

1 June 1 TO DO

Read the SMALL RAMSEY NUMBERS slides- even though you already know most it, there is one aspect you don't know: That some of the graph colorings have a nice algebraic structure.

2 Random Ramsey Numbers

1. Write a program that will
Given n , generate a random 2-coloring of K_n .
2. Write a program that will, given k and a 2-coloring of K_n , report how many mono K_k there are.
3. Put those two programs together to produce a program that will,
Given n, k generate a random 2-coloring of K_n and report how many mono K_k 's there are.
4. Use the program in the last point to write a program that does the following:

Given n, k, N do the following:

For $i = 1$ to N

Generate a random 2-coloring of K_n and count how many mono K_k 's there are . Say there were L mono K_k 's. You will have counters keeping track of how many mono K_k 's there are, so increase the counter for L of them by 1.

After you gather all of this data output the a table like the one below which is an example with $n = 10, k = 3, N = 100$. Then numbers are made up.

Here is your output. It does not need to be in italics. I do that to set it off from everything else.

If we randomly color the edges of K_{10} 100 time then:

We got exactly 10 mono K_3 9 times

We got exactly 11 mono K_3 22 times

We got exactly 12 mono K_3 42 times

We got exactly 13 mono K_3 22 times

We got exactly 14 mono K_3 5 times

5. My main interest for now is K_{17}, K_{16}, \dots and mono K_4 .
When is the prob of 1 mono K_4 go from under 0.5 to over 0.5.
6. I leave it to you ask and answer more questions about this. My question was just about is there a mono K_k or not. You can ask about number of mono K_k .

3 Random Grid Colorings: Mono Rectangles

Similar problem for when over half the colorings of $a \times b$ have a mono rectangle, and also how many mono rectangles.

4 Random Grid Colorings: Mono Squares

Similar problem for when over half the colorings of $a \times b$ have a mono squares, and also how many mono rectangles.