DISCRETE MATH

▷ Test 1 // Review A

N: Key

D: **9/27/2012**

P: 1 2 3 4 5 6

Questions 1 –13 refer to an election with 4 candidates (A, B, C, and D), 71 voters and preference schedule given by the following table.

# of voters	27	19	8	15	2
1	B	A	D	C	A
2	D	D	C	A	C
3	A	C	A	D	D
4	C	B	B	B	B

1. Use the *Plurality* Method, to find the winner of the election.

B ← "most" votes

2. Use the *Plurality w/ Elimination*, to find the winner of the election.

elim D. → C = 8+15 = 23

elim A. → C = 23+19+2 = 44 C

* $\frac{71}{2}$ = 35.5 round up 36 need for "majority"

3. Use the *Borda Count* Method, to find the winner of the election.

	27	19	8	15	2
4 ×	108	76	32	60	8
3 ×	81	57	24	45	6
2 ×	54	38	16	30	4
1 ×	27	19	8	15	2

A = 54 + 76 + 16 + 45 + 8 = 199

B = 108 + 19 + 8 + 15 + 2 = 152

C = 27 + 38 + 24 + 60 + 4 = 153

D = 81 + 57 + 32 + 30 + 6 = 206

↳ D

4. Use the *Pairwise Comparisons* Method, to find the winner of the election.

A v B: A = 19+8+15+2 = 44

B = 27 A = 1pt

A v C: A = 27+19+2 = 48

C = 8+15 = 23 → A = 1pt

A v D: A = 19+15+2 = 36

D = 27+8 = 35 → A = 1pt

B v C: B = 27 → C = 1pt

C = 19+8+15+2 = 44

B v D: B = 27 → D = 1pt

D = 19+8+15+2 = 44

C v D: C = 15+2 = 17 → D = 1pt

D = 27+19+8 = 54

A

5. In this election, which of the above were a "Condorcet candidate"? [hint: one of the above will give you an easy answer]

Condorcet means "head-to-head". Look @ Pairwise! A

For the following *Extended Ranking* problems, recall from p. 22-23 and from lecture, that *Extended Ranking* is simply looking at your work above and placing a 1st, 2nd, 3rd, ..etc on the math already done. This should be quick.

6. Using the *extended* Plurality ranking method, which candidate comes in last? D has least votes

7. Using the *extended* Borda Count ranking method, which candidate comes in last? B has 152 points

8. Using the *extended* Plurality w/ Elimination ranking method, which candidate comes in last? D is 1st eliminated

9. Using the *extended* Pairwise Comparisons ranking method, which candidate comes in last? B has 0 points

For the following *Recursive Ranking* problems, recall from p. 24-26 and from lecture, that *Recursive Ranking* is NOT simply looking at your work above. You will need to find the first place person using the given method, then start the math over without that person to find 2nd place. Then start the math over without that person to find 3rd place. And so on. This will take a while.

10. Using the *recursive* Plurality ranking method, which candidate comes in 3rd?

#	27	19	8	15	2
1	[redacted]	A	D	C	A
2	D	D	C	A	C
3	A	C	A	D	D
4	C	[redacted]	[redacted]	[redacted]	[redacted]

1st: B
2nd: D
3rd: A

→ D: 27+8 = 35 ← round 1
A: 21 C=15

A: 27+19+2 = 48 ←
C: 8+15+2 = 25

A

11. Using the *recursive* Borda Count ranking method, which candidate comes in 2nd?

#	27	19	8	15	2
1	B	A	[redacted]	C	A
2	[redacted]	[redacted]	C	A	C
3	A	C	A	[redacted]	[redacted]
4	C	B	B	B	B

1st: D
2nd: A

← A = 54+63+46 = 163
B = 81+21+23 = 125
C = 27+42+69 = 138

B A C C A
A C A A C
C B B B B

	27	21	23
3x	B	A	C
2x	A	C	A
1x	C	B	B

→

81	63	69
54	42	46
27	21	23

A

12. Using the *recursive* Plurality w/ Elimination ranking method, which candidate comes in 3rd?

#	27	19	8	15	2
1	B	A	D	[redacted]	A
2	D	D	[redacted]	A	[redacted]
3	A	[redacted]	A	D	D
4	[redacted]	B	B	B	B

1st: C
2nd: A
3rd: D
4th: B

2nd round

27	36	8
B	A	D
D	D	A
A	B	B

A: 44 A wins 2nd round.

3rd round

27	44
B	D
D	B

→ D wins round 3

D

13. Using the *recursive* Pairwise Comparisons ranking method, which candidate comes in 2nd?

#	27	19	8	15	2
1	B	[redacted]	D	C	[redacted]
2	D	D	C	[redacted]	C
3	[redacted]	C	[redacted]	D	D
4	C	B	B	B	B

1st: A

B v C: B = 27
C = 19+8+15+2 = 44 → C gets 1 pt

B v D: B = 27
D = 44 → D gets 1 pt.

C v D: C = 15+2 = 17
D = 27+19+8 = 54 → D gets 1 pt.

D

Note: if you were neat + organized on page 1, then you can still use the math from that page!