

Instructions: Counting the following preference ballots according the Borda Count Method and the plurality with elimination. Note any fairness criteria that have been violated. Use the information from the first voting activity.

Number of voters	5	3	3	5	3	2
1st choice	N	H	B	H	F	F
2nd choice	S	F	S	B	N	N
3rd choice	F	B	H	N	B	B
4th choice	H	N	N	F	S	H
5th choice	B	S	F	S	H	S

1.

Number of voters	27	19	8	15	2
1st choice	B	A	D	C	A
2nd choice	D	D	C	A	C
3rd choice	A	C	A	D	D
4th choice	C	B	B	B	B

2.

	A	B	C	D	E	F
1 # of Voters			45	40	15	
2						
3 1st choice	B		A	C		
4 2nd choice	D		C	D		
5 3rd choice	E		D	E		
6 4th choice	C		E	A		
7 5th choice	A		B	B		
8						

3.

Number of voters	25	20	10	30	10
1 st choice	F	B	H	S	S
2 nd choice	S	H	F	F	H
3 rd choice	H	F	S	B	B
4 th choice	B	S	B	H	F

4.

Number of voters	10	8	10	8	7	8
1st choice	A	A	C	D	D	B
2nd choice	B	D	E	C	C	E
3rd choice	C	B	D	B	B	A
4th choice	D	C	A	E	A	C
5th choice	E	E	B	A	E	D

5.

Math 116 Voting Activity 2 Key

①

1. Borda Count

$$N = 5(5) + 2(3) + 2(3) + 3(5) + 4(3) + 4(2) = 72 \leftarrow \text{N wins}$$

$$H = 2(5) + 5(3) + 3(3) + 5(5) + 1(3) + 2(2) = 66$$

$$B = 1(5) + 3(3) + 5(3) + 4(5) + 3(3) + 3(2) = 64$$

$$F = 3(5) + 4(3) + 1(3) + 2(5) + 5(3) + 5(2) = 65$$

$$S = 4(5) + 1(3) + 4(3) + 1(5) + 2(3) + 1(2) = 48$$

Plurality w/ Elimination

21 votes cast; majority is 11

$$N = 5 \quad H = 8 \quad \cancel{B = 3} \quad F = 5 \quad \cancel{S = 0}$$

$$\text{2nd Round } N = 5 \quad \underline{H = 8 + 3 = 11} \quad F = 5$$

H has a majority so H wins

Since H won pairwise comparison, Borda Count produced a Condorcet criterion violation.

2. Borda Count

$$A = 2(27) + 4(19) + 2(8) + 3(15) + 4(2) = 199$$

$$B = 4(27) + 1(19) + 1(8) + 1(15) + 1(2) = 152$$

$$C = 1(27) + 2(19) + 3(8) + 4(15) + 3(2) = 155$$

$$D = 3(27) + 3(19) + 4(8) + 2(15) + 2(2) = 204 \leftarrow \text{D wins}$$

Plurality w/ Elimination

$$\text{1st} - A = 19 + 2 = 21 \quad B = 27 \quad C = 15 \quad \cancel{D = 8}$$

36 for majority

$$\text{2nd} - \cancel{A = 21} \quad B = 27 \quad C = 15 + 8 = 23$$

$$\text{3rd round: } B = 27 \quad C = 23 + 21 = 44 \leftarrow \text{C wins}$$

Both Borda Count and Plurality w/ Elimination violates Condorcet criterion. Plurality w/ Elimination also violates IIA.

3. Borda Count

$$A = 1(45) + 5(40) + 2(15) = 270$$

$$B = 5(45) + 1(40) + 1(15) = 190$$

$$C = 2(45) + 4(40) + 5(15) = 325$$

$$D = 4(45) + 3(40) + 4(15) = 360 \leftarrow \text{D wins}$$

$$E = 3(45) + 2(40) + 3(15) = 260$$

3 cont'd.

Plurality w/ Eliminations

1st A = 40

B = 45

~~C = 15~~

~~D = 0~~

~~E = 0~~

2

2nd A = 40 + 15 = 55 B = 45

51 needed for majority

A wins

violates IIA. both methods violate Condorcet criterion

4. Borda Count

F = 4(25) + 2(20) + 3(10) + 3(30) + 1(10) = 270

S = 3(25) + 1(20) + 2(10) + 4(30) + 4(10) = 275 ← S wins

H = 2(25) + 3(20) + 4(10) + 1(30) + 3(10) = 210

B = 1(25) + 4(20) + 1(10) + 2(30) + 2(10) = 195

Plurality w/ Eliminations

1st F = 25

S = 30 + 10 = 40

~~H = 10~~

B = 20

48 for majority

2nd F = 25 + 10 = 35 S = 40

~~B = 20~~

3rd F = 35 + 20 = 55 S = 40

F wins

Borda Count produces a Condorcet criterion violation

5. Borda Count

A = 5(10) + 5(8) + 2(10) + 1(8) + 2(7) + 3(8) = 156

B = 4(10) + 3(8) + 1(10) + 3(8) + 3(7) + 5(8) = 159

C = 3(10) + 2(8) + 5(10) + 4(8) + 4(7) + 2(8) = 172 ← C wins

D = 2(10) + 4(8) + 3(10) + 5(8) + 5(7) + 1(8) = 165

E = 1(10) + 1(8) + 4(10) + 2(8) + 1(7) + 4(8) = 113

26 for majority

Plurality w/ Eliminations method

1st A = 18

~~B = 8~~

C = 10

D = 15

~~E = 0~~

2nd A = 18 + 8 = 26

C = 10

D = 15

A wins

Borda Count produces a Condorcet violation