

# un-stacking the deck

redistricting, voting rights, and math

hi! I'm Anthony.

civics

mathematics

Anthony.

**what's in this talk**

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1. some historical context

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2. contemporary research

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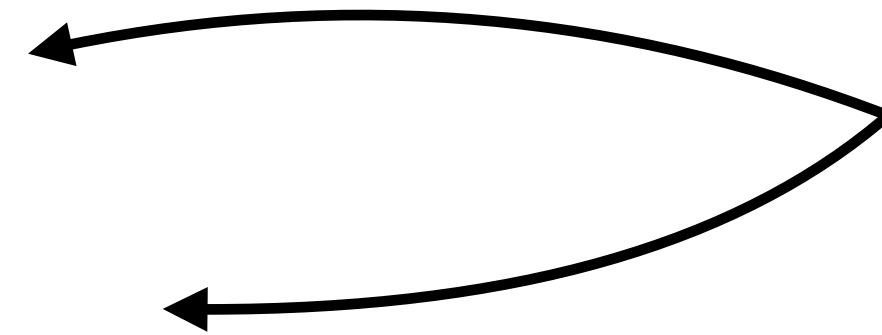
1. some historical context
2. contemporary research
3. an outlook for 2022 and beyond

# **what's in this talk**

1. some historical context

2. contemporary research

3. an outlook for 2022 and beyond



(with little breaks in between)



**redistricting**

## **redistricting**

the practice of dividing a jurisdiction into electoral districts.

**gerrymandering**

## **gerrymandering**

the practice of redistricting to favor *or disfavor* a specific group

redistricting is a voting rights issue.

redistricting is a issue.

redistricting is a human issue.

# 1. historical context



**statutory law**

## **statutory law**

laws that get written, debated on, re-written, and passed by a legislative body.

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**case law**

## **case law**

rules or guidelines based on cases that previously came before the courts.

## **case law**

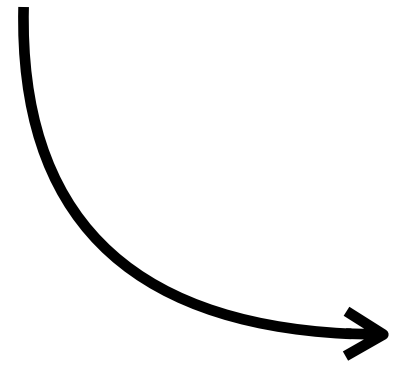
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equally-populated, single-member districts

# US Constitution and Apportionment Acts (pre-1842)

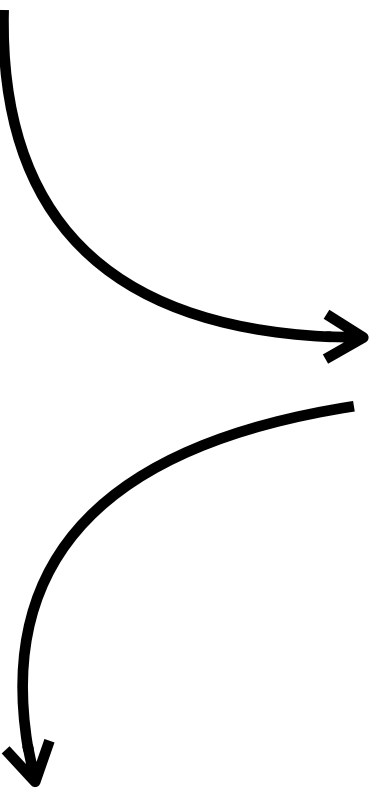


US Constitution and Apportionment Acts (pre-1842)



Apportionment Act of 1842

US Constitution and Apportionment Acts (pre-1842)



Apportionment Act of 1842

Apportionment Act of 1850

US Constitution and Apportionment Acts (pre-1842)

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*Wood v. Broom*

US Constitution and Apportionment Acts (pre-1842)

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*Wood v. Broom*

*Reynolds v. Sims*

*Baker v. Carr*

*Wesberry v. Sanders*



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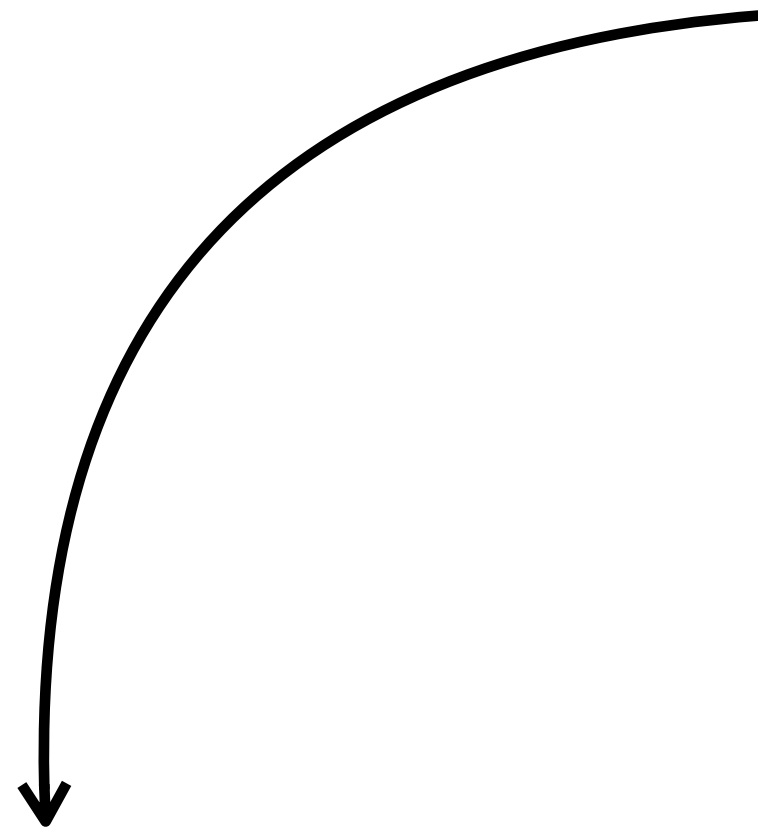
Public Law 90-196

phew.

# 1 The United States Census

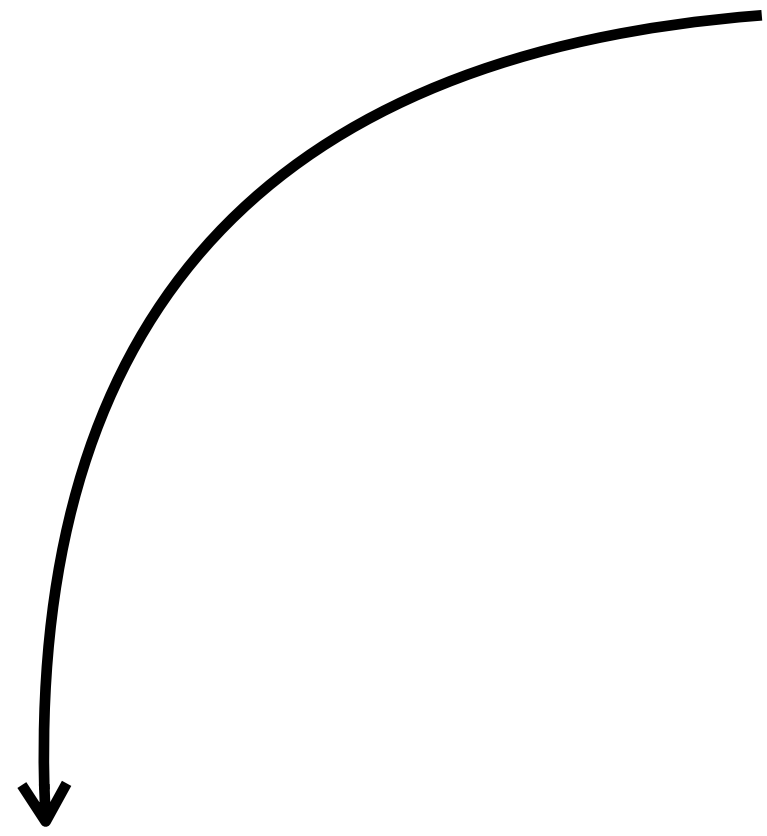
everyone\* gets counted.

**1** The United States Census  
everyone\* gets counted.

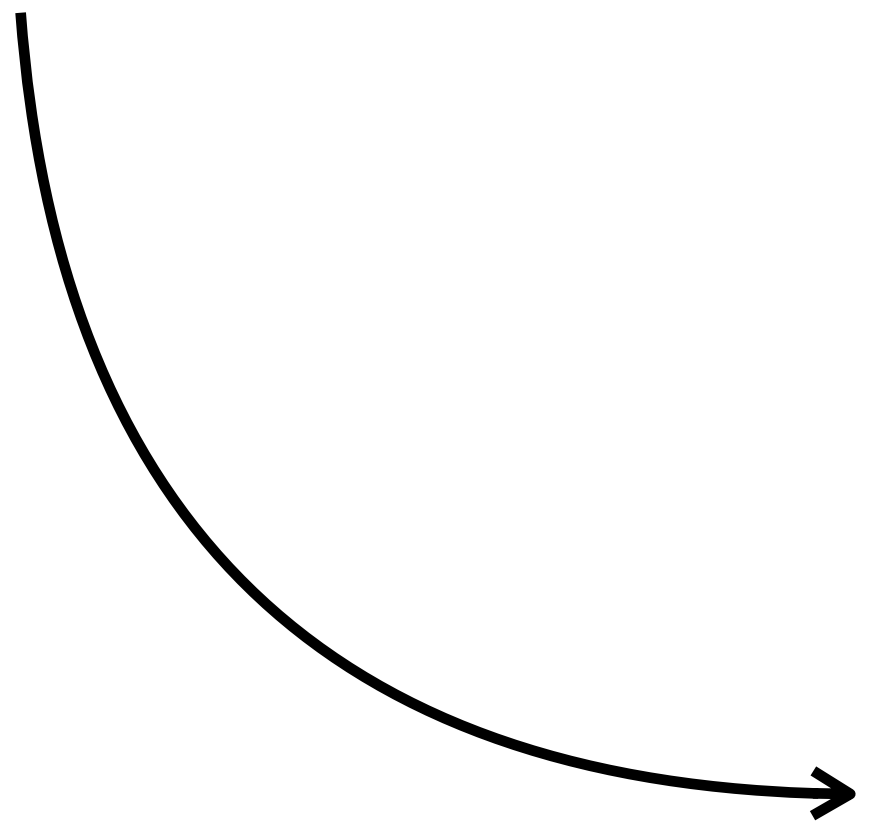


**2** Redistricting rules  
state and federal statutes, case law

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**3** Drawing the maps  
where the sausage gets made?

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1

## The United States Census

everyone\* gets counted.

2

## Redistricting rules

state and federal statutes, case law

MGGG

4

## Challenging the maps

someone's angry...

3

## Drawing the maps

where the sausage gets made?

## 2. contemporary research

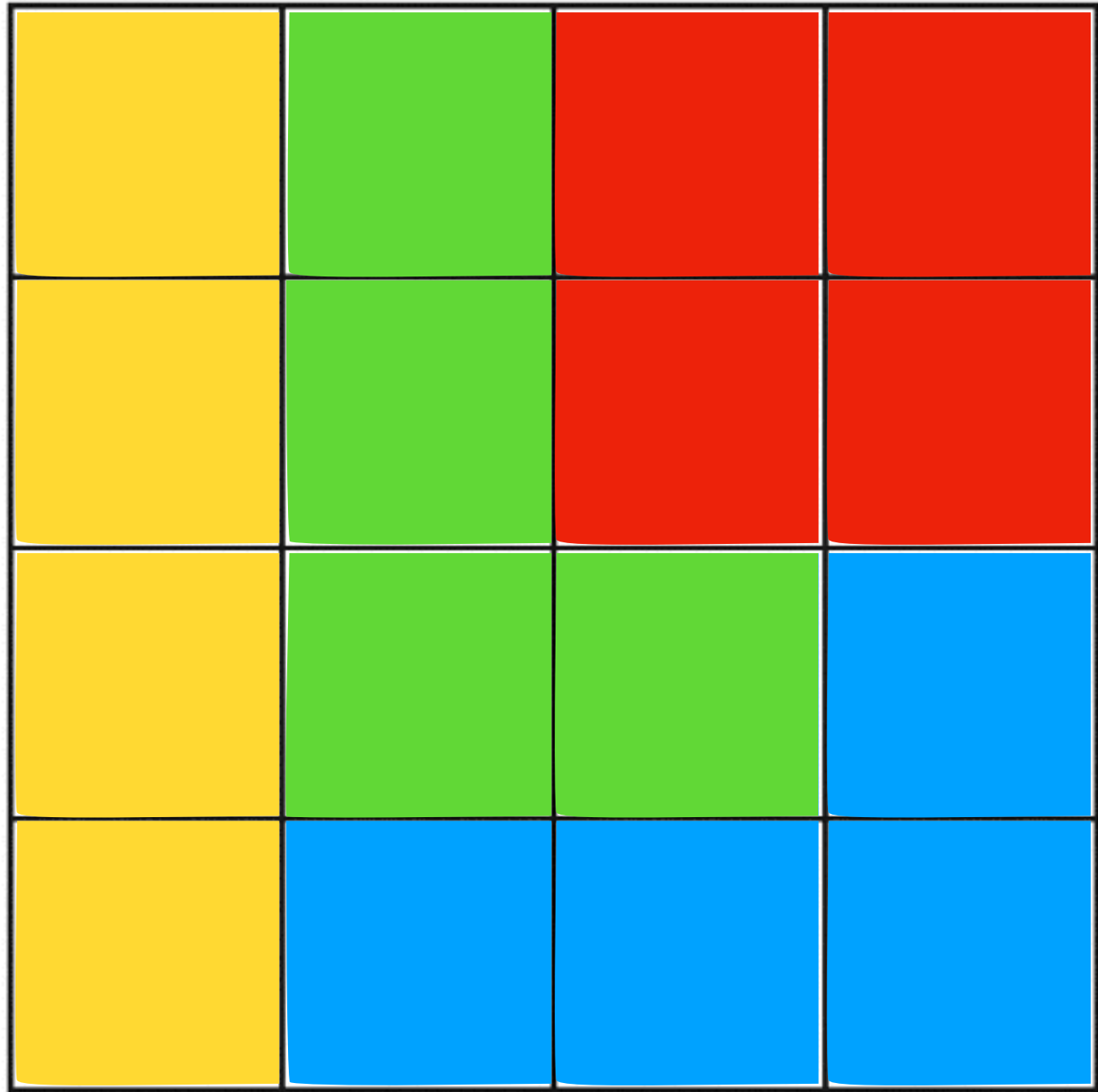
GerryChain



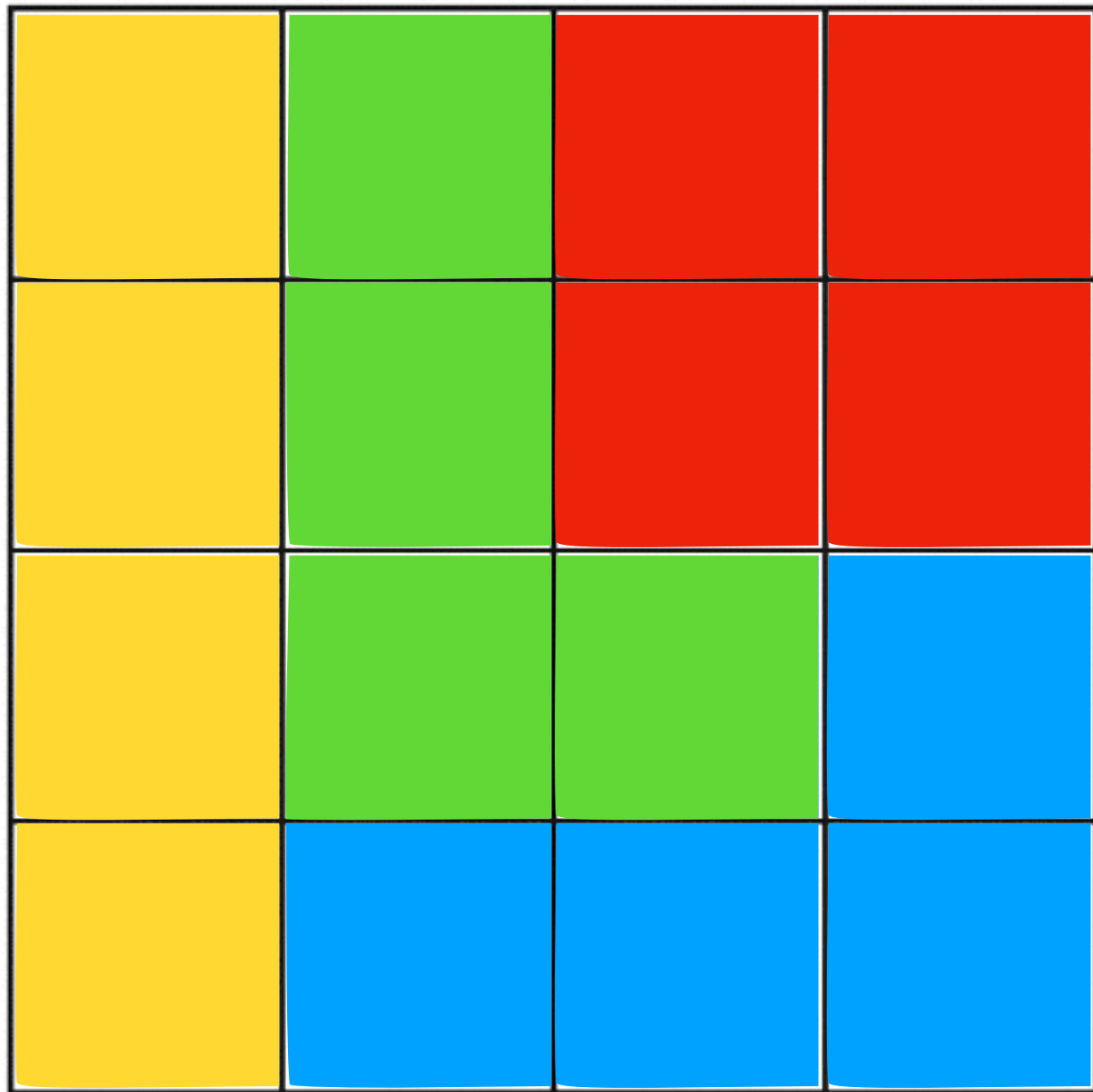




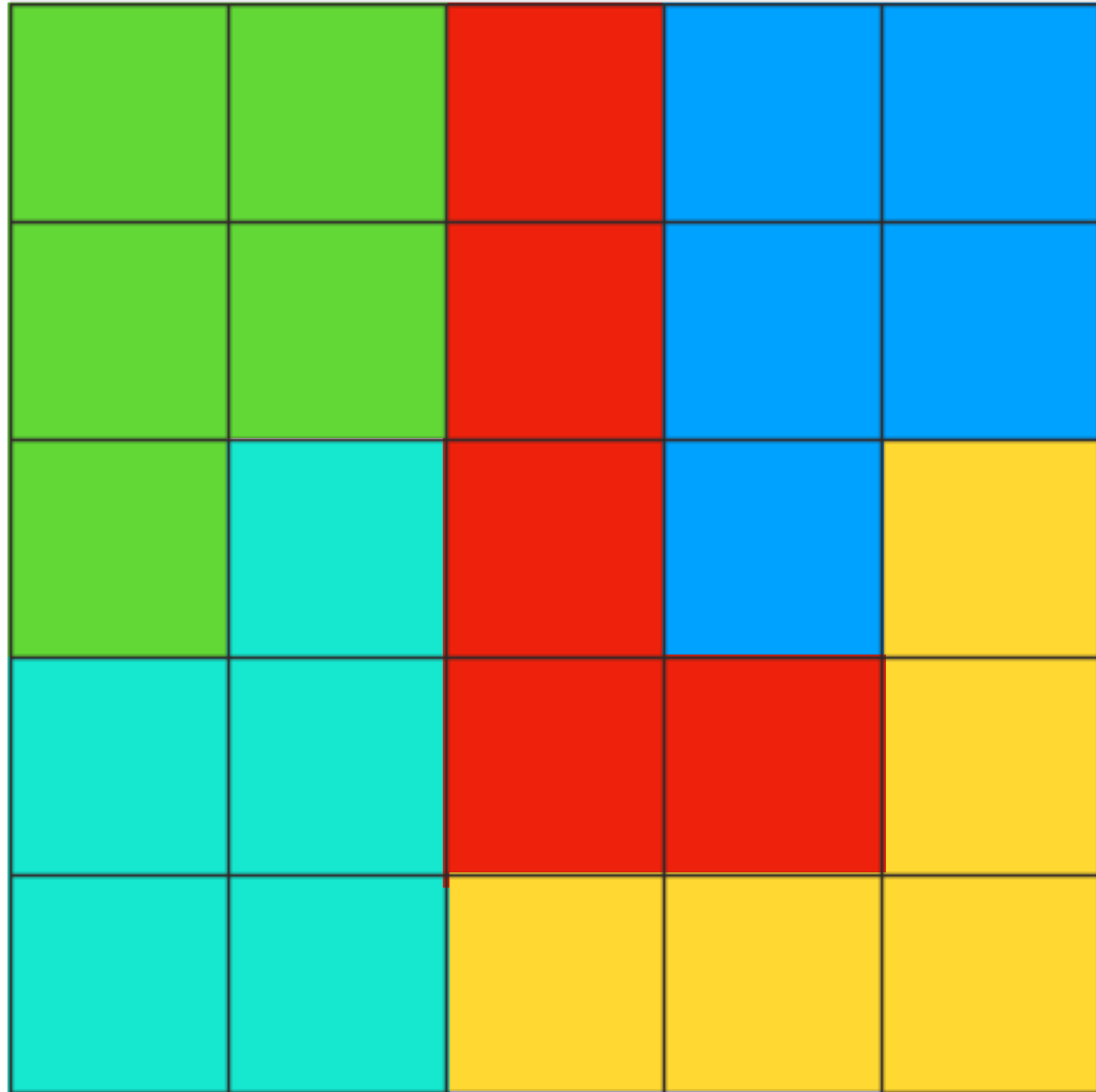
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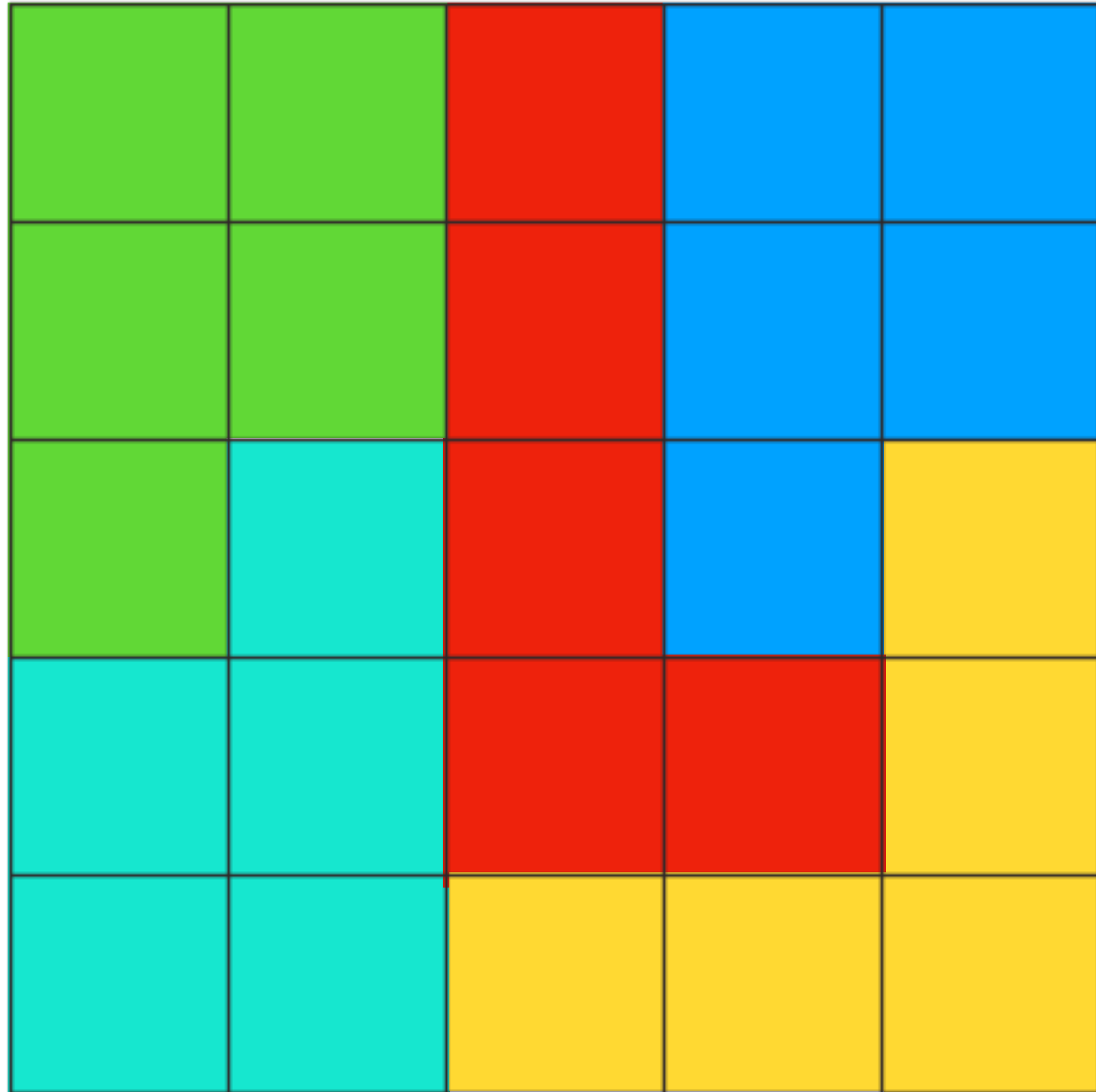





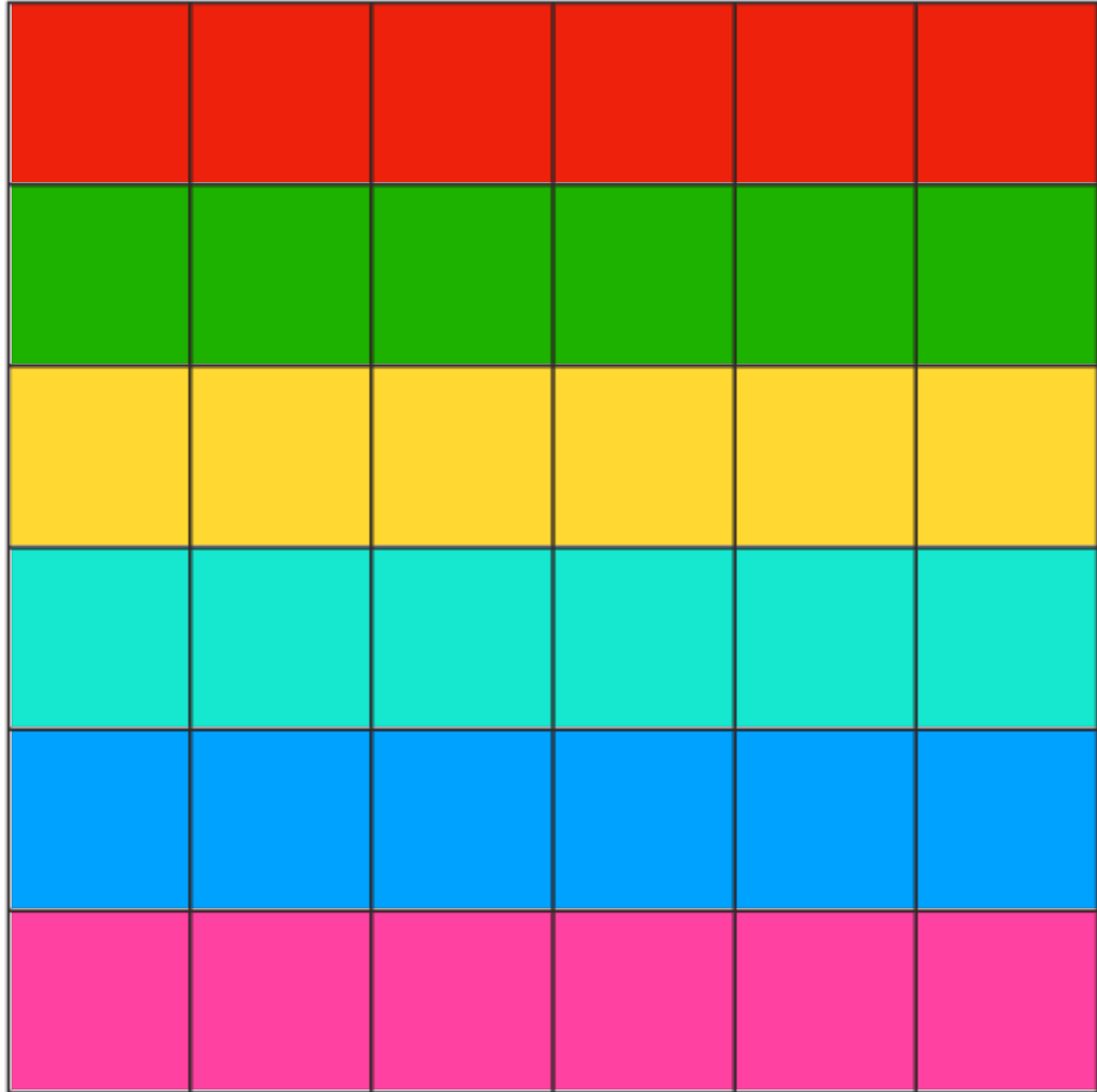


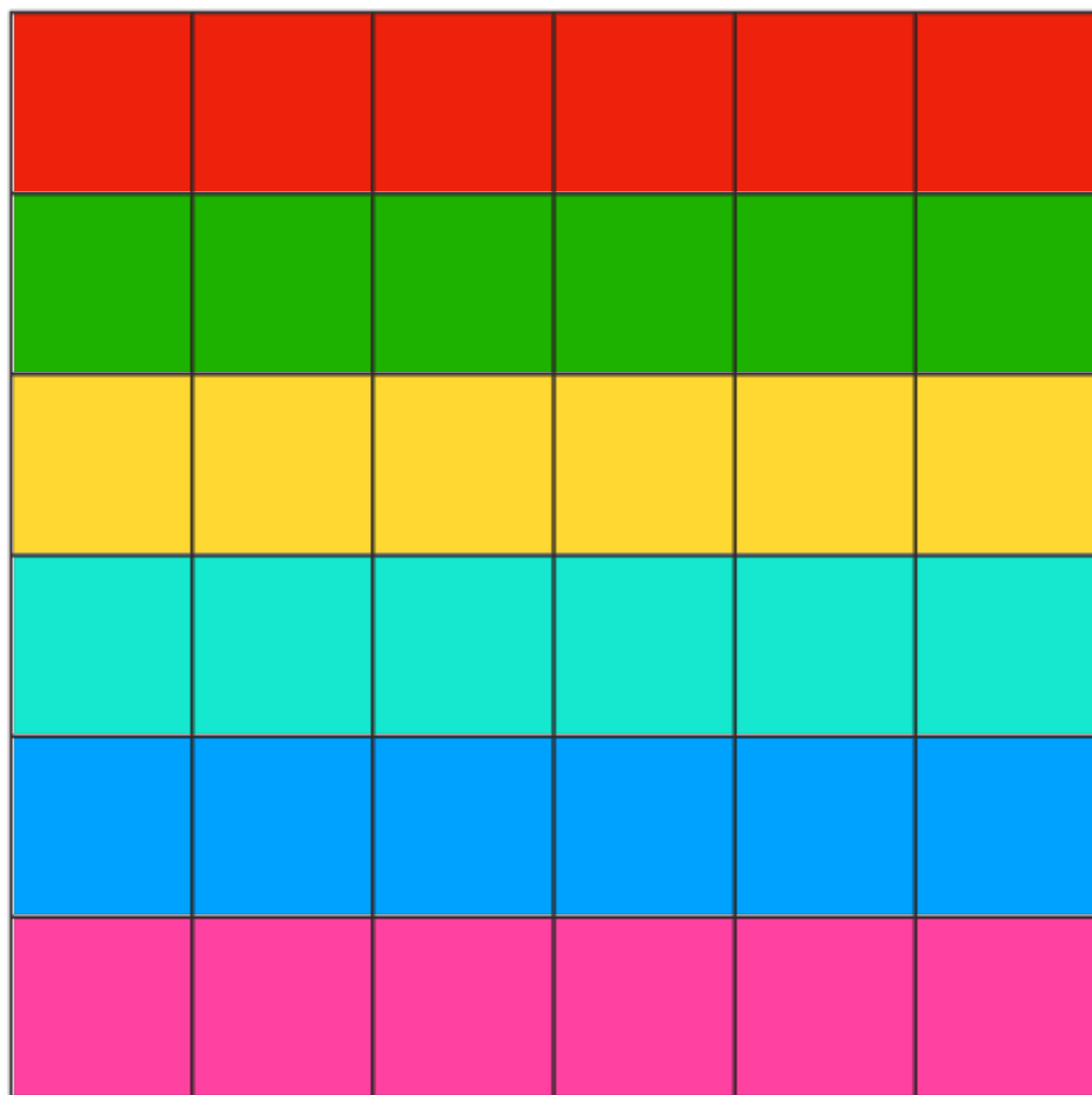
117



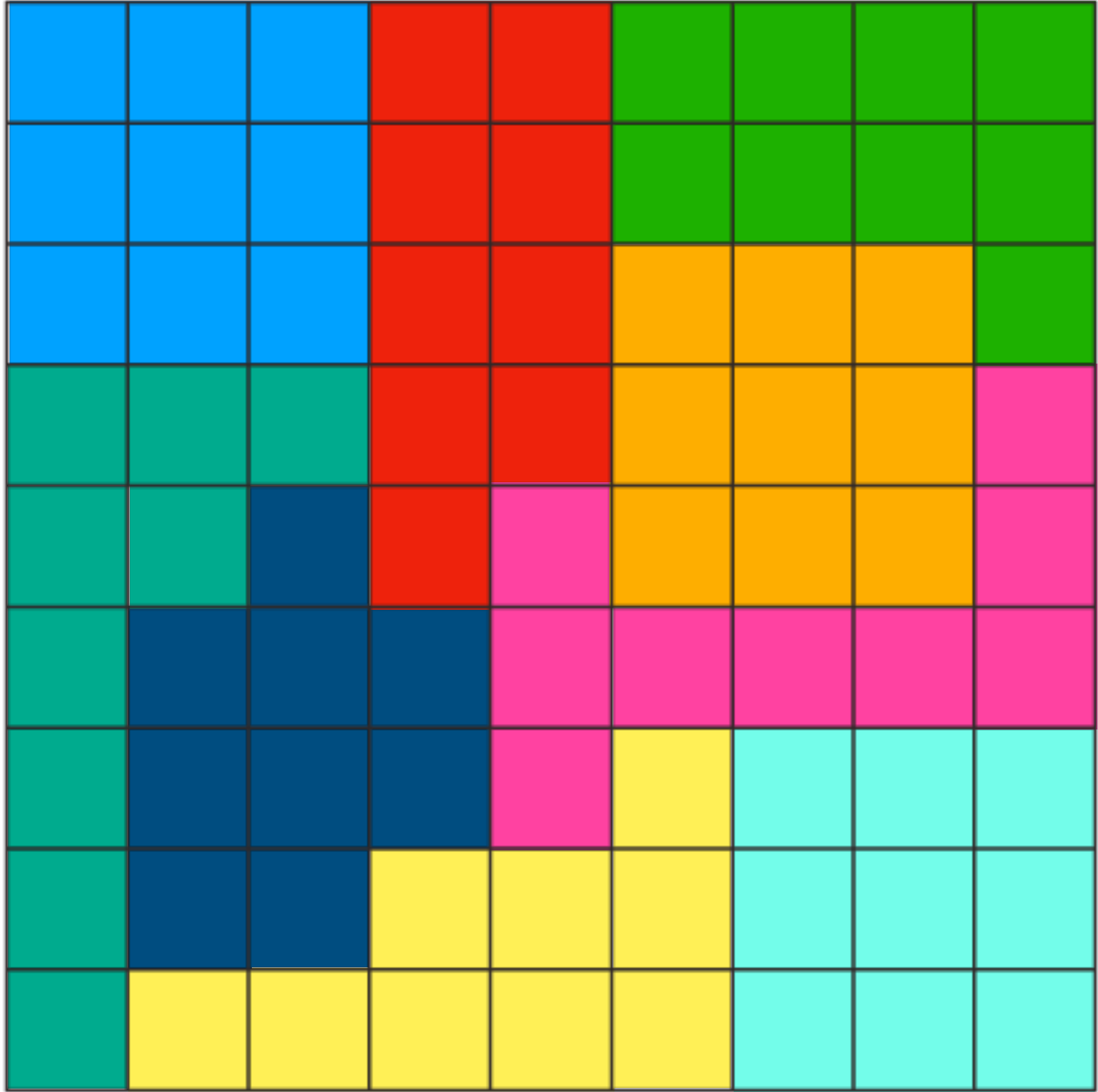


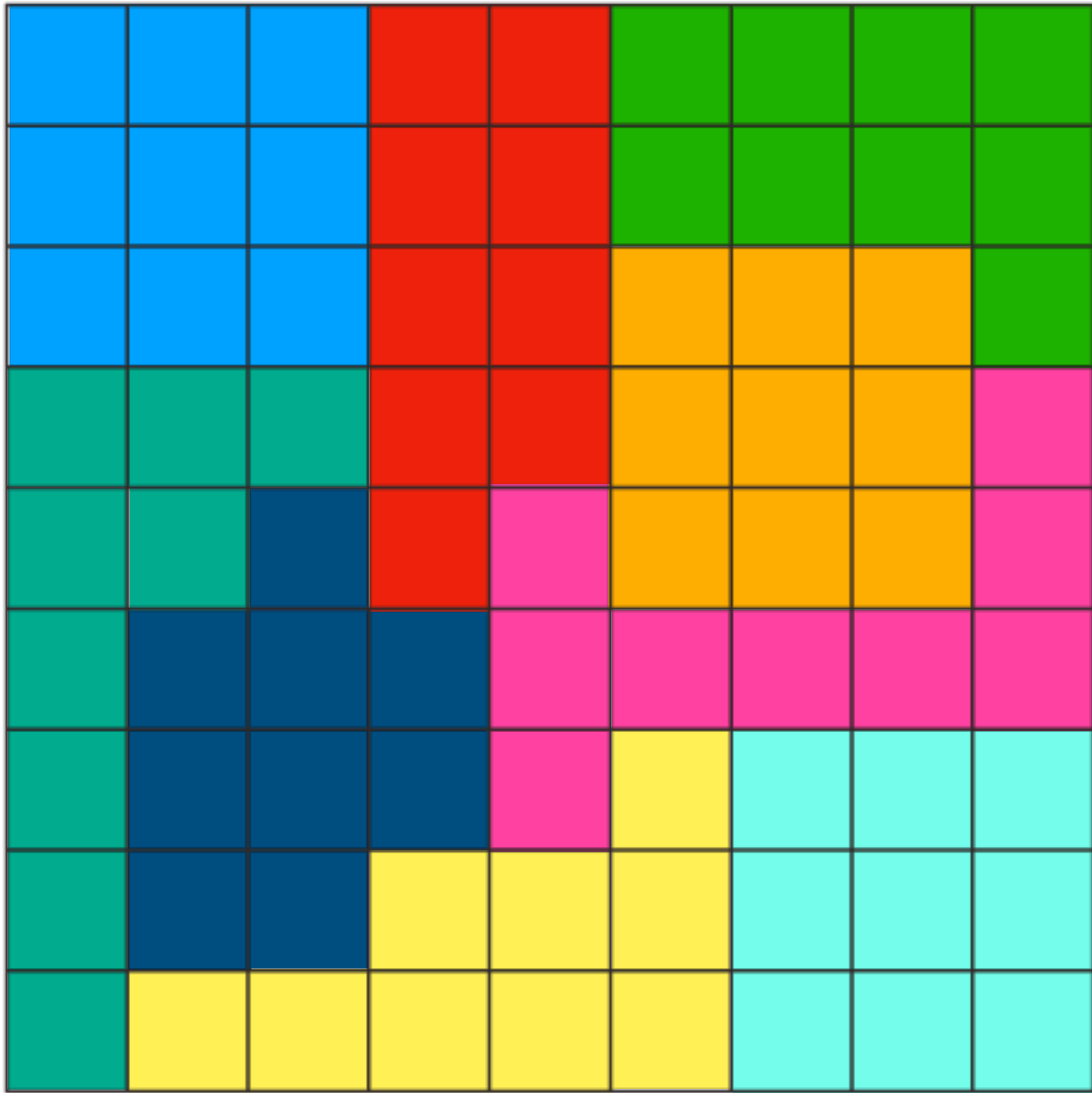
4,006





451,206

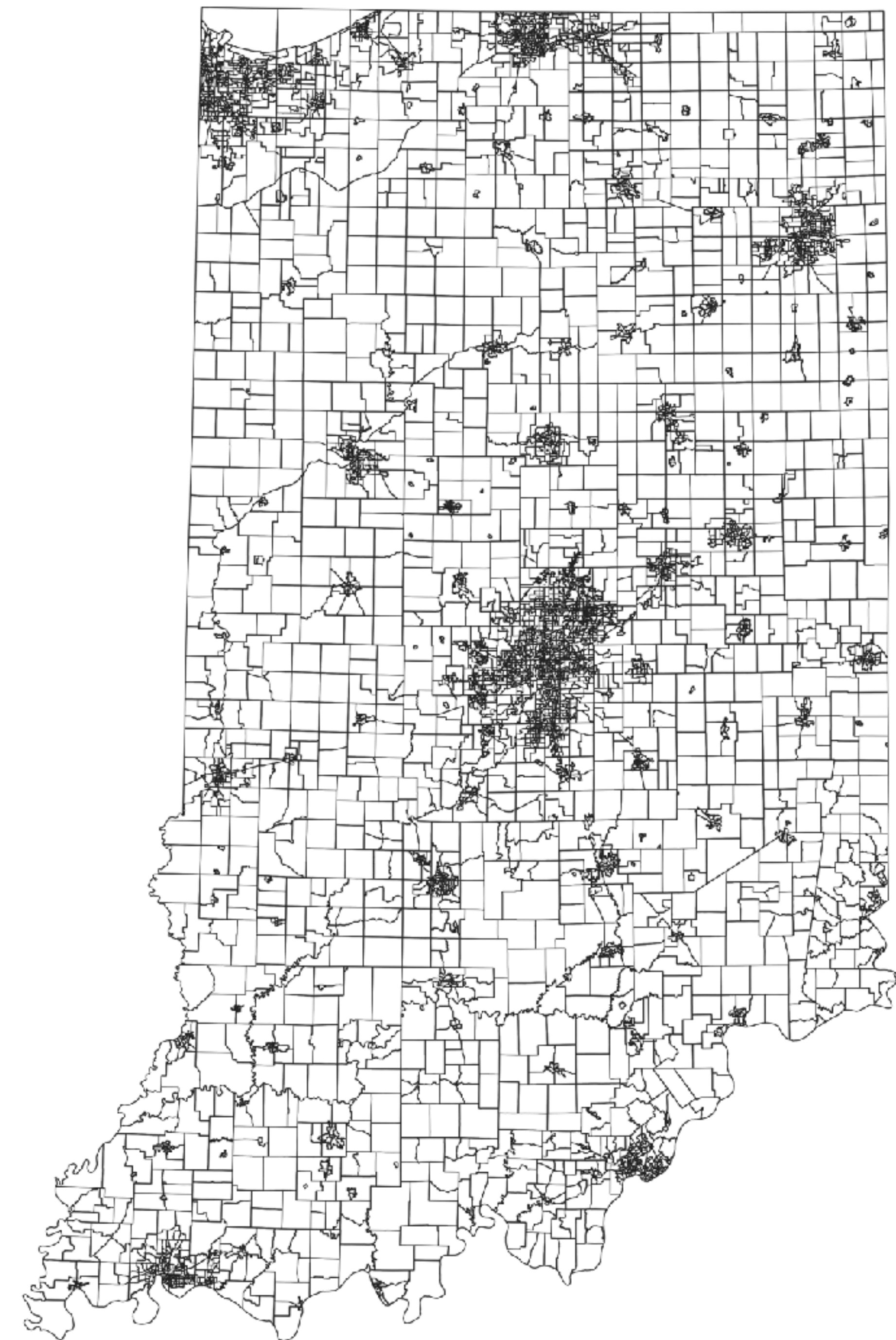




706,152,947,468,301







there are 5,159 individual units in the state of Indiana.

# Monte Carlo Markov chain

MCMC



a. large

- a. large
- b. contains districting plans that are “valid”

# Markov chain

## **Markov chain**

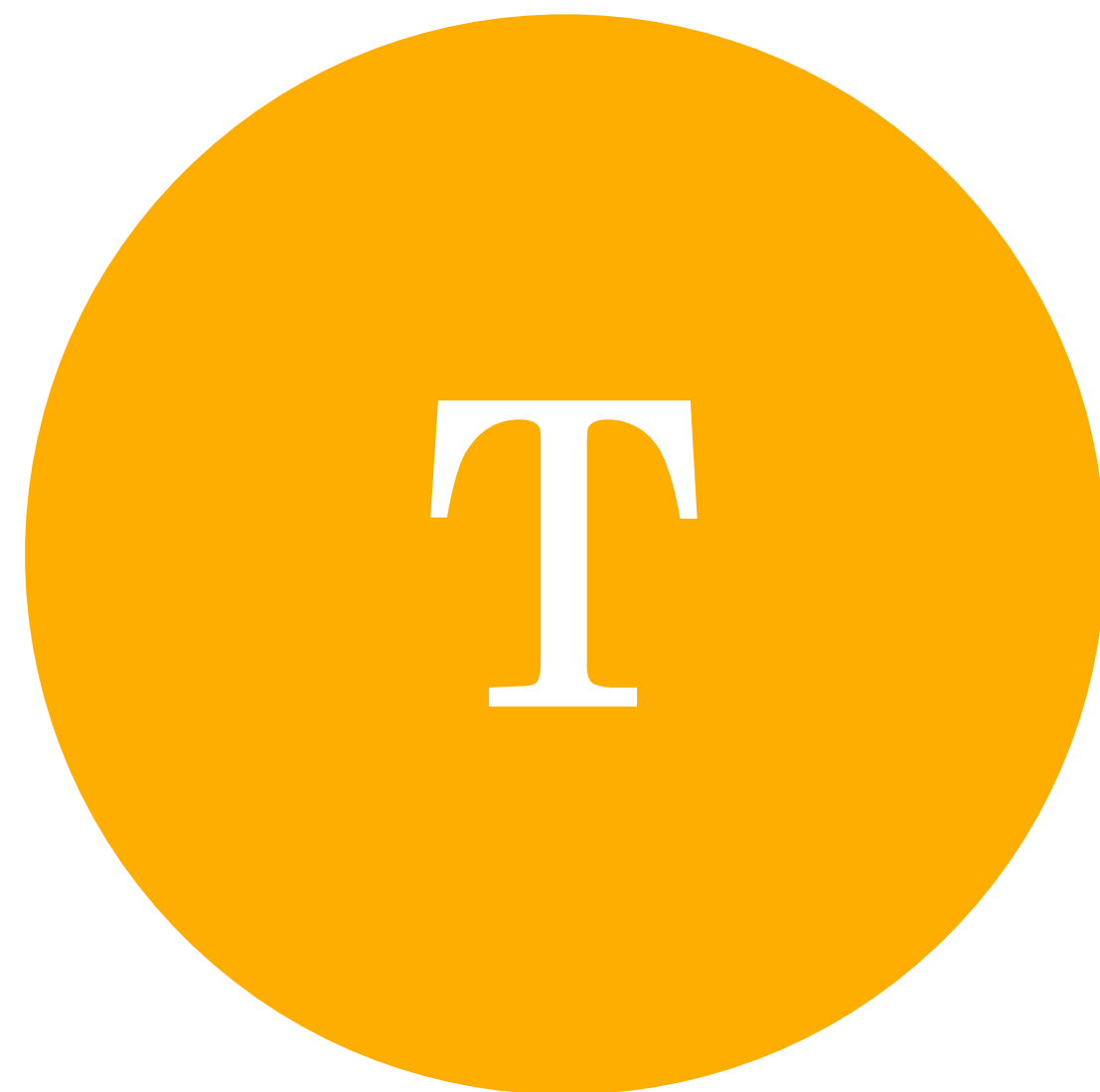
*a random process equipped with the memoryless property.*

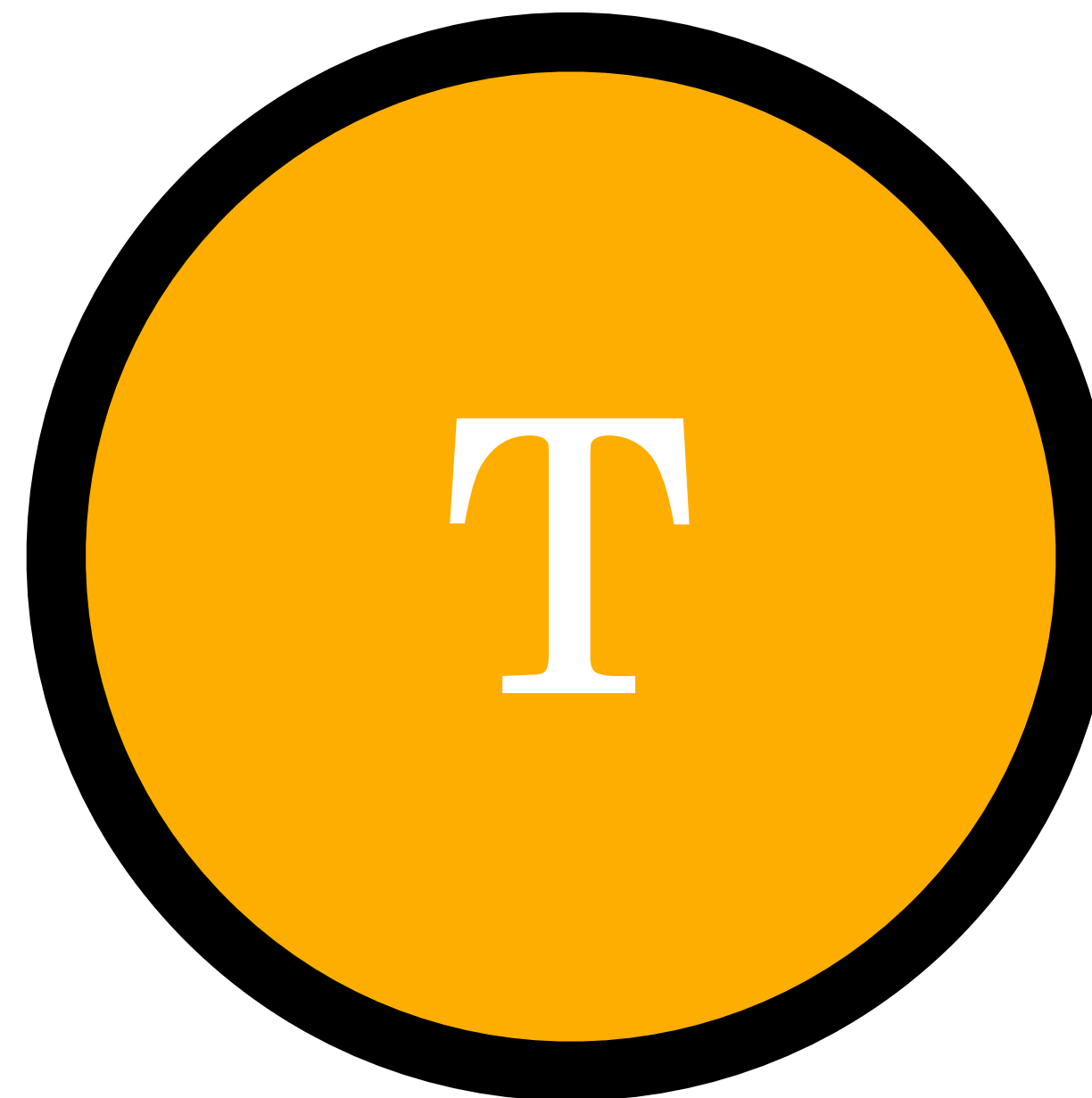


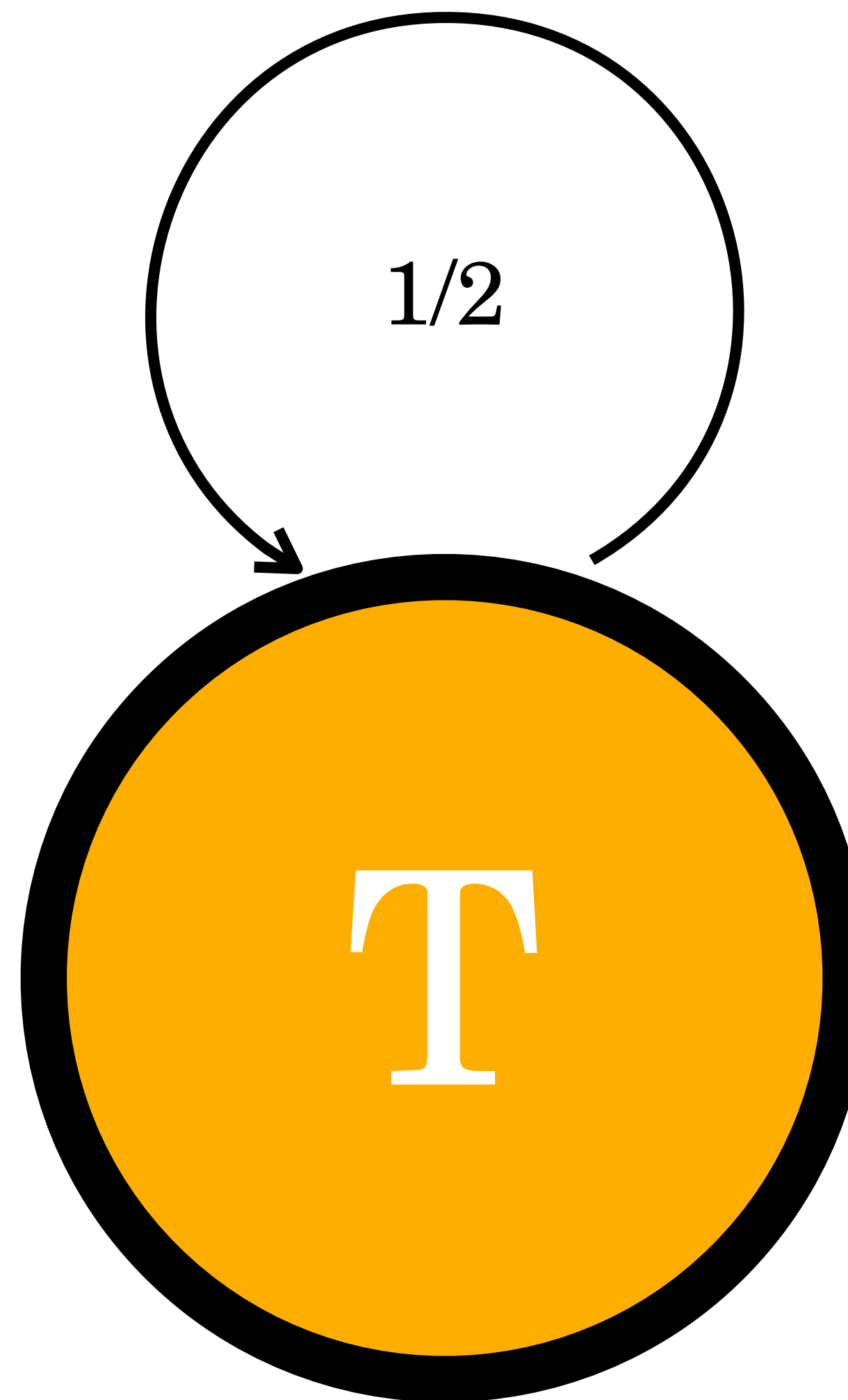
# Markov chain

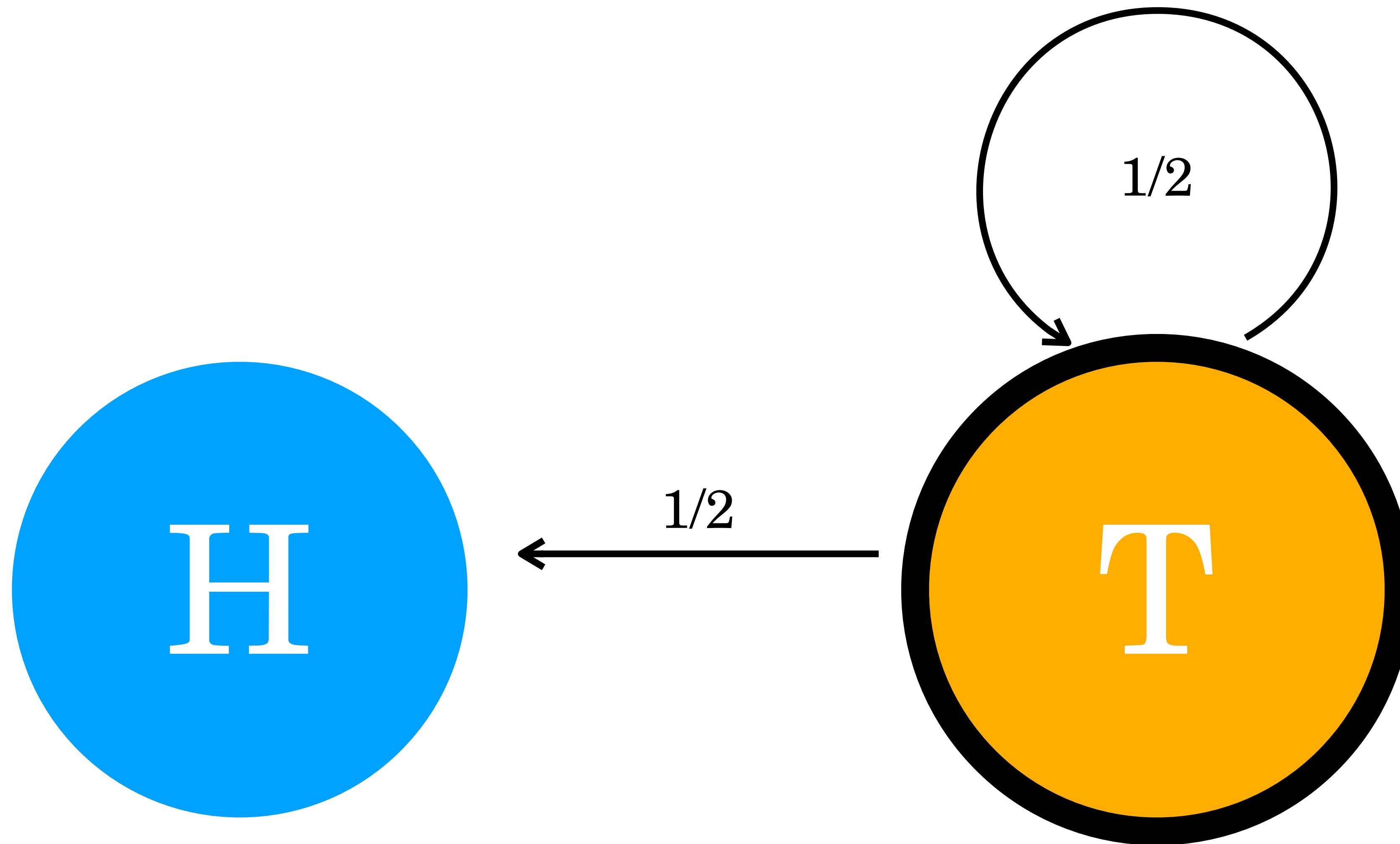
## **Markov chain**

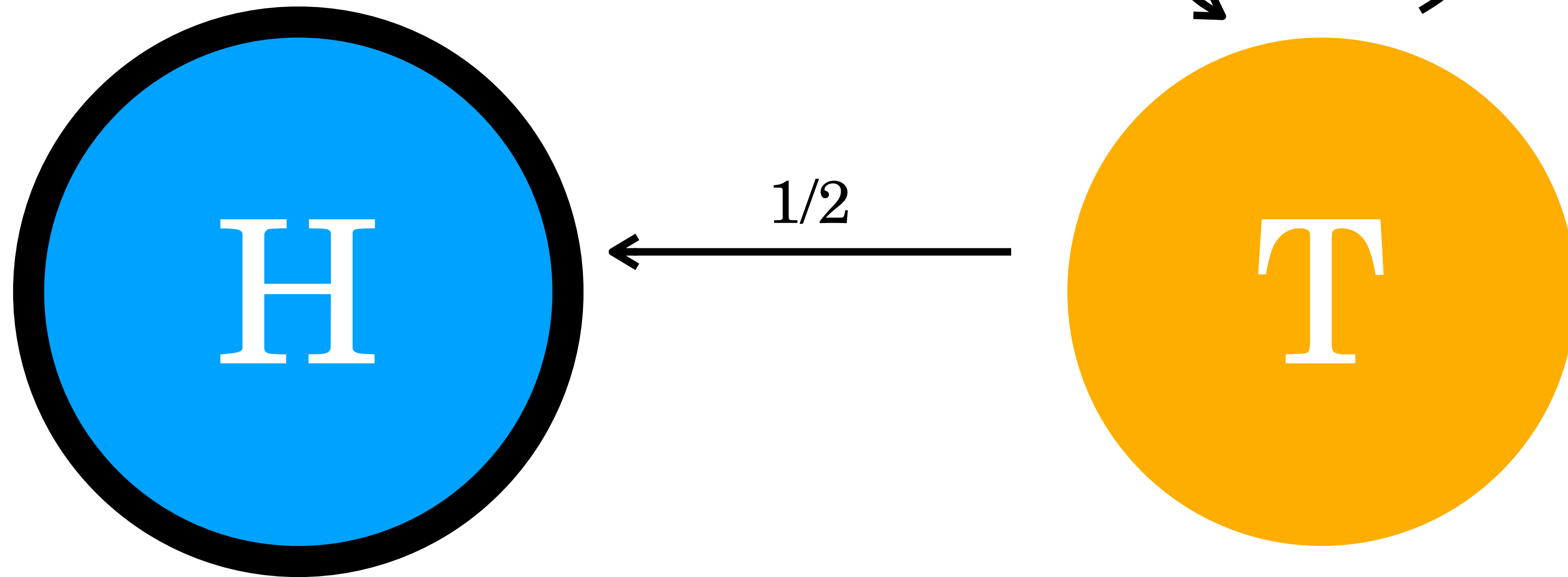
a series of draws from a random variable where the outcome of the next draw depends only on the outcome of the current one.

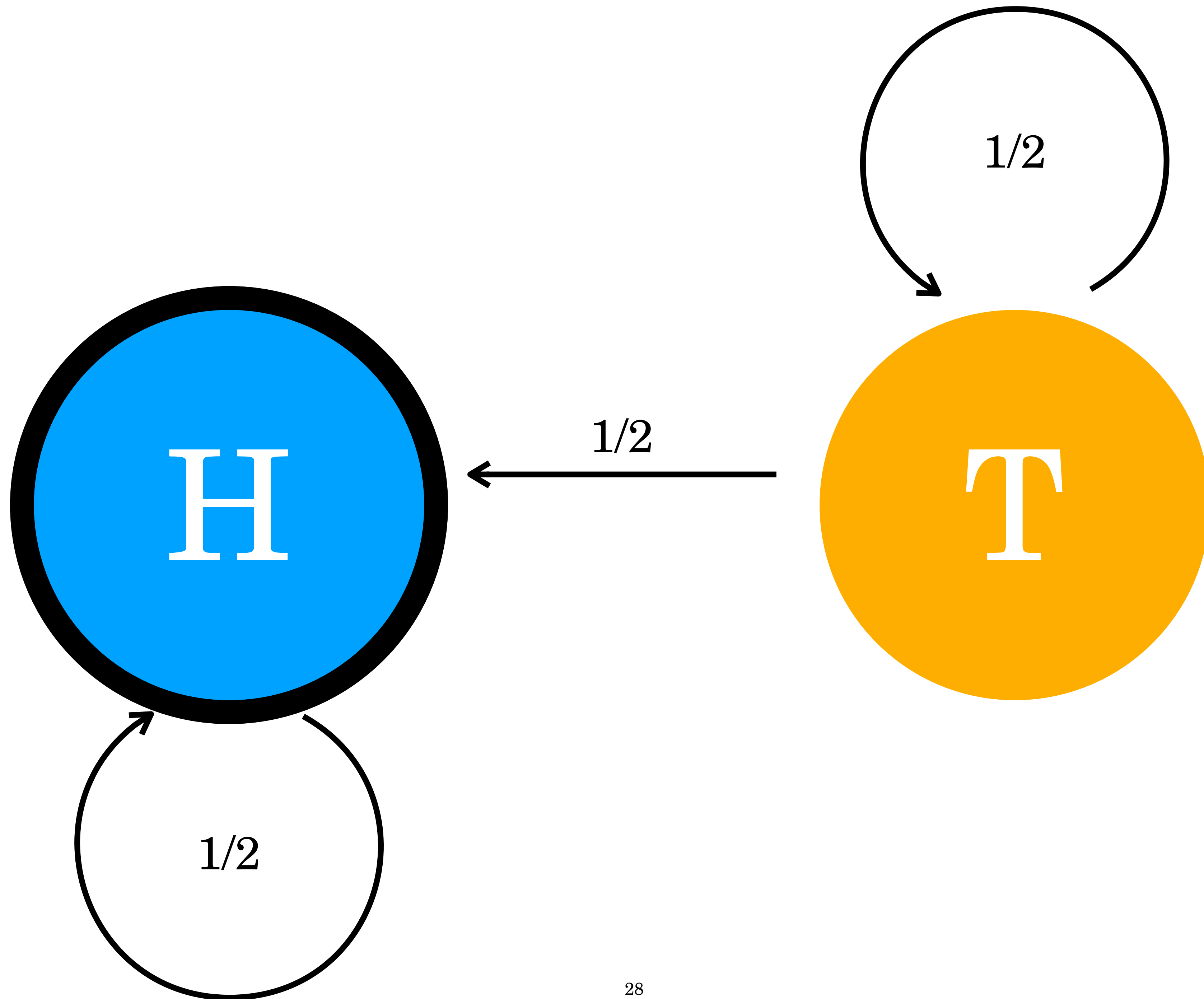




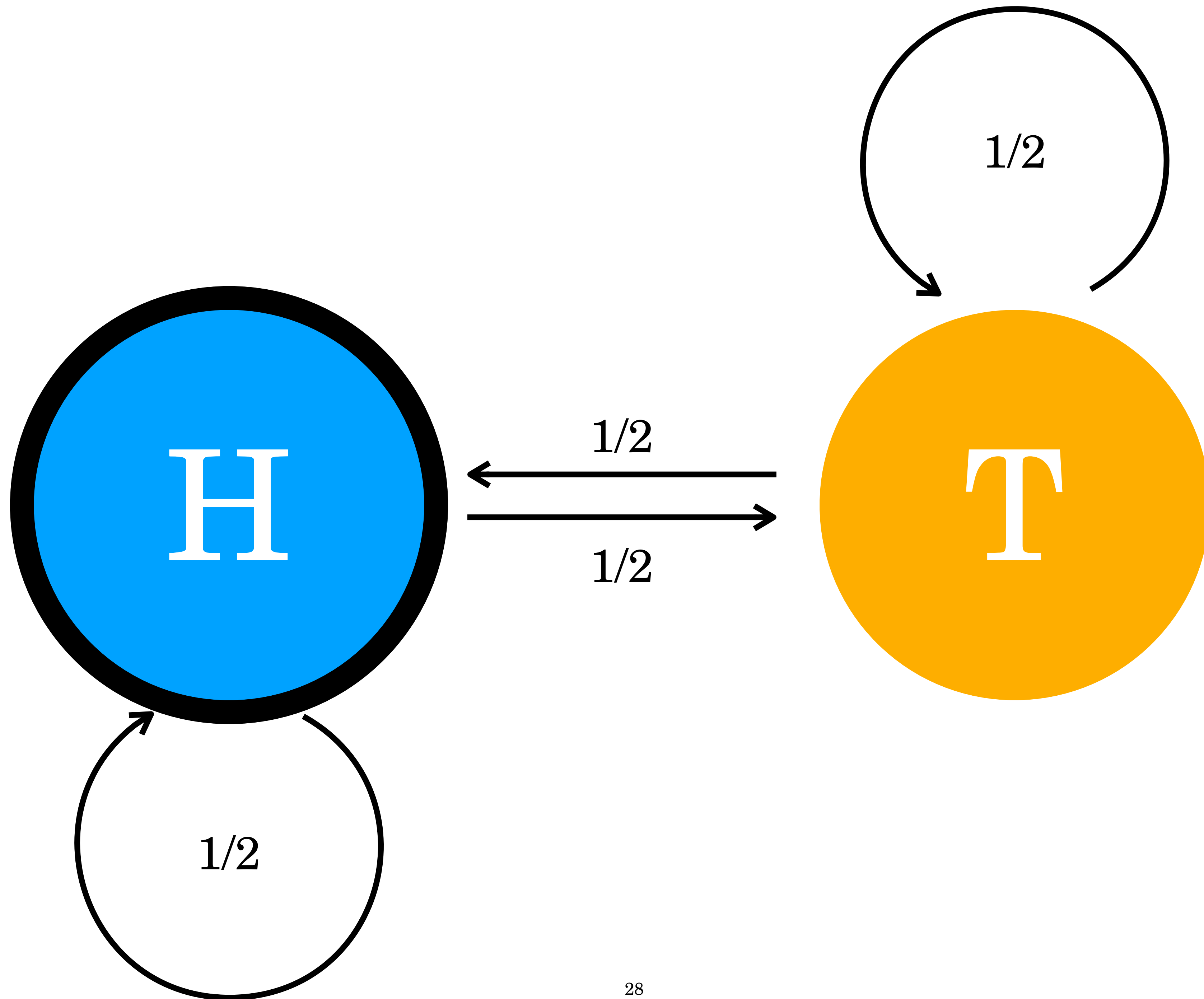


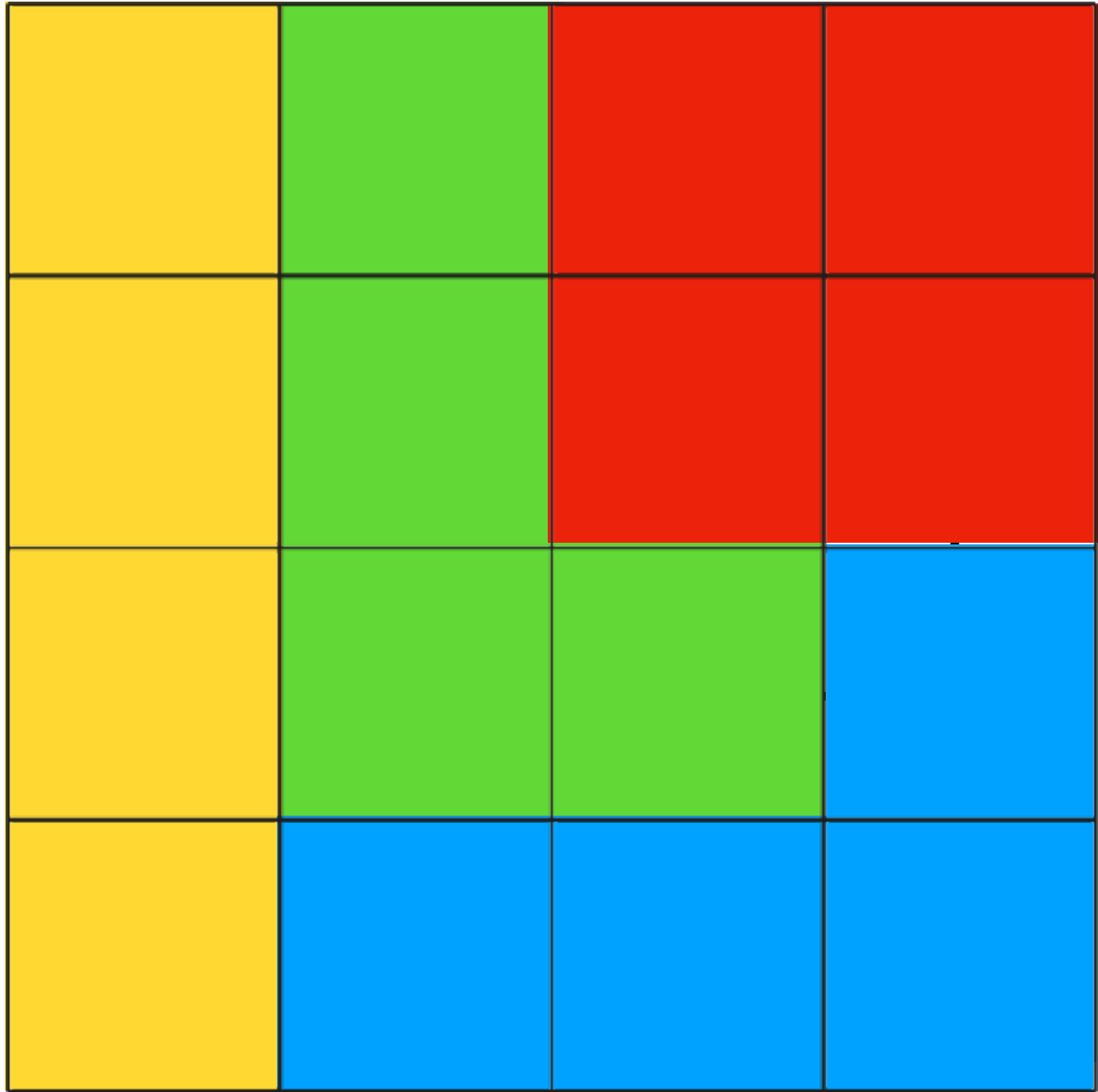


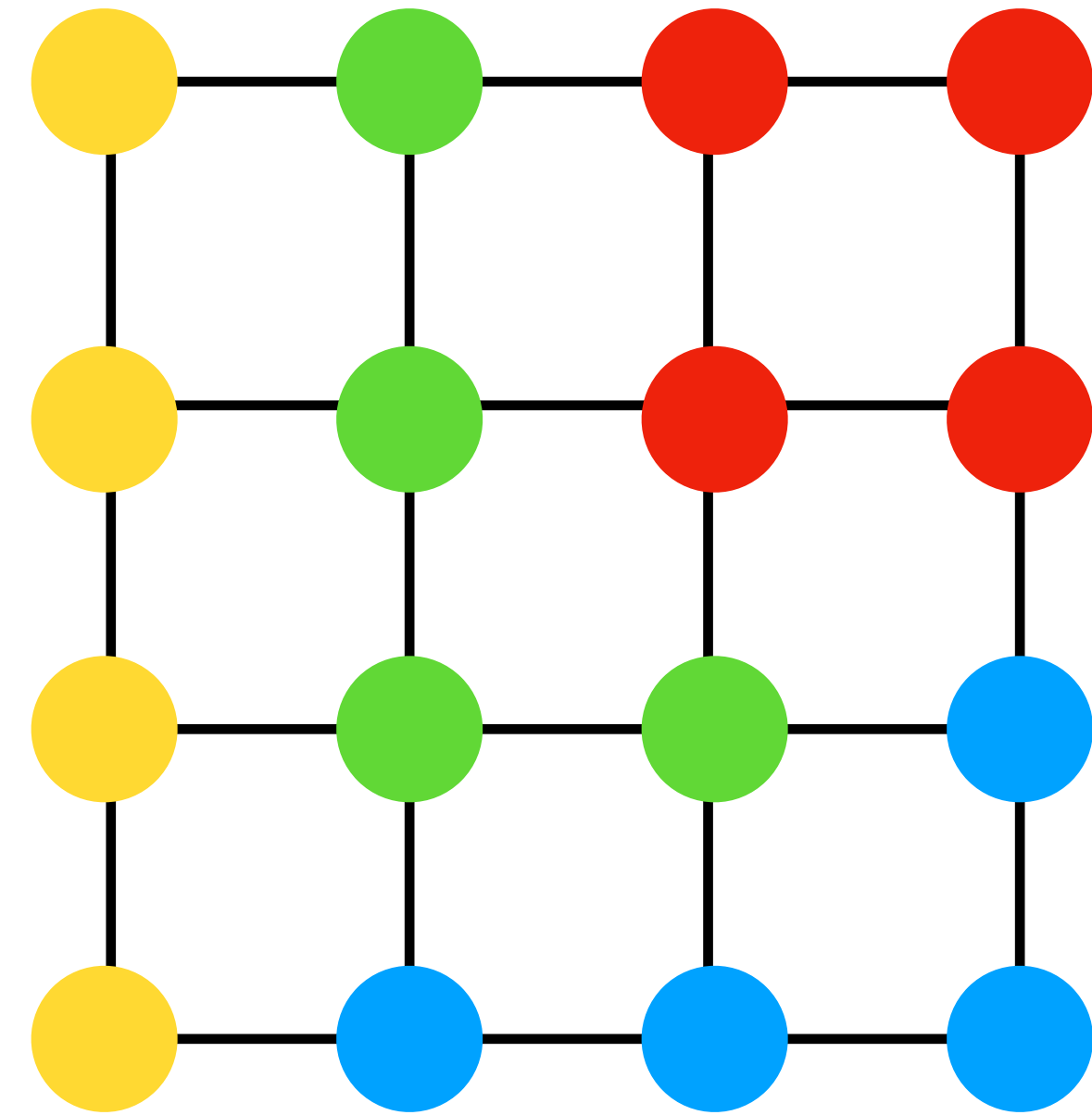
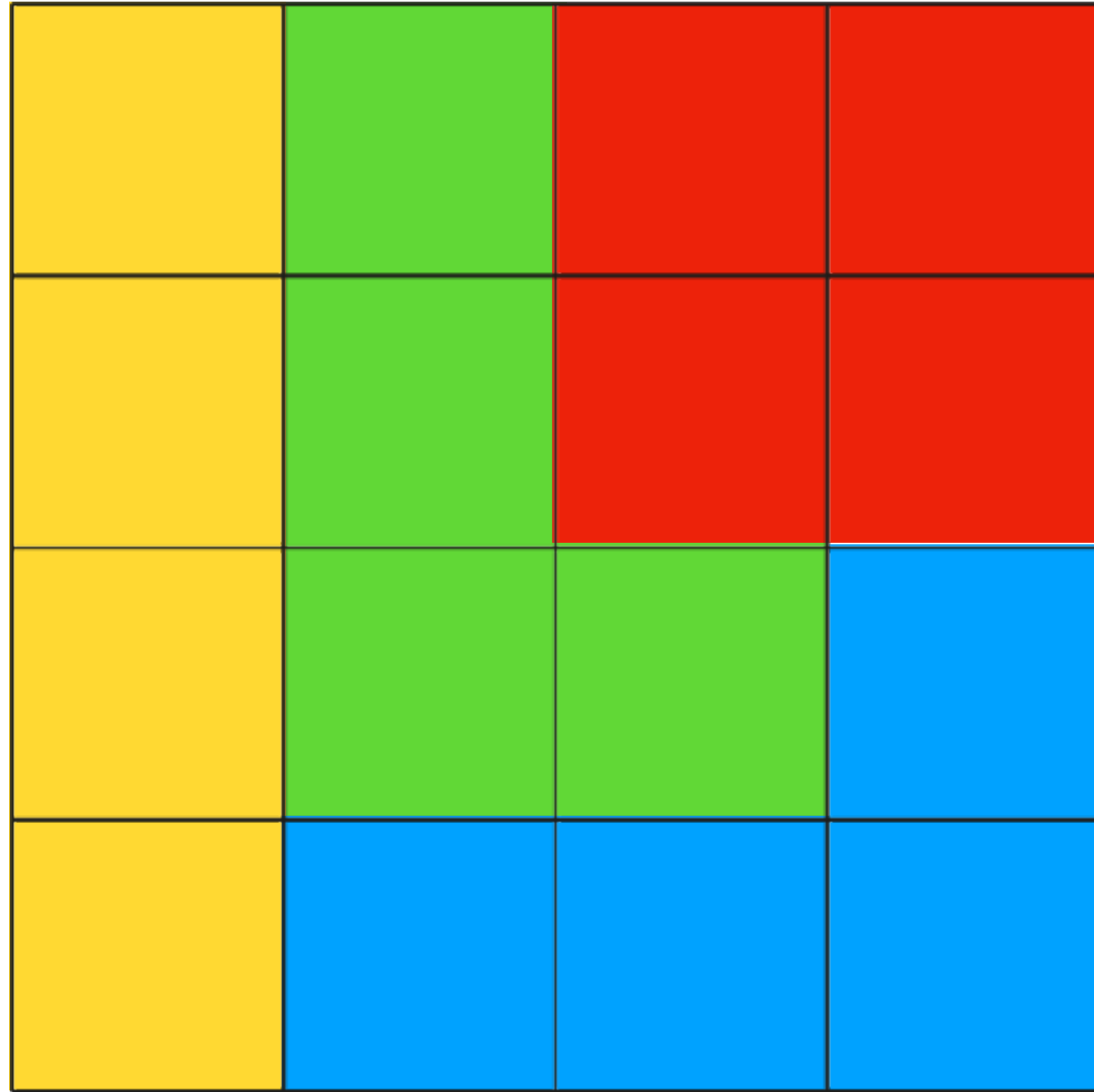






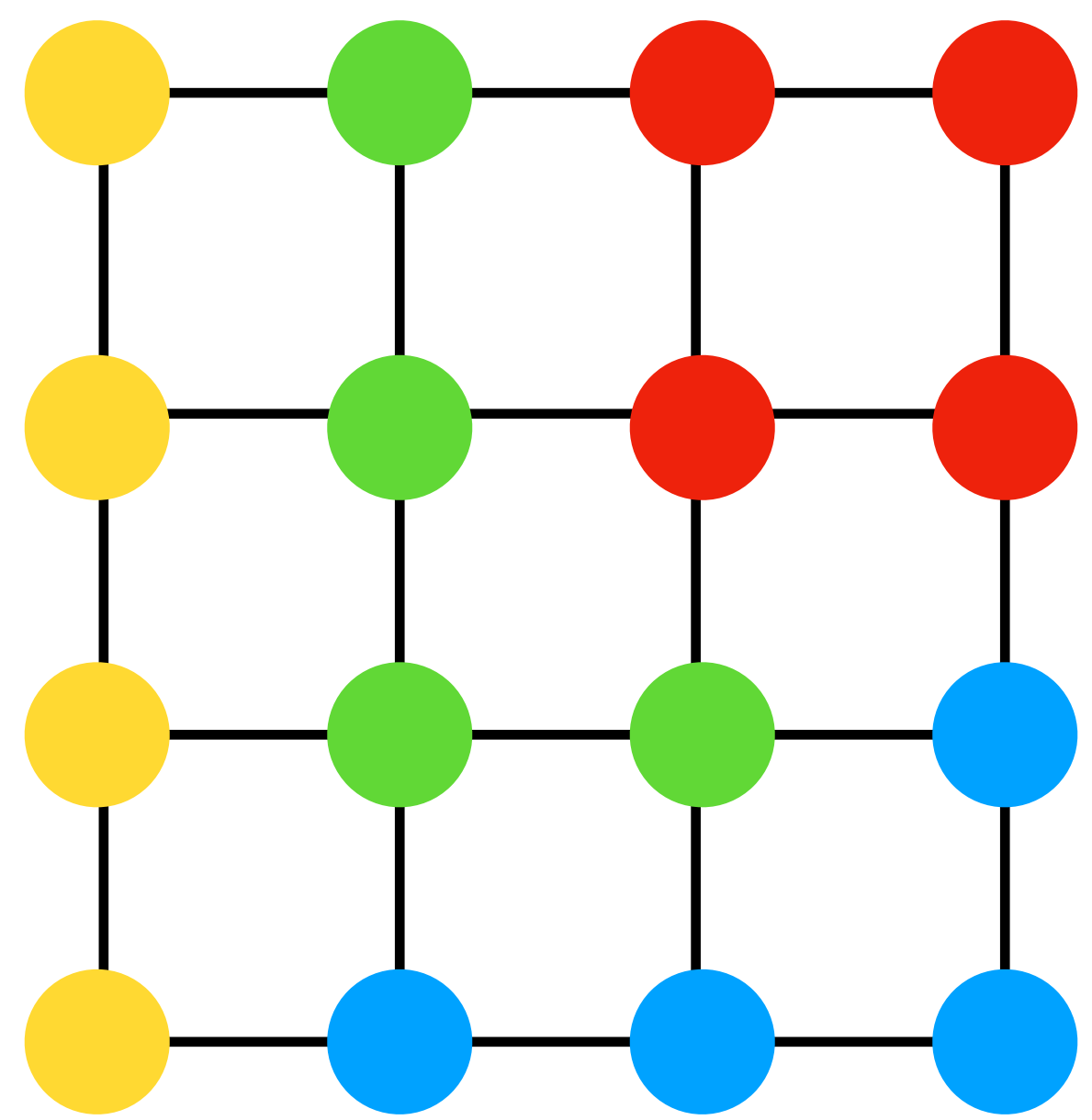


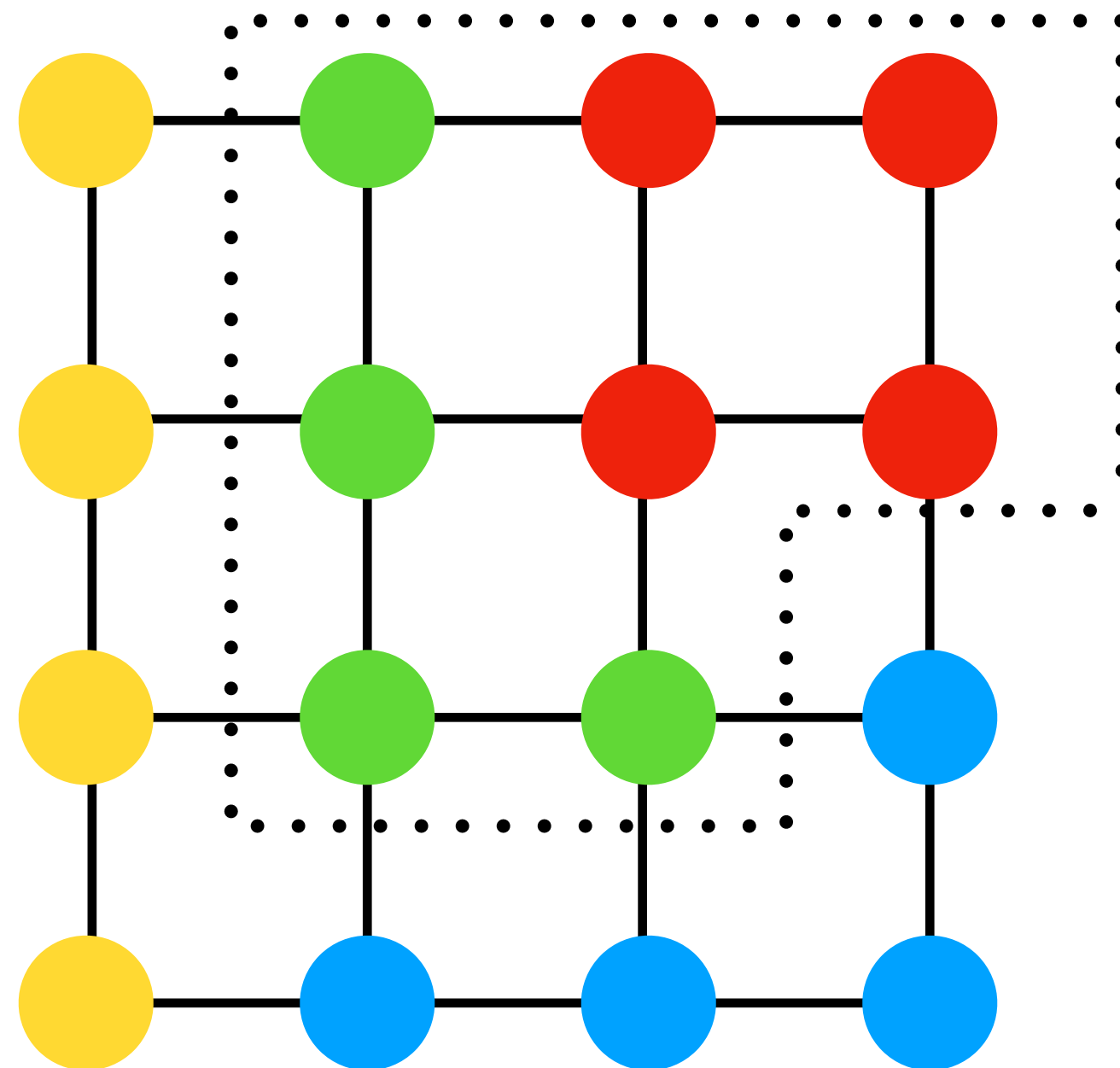


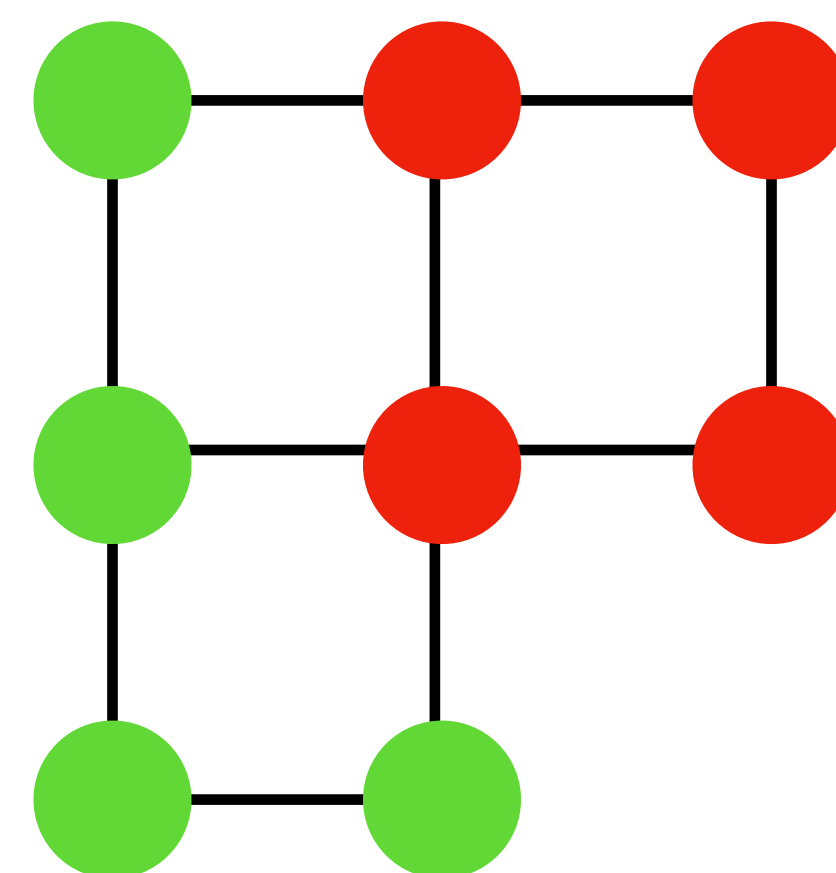


ReCom

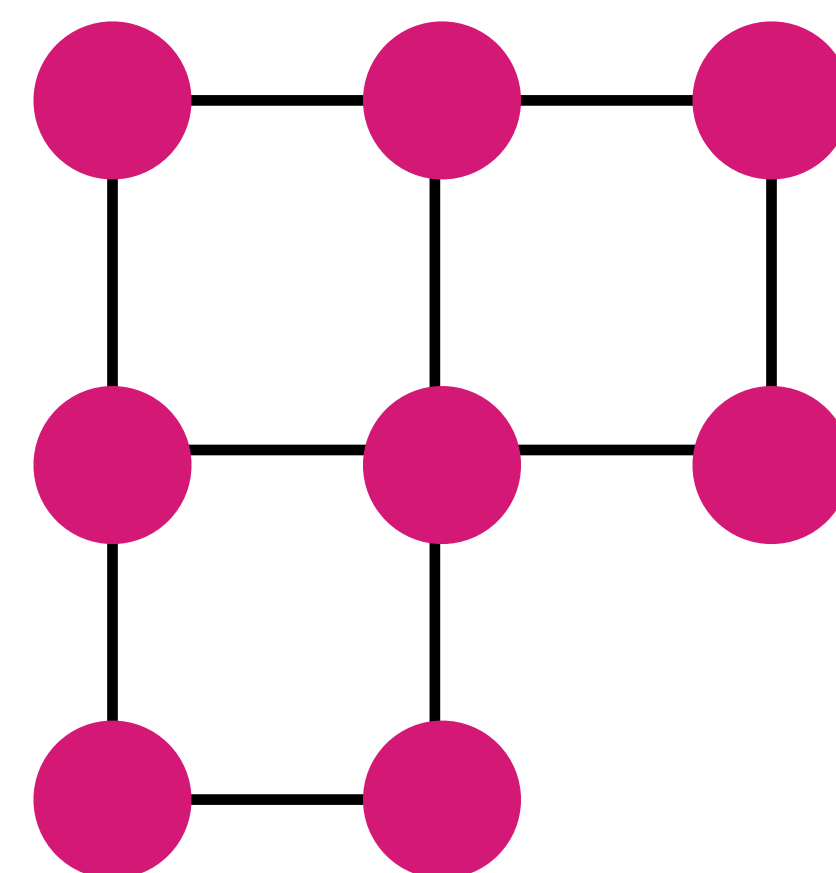
# ReCombination

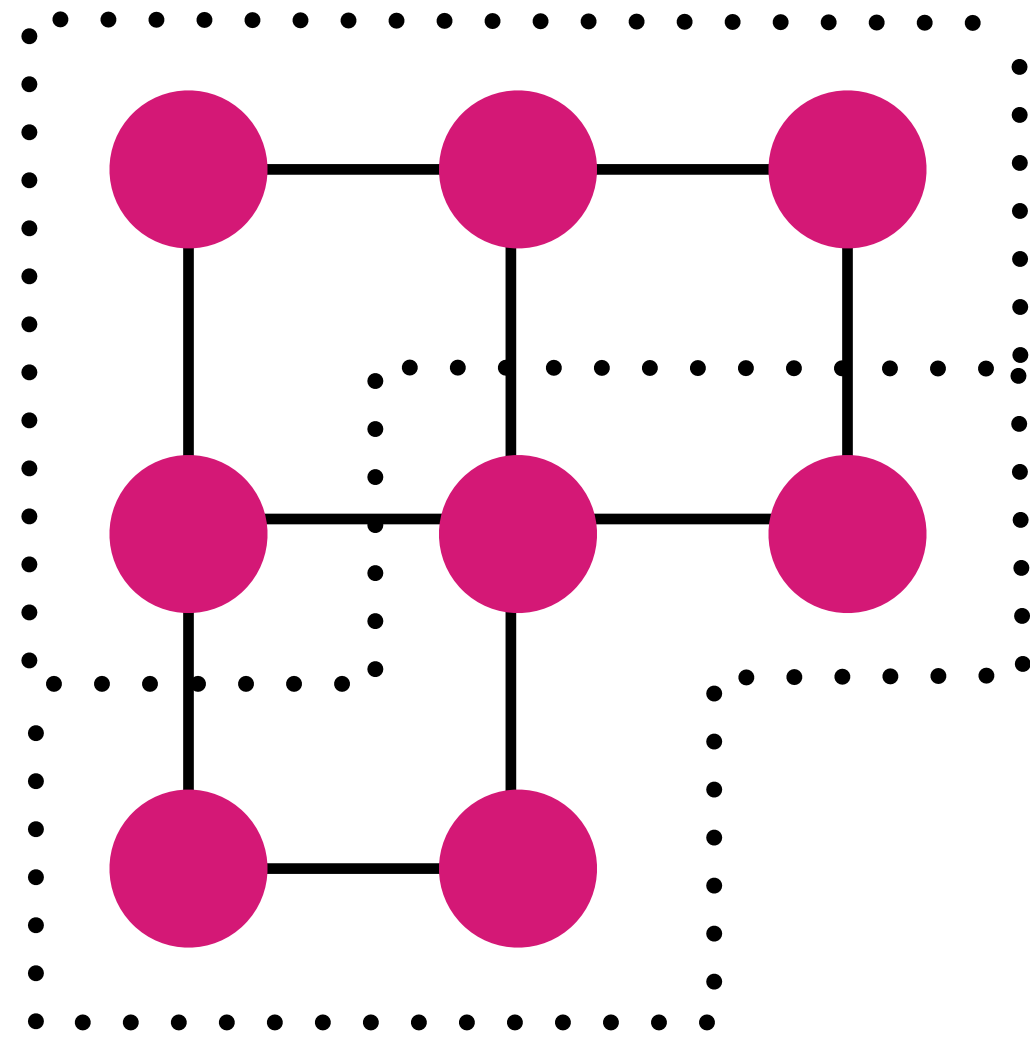


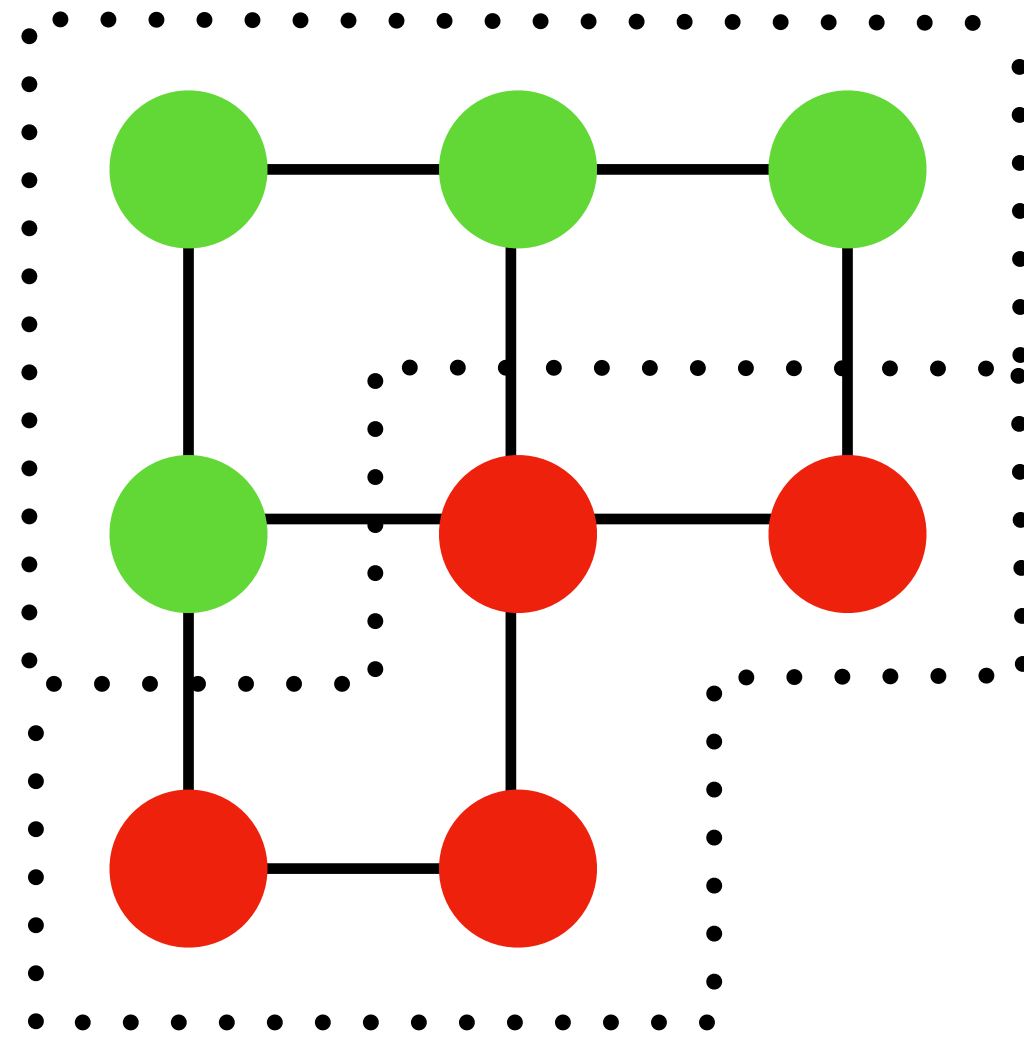


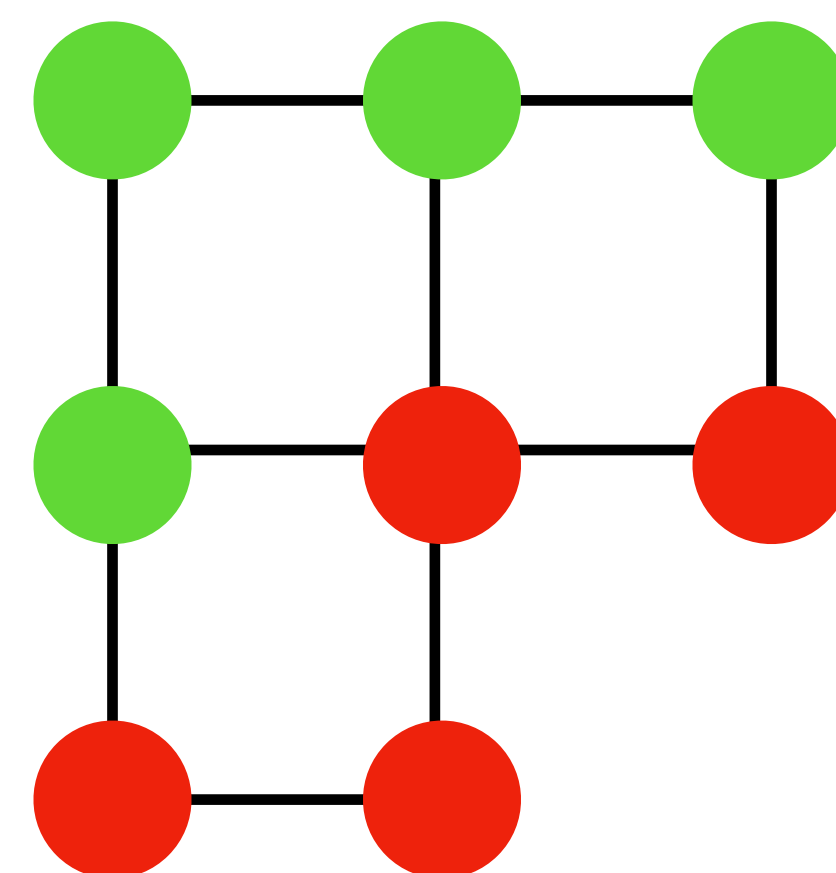


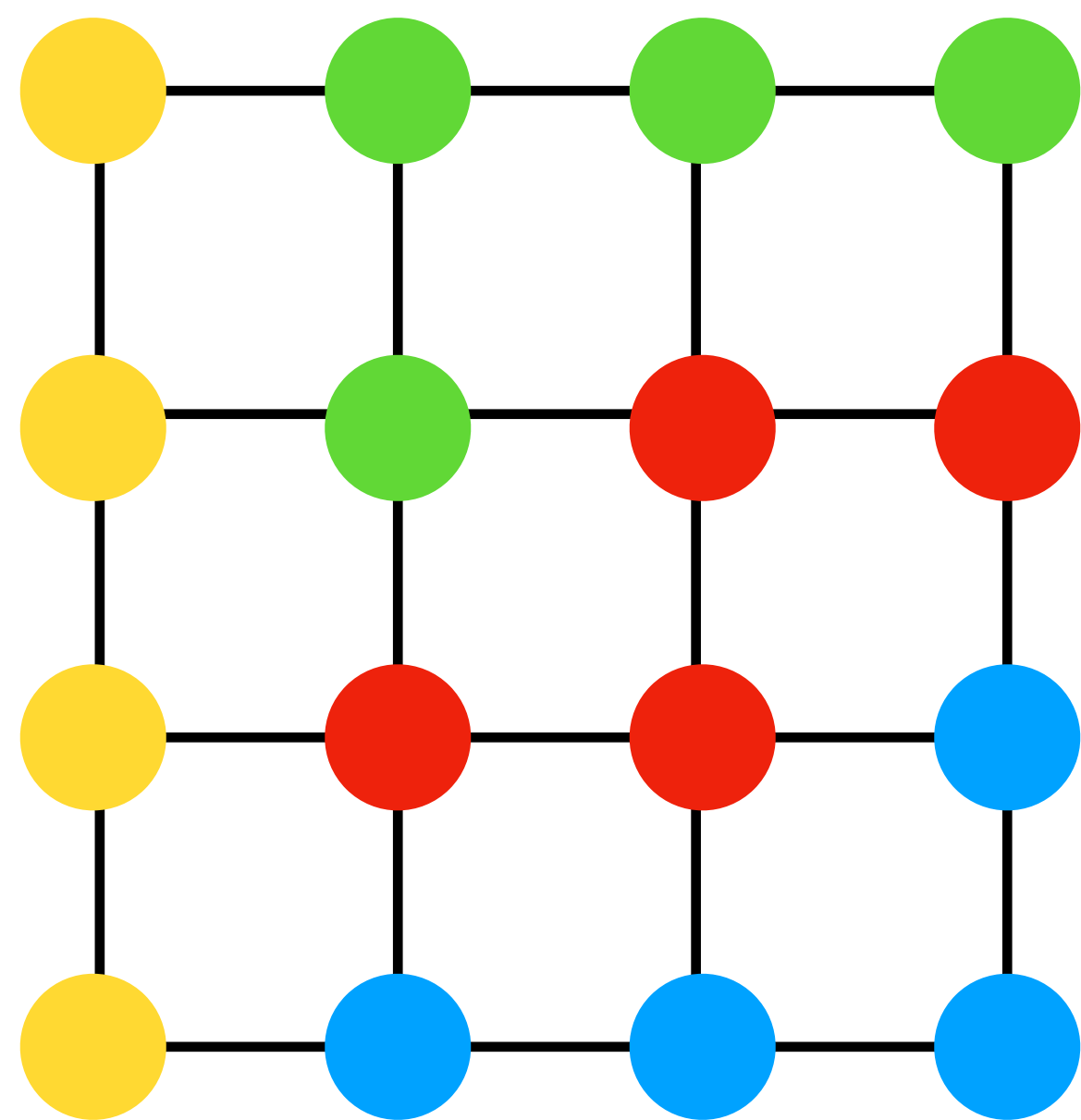


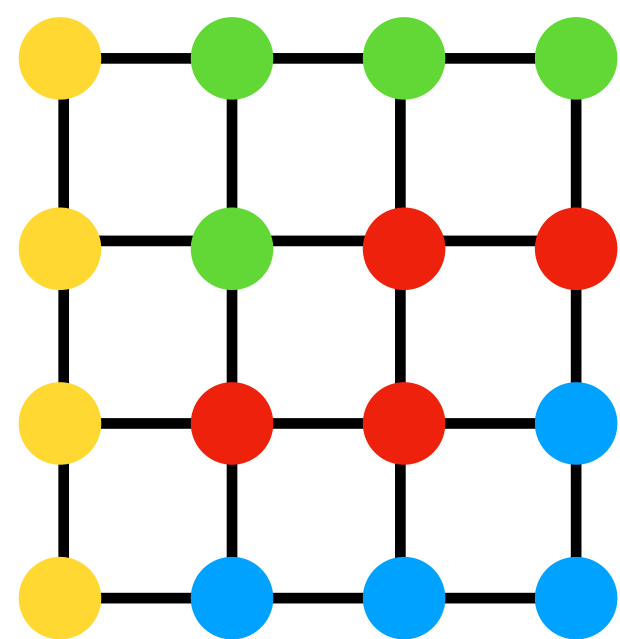


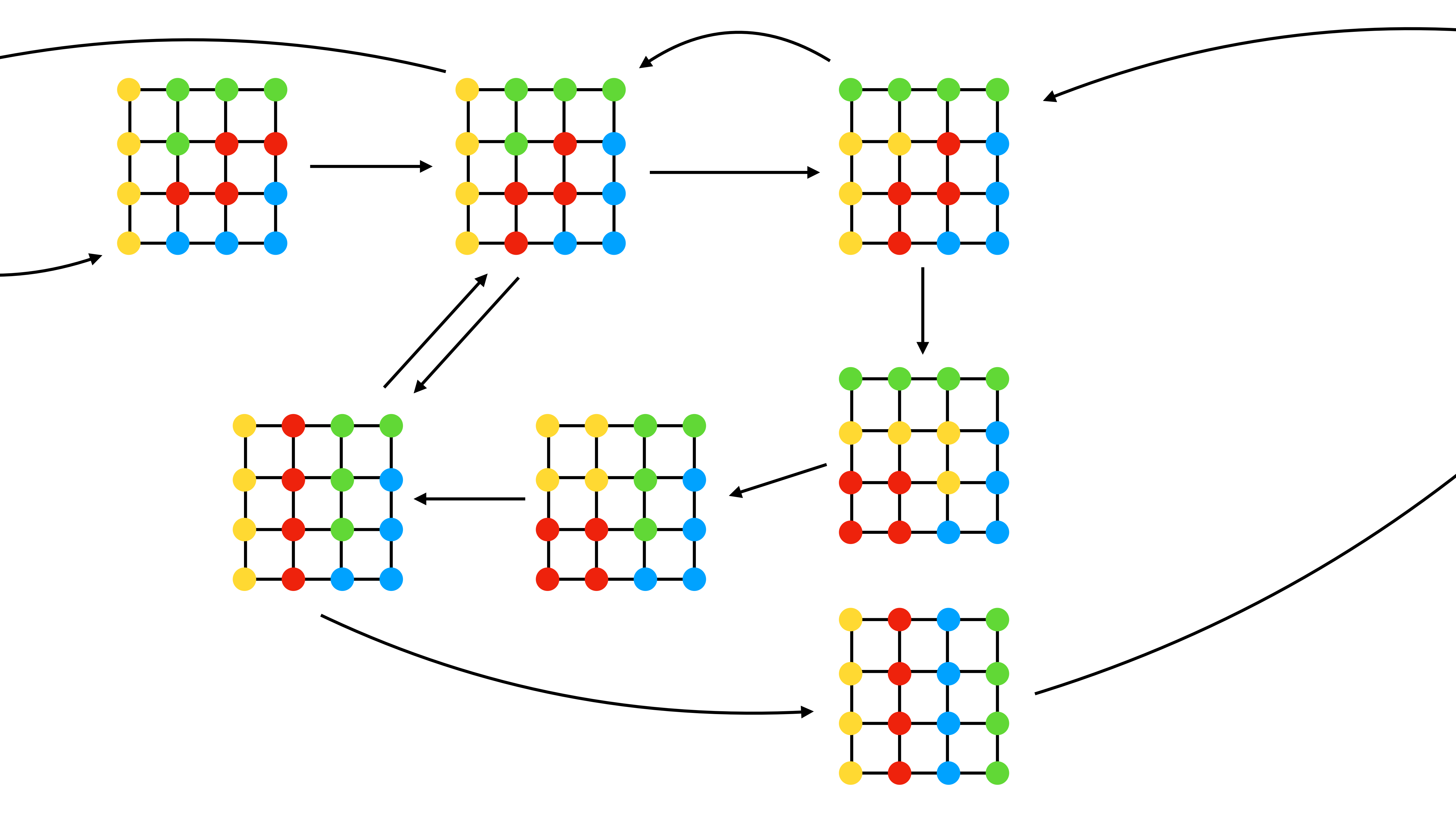


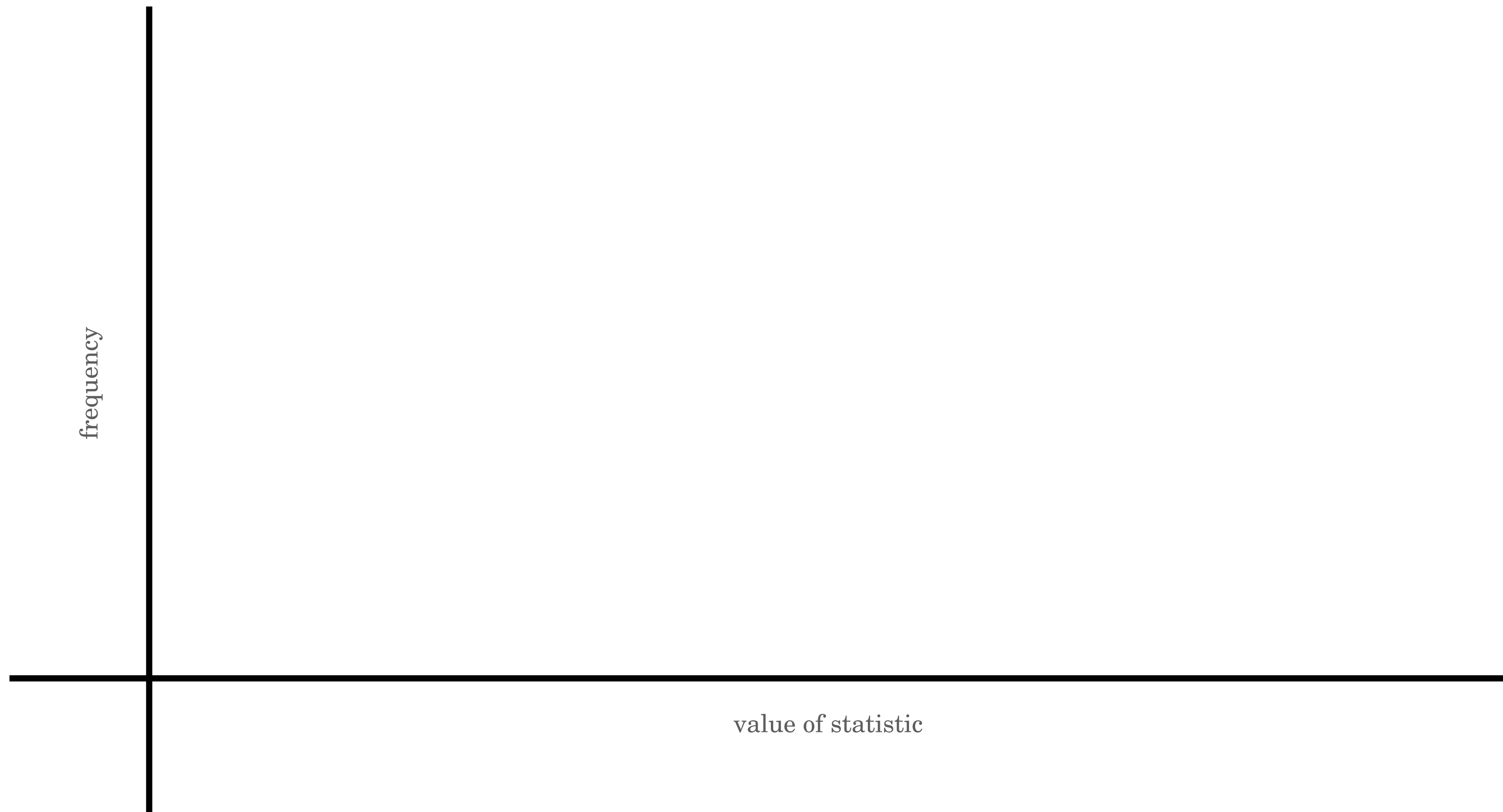




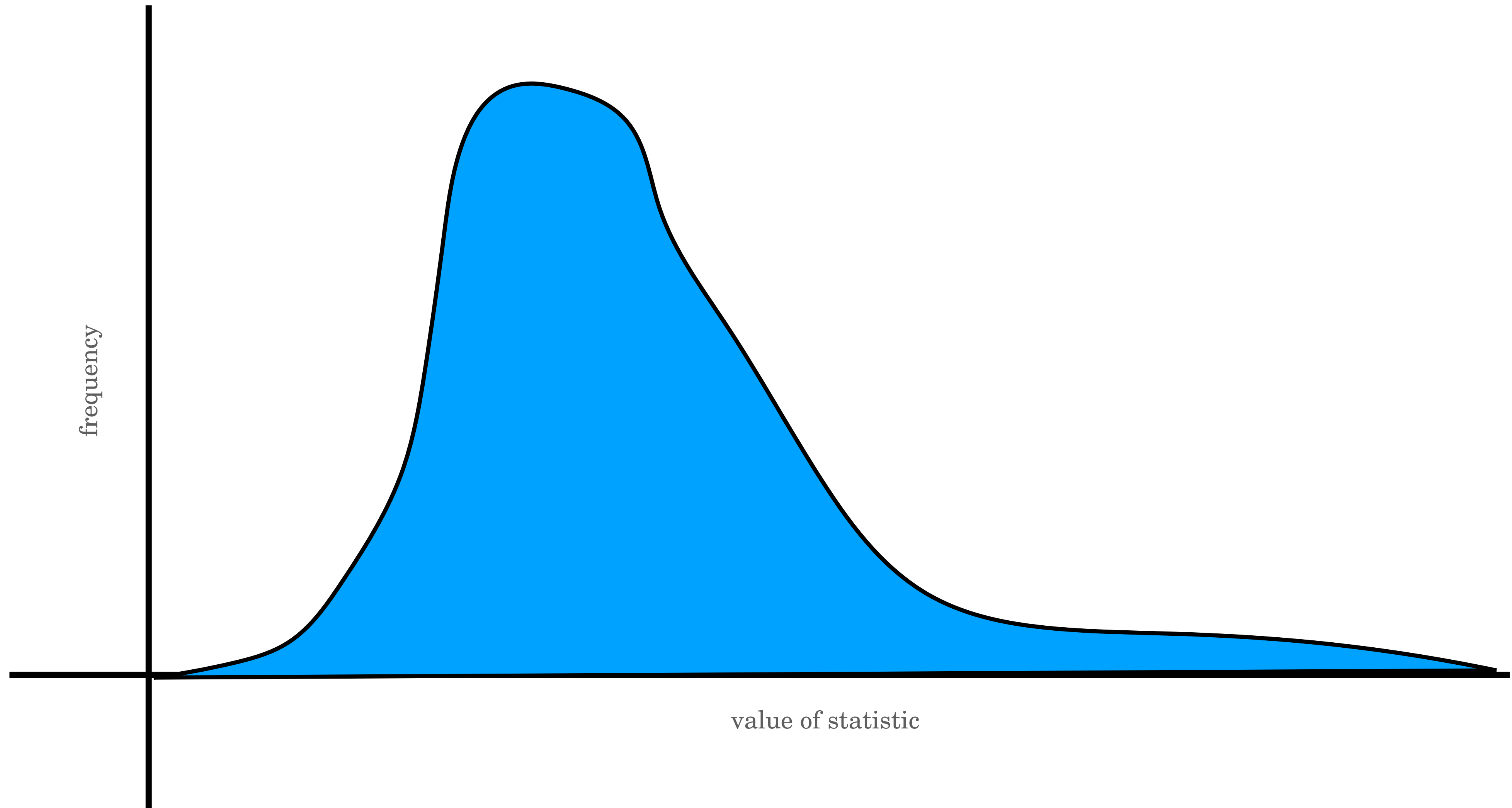


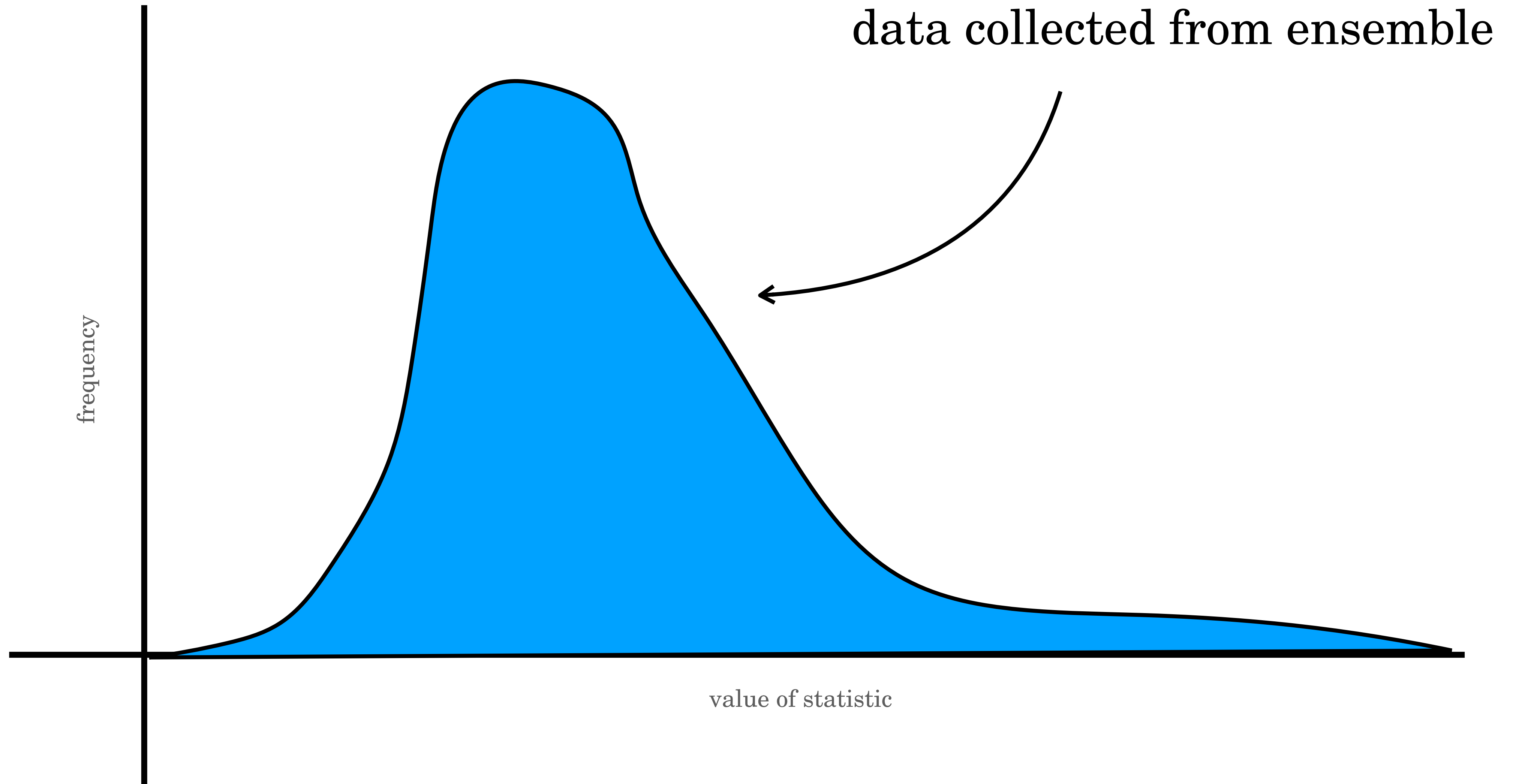


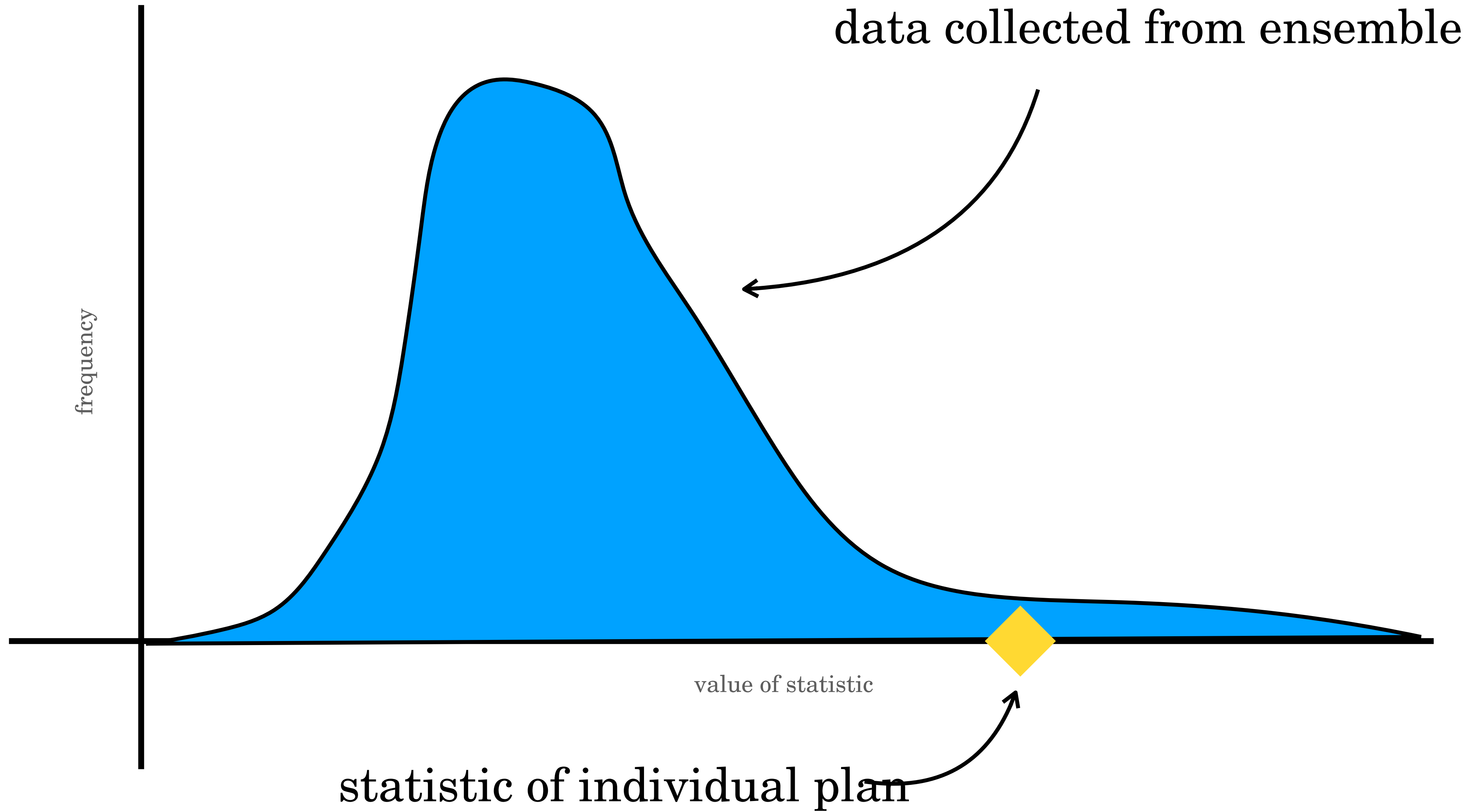


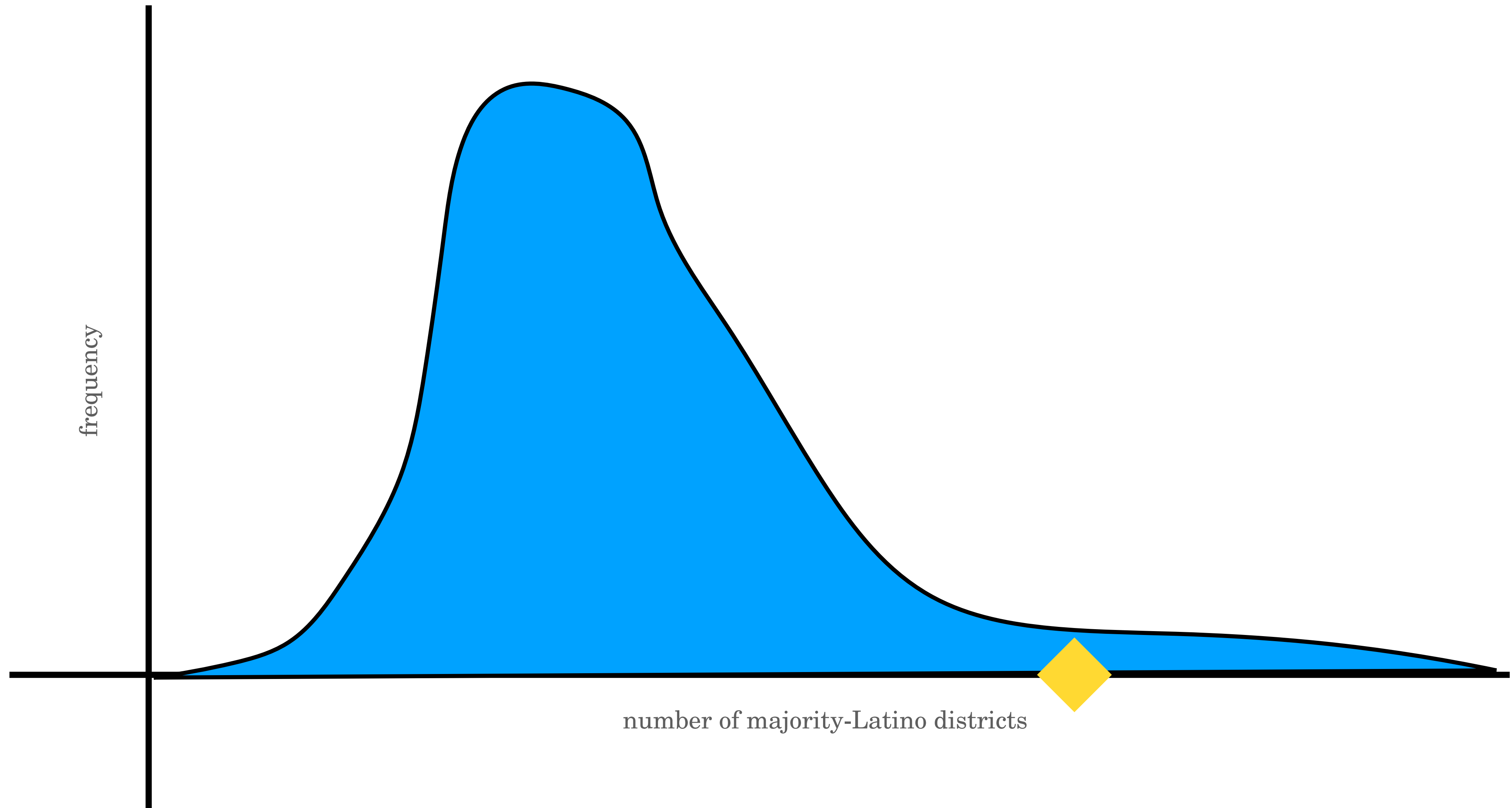












applying this technique to redistricting is fairly revolutionary.

... what happens now?

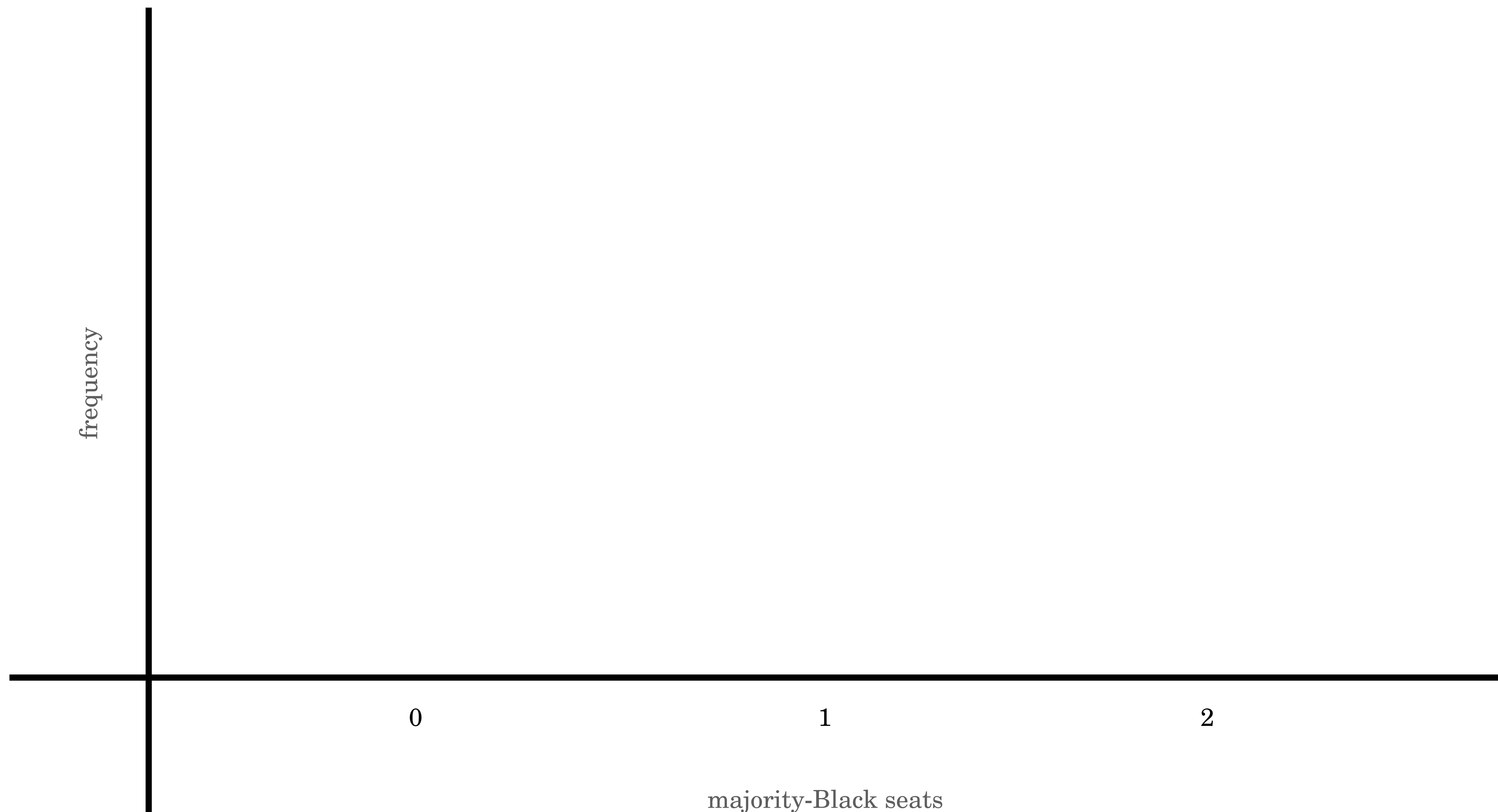
### 3. outlook (not the software)

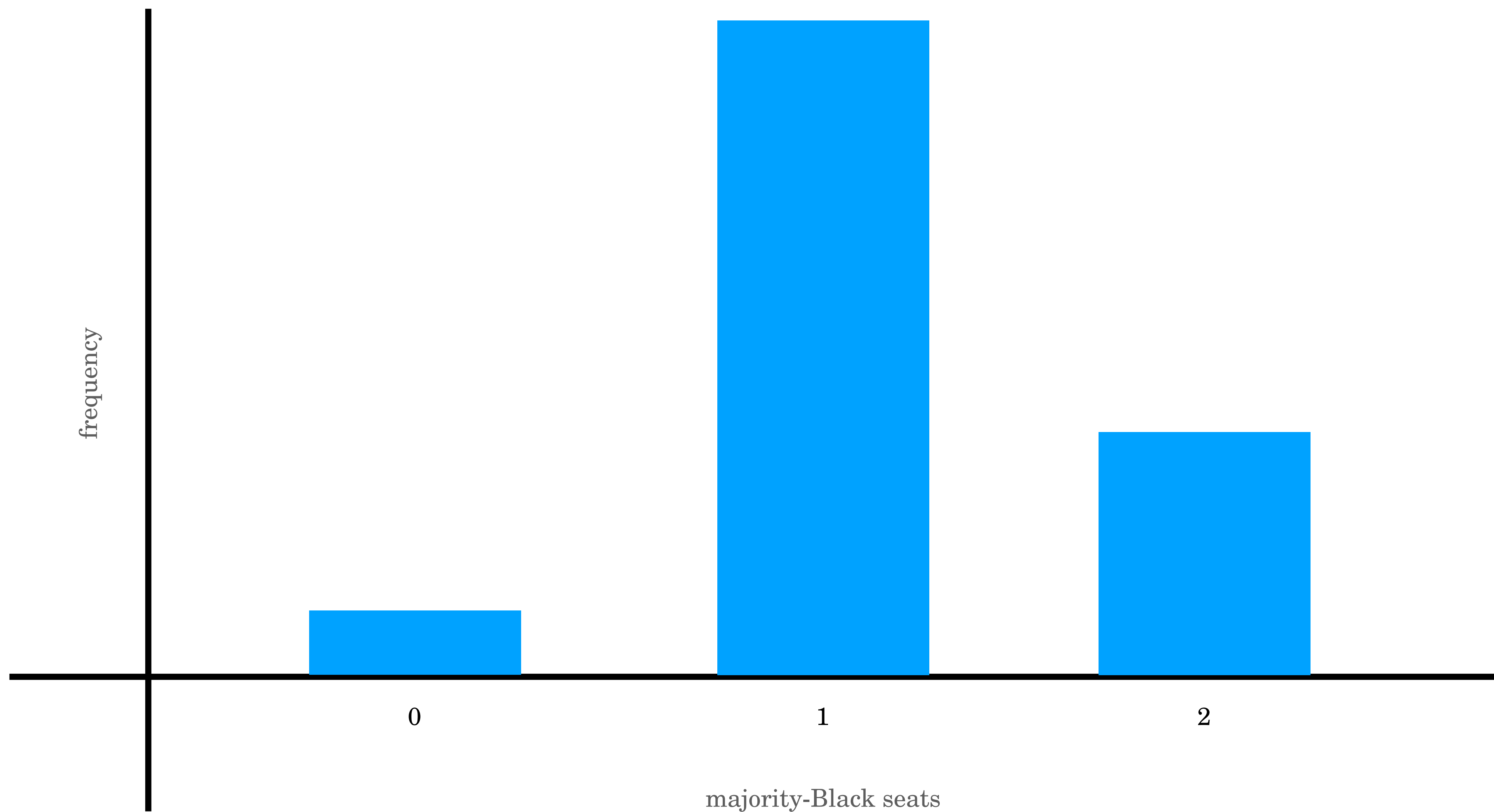
civically-minded mathematicians.



combating not-so-great ideas.

redistricting is too human for computers to do for us.





use your skills for good.

questions?

thank you!