12. Consider the following set of preference lists:

Rank	Number of Voters (8)					
	2	2	1	1	1	1
First	A	E	A	B	C	D
Second	B	B	D	E	E	E
Third	C	D	C	C	D	A
Fourth	D	C	B	D	A	B
Fifth	E	A	E	A	B	C

Calculate the winner using

(a) plurality voting.
(b) the Borda count.
(c) the Hare system.
(d) sequential pairwise voting with the agenda B, D, C, A, E.

13. Consider the following set of preference lists:

Rank	Number of Voters (5)				
	1	1	1	1	1
First	A	B	C	D	E
Second	B	C	B	C	D
Third	E	A	E	A	C
Fourth	D	D	D	E	A
Fifth	C	E	A	B	B

Calculate the winner using

(a) plurality voting.
(b) the Borda count.
(c) the Hare system.
(d) sequential pairwise voting with the agenda A, B, C, D, E.

14. Consider the following set of preference lists:

Rank	Number of Voters (7)				
	2	2	1	1	1
First	A	B	A	C	D
Second	D	D	B	B	B
Third	C	A	D	D	A
Fourth	B	C	C	A	C

Calculate the winner using

(a) plurality voting.
(b) the Borda count.
(c) the Hare system.
(d) sequential pairwise voting with the agenda B, D, C, A.

15. Consider the following set of preference lists:

Rank	Number of Voters (7)				
	2	2	1	1	1
First	C	E	C	D	A
Second	E	B	A	E	E
Third	D	D	D	A	C
Fourth	A	C	E	C	D
Fifth	B	A	B	B	B

Calculate the winner using

(a) plurality voting.
(b) the Borda count.
(c) the Hare system.
(d) sequential pairwise voting with the agenda A, B, C, D, E.

16. Consider the following set of preference lists:

Rank	Number of Voters (7)						
	1	1	1	1	1	1	1
First	C	D	C	B	E	D	C
Second	A	A	E	D	D	E	A
Third	E	E	D	A	A	A	E
Fourth	B	C	A	E	C	B	B
Fifth	D	B	B	C	B	C	D

Calculate the winner using

(a) plurality voting.
(b) the Borda count.
(c) sequential pairwise voting with the agenda A, B, C, D, E.
(d) the Hare system.

17. An interesting variant of the Hare system was proposed by the psychologist Clyde Coombs. It operates exactly as does the Hare system, but instead of deleting alternatives with the fewest first-place votes, it deletes those with the most last-place votes.

(a) Use the Coombs procedure to find the winner if the ballots are as in Exercise 16.
(b) Show that for two voters and three alternatives, it is possible to have ballots that result in one candidate winning if the Coombs procedure is used and a tie between the other two if the Hare system is used.

◆ **18.** In a few sentences, explain why Condorcet's rule satisfies

(a) the Pareto condition.
(b) monotonicity.