Finite Mathematics Problem Set K Solutions

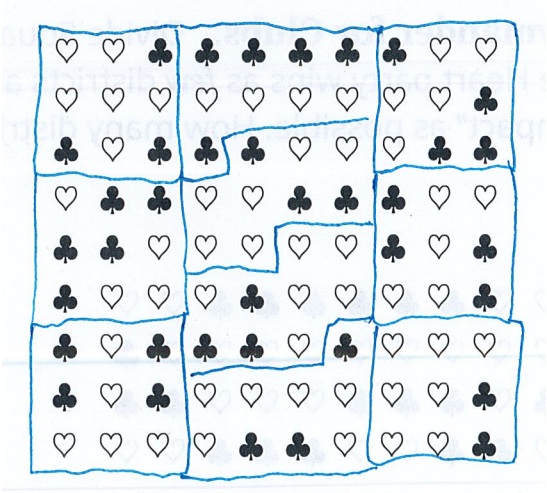
These are some solutions from the Gerrymandering exercises. They are the questions I feel are most relevant.

1. a. 90 voters, 10 districts so 9 in each. To win each 5 votes are needed. So, $9(5) = 45$ total votes needed to win all ten.

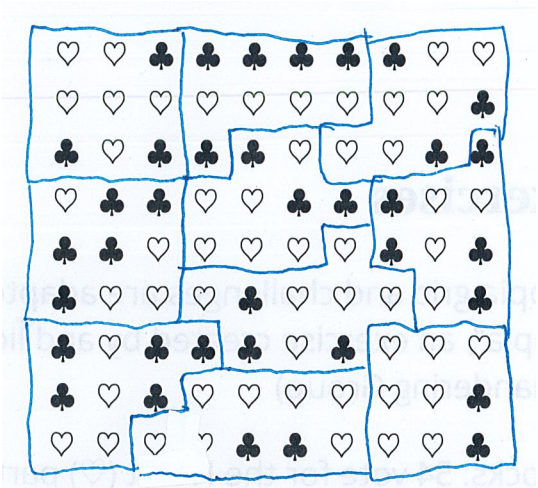
b. Heart has 54 votes, so enough to win all districts.

c. 36 votes can be most effectively used to win 7 ($7(5) = 35$)) seats.

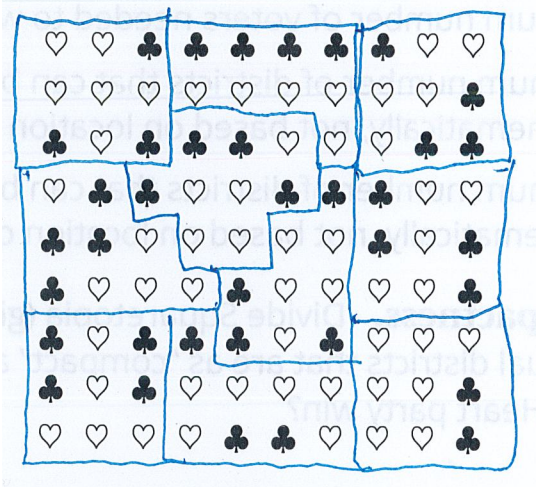
2. Here's my try at compactness. Heart wins 8.



3. Here's my try at proportionality. I made a few changes from the above. Heart wins 6, which is proportional to 54 out of 90.

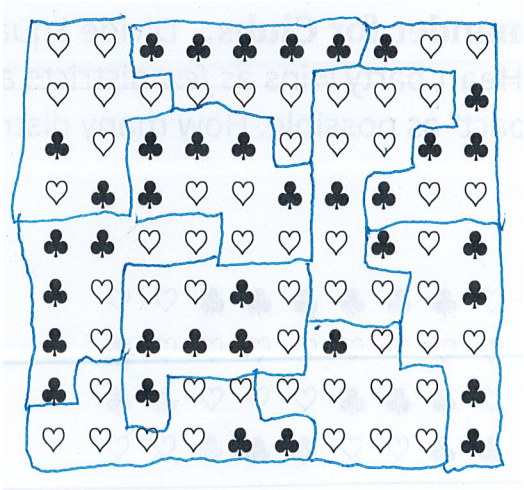


errymander for Hearts. Divide
: the Heart party wins as many dist
ıs "compact" as possible. How mar



4. My try at favouring hearts is above. I could only get 9 seats. I will be impressed if someone gets 10.

5. This was most challenging. I got it down to 4 hearts. I will again be impressed if someone gets down to 3, the minimum possible strictly by number.



7. This is area of region / area of square it fits in. I will give them as fractions and I think you can see where they came from. 1. $\frac{12}{49}$ 2. $\frac{14}{49}$ 3. $\frac{16}{64}$ 4. $\frac{21}{64}$ 5. $\frac{21}{36}$, 6. $\frac{14}{100}$.

8. This time we will need perimeter as a step. 1. $P = 20, \frac{12}{25}$, 2. 20, $\frac{14}{25}$, 3. 26, $\frac{16}{42.25}$, 4. 28, $\frac{21}{49}$, 5. 22, $\frac{21}{30.25}$, 6. 24, $\frac{14}{36}$

11. Here's a table of the districts:

wasted heart	heart votes	district number	club votes	wasted club
4	4	1	7	1
3	3	2	8	2
1	7	3	4	4
5	11	4	0	0
2	2	5	9	3
1	1	6	10	4
5	5	7	6	0

Total wasted heart is 21, and club is 14. Efficiency gap is $\frac{21-14}{33+44} = \frac{1}{11}$ This is quite small. $\frac{1}{11}7 \simeq .636$ so a moderate gain favouring clubs. Maybe it explains one seat at 5-2 instead of 4-3.