Review

1. Answer questions about the weighted voting system below.

$$\begin{array}{cccccc} P_1 & P_2 & P_3 & P_4 & P_5 & P_6 \end{array}$$
$$[67 : 50, 30, 10, 5, 4, 1].$$

   (a) How many players are there? 6

   (b) What is the quota? 67

   (c) What is the total weight of the voting system? $50+30+10+5+4+1 = 100$

2. Explain the terminology below. Then use the voting system from #1 to add illuminating examples.

   (a) coalition - a group of players that vote together

   say $\{P_1, P_3, P_4\}$.

   (b) winning coalition - a coalition with weights that sum to at least the quota.

   $\{P_1, P_2\}$ have total weight of $50+30=80 > 67$!

   (c) critical player - a player in a winning coalition that, if they leave the coalition, it will no longer be winning.

   Both P_1 and P_2 are critical.

   (d) dictator - a player whose weight is the quota or larger.

   No dictators in example 1.

   (e) a player with veto power - a player who is critical in every winning coalition.

   P_1 has veto power b/c the sum of weights of all other players P_2, P_3, P_4, P_5, P_6 is not enough to reach the quota

   (f) a dummy player

   - a player who is never critical in any winning coalition

   P_6 is a dummy b/c no collection of players can sum to $67-1=66$

3. Answer questions about the weighted voting system below.

$$[30 : 25, 10, 5]$$

(a) List **ALL** coalitions.

1 member: P_1; P_2; P_3

2 players: P_1, P_2; P_1, P_3; P_2, P_3

3 players: P_1, P_2, P_3

(b) List all **WINNING** coalitions.

$\underline{P_1}, \underline{P_2}$: $25+10=35$

$\underline{P_1}, P_2, P_3$: $25+10+5=40$

$\underline{P_1}, \underline{P_3}$: $25+5=30$

(c) In each **winning** coalition listed above, underline the critical players.

(d) Calculate the Banzhaf Power index.

i. Find all winning coalitions → b
ii. Find all critical players → c
~~iii.~~ Underline critical players
iv. Count total # underlines = 5
v. For each player, compute:

$$\frac{\text{(\# times the player is underlined)}}{\text{total \# underlines}}$$

player	# times underlined	$\frac{\text{\# times}}{\text{total}}$
P_1	3	$3/5 = 60\%$
P_2	1	$1/5 = 20\%$
P_3	1	$1/5 = 20\%$
		$+$ 100% ← quick check.