

Sample Exam 1

Use a #2 pencil. Calculators are allowed, but cell phones, iPods, etc. are NOT acceptable. Please turn cell phones off.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. And mark your answer on the scantron form. Scantrons with no answers marked will receive a score of 0.

Use the following preference schedule to answer questions #1 - #10:

Number of Voters	9	2	10	5	7
1 st choice	A	D	A	B	D
2 nd Choice	B	B	C	C	B
3 rd choice	C	A	D	D	C
4 th choice	D	C	B	A	A

- 1) How many first place votes does candidate A receive?
 - A) 19
 - B) 5
 - C) 0
 - D) 9
 - E) None of the above.
- 2) What is the minimum number of first place votes needed to have a majority?
 - A) 19
 - B) 33
 - C) 16
 - D) 17
 - E) None of the above.
- 3) Which candidate has a majority of the first place votes?
 - A) A
 - B) B
 - C) C
 - D) D
 - E) None of the above.
- 4) Rank the candidates using the plurality method.
 - A) A
 - B) B
 - C) C
 - D) D
 - E) None of the above.
- 5) How many points does candidate B earn when using the Method of Pairwise Comparisons?
 - A) 2
 - B) 3
 - C) 1.5
 - D) 0
 - E) 1

- 6) Which candidate wins using the Method of Pairwise Comparisons?
 A) A
 B) B
 C) C
 D) D
 E) None of the above.
- 7) Which candidate is a Condorcet Candidate?
 A) A
 B) B
 C) C
 D) D
 E) None of the above.
- 8) How many points does candidate B earn using the Borda Count method?
 A) 75
 B) 79
 C) 84
 D) 92
 E) None of the above.
- 9) Using the Borda Count method, which candidate comes in 2nd place?
 A) A
 B) B
 C) C
 D) D
 E) None of the above.
- 10) Is the Majority Criterion violated with this preference schedule? If not, why? If so, which method caused the violation?
 A) No, there was no player with the majority.
 B) No, the majority winner never lost 1st place in any method.
 C) Yes, under the method of Pairwise Comparisons.
 D) Yes, under the Borda count method.
 E) None of the above.

Use the following preference schedule to answer question #11:

Number of Voters	5	26	18	6	11	3
1 st Choice	B	C	B	A	C	A
2 nd Choice	C	B	A	C	B	B
3 rd Choice	A	D	D	D	A	C
4 th Choice	D	A	C	B	D	D

- 11) The ranking of the candidates using plurality-with-elimination is
 A) 1st - B; 2nd - A; 3rd - B; 4th - D
 B) 1st - A; 2nd - C; 3rd - B; 4th - D
 C) 1st - C; 2nd - B; 3rd - A; 4th - D
 D) 1st - A; 2nd - B; 3rd - C; 4th - D
 E) None of the above.

- 12) What is the quota of the weighted voting system?
[22 : 10,9,8,5,1]
A) 22
B) 10
C) 9
D) 17
E) None of the above
- 13) In the weighted voting system [32 : 28,3,2]
A) P_1 is a dictator.
B) P_2 is a dummy.
C) P_1 and P_2 have all the power.
D) All three players have equal power.
E) None of the above.
- 14) In the weighted voting system [q : 11,8,7,2] what is the largest value q can take on?
A) 27
B) 28
C) 14
D) 15
E) None of the above.
- 15) In the weighted voting system [17 : 10,8,7,4,2], the total number of possible coalitions (**including the empty set**) is
A) 32
B) 15
C) 16
D) 24
E) 120
- 16) In the weighted voting system [17 : 10,8,7,4,2], the total number of possible **sequential** coalitions is
A) 32
B) 15
C) 16
D) 24
E) 120

Refer to the weighted voting system and the **Banzhaf** definition of power to answer questions #17 - #20:
 $[25:17,9,8,6]$

17) The weight of the coalition $\{P_2, P_3, P_4\}$ is

- A) 12
- B) 25
- C) 20
- D) 23
- E) None of the above.

18) The winning coalitions for the weighted voting system are

- A) $\{17,9,8,6\}, \{17,9,8\}, \{17,9,6\}, \{17,8,6\}$
- B) $\{17,9,8,6\}, \{17,9,8\}, \{17,9,6\}, \{17,8,6\}, \{17,9\}$
- C) $\{17,9,8,6\}, \{17,9,8\}, \{17,9,6\}, \{17,8,6\}, \{17,9\}, \{17,8\}$
- D) $\{17,9,8,6\}, \{17,9,8\}, \{17,9,6\}, \{17,8,6\}, \{9,8,6\}, \{17,9\}, \{17,8\}, \{17,6\}$
- E) $\{17,9,8,6\}, \{17,9,8\}, \{17,9,6\}, \{17,8,6\}, \{9,8,6\}, \{17,9\}, \{17,8\}, \{17,6\}, \{9,8\}, \{9,6\}, \{8,6\}, \{17\}, \{9\}, \{8\}, \{6\}$

19) Which players in $\{17,8,6\}$ are critical?

- A) None of the players are critical.
- B) 17 and 8 are the only critical players.
- C) 17 is the only critical player.
- D) All of the players are critical.
- E) None of the above.

20) What is the Banzhaf power distribution?

- A) $17:6; 9:2; 8:2; 6:0$
- B) $17:\frac{1}{2}; 9:\frac{1}{6}; 8:\frac{1}{6}; 6:\frac{1}{6}$
- C) $17:\frac{6}{11}; 9:\frac{2}{11}; 8:\frac{2}{11}; 6:\frac{1}{11}$
- D) $17:\frac{3}{5}; 9:\frac{1}{5}; 8:\frac{1}{5}; 6:0$
- E) $17:\frac{1}{2}; 9:\frac{1}{5}; 8:\frac{1}{5}; 6:\frac{1}{10}$

Refer to the weighted voting system and the **Shapley-Shubik** definition of power to answer questions #21 - #24: $[10: 6,3,2]$

21) Which player in the sequential coalition $\langle 3,6,2 \rangle$ is pivotal?

- A) 2 is the only pivotal player
- B) 3 is the only pivotal player
- C) 6 is the only pivotal player
- D) All three players are pivotal
- E) None of the above.

22) What are the sequential coalitions?

- A) $\langle 6,3,2 \rangle$
- B) $\langle 6,3,2 \rangle, \langle 3,6,2 \rangle, \langle 2,6,3 \rangle$
- C) $\langle 6,3,2 \rangle, \langle 6,2,3 \rangle, \langle 3,6,2 \rangle, \langle 3,2,6 \rangle, \langle 2,6,3 \rangle, \langle 2,3,6 \rangle$
- D) $\langle 6,3,2 \rangle, \langle 6,2,3 \rangle, \langle 3,6,2 \rangle, \langle 3,2,6 \rangle, \langle 2,6,3 \rangle, \langle 2,3,6 \rangle, \langle 6 \rangle$
- E) None of the above.

23) How many times is P_1 pivotal?

- A) 0
- B) 1
- C) 2
- D) 4
- E) 6

24) What is the Shapley-Shubik power distribution?

- A) $6: \frac{2}{3}; 3: \frac{1}{6}; 2: \frac{1}{6}$
- B) $6: \frac{1}{2}; 3: \frac{1}{2}; 2: 0$
- C) $6: 2; 3: 2; 2: 2$
- D) $6: 1; 3: 0; 2: 0$
- E) $6: \frac{1}{3}; 3: \frac{1}{3}; 2: \frac{1}{3}$