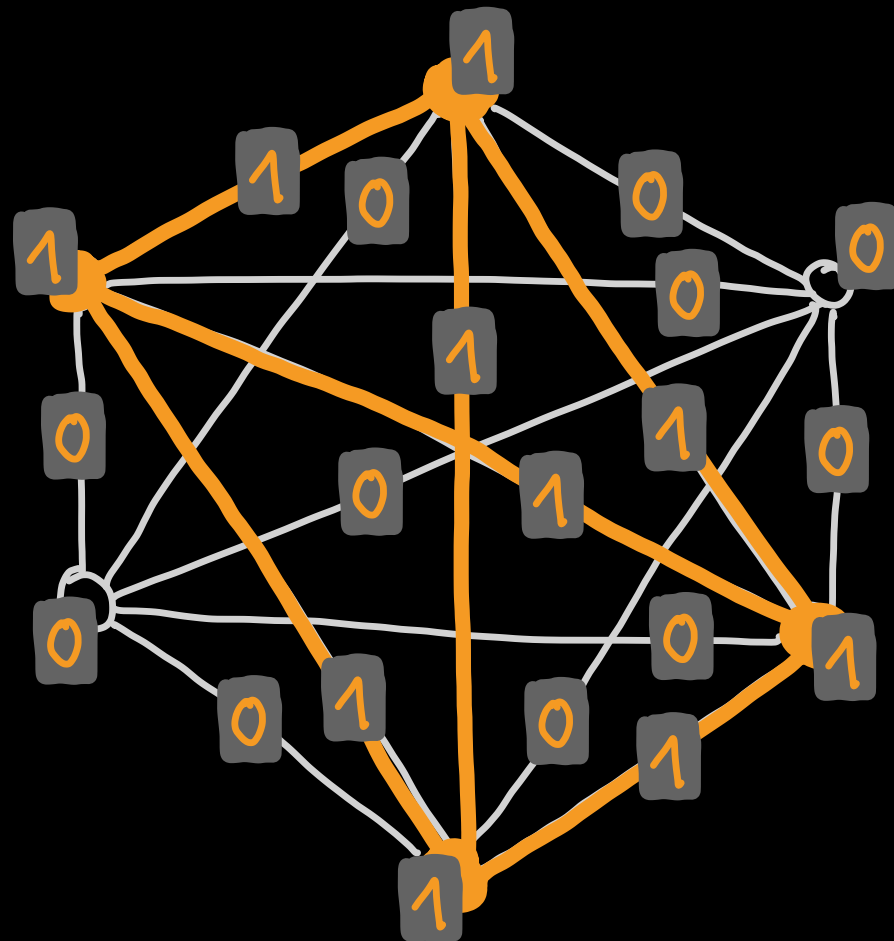


# THE CORRELATION POLYTOPE

$$\text{CORR}(n) := \text{conv} \left\{ (x(A), x(E(A))) : A \subseteq [n] \right\}$$



THEOREM [K. ZWELTGE 2013]

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$$\chi_C(\text{CORR}(n)) \geq 1.5^n$$

THEOREM [K. ZWELTGE 2013]

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$$\chi C(\text{CORR}(n)) \geq 1.5^n$$

EXTENSION COMPLEXITY

||

SMALLEST NUMBER OF FACETS  
OF A POLYTOPE  
WHOSE PROJECTION IS  $\text{CORR}(n)$

FIORINI, MASSAR, POKUTTA, DE WOLF, TIWARY 2012

$$\exists \varepsilon > 0 : \chi_C(\text{CORR}(n)) \geq (1 + \varepsilon)^n$$

$$\left( \Rightarrow \chi_C(\text{TSP}(n)) \geq 2^{\Omega(\sqrt{n})}, \dots \right)$$

FIORINI, MASSAR, POKUTTA, DE WOLF, TIVARY 2012

$$\exists \varepsilon > 0 : \chi_C(\text{CORR}(n)) \geq (1 + \varepsilon)^n$$

$$\left( \Rightarrow \chi_C(\text{TSP}(n)) \geq 2^{\Omega(\sqrt{n})}, \dots \right)$$

BRAUN & POKUTTA 2013

$$\chi_C(\text{CORR}(n)) \geq 1.24^n$$

$$\text{CORR}(n) = \text{conv} \left\{ (\chi(A), \chi(E(A))) : A \subseteq [n] \right\}$$

FOR EACH  $B \subseteq [n]$  :

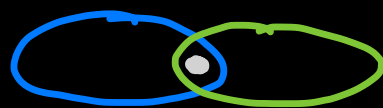
$$\left\langle (\chi(B), -2 \cdot \chi(E(B))), (\chi(A), \chi(E(A))) \right\rangle \leq 1$$

$$|A \cap B| - 2 \cdot |E(A \cap B)|$$



$$|A \cap B| = 0$$

NON-INCIDENT



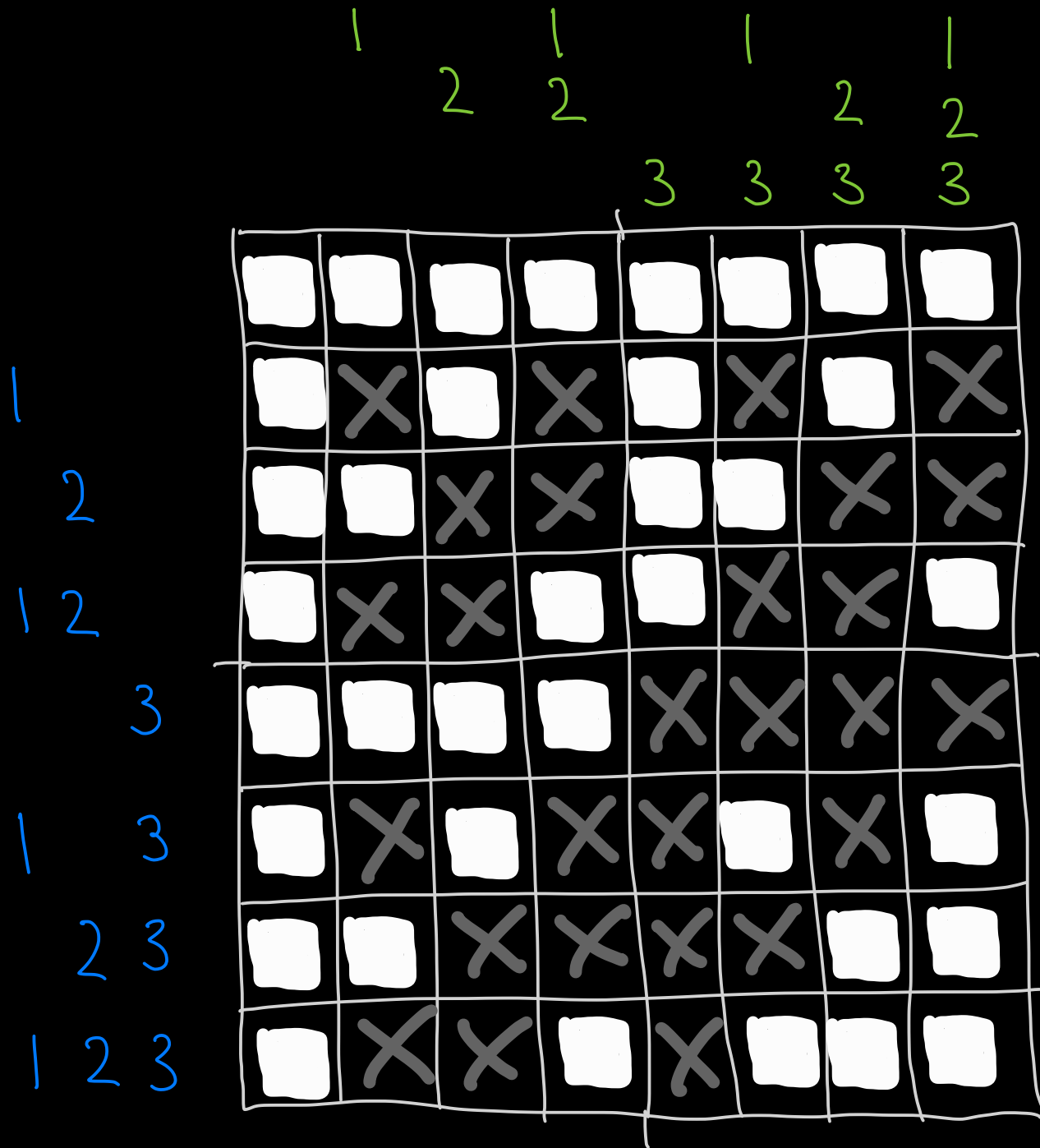
$$|A \cap B| = 1$$

INCIDENT



$$|A \cap B| \geq 2$$

NON-INCIDENT



TO SHOW:

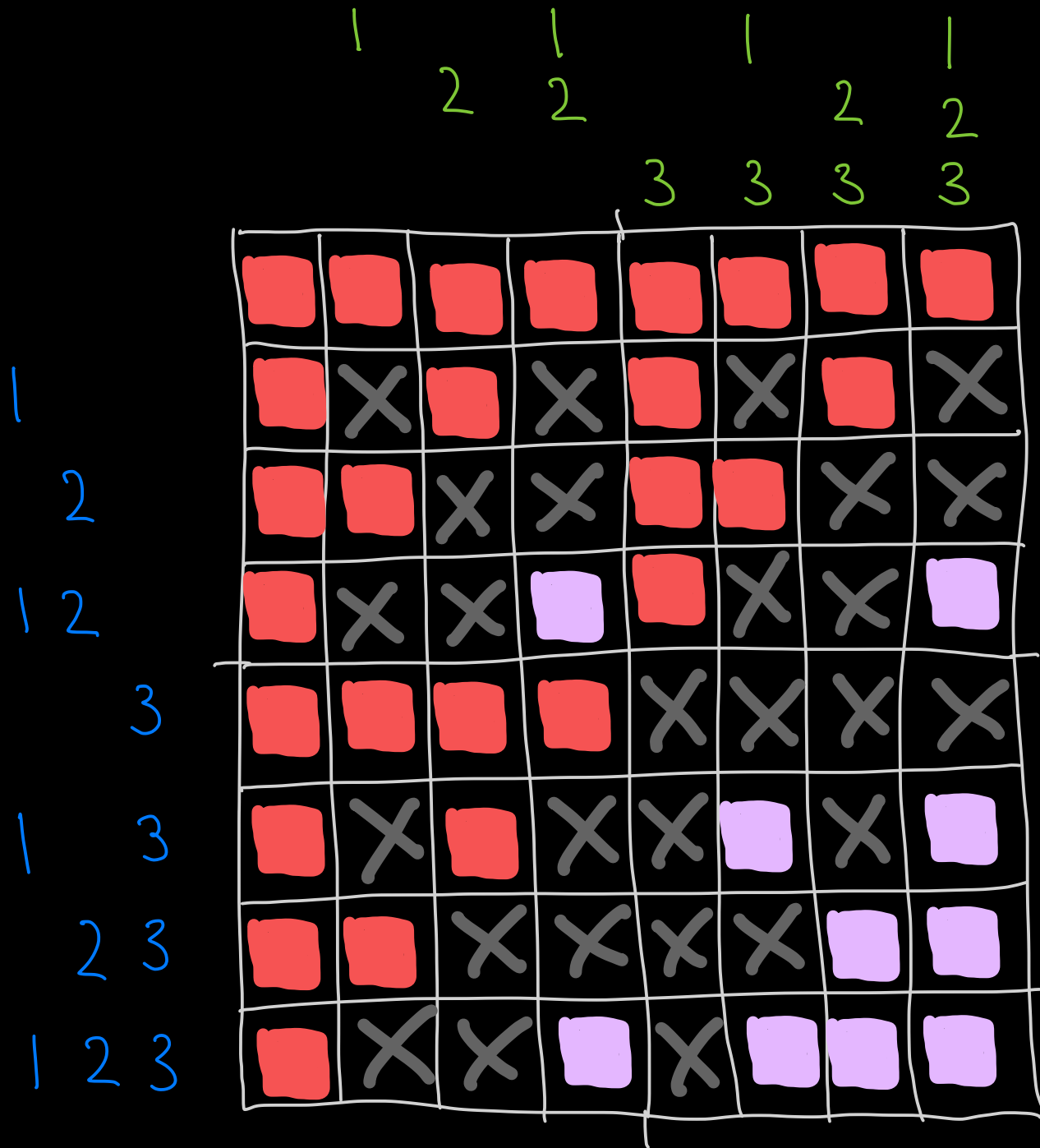
AT LEAST  $\left(\frac{3}{2}\right)^n$

X-FREE RECTANGLES

NECESSARY TO

COVER ALL





TO SHOW:

AT LEAST  $\left(\frac{3}{2}\right)^n$

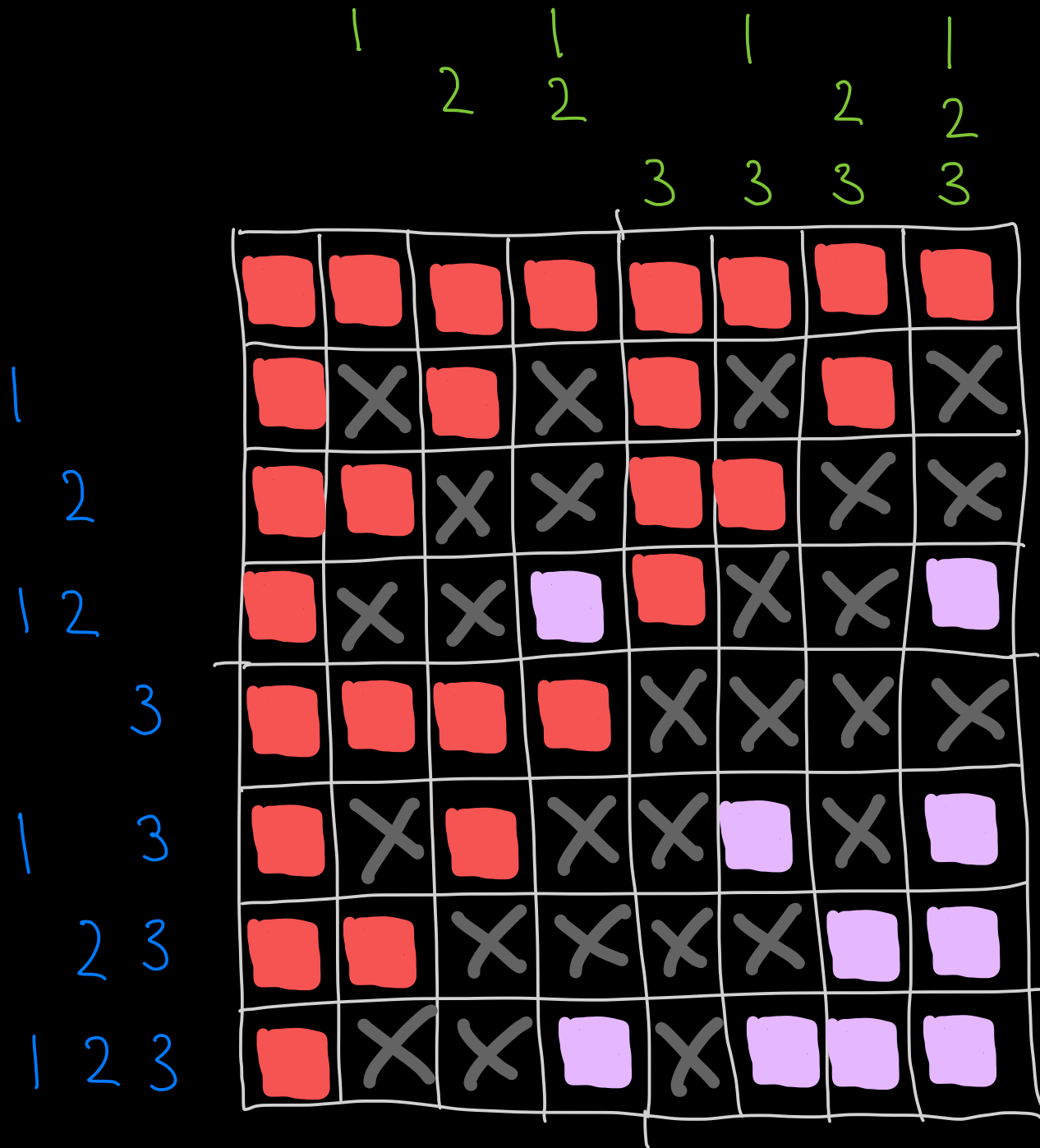
X-FREE RECTANGLES

NECESSARY TO

COVER ALL

 AND 





TO SHOW:

AT LEAST  $\left(\frac{3}{2}\right)^n$

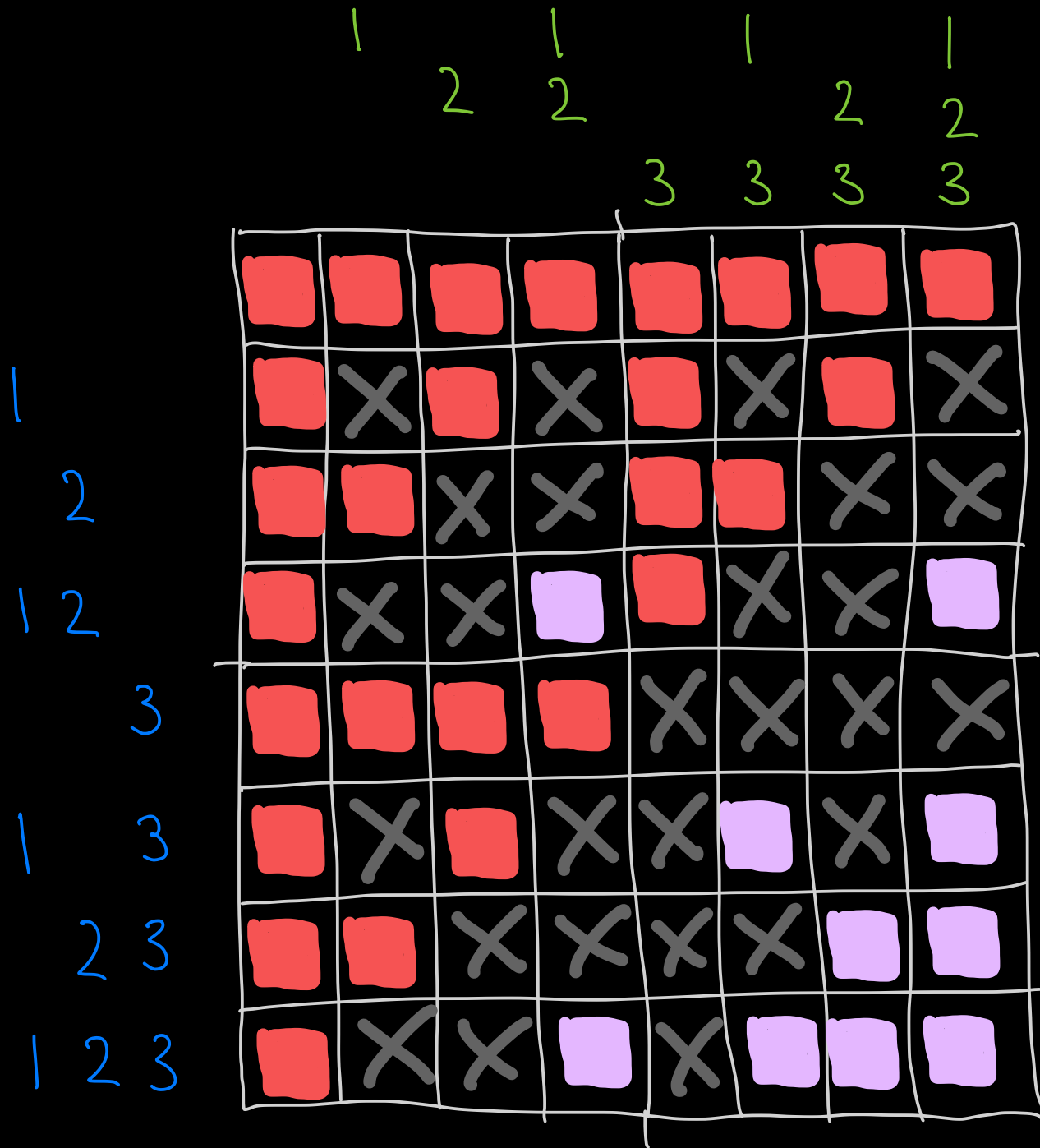
X-FREE RECTANGLES

NECESSARY TO

COVER ALL

 AND 


↑  
 $3^n$

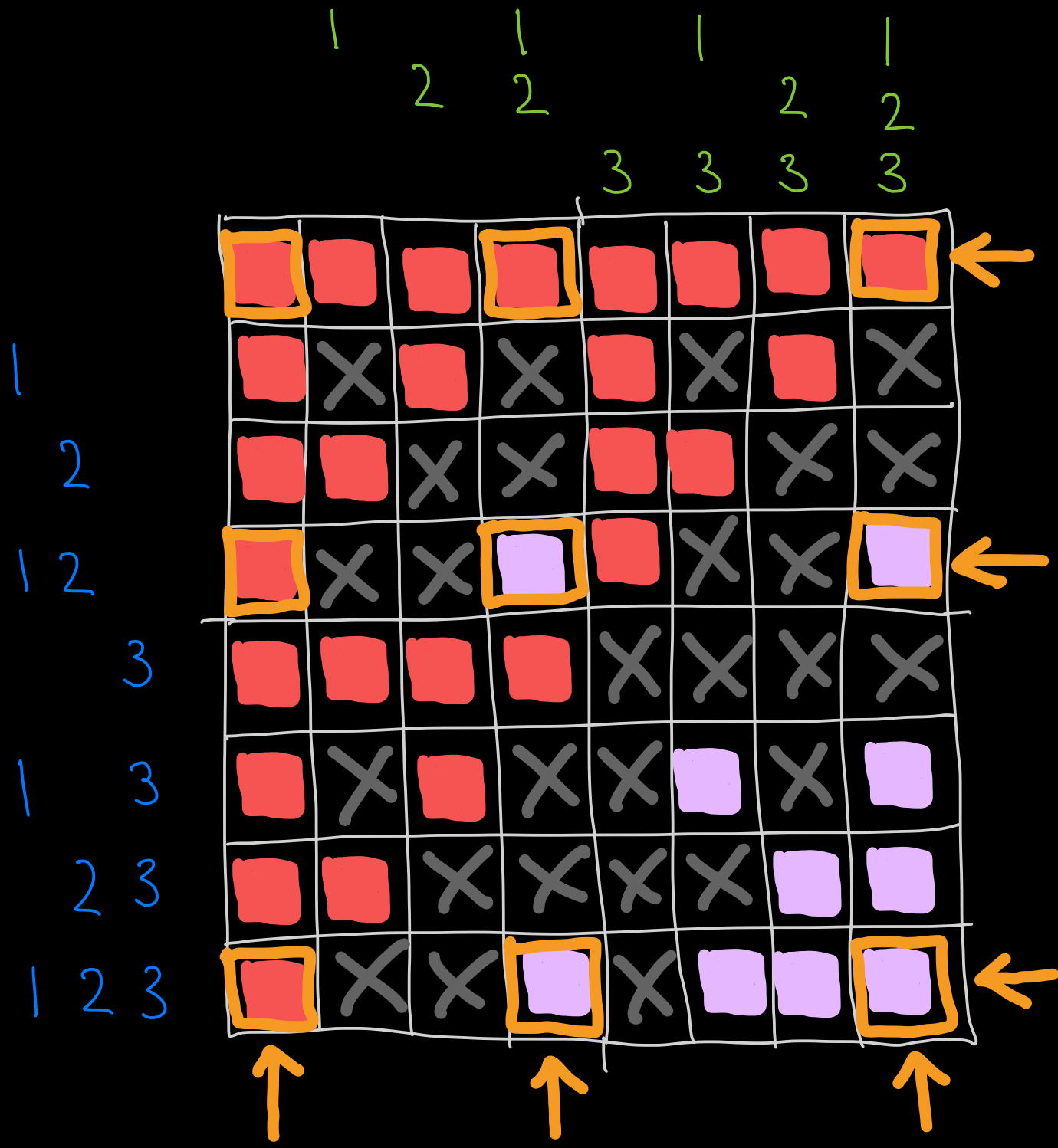


TO SHOW:

X-FREE RECTANGLES

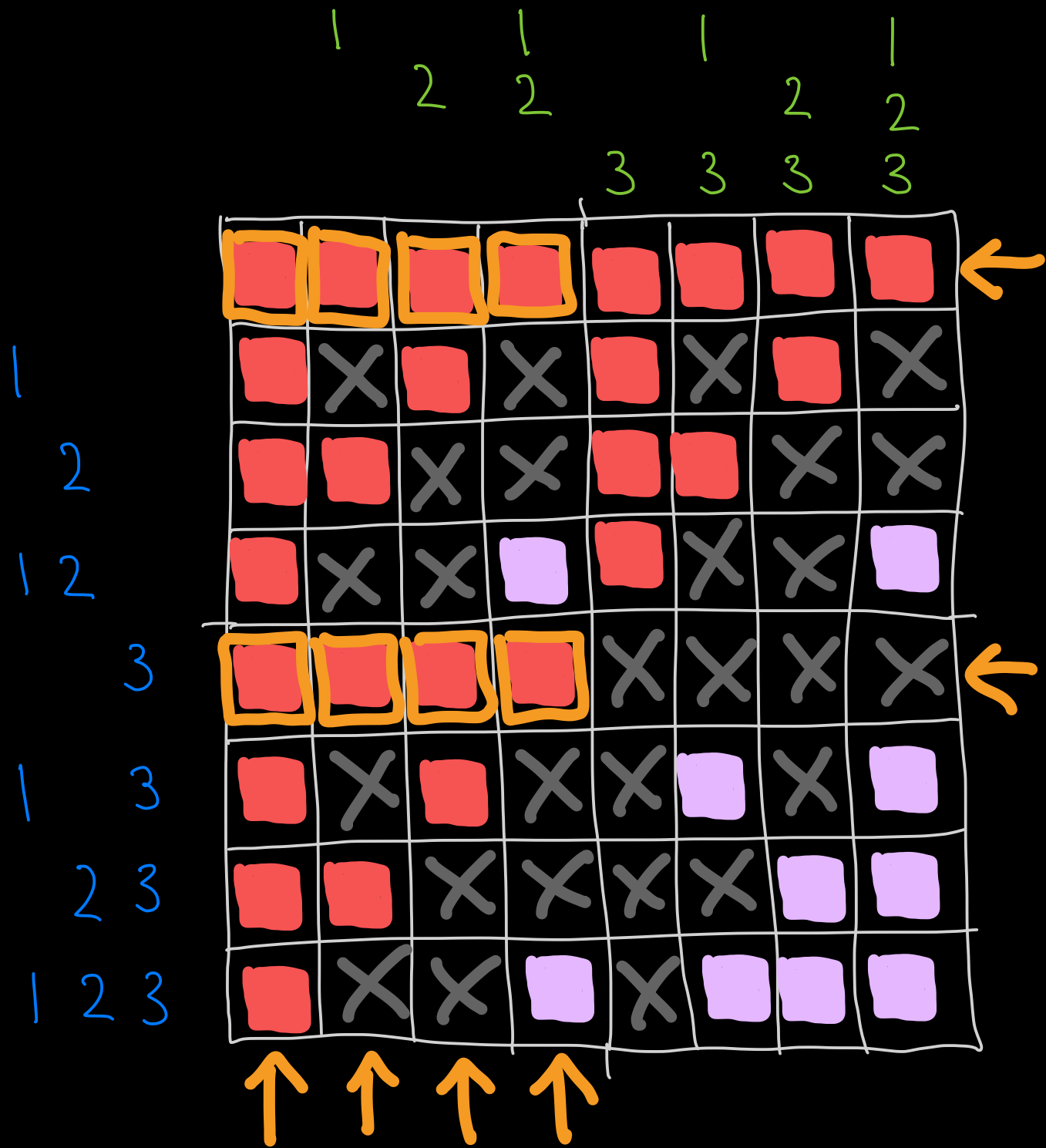
HAVE AT MOST

$2^n$   's



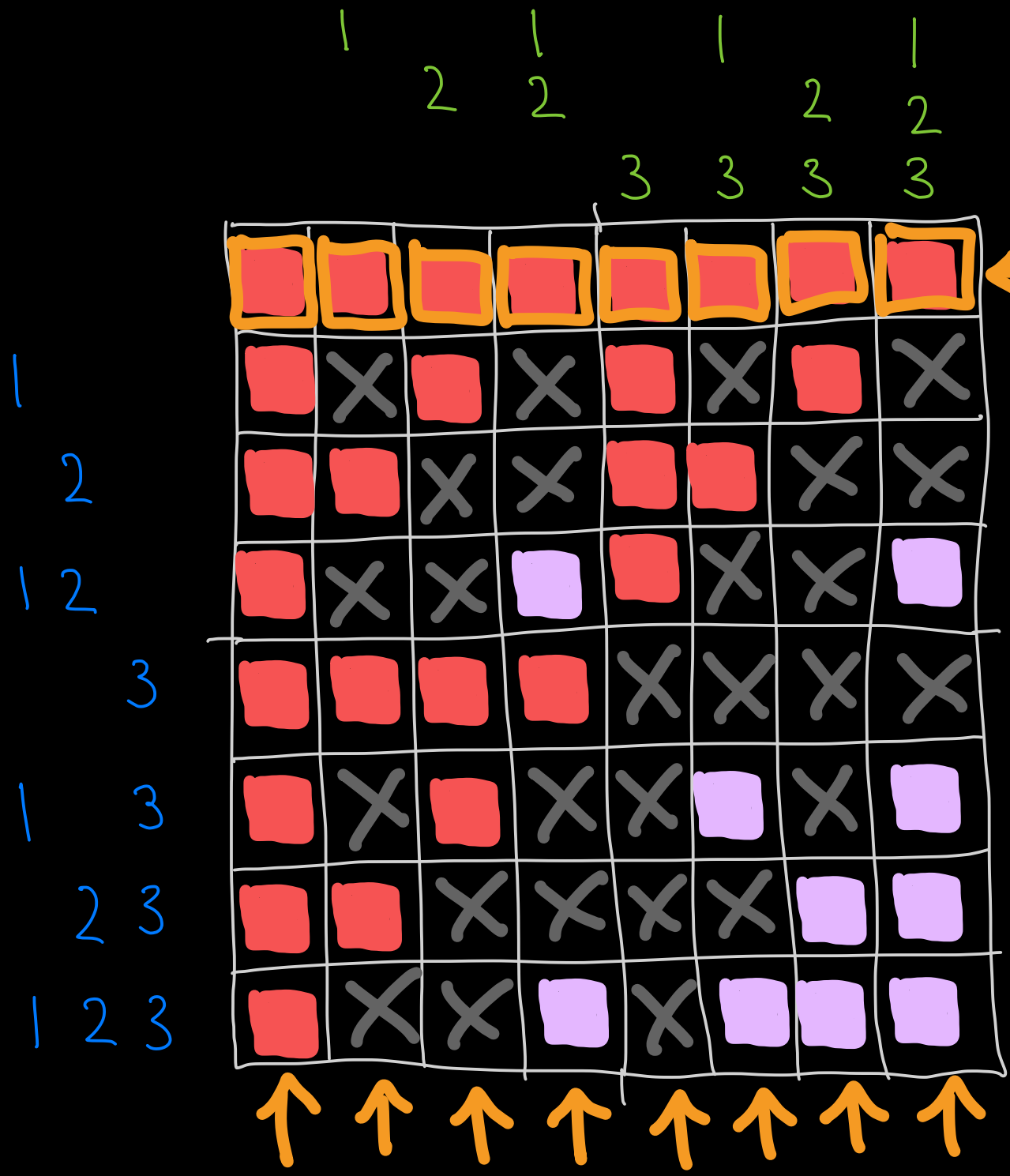
TO SHOW:

X-FREE RECTANGLES  
 HAVE AT MOST  
 $2^n$  's



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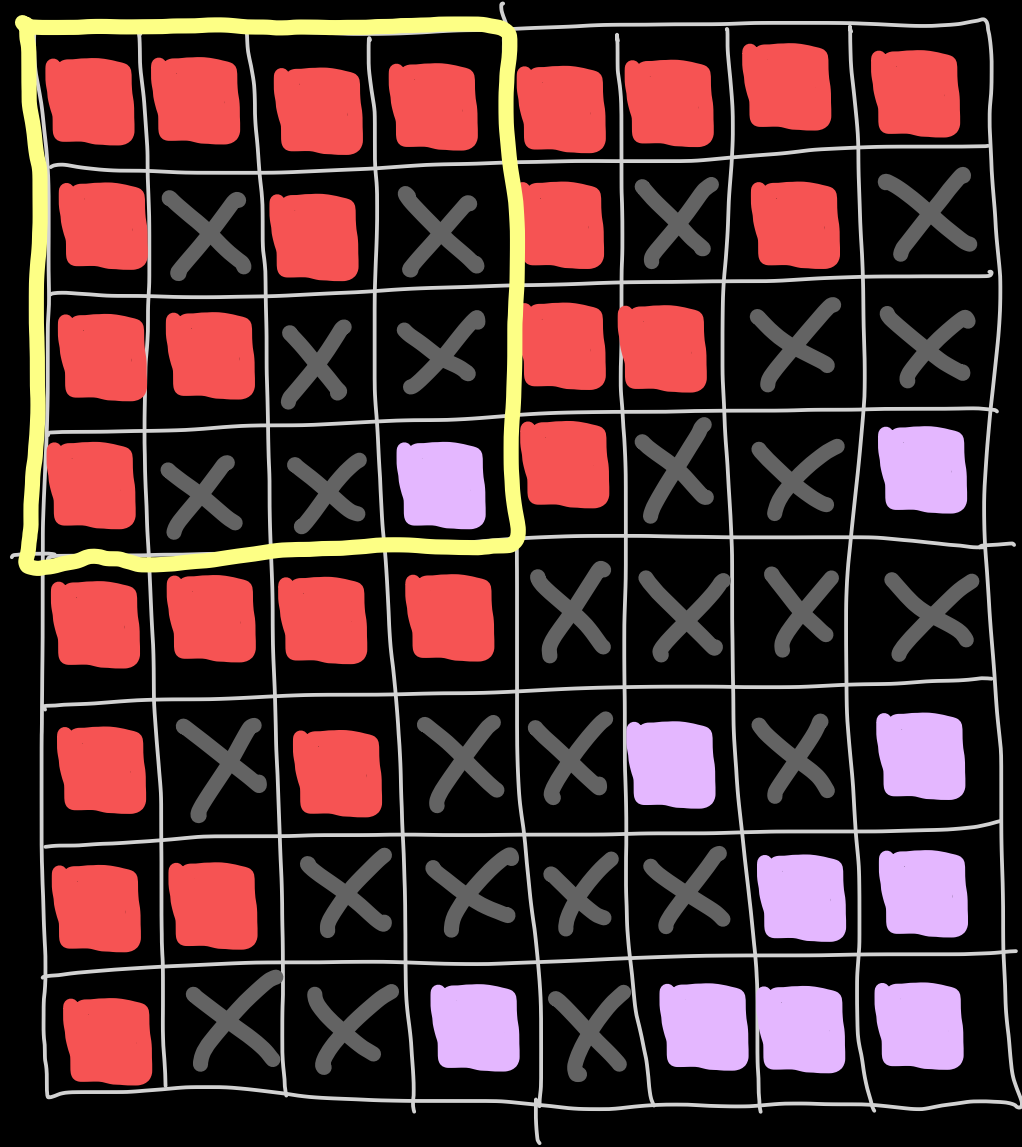


TO SHOW:

X-FREE RECTANGLES  
 HAVE AT MOST  
 $2^n$  's

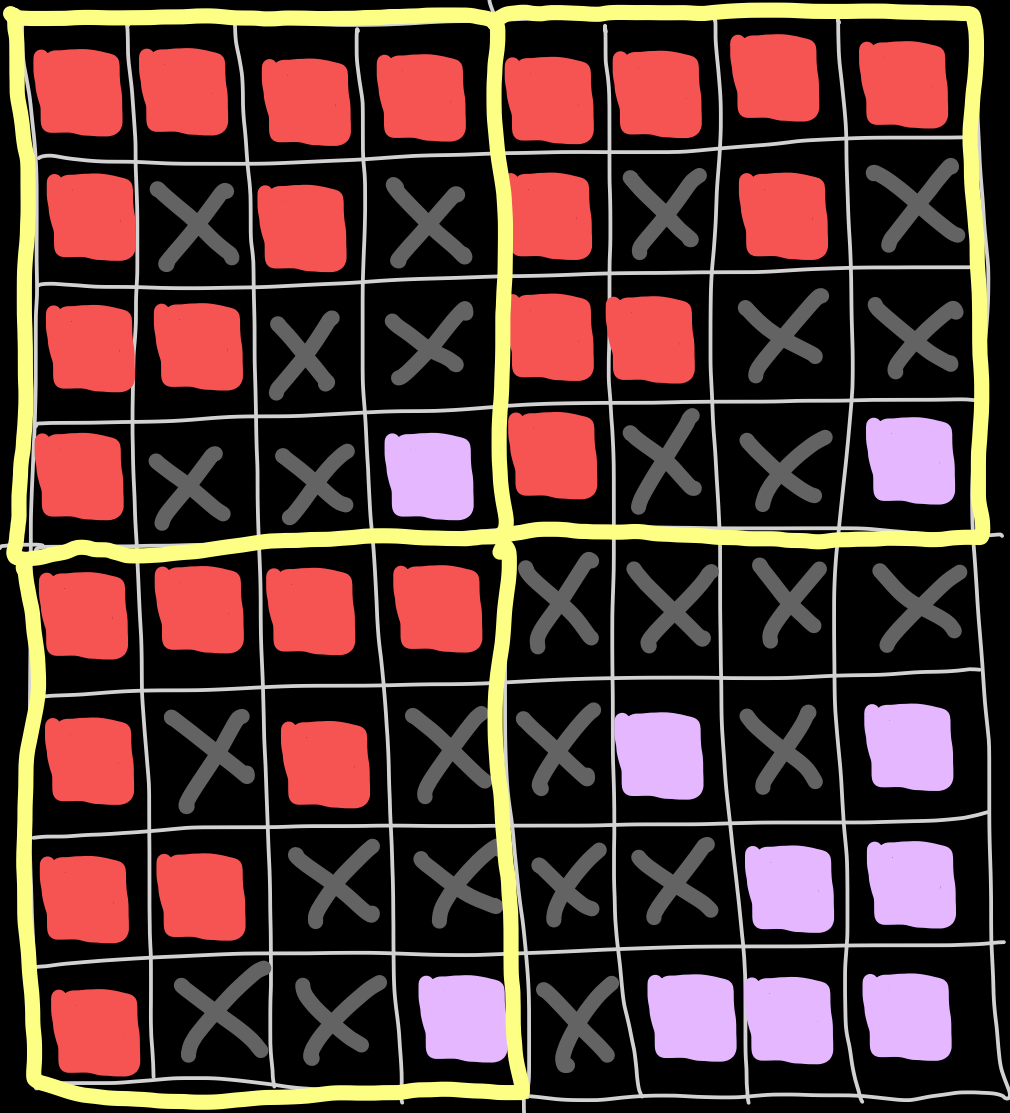
1 1 1 1  
2 2 2 2  
3 3 3 3

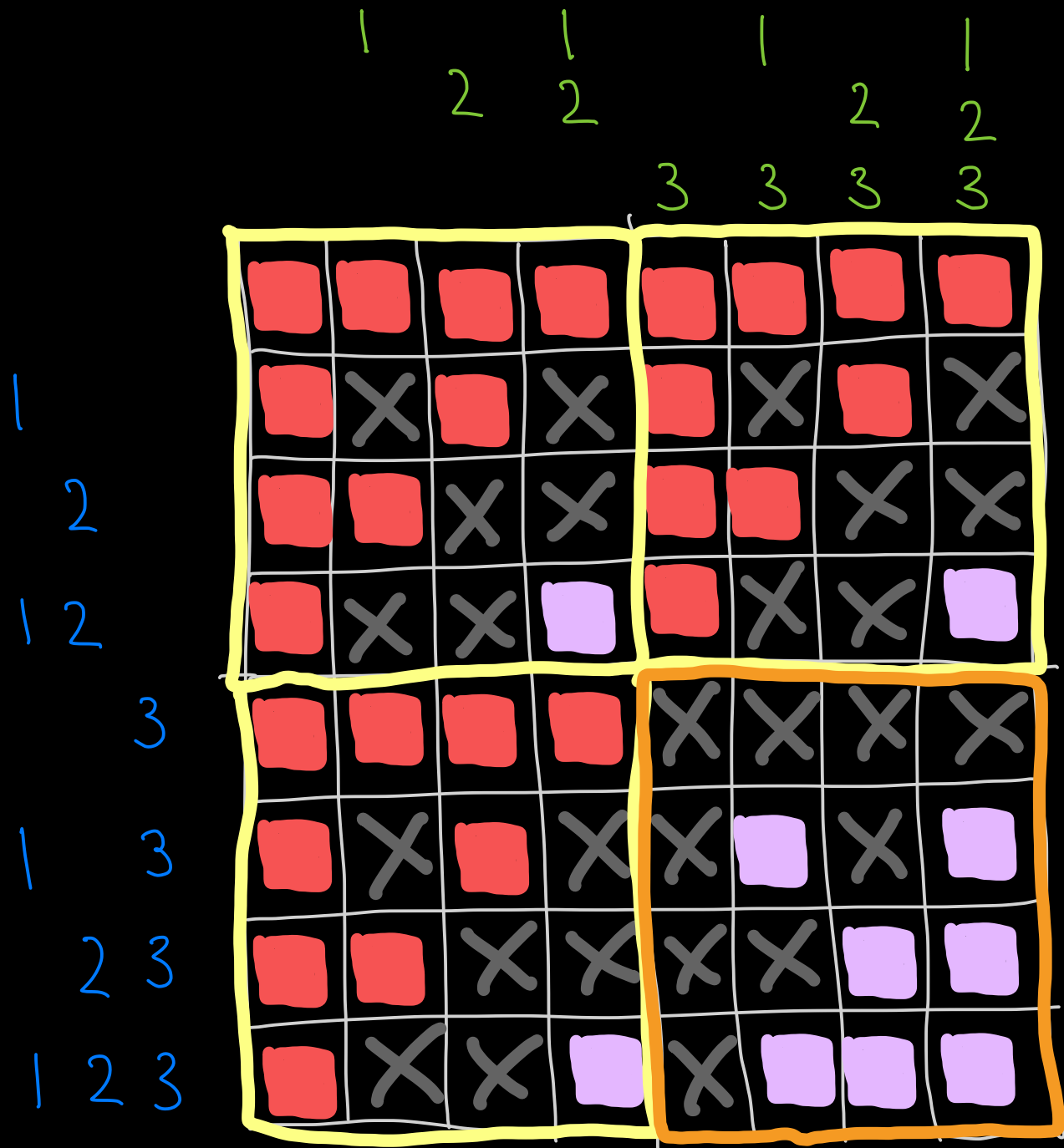
1  
2  
1 2  
3  
1 3  
2 3  
1 2 3



1 2 1 1 2 1  
 2 2 3 3 3 3

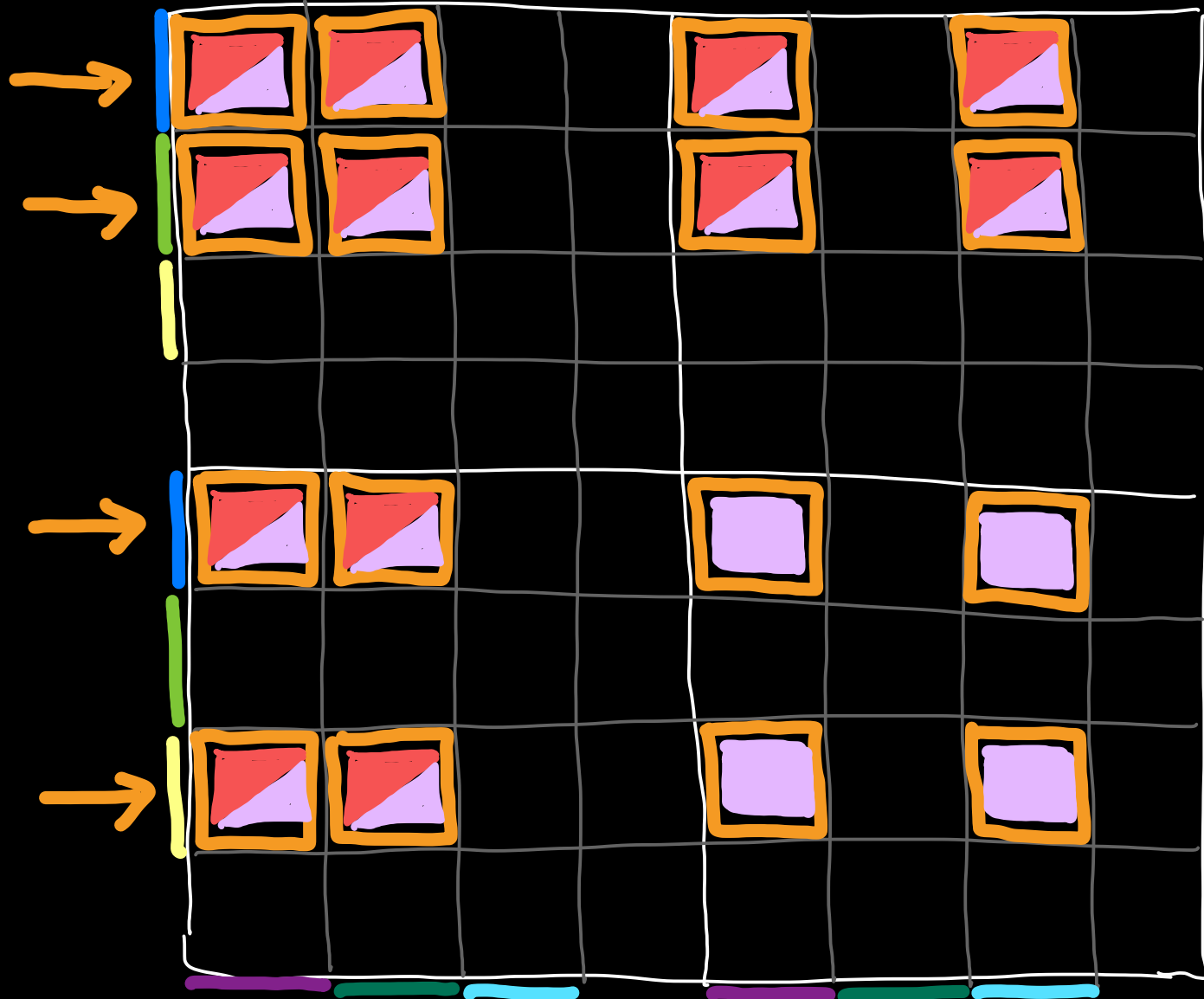
1  
 2  
 1 2  
 3  
 1 3  
 2 3  
 1 2 3







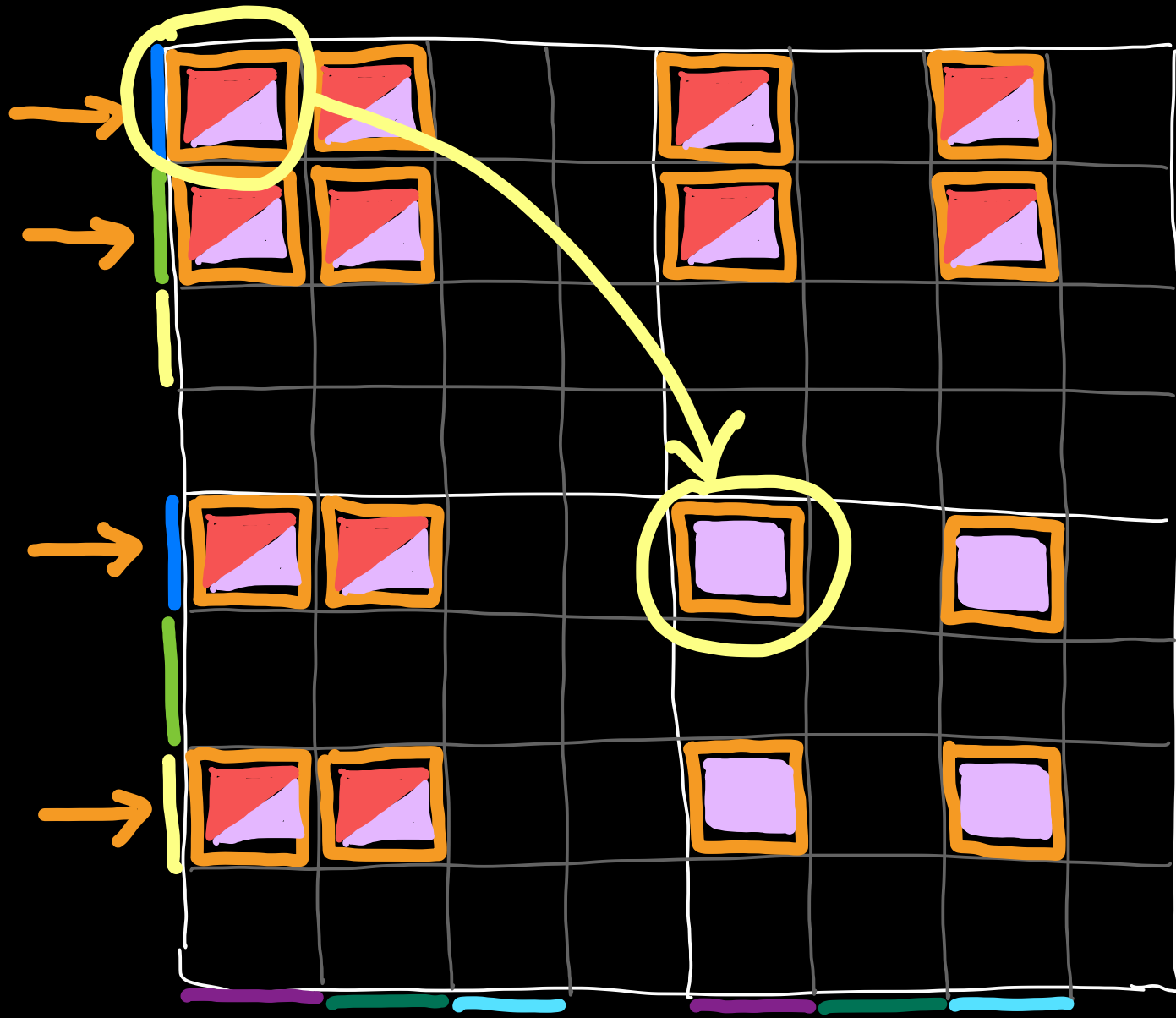


TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  's



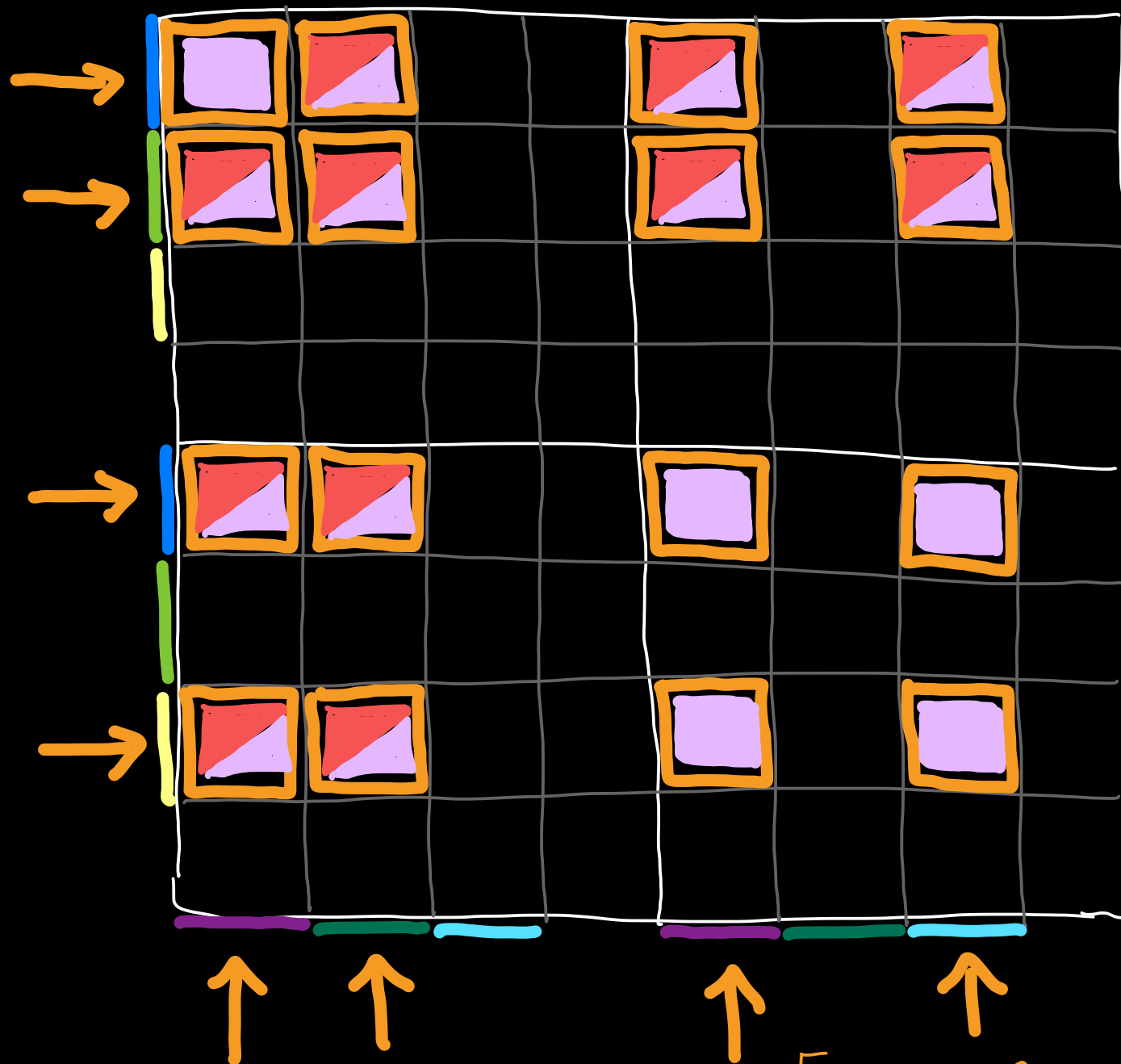
[LOWER RIGHT:   $\rightsquigarrow$  



TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  's



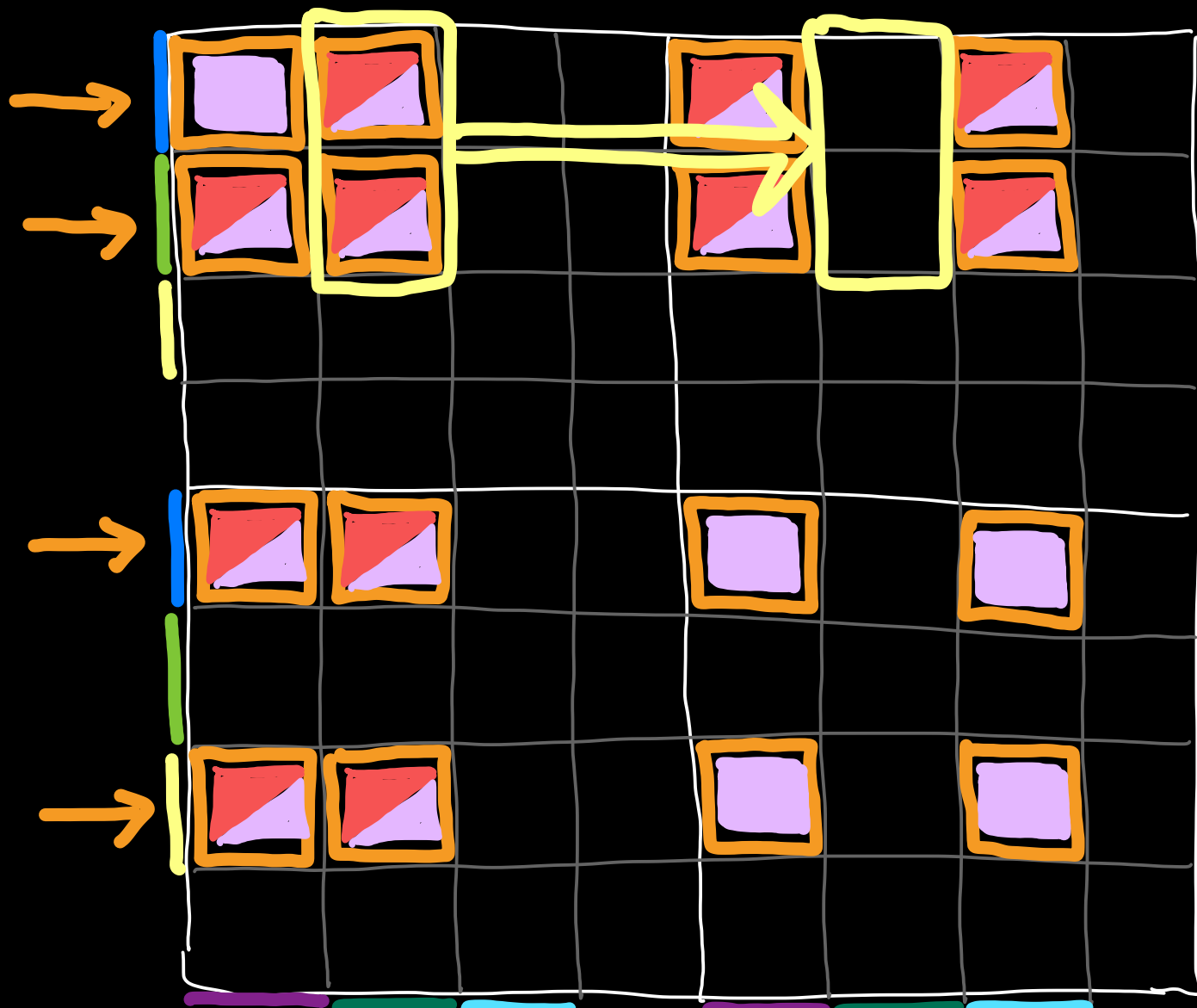
[LOWER RIGHT:   $\rightsquigarrow$  

TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  'S



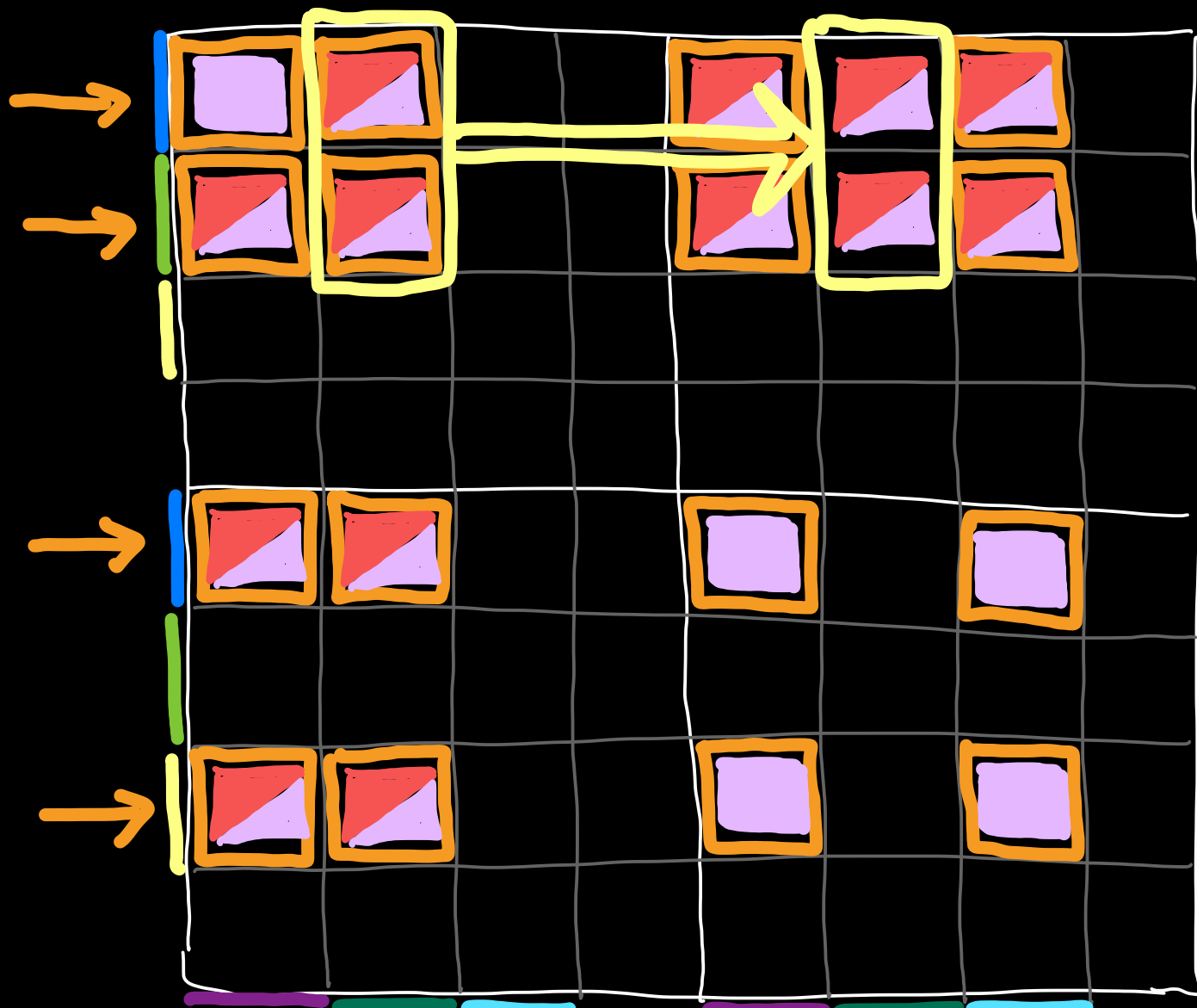
[LOWER RIGHT:   $\rightsquigarrow$  ]

TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  'S



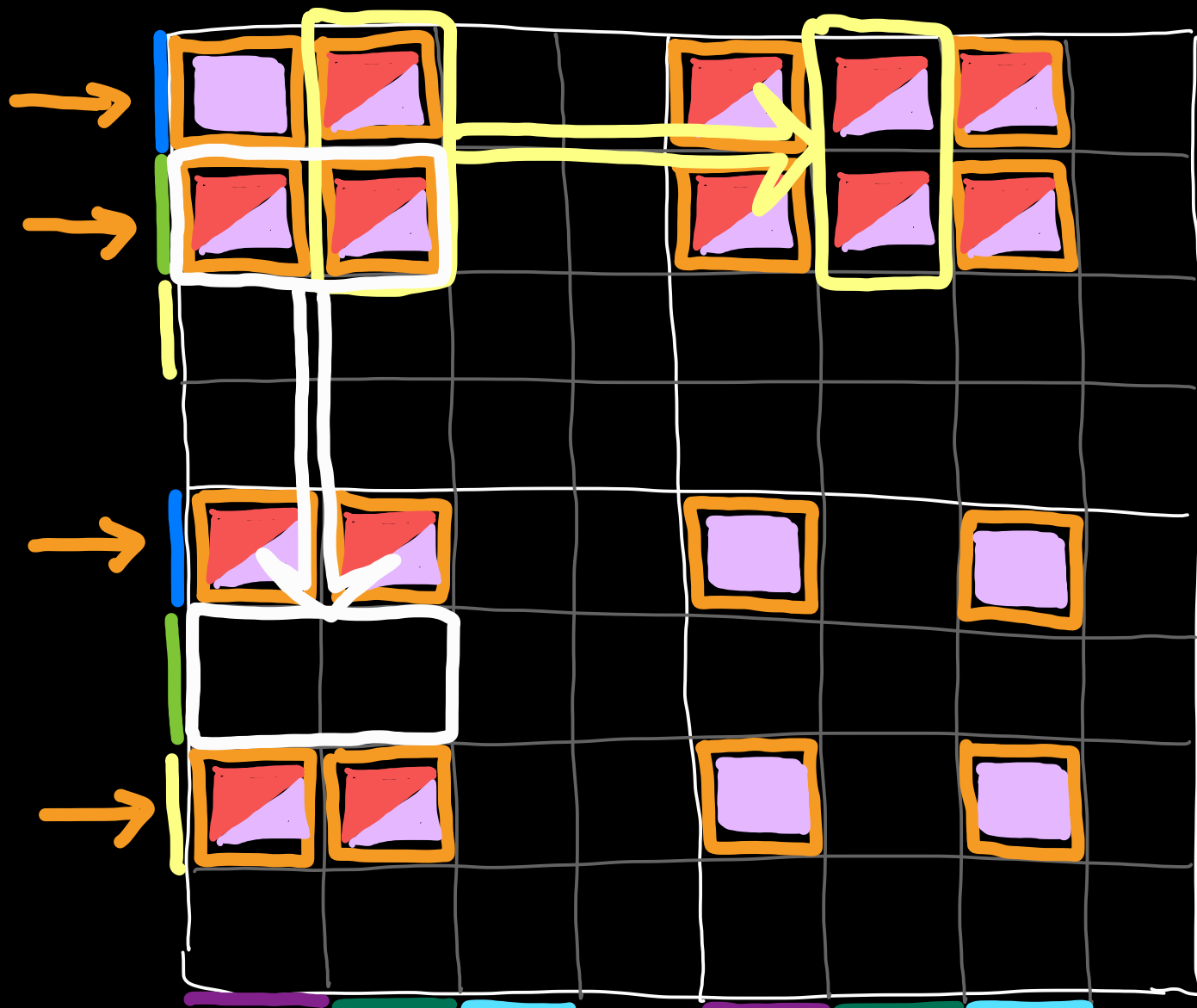
[LOWER RIGHT:   $\rightsquigarrow$  

TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  's



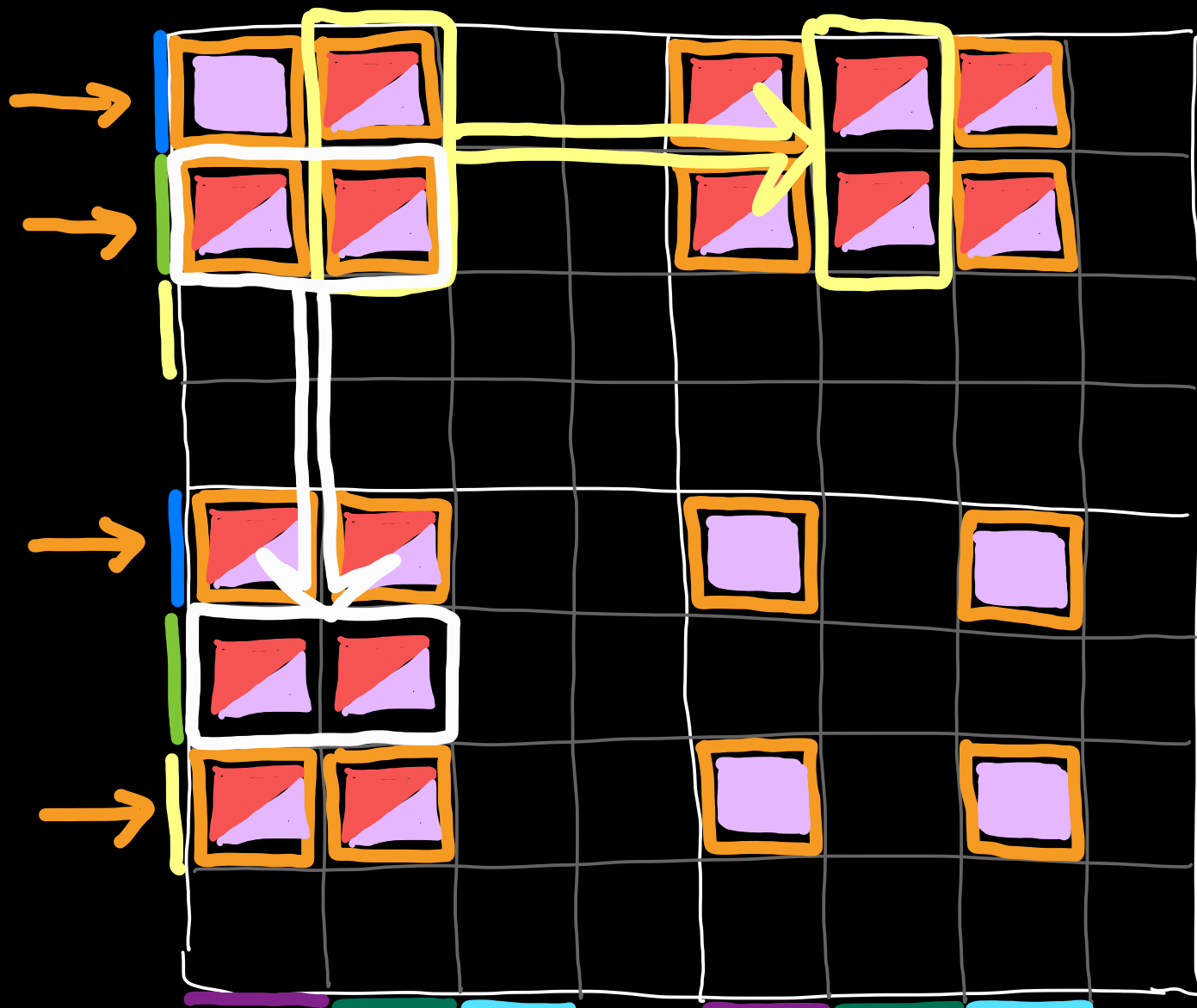
[LOWER RIGHT:   $\rightsquigarrow$  ]

TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  'S



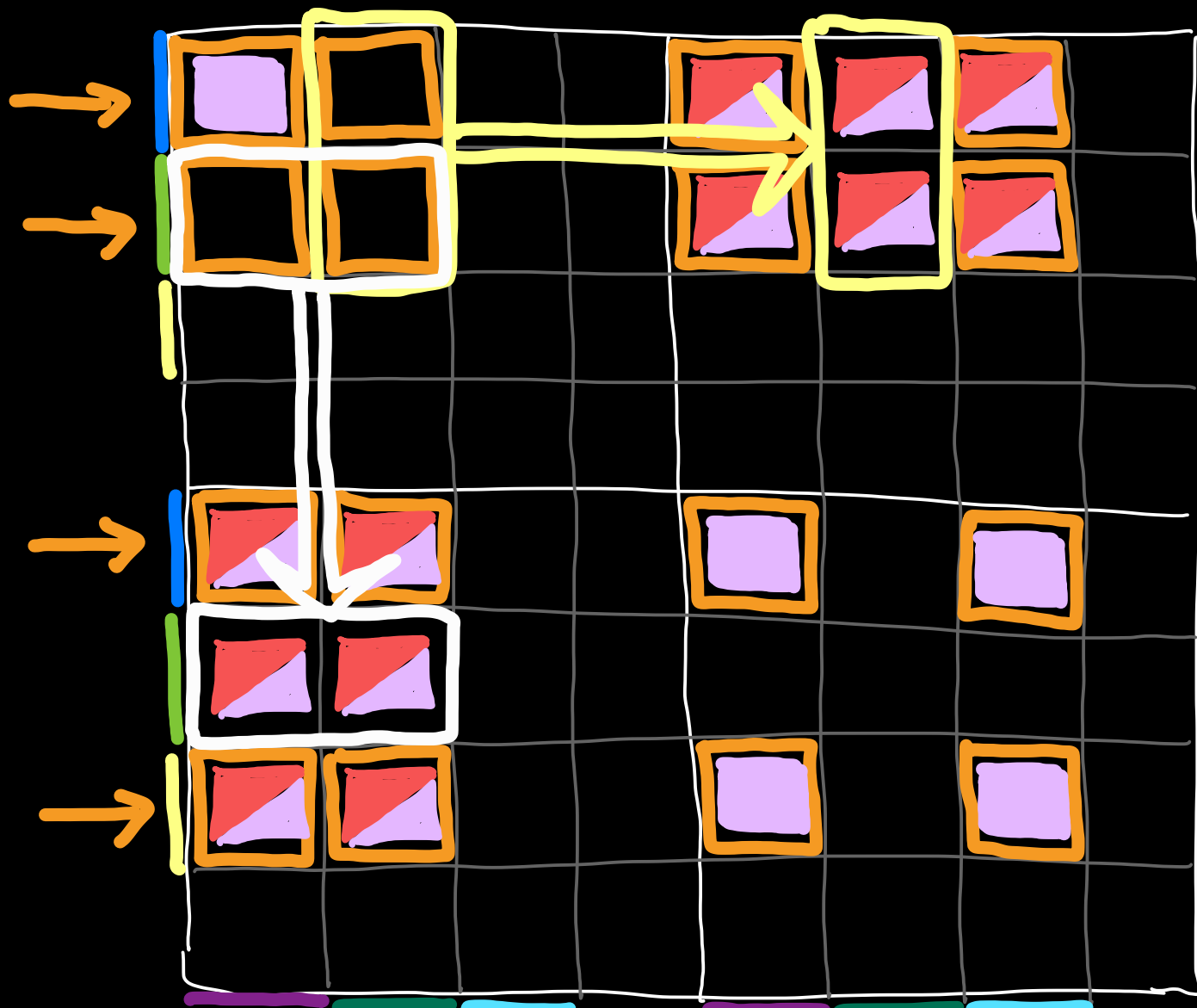
[LOWER RIGHT:   $\rightsquigarrow$  

TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  'S



[LOWER RIGHT:   $\rightsquigarrow$  

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TO SHOW: X-FREE RECTANGLES HAVE  $\leq 2^n$  's

