

[1] (22 points) An election is run. The candidates are Paul (P), Tom (T), Sally (S), and Ann (A). There are 17 voters. Here is a tabulation of their preference lists:

# Voters	5	4	4	2	2
First place	S	P	A	T	A
Second place	P	T	S	P	P
Third place	A	S	T	A	S
Fourth place	T	A	P	S	T

(a: 3 points) Determine the vote totals using plurality voting. Who is the winner?

(b: 2 points) Who wins if Sally drops out of the race?

(c: 2 points) Do (a) and (b) give an example of a violation of a fairness criterion? If so which one? Explain.

(d: 3 points) Determine the vote totals using the Borda count. Who is the winner?

(e: 2 points) Does (d) give an example of a violation of a fairness criterion? If so which one? Explain.

(f: 3 points) Indicate the order of elimination using plurality with elimination voting. Who wins?

(g: 2 points) Suppose we switch P and A in the last column. Who now wins using plurality with elimination voting?

(h: 2 points) Does (g) give an example of a violation of a fairness criterion? If so which one? Explain.

(i: 3 points) Determine the vote totals using pairwise comparison voting. Who is the winner?

[2] (8 points) Consider the weighted voting system  $[20 \mid 13, 8, 7, 4]$ .

(a) Which if any of the voters are dummies? Explain.

(b) Which if any of the voters have veto power? Explain.

(c) Which if any of the voters are dictators? Explain.

(d) What is the Banzhaf power index of each voter?