

Math of Social Choice Extra Credit

Suppose Tufts is building a new study space. What elements are most important to you when choosing a study space? Please rank the following from most important to least important.

preference schedule:

	2	1	1	1	1	1	1	1	1	2	1	3	1	1	1	1
B	A	A	D	C	C	B	C	B	C	A	A	E	A	C	E	
D	B	D	A	A	B	D	B	E	A	C	B	D	C	A	C	
E	D	B	B	D	A	C	D	A	D	D	C	B	B	E	A	
C	E	E	E	E	D	A	A	D	B	B	D	A	D	B	D	
A	C	C	C	B	E	E	E	C	E	E	E	C	E	D	B	

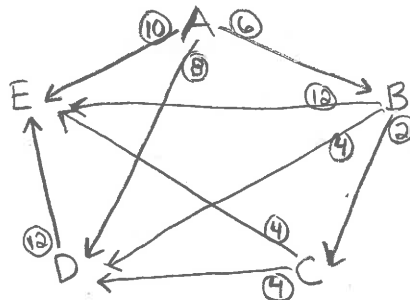
Key:

- A= Noise/ Volume
- B= Food Access
- C= Distance from House/Dorm
- D= Chair Comfort
- E= Computer Access

n=5, N=20

one to one comparisons:

- A:B 13:7
- A:C 10:10
- A:D 14:6
- A:E 15:5
- B:C 11:9
- B:D 12:8
- B:E 16:4
- C:D 12:8
- C:E 12:8
- D:E 16:4



Smith Set:

{A, B, C}  
(A and C tie)

Plurality:

most first place votes...  
A=7, B=4, C=6, D=1, E=2  
w = {A}.

Elimination:

Elim. D (1 first place vote)  
Elim. E (2 first place votes)  
2 1 1 1 1 1 1 1 2 1 3 1 1 1 1  
B A A C C B C B C A A B A C C  
B=5, A=8, C=7

Runoff:

Runoff A and C.  
2 1 1 1 1 1 1 1 2 1 3 1 1 1 1  
C A A C C C C A C A A A C C  
C=10, A=10  
A and C tie.  
w = {A, C}

Majority Candidate:

$> \frac{N}{2}$  first place votes.  
 $\frac{20}{2} = 10 (>10)$

1st place votes:  
A=7, B=4, C=6, D=1, E=2  
So, no majority candidate.

Condorcet candidate:

For CC, need n-1 pairwise points. (4)  
pairwise pts:  
A=3.5  
B=3  
C=2.5  
D=1  
E=0  
So, no condorcet candidate.

Pairwise:

points provided  
w = {A}.  
check: 3.5 + 3 + 2.5 + 1 + 0 = 10. ✓

2 1 1 1 1 1 1 1 2 1 3 1 1 1 1  
C A A C C C C A C A A A C C  
C=10  
A=10  
C and A tie. w={C, A}

**Coombs :**

last place votes:

A=2, B=2, C=5, D=1, E=10  
Elim E.

A C C C B D A A C B B D C D D B

Elim D.

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

A=5, B=7, C=8.

Elim C.

A B B B B A A A A B B B A B B B

A=7 B=13 elim B.

W = {A}

**Beatpath :**

A > B (6 > 0)  
A > D (2 > 0)  
A > D (8 > 0)  
A > E (10 > 0)  
B > C (2 > 0)

W = {A}

**Ballot Report**

	Chair comfort	Distance from your house/dorm	Noise/Volume	Food access	Computer access
1.	2	4	5	1	3
2.	3	5	1	2	4
3.	2	5	1	3	4
4.	1	5	2	3	4
5.	3	1	2	5	4
6.	4	1	3	2	5
7.	2	4	5	1	3
8.	2	3	4	1	5
9.	3	1	4	2	5
10.	4	5	3	1	2
11.	3	1	2	4	5
12.	3	2	1	4	5
13.	4	3	1	2	5
14.	3	1	2	4	5
15.	4	3	1	2	5
16.	2	5	4	3	1
17.	4	2	1	3	5
18.	4	3	1	2	5
19.	5	1	2	4	3
20.	4	2	3	5	1

\* no ties

	1	2	3	4	5
<b>1. Noise/Volume</b>	-	13	10	14	15
<b>2. Food access</b>	7	-	11	12	16
<b>3. Distance from your house/dorm</b>	10	9	-	12	12
<b>4. Chair comfort</b>	6	8	8	-	16
<b>5. Computer access</b>	5	4	8	4	-

	1.	2.	3.	4.	5.
<b>1. Noise/Volume</b>	-	13-	11-	14-	15-
<b>2. Food access</b>	.	-	11-	12-	16-
<b>3. Distance from your house/dorm</b>	.	.	-	12-	12-
<b>4. Chair comfort</b>	.	.	.	-	16-
<b>5. Computer access</b>	.	.	.	.	-