MA111-011 Exam 1 Name: KEY

1.

	Alex	Blair	Casey	Devin	Gayl	Lee	Nikki	Sonia	Toni
1st	Ovid's	Panera	Panera	Subway	Panera	Panera	Panera	Subway	Subway
2nd	Panera	Subway	Subway	Ovid's	Subway	Subway	Subway	Ovid's	Ovid's
3rd	Subway	Ovid's	Ovid's	Panera	Ovid's	Ovid's	Ovid's	Panera	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's

(a) Convert this set of ballots into a preference schedule.

A BCGLN PST

1	5	3	0

Your answer:

1st	Ovid's	Panera	Subway	Fazoli's
2nd	Panera	Subway	Ovid's	Ovid's
3rd	Subway	Ovid's	Panera	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Subway

(b) How many voters voted and how many are needed to form a majority in this election?

9 voted, more than $\frac{9}{2} = 4.5$ needed for majority

so 5 or more

(c) If you eliminate Panera, what does the new preference schedule look like?

1	5	3
O	S	S
S	O	O
F	F	F

=

1	8
O	S
S	O
F	F

(d) In Ovid's versus Panera head-to-head matchup, **whose** votes does each restaurant get?

A B
D C
S G
T L
N

4 to 5

(e) Name one restaurant that is NOT a Condorcet winner. Explain why.

Ovid's loses the head-to-head against Panera in (d)
but a Condorcet winner never loses a head to head.

Fazoli's loses every head-head 0 to 9

2. Here is a preference schedule.

	12	9	7	3
1st	A	C	D	B
2nd	B	B	C	D
3rd	C	D	B	A
4th	D	A	A	C

(a) Show work: Who wins using plurality?

A: 12 ← Most A wins
B: 3
C: 9
D: 7

(b) Show work: Who wins using plurality with elimination?

B eliminated, 3 votes to D (A:12, C:9, D:10)
C eliminated, 9 votes to D (A:12, D:19)
A eliminated, 12 votes to D (D:31)

D wins

(c) Show work: Who wins using pairwise comparison?

A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
12 9	12 9	12 9	12 9	12 7	12 7
7	3 7	7	3 7	9	9 3
3	15 16	3	15 16	3	21 10
12 19		12 19		24 7	
B	C	D	C	B	C

A: 0
B: 2
C: 3
D: 1

C wins

(d) Show work: Who wins using the full Borda count?

(4 points for first, 3 points for second, 2 points for third, 1 point for last;
or faster 2 points for first, 1 point for second, 0 points for third, -1 point for last)

A: 2(12) − 9 − 7 + 0 = 8
B: 12 + 9 + 0 + 2(3) = 27 ← most
C: 0 + 2(9) + 7 − 3 = 22
D: −12 + 0 + 2(9) + 3 = 5

B wins

(62)
A: 70
B: 89
C: 84
D: 67

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1.

	Alex	Blair	Casey	Devin	Gayl	Lee	Nikki	Sonia	Toni
1st	Ovid's	Ovid's	Subway	Subway	Ovid's	Subway	Subway	Panera	Subway
2nd	Panera	Panera	Ovid's	Ovid's	Panera	Ovid's	Ovid's	Subway	Ovid's
3rd	Subway	Subway	Panera	Panera	Subway	Panera	Panera	Ovid's	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's

(a) Convert this set of ballots into a preference schedule.

ABG S EDLNT

Your answer:

	3	1	5	0
1st	Ovid's	Panera	Subway	Fazoli's
2nd	Panera	Subway	Ovid's	Ovid's
3rd	Subway	Ovid's	Panera	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Subway

(b) How many voters voted and how many are needed to form a majority in this election?

9 voted, more than $\frac{9}{2} = 4.5$ needed for majority

so 5 or more for majority

(c) If you eliminate Panera, what does the new preference schedule look like?

3	1	5
O	S	S
S	O	O
F	F	F

=

3	6
O	S
S	O
F	F

(d) In Ovid's versus Panera head-to-head matchup, **whose** votes does each restaurant get?

A T S
B
C
D
G
L
N

8 to 1

(e) Name one restaurant that is NOT a Condorcet winner. Explain why.

Panera lost badly in the OvsP head to head, but a condorcet winner never loses a head to head.

Fazolis also loses every head to head 0 to 9

2. Here is a preference schedule.

	13	10	6	2
1st	A	D	C	B
2nd	B	C	B	D
3rd	C	B	D	A
4th	D	A	A	C

(a) Show work: Who wins using plurality?

A: 13 ← Most   A wins
B: 2
C: 6
D: 10

(b) Show work: Who wins using plurality with elimination?

B eliminated, 2 votes go to D (A:13, C:6, D:12)
C eliminated, 6 votes go to D (A:13, D:18)
A eliminated, 13 votes go to D (D:31)

D wins

(c) Show work: Who wins using pairwise comparison?

A vs B		A vs C		A vs D		B vs C		B vs D		C vs D	
13	10	13	10	13	10	13	10	13	10	13	10
	6	2	6		6	2	6	6		6	2
	2				2			2			
13	18	15	16	13	18	15	16	21	10	19	12
B		C		D		C		B		C	

A: 0
B: 2
C: 3
D: 1

C wins

(d) Show work: Who wins using the full Borda count?

(4 points for first, 3 points for second, 2 points for third, 1 point for last;
or faster 2 points for first, 1 point for second, 0 points for third, -1 point for last)

A 2(13) − 10 − 6 = 10
B 13 + 6 + 4 = 23
C 10 + 2(6) − 2 = 20
D −13 + 2(10) + 2 = 9

B wins

A: 72
B: 85
C: 82
D: 71

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1st	Ovid's	Ovid's	Panera	Panera	Ovid's	Ovid's	Ovid's	Panera	Subway
2nd	Panera	Panera	Subway	Subway	Panera	Panera	Panera	Subway	Ovid's
3rd	Subway	Subway	Ovid's	Ovid's	Subway	Subway	Subway	Ovid's	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's	Fazoli's

(a) Convert this set of ballots into a preference schedule.

Your answer:

ABGLN CDS T

	5	3	1	0
1st	Ovid's	Panera	Subway	Fazoli's
2nd	Panera	Subway	Ovid's	Ovid's
3rd	Subway	Ovid's	Panera	Panera
4th	Fazoli's	Fazoli's	Fazoli's	Subway

(b) How many voters voted and how many are needed to form a majority in this election?

9 voted, more than $\frac{9}{2}$ needed for majority

$\parallel$

4.5, so 5 or more

(c) If you eliminate Panera, what does the new preference schedule look like?

5	3	1
O	S	S
S	O	O
F	F	F

=

5	4
O	S
S	O
F	F

(d) In Ovid's versus Panera head-to-head matchup, **whose** votes does each restaurant get?

A	C
B	D
G	S
L	
T, N	

6 to 3

(e) Name one restaurant that is NOT a Condorcet winner. Explain why.

Panera lost in (d), but a Condorcet winner never loses a head-to-head.

or Fazoli's loses every head-to-head 0 to 9

2. Here is a preference schedule.

	13	12	4	2
1st	A	D	C	A
2nd	B	C	B	B
3rd	C	B	D	D
4th	D	A	A	C

(a) Show work: Who wins using plurality?

Count First Place Votes

A: 15 ← Most

B: 0

C: 4

D: 12

A wins

(b) Show work: Who wins using plurality with elimination?

B eliminated, 0 votes change. (A:15, C:4, D:12)

C eliminated, 4 votes go to D (A:15, D:16)

A eliminated, 15 votes go to D (D:31)

D wins

(c) Show work: Who wins using pairwise comparison?

A vs B	A vs C	A vs D	B vs C	B vs D	C vs D	A:D
13 12	13 12	13 12	13 12	13 12	4 27	B:2
2 4	2 4	2 4	2 4	2 4	27 14	C:3
15 16	15 16	15 16	15 14	19 12		D:1
B	C	D	C	B	C	C wins

(d) Show work: Who wins using the full Borda count?

(4 points for first, 3 points for second, 2 points for third, 1 point for last;

or faster 2 points for first, 1 point for second, 0 points for third, -1 point for last)

A: 2(13) − 12 − 4 + 2(2) = 14

B: 13 + 4 + 2 = 19 ← Most Points

C: + 12 + 2(4) − 2 = 15

D: − 13 + 2(12) = 11

B wins

A: 76

B: 81

C: 80

D: 73