: 2.9
~~N: .1~~

Rd 2
 B: 2.9
 G: 3.0

<u>2.9</u>	<u>2.9</u>	<u>.1</u>
B	G	G
G	B	B

G wins!

In USA, we generally use plurality.

In a plurality election, voting for the loser has no effect.

You vote only matters if your candidate wins.

in USA this makes everybody vote for the D or the R.

Voting for an outsider is "throwing your vote away"

This makes the D & R parties invincible.

This is because we use plurality

Duverger's Law Any political system using plurality will eventually degenerate into a 2-party system.

$\frac{2.9}{B}$	$\frac{2.9}{G}$	$\frac{.1}{N}$
G	B	G
N	N	B

Considering only B v G : B: 2.9
G: 2.9 + .1 = 3.0 G wins.

only B v N : B: 2.9 + 2.9 = 5.8
N: .1 B wins.

G v N : G: 5.8
N: .1 G wins.

G would win every pairwise matchup involving Gore.

Def A candidate who would defeat every other candidate in 1-on-1 matchups is called the Condorcet winner.

So in 2000, Gore was Condorcet winner.

Theorem There can't be 2 Condorcet winners.

Pf Imagine we had 2 Cond. winners, say X & Y.

Then in the comparison $X \vee Y$, they can't both win, so both cannot be a Cond. winner.

Condorcet's Method Compare all candidates

in pairs, find the Condorcet winner, make them the winner of the election.

in BGN election, G would've won using Condorcet's method.

14	10	8	4	1
A	C	D	B	C
B	B	C	D	D
C	D	B	C	B
D	A	A	A	A

Find the winner with Condorcet's method

A \vee B A: 14
B: $10+8+4+1=23$

B \vee C B: $14+4=18$
C: $10+8+1=19$

A \vee C A: 14
C: $10+8+4+1=23$

B \vee D B: $14+10+4=28$
D: $8+1=9$

A \vee D A: 14
D: 23

C \vee D C: $14+10+1=25$
D: $8+4=12$

C wins every one of their comparisons

C wins with Condorcet's method

29 voters	12	8	7	2	find the Cond. winner
	A	B	C	B	
	B	C	A	A	
	C	A	B	C	

(A) v B A:
 B:

There is no Cond. winner

A v (C) A:
 C:

(B) v C B:
 C:

Often, Condorcet's method does not choose a winner, so we don't use it as a method in real elections.

Another method: The Borda Count

Each ballot gives points, the winner is the one with the most points.

Specifically: last position gets 0 pts
2nd-to-last gets 1,
3rd - - - 2, etc.

if there's N candidates, top choice gets $N-1$ pts.

3 A
2 B
1 C
0 D

Ex

	$\frac{1}{A}$	$\frac{1}{B}$	$\frac{1}{C}$	pts	
A:				3	$3+2+0 = 5$
B:				2	$2+3+1 = 6$
C:				1	$1+0+3 = 4$
D:				0	$0+1+2 = 3$

B wins with Borda!

Ex

<u>3</u>	<u>2</u>	
A	B	2
B	C	1
C	A	0

$$A: 3 \cdot 2 + 2 \cdot 0 \\ 6 + 0 = 6$$

$$B: 3 \cdot 1 + 2 \cdot 2 \\ 3 + 4 = 7$$

$$C: 3 \cdot 0 + 2 \cdot 1 \\ 0 + 2 = 2$$

B wins!

BGN with Borda's

<u>2.9</u>	<u>2.9</u>	<u>.1</u>	
B	G	N	2
G	B	G	1
N	N	B	0

$$B: 2.9 \cdot 2 + 2.9 \cdot 1 + 0.1 \\ = 8.7$$

$$G: 2.9 \cdot 1 + 2.9 \cdot 2 + .1 \cdot 1 \\ = 8.8$$

$$N: 2.9 \cdot 0 + 2.9 \cdot 0 + .1 \cdot 2 = 0.2$$

G wins!