

Worksheet 1
Mathematics of Social Choice
Duchin, Spring 2021



Problem 1. Practice all the voting systems on this simple reduced preference schedule. (Plurality, PWC, Borda, Runoff, Elimination, Sequential, Coombs, Secondality)

1	2	3	1
<i>A</i>	<i>B</i>	<i>D</i>	<i>A</i>
<i>B</i>	<i>C</i>	<i>A</i>	<i>C</i>
<i>C</i>	<i>A</i>	<i>C</i>	<i>B</i>
<i>D</i>	<i>D</i>	<i>B</i>	<i>D</i>

Problem 2. Suppose an election has 15 voters and 3 candidates. Show that for *any* preference schedule, the sum of the Borda scores for all the candidates must be 90. What about for 18 voters and 4 candidates? **Challenge: Come up with a formula for the sum of Borda scores when there are N voters and n candidates.**

Problem 3. Show that the total number of pairwise comparison points in any election involving 4 candidates is 6. What is the total number of points for 5 candidates? Your solution should also work for when there are ties in head-to-head competitions. **Challenge: Come up with a formula for the total number of pairwise comparison points in an election with n candidates.**