

Name: _____ score: _____ / 10

There are 10 points possible on this quiz. No aids (book, notes, etc.) are permitted. You may use a non-programmable calculator. **Show all work and supporting calculations for full credit. Explain how you get your answers.**

1. (3 points) Consider the weighted voting system $[25 : 10, 8, 5, 3, 2, 1]$

(a) Identify the dictators, if any. Explain your reasoning.

There are no dictators as no player has sufficient weight to make quots alone.

(b) Identify any players with veto power, if any. Explain your reasoning.

P_1, P_2, P_3 have veto power, as it is not possible to have a winning coalition that omits any of these players.

(c) Identify any dummies, if any. Explain your reasoning.

P_6 is a dummy as this player is not critical to any winning coalition.

2. (3 points) Consider the weighted voting system $[10 : 6, 5, 4, 2, 1]$,

(a) Does $\{P_3, P_4, P_5\}$ form a winning coalition? Explain.

No. $w_3 + w_4 + w_5 = 4 + 2 + 1 < 10 = q$.

(b) It is a fact that $\{P_1, P_2, P_4, P_5\}$ forms a winning coalition. Underline the players that are **critical** to the coalition, and write/provide a computation that supports this.

Coalition	total weight	
$\{P_1, P_2, P_4\}$	$13 > q$ so P_5 is not critical	<u>P_1, P_2, P_4, P_5</u>
$\{P_1, P_2, P_5\}$	$12 > q$ so P_4 is not critical	
$\{P_1, P_4, P_5\}$	$9 < q$ so P_2 is critical	
$\{P_2, P_4, P_5\}$	$8 < q$ so P_1 is critical	

3. (4 points) For the weighted voting system $[50 : 40, 30, 20, 5]$, the winning coalitions are listed below. The critical players are underlined.

(a) Using this information, determine the Banzhaf Power Distribution. Show your work.

winning coalitions

P_1 P_2

P_1 P_3

P_2 P_3

P_1 P_2 P_3

P_1 P_2 P_4

P_1 P_3 P_4

P_2 P_3 P_4

P_1 P_2 P_3 P_4

10 total underlines

Player	# of times underlined	Banzhaf Power Index
P_1	4	$\frac{4}{10} = 0.4 = 40\%$
P_2	3	$\frac{3}{10} = 0.3 = 30\%$
P_3	3	$\frac{3}{10} = 0.3 = 30\%$
P_4	0	$\frac{0}{10} = 0 = 0\%$

Fractions, decimals, and percents are all valid ways to express the index.

- (b) Does this power distribution seem fair given the weighted voting system described above? Explain.

There are many viable answers, but I would say no. It seems unfair to me that P_2 has a higher weight than P_3 but the same index. It also seems unfair that P_4 has non-zero weight but index zero.