Chapter 1 Practice Test Questions

VOCABULARY. On the exam, be prepared to match the correct definition to the following terms:

1) Voting Elements:
   Single-choice ballot, preference ballot, ranking (full ranking), preference schedule, Condorcet Candidate

Voting Methods:
   Plurality, Borda Count, Plurality with Elimination, Pairwise Comparisons, Insincere Voting

Fairness Criteria:
   Majority Criterion, Condorcet Criterion, Monotonicity Criterion, Independence of Irrelevant Alternatives
   Criterion, Arrows Impossibility Theorem.

Definitions can be found on page 26 and 27 of the textbook.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

2) Arrow’s Impossibility Theorem implies
   A) that every voting method can potentially violate each one of the four fairness criteria.
   B) that it is impossible to have a voting method that satisfies all four of the fairness criteria.
   C) that in every election, no matter what voting method we use, at least one of the four fairness criteria will be violated.
   D) that in every election, each of the voting methods must produce a different winner.
   E) none of these

3) An election is held for president of the United States. Three candidates are running: a Democrat, a Republican, and an Independent. A certain voter prefers the Independent candidate over the other two, but realizing (because of all the pre-election polls) the race is going to be a close race between the Democrat and the Republican and that the Independent doesn’t have a chance, he votes instead for his second choice (his preference between the Democrat and the Republican). This is an example of
   A) the independence of irrelevant alternatives criterion.
   B) the monotonicity criterion.
   C) insincere voting.
   D) the majority criterion.
   E) none of these

4) An election is held among four candidates (A, B, C, and D). Using a voting method we will call X, the winner of the election is candidate A. Due to an irregularity in the original vote count, a recount is required. Before the recount takes place, candidate B drops out of the race. In the recount, still using voting method X, candidate D wins the election. Based on this information, we can say that voting method X violates the
   A) monotonicity criterion.
   B) majority criterion.
   C) independence of irrelevant alternatives criterion.
   D) Condorcet criterion.
   E) none of these
5) An election is held among four candidates (A, B, C, and D). Using a voting method we will call X, the winner of the election is candidate A. Due to an irregularity in the original procedures, a new election is required. Before the new election takes place, one of the voters changes his mind and moves A from third choice to second choice on his ballot. All other voters vote the same way they did in the original election. In the new election, still using voting method X, candidate D wins the election. Based on this information, we can say that voting method X violates the
   A) Condorcet criterion.
   B) independence of irrelevant alternatives criterion.
   C) majority criterion.
   D) monotonicity criterion.
   E) none of these

6) An election is held among four candidates (A, B, C, and D). Using a voting method we will call X, the winner of the election is candidate A. However, candidate D has more than 50% of the possible votes. Based on this information, we can say that voting method X violates the
   A) independence of irrelevant alternatives criterion.
   B) Condorcet criterion.
   C) majority criterion.
   D) monotonicity criterion.
   E) none of these

7) An election is held among four candidates (A, B, C, and D). Using a voting method we will call X, the winner of the election is candidate A. However, candidate D beats each other candidate in a head to head, pairwise comparison. Based on this information, we can say that voting method X violates the
   A) majority criterion.
   B) independence of irrelevant alternatives criterion.
   C) Condorcet criterion.
   D) monotonicity criterion.
   E) none of these
8) The Mathematics Society is holding an election for the president. The three candidates are A, B, and C. Forty-five percent of voters like A the most and B the least. Thirty percent of voters like B the most and C the least. Twenty-five percent of voters like C the most and A the least. Write out the preference schedule for this election.

A) 45 30 25
   1st choice C A A
   2nd choice B B C
   3rd choice A C B

B) 45 30 25
   1st choice A B C
   2nd choice C A B
   3rd choice B C A

C) 45 30 25
   1st choice A B C
   2nd choice C A A
   3rd choice B C B

D) 45 30 25
   1st choice A B C
   2nd choice B A B
   3rd choice C C A

E) 45 30 25
   1st choice B C A
   2nd choice A A B
   3rd choice C B C

For an election with four candidates (A, B, C, and D) we have the following preference schedule:

<table>
<thead>
<tr>
<th>Number of Voters</th>
<th>6</th>
<th>3</th>
<th>5</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st choice</td>
<td>D</td>
<td>D</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>2nd choice</td>
<td>B</td>
<td>A</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>3rd choice</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>4th choice</td>
<td>C</td>
<td>C</td>
<td>D</td>
<td>B</td>
</tr>
</tbody>
</table>

9) Using the plurality method, which candidate wins the election?
   A) A  B) B  C) C  D) D

10) The ranking of the candidates using the plurality method is
    A) first: D; second: A; third: C; fourth: B.
    B) first: D; second: A; third: B; fourth: C.
    C) first: C; second: D; third: A; fourth: B.
    D) first: D; second: C; third: A; fourth: B.
    E) none of these
11) Using the Borda count method, which candidate wins the election?
   A) A  B) B  C) C  D) D

12) The ranking of the candidates using the Borda count method is
   A) first: A; second: D; third: C; fourth: B.
   B) first: D; second: A; third: C; fourth: B.
   C) first: D; second: C; third: A; fourth: B.
   D) first: A; second: C; third: D; fourth: B.
   E) none of these

13) Using the plurality-with-elimination method, which candidate wins the election?
   A) A
   B) B
   C) C
   D) D
   E) none of these

14) The ranking of the candidates using the plurality-with-elimination method is
   A) first: C; second: D; third: A; fourth: B.
   B) first: C; second: A; third: B; fourth: D.
   C) first: C; second: A; third: D; fourth: B.
   D) first: D; second: C; third: A; fourth: B.
   E) none of these

15) Using the method of pairwise comparisons, which candidate wins the election?
   A) A
   B) B
   C) C
   D) D
   E) none of these

16) The ranking of the candidates using the pairwise comparisons method is
   A) first: D; second: A; third: C; fourth: B.
   B) first: A; second: C; third: D; fourth: B.
   C) first: A; second: D; third: C; fourth: B.
   D) first: D; second: C; third: A; fourth: B.
   E) none of these

17) In this election,
   A) B is a Condorcet candidate.
   B) A is a Condorcet candidate.
   C) every candidate is a Condorcet candidate.
   D) there is no Condorcet candidate.
   E) none of these
For an election with four candidates (A, B, C, and D) we have the following preference schedule:

<table>
<thead>
<tr>
<th>Number of voters</th>
<th>15</th>
<th>11</th>
<th>9</th>
<th>6</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st choice</td>
<td>A</td>
<td>C</td>
<td>D</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>2nd choice</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>3rd choice</td>
<td>C</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>4th choice</td>
<td>D</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

18) How many first-place votes are needed for a majority in this election?
   A) 43  
   B) 22  
   C) 20  
   D) 15  
   E) none of these

19) Using the plurality method, which candidate wins the election?
   A) A  
   B) B  
   C) C  
   D) D  
   E) none of these

20) The ranking of the candidates using the plurality method is
   A) first: A; second: B; third: C; fourth: D.  
   B) first: A; second: D; third: C; fourth: B.  
   C) first: A; second: D; third: B; fourth: C.  
   D) first: A; second: C; third: D; fourth: B.  
   E) none of these

21) How many Borda points does candidate D earn in this election?
   A) 124  
   B) 97  
   C) 88  
   D) 121  
   E) none of these

22) Using the Borda count method, which candidate wins the election?
   A) A  
   B) B  
   C) C  
   D) D  
   E) none of these

23) The ranking of the candidates using the Borda count method is
   A) first: B; second: C; third: A; fourth: D.  
   B) first: B; second: A; third: C; fourth: D.  
   C) first: B; second: C; third: D; fourth: A.  
   D) first: C; second: A; third: D; fourth: B.  
   E) none of these
24) Using the plurality-elimination method, which candidate is eliminated second?
   A) A
   B) B
   C) C
   D) D
   E) none of these

25) Using the plurality-elimination method, which candidate wins the election?
   A) A
   B) B
   C) C
   D) D
   E) none of these

26) The ranking of the candidates using the plurality-elimination method is
   A) first: C; second: D; third: A; fourth: B.
   B) first: D; second: A; third: C; fourth: B.
   C) first: C; second: A; third: D; fourth: B.
   D) first: D; second: C; third: B; fourth: A.
   E) none of these

27) Which candidate wins in the pairwise comparison between candidate B and candidate C?
   A) Neither - it is a tie.
   B) B
   C) C
   D) Cannot be determined from the information given.
   E) none of these

28) How many pairwise comparisons does candidate B win?
   A) 0
   B) 1
   C) 2
   D) 3
   E) none of these

29) Using the method of pairwise comparisons, which candidate wins the election?
   A) A
   B) B
   C) C
   D) D
   E) none of these

30) The ranking of the candidates using the pairwise comparisons method is
   A) first: C; second: B; third: A; fourth: D.
   B) first: B; second: C; third: A; fourth: D.
   C) first: C; second: B; third: D; fourth: A.
   D) first: C; second: A; third: D; fourth: B.
   E) none of these
31) In this election,
   A) C is a Condorcet candidate.
   B) D is a Condorcet candidate.
   C) every candidate is a Condorcet candidate.
   D) there is no Condorcet candidate.
   E) none of these

For an election with 6 candidates (A, B, C, D, E, and F), we have the following preference schedule:

<table>
<thead>
<tr>
<th>Number of Voters</th>
<th>41</th>
<th>10</th>
<th>10</th>
<th>15</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st choice</td>
<td>B</td>
<td>F</td>
<td>A</td>
<td>A</td>
<td>E</td>
</tr>
<tr>
<td>2nd choice</td>
<td>A</td>
<td>A</td>
<td>E</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>3rd choice</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>4th choice</td>
<td>F</td>
<td>C</td>
<td>D</td>
<td>D</td>
<td>B</td>
</tr>
<tr>
<td>5th choice</td>
<td>E</td>
<td>D</td>
<td>C</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>6th choice</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

32) How many people voted in the election?
   A) 81
   B) 5
   C) 6
   D) 41
   E) none of these

33) Using the plurality-with-elimination method, the winner of the election is
   A) A.
   B) B.
   C) C.
   D) E.
   E) none of these

34) Using the pairwise comparisons method, there is a candidate that loses every pairwise comparison between itself and the other candidates. That candidate is
   A) C.
   B) D.
   C) E.
   D) F.
   E) none of these

For an election with candidates (A, B, C, D, and E), we have the following preference schedule:

<table>
<thead>
<tr>
<th>Number of voters</th>
<th>51</th>
<th>48</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st choice</td>
<td>A</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>2nd choice</td>
<td>B</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>3rd choice</td>
<td>C</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>4th choice</td>
<td>D</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>5th choice</td>
<td>E</td>
<td>E</td>
<td>A</td>
</tr>
</tbody>
</table>

35) Using the Borda count method, the winner of the election is
   A) A.  
   B) B.  
   C) C.  
   D) D.  
   E) E.
36) Using the plurality-with-elimination method, the winner of the election is
A) A. B) B. C) C. D) D. E) E.

Solve the problem.
37) An election is held among three candidates (A, B, and C) using the Borda count method. There are 20 voters. If candidate A received 37 points and candidate B received 39 points, how many points did candidate C receive?
A) 38 B) 44 C) 21 D) Cannot be determined from the information given. E) none of these

38) An election involving 5 candidates and 30 voters is held, and the results of the election are determined using the Borda count method. The maximum number of points a candidate can receive is
A) 90 points. B) 150 points. C) 30 points D) 50 points E) none of these

39) An election involving 5 candidates and 30 voters is held, and the results of the election are to be determined using the Borda count method. The minimum number of points a candidate can receive is
A) 50 points. B) 30 points. C) 90 points. D) 150 points. E) none of these

40) An election is held among six candidates. What is the total number of pairwise comparisons in this election?
A) $6^2$ B) $\frac{6 \times 5}{2}$ C) 6 D) $2 \times 6$ E) $2^6$

41) An election is held among six candidates (A, B, C, D, E, and F). Using the method of pairwise comparisons, A gets 5 points; B gets 4 points; C gets 2 points; D gets $\frac{11}{2}$ points, and E gets 0 points. How many points does F get?
A) $1\frac{1}{2}$ B) $2\frac{1}{2}$ C) 2 D) 3 E) none of these

42) In a round robin tennis tournament, every player plays against every other player. If 11 players are entered in a round robin tennis tournament, how many matches will be played?
A) $11 \times 10$ B) $11^2$ C) $\frac{11 \times 10}{2}$ D) $11 \times 2$ E) $2^{11}$