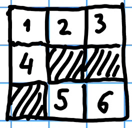
Rook POLYNOMIALS



C

In how many ways can we place x rooks so that they cannot take each other

$x=0 \to 1$

$x=1 \to 6$

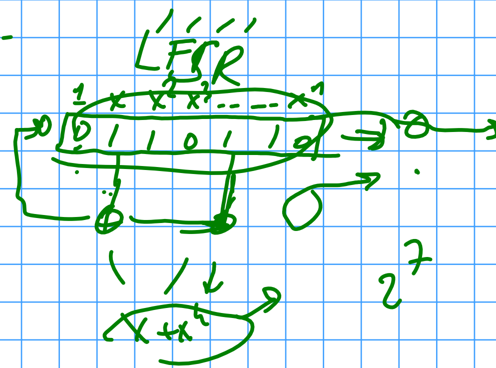
$x=2 \to 8$

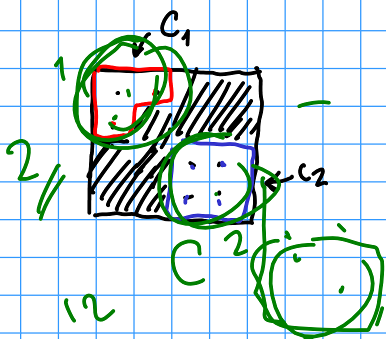
$x=3 \to 2$

$$r(C,x) = 1+6x+8x^2+2x^3$$

101
111 ?

$(1+x^2)(1+x) \ldots$?



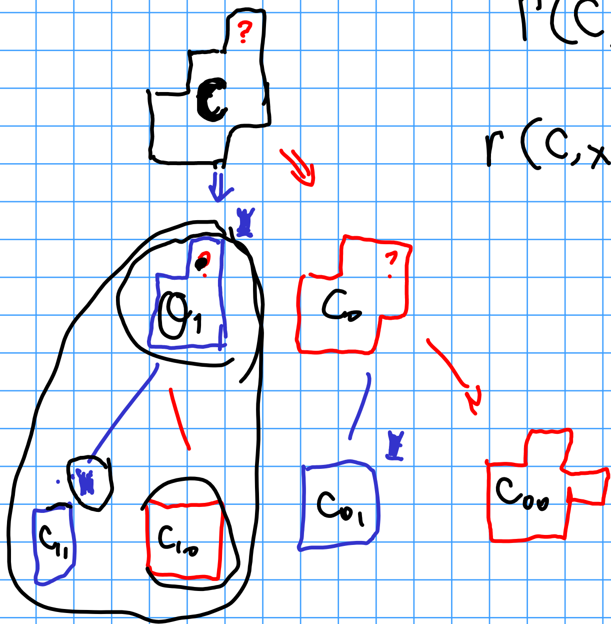


$$r(C_1,x) = 1+3x+x^2$$

$$r(C_2,x) = 1+4x+2x^2$$

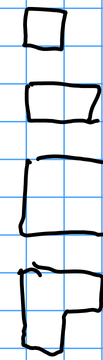
$$r(C,x) = (1+3x+x^2)(1+4x+2x^2)$$

$$= 1+7x+15x^2+10x^3+2x^4.$$



$$r(C,x) = ? \quad 1+8x+16x^2+\dots$$

$$r(C,x) = x\cdot r(C_1,x) + r(C_0,x)$$



$1+x$

$1+2x$

$1+4x+2x^2$

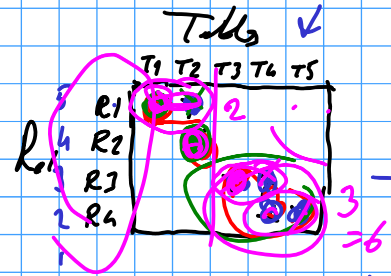
$1+3x+x^2$

$$r(C_1,x) = \underbrace{r(C_{11},x)}\cdot x + \underbrace{r(C_{10},x)}$$

$$= (1+2x)\cdot x + 1+4x+2x^2$$

$$= x+2x^2+1+4x+2x^2$$

$$= 1+5x+4x^2$$



Let c_i denote R_i sits in a wrong forbidden table

$$\bar{N} = S_0 - S_1 + S_2 - S_3 + S_4 \quad \text{by I.E}$$

$$P(5,4) = \frac{5!}{1!} - 7.4! + 16.3! - 13.2! + 3.1!$$

$$S_0 = P(5,4) = 5!$$

$$S_1 = \underbrace{N(c_1)}_{4!+4!} + \underbrace{N(c_2)}_{4!} + \underbrace{N(c_3)}_{4!+4!} + \underbrace{N(c_4)}_{4!+4!} = 7.4!$$

$$S_2 = N(c_1c_2) + N(c_1c_3) + N(c_1c_4) + N(c_2c_3) + N(c_2c_4) + N(c_3c_4) = 16.3!$$

$$3! + 4.3! + 4.3! + 2.3! \quad 2.3! \quad 3.3!$$

$$S_3 = N(c_1c_2c_3) + N(c_1c_2c_4) + N(c_1c_3c_4) + N(c_2c_3c_4) = 13.2!$$

$$= 2.2! + 2.2! + 6.2! + 3.2!$$

$$S_4 = N(c_1c_2c_3c_4) = 3.1!$$