Math 1015: Homework #6

Question 1. Compute the Banzhaf power index for [15: 10,7,3].

Question 2. Compute the Banzhaf power index for [12: 8, 8, 4].

Question 3. Compute the Banzhaf power index for [20: 10, 7, 5, 5].

Combos	total
A B C D	27
A B C	22
A B D	22
A C D	20
B C D	17
A B	17
A C	
A D	
B C	
B D	
C D	
A	
B	
C	
D	
∅	

critical

A	B	C	D
✓			
✓	✓	✓	
✓	✓		✓
✓		✓	✓

A: $4/10$ = 40%

B: $2/10$ = 20%

C: $2/10$ = 20%

D: $2/10$ = 20%

The last page includes some extra copies of the pictures so you can practice. This whole document is at the class website in case you need to print it again.

Question 4. In this grid there are 20 light squares and 20 dark squares. We must divide the grid into 4 districts of 10 voters each.

a) There are 3 different possible outcomes for how many districts can be won by the lights and the darks. Figure out which outcomes are possible (like one is "2 light, 2 dark"), and draw pictures which give each of the three outcomes.

Clearly label which picture gives which result.

1L / 3D   2L / 2D   3L / 1D
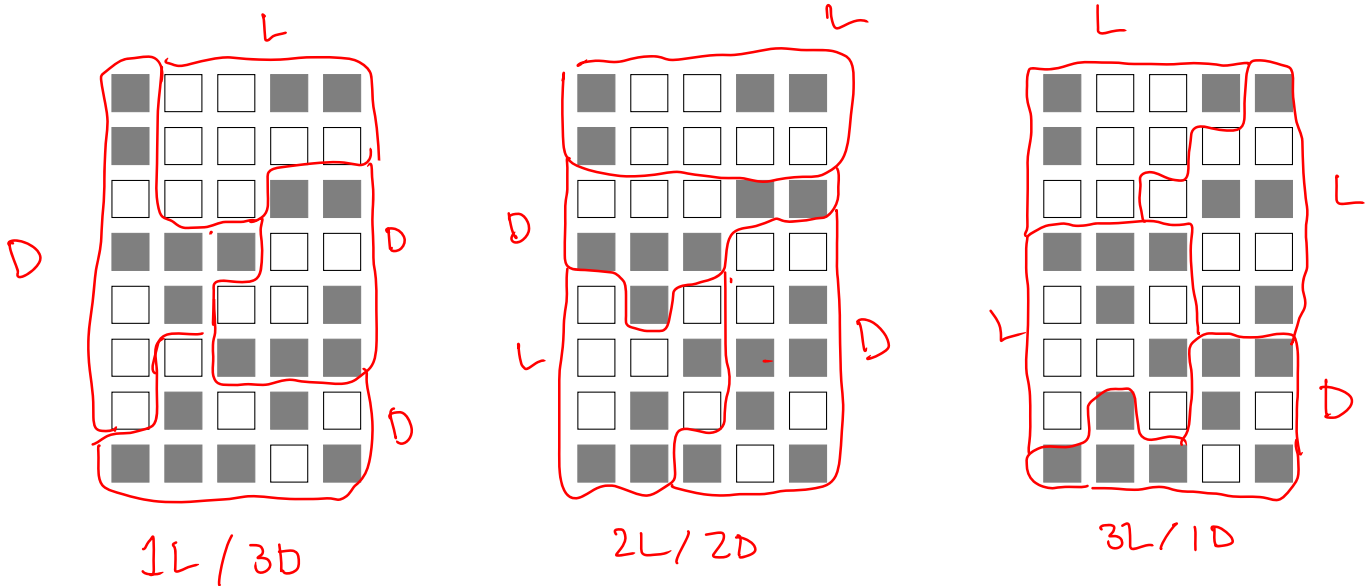
b) Please explain why it is impossible to draw districts giving "4 light, 0 dark" or "0 light, 4 dark".

Question 5. Pikachuland has 45 inhabitants: 20 squares and 25 circles. We need to divide them into 3 districts of 15 voters each.

a) Please determine all possible outcomes that can be achieved by districting, and draw diagrams for all the possible ones. (You may not need to use all of these pictures.) Clearly label which picture gives which result.
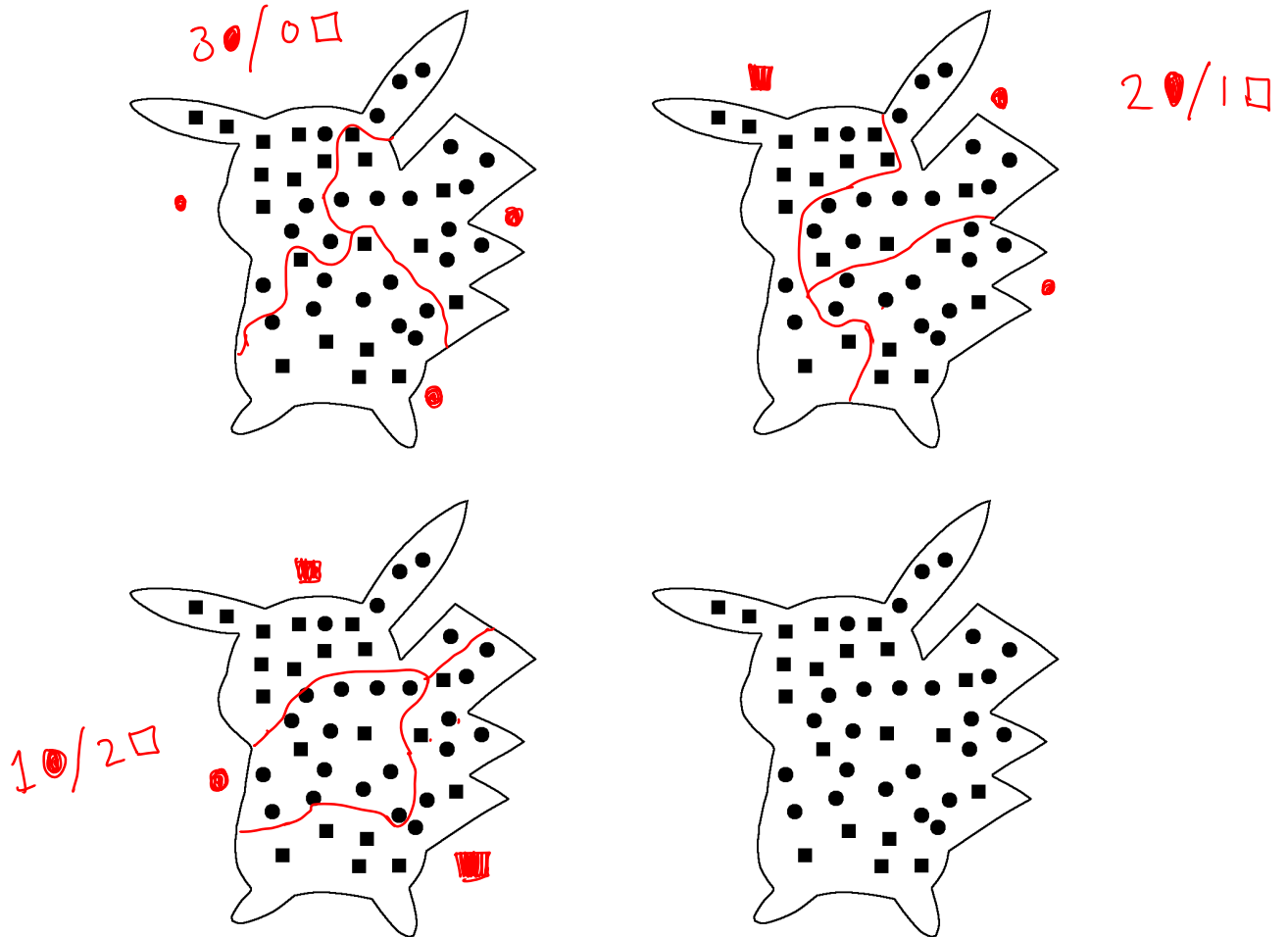
b) For all outcomes that you did not draw, explain why they are impossible.

○ 0/3□ is impossible : You need 8 to win each district, so for □ to win 3, they would need at least 3×8 = 24. But they only have 20!