

## Review

1. Answer questions about the weighted voting system below.

$$[67 : \overset{P_1}{50}, \overset{P_2}{30}, \overset{P_3}{10}, \overset{P_4}{5}, \overset{P_5}{4}, \overset{P_6}{1}].$$

- (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

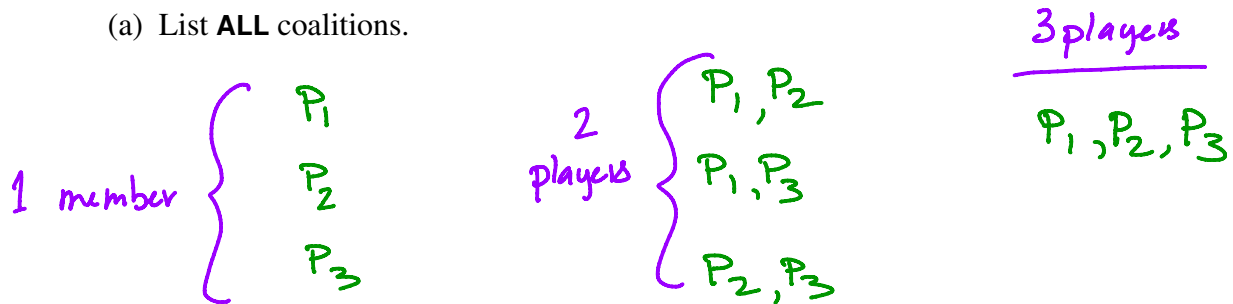
- a player who is never critical in any winning coalition

$P_6$  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.



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

Handwritten calculations for winning coalitions:

- $\underline{P_1}, \underline{P_2} : 25+10=35$
- $\underline{P_1}, \underline{P_3} : 25+5=30$
- $\underline{P_1}, P_2, P_3 : 25+10+5=40$

(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	# times total
$P_1$	3	$\frac{3}{5} = 60\%$
$P_2$	1	$\frac{1}{5} = 20\%$
$P_3$	1	$\frac{1}{5} = 20\%$