

## MA111 – Homework #2 Short Solutions

### Chapter 1

18. (a) B  
(b)

Number of voters	153	102	55	202	108	20	110	160	175	155
1st choice	A	A	A	B	B	B	C	C	A	B
2nd choice	C	B	C	A	C	C	A	B	C	C
3rd choice	B	C	B	C	A	A	B	A	B	A

- (c) A  
(d) Independence-of-Irrelevant Alternatives Criterion (IIA)
30. (a) C  
(b) C is a majority winner.  
(c) If there is a choice that has a majority of the first-place votes, then that candidate will be the winner under the plurality-with-elimination method in the first round.
33. (a) D  
(b) B  
(c) The Condorcet Criterion
34. (a) Clinton  
(b) Buford  
(c) The Monotonicity Criterion
36. C
56. (a) 210 matches. The number of matches will be  $20 + 19 + 18 + \dots + 3 + 2 + 1$ . Using the method we discussed in class:

$$\begin{aligned}
 S &= 20 + 19 + 18 + \dots + 3 + 2 + 1 \\
 S &= 1 + 2 + 3 + \dots + 18 + 19 + 20 \\
 2S &= 21 + 21 + 21 + \dots + 21 + 21 + 21 \\
 2S &= 20 \times 21 \\
 2S &= 420 \\
 S &= 210.
 \end{aligned}$$

The book (and my slides) explains how to use this method to get the general formula: If there are  $N$  candidates, then there are  $(N - 1)N/2$  pairwise comparisons.

- (b) 3 days
63. If  $X$  is the winner of an election using the Plurality Method and, in a reelection, the only changes in the ballots are changes that only favor  $X$ , then  $X$  will lose no first-place votes and no candidate other than  $X$  can increase his or her first-place votes, so  $X$  is still the winner of the election.
64. If  $X$  is the winner of an election using the Borda Count Method and, in a reelection, the only changes in the ballots are changes that only favor  $X$ , then  $X$  will gain Borda points and no candidate other than  $X$  can increase his or her Borda points, so  $X$  is still the winner of the election.