Triangles, Squares, & Segregation

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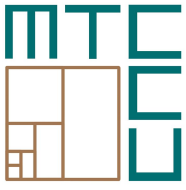
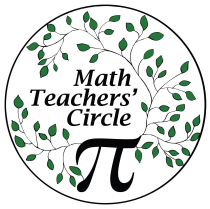
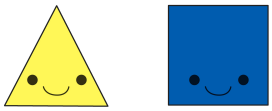


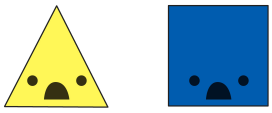


Population of Polygons

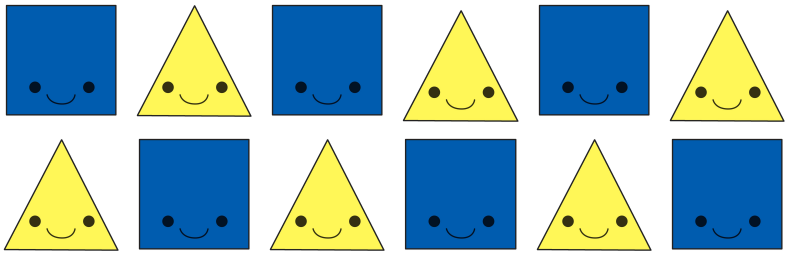
This is a population of Polygons including Triangles and Squares. Sometimes the Polygons are happy…



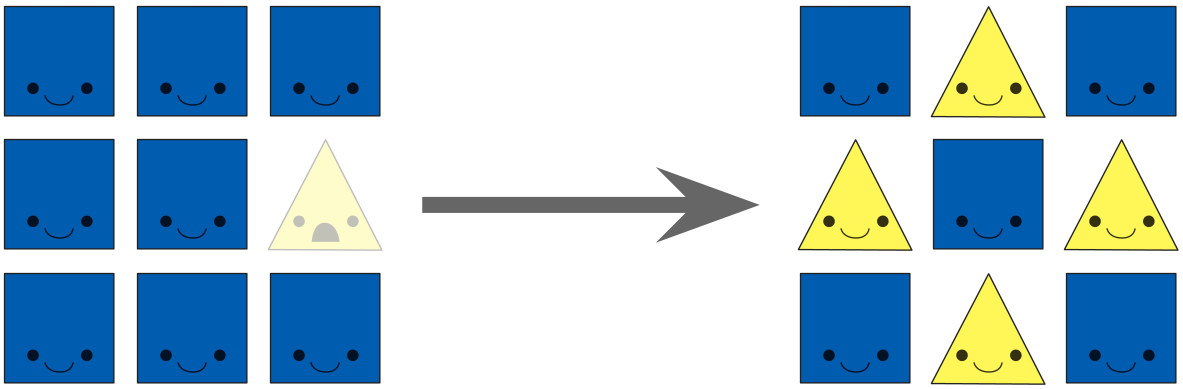
…and sometimes they are upset.



All the Polygons live together as neighbors.



They get upset when not enough neighbors are similar to them. Every Polygon prefers to live with at least some neighbors that share similar traits.



Ground Rules About Group Work

- **Don’t rush to an answer.** The goal is to learn by thinking thoroughly about problems rather than getting through as many questions as possible.
- **Stop and smell the roses.** Be comfortable making mistakes--there isn’t always a “correct” answer. How does this question relate to other topics? How do others think about this question? Feel free to go on tangents.
- **Respect everyone’s views.** Everyone works at a different pace, and everyone sees things from a different perspective. You might learn something new from someone else.
- **Teach only if you have to.** Resist the urge to dominate the conversation. Discuss your thoughts, but allow everyone else an opportunity to discover their own ideas.

Rules of the Game

You will be given a board with Triangles and Squares.

- Goal: make all the Polygons happy.
- You can only move Polygons if they are unhappy with their immediate neighborhood.
- You cannot move them if they are currently happy, but their mood can change depending on their neighbors.
- They all believe two things:

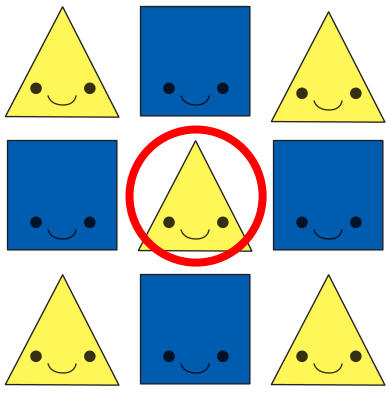
“I want to move if fewer than 1/3 of my neighbors are like me.”

and

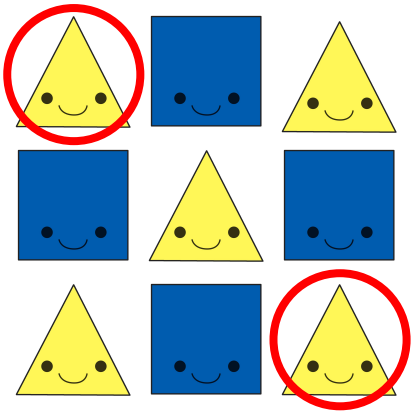
“I want to move if I have no neighbors.”

Immediate neighbors are defined to be the Polygons on either side or diagonally next to an individual Polygon.

The middle Triangle has 8 immediate neighbors.

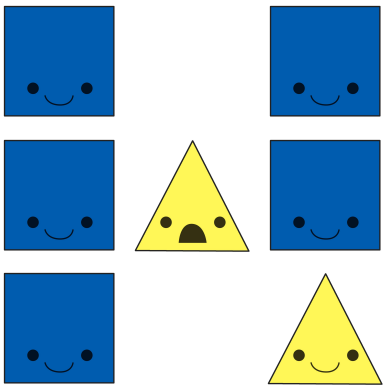


These two Triangles are not immediate neighbors.



Example 1

In this example, the middle Triangle is unhappy because only 1/6 of its immediate neighbors are similar, and 1/6 < 1/3.

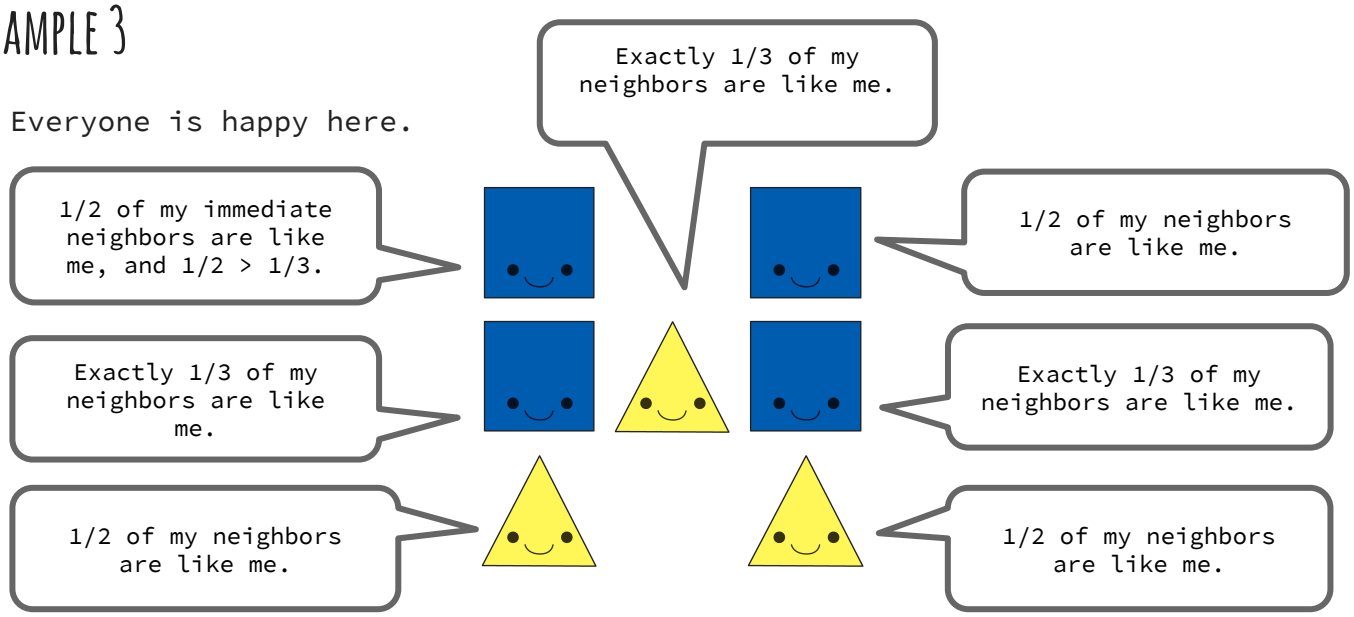


Example 2

The middle Triangle is unhappy because it has no immediate neighbors.

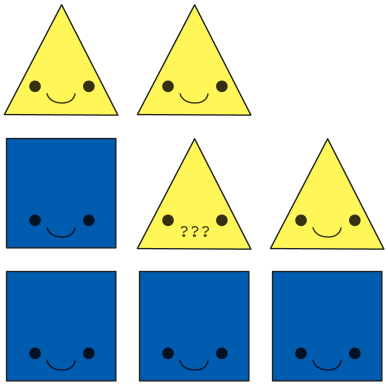
Example 3

Everyone is happy here.

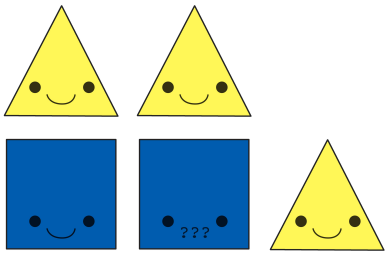


Your Turn!

How does the middle Triangle feel?



How does the middle Square feel?

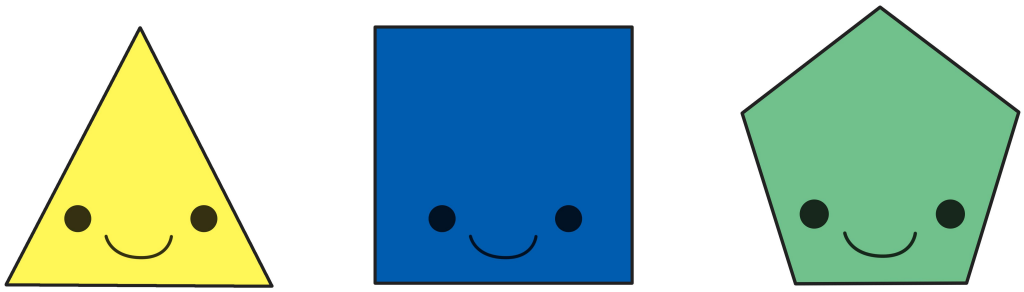


On the Board...

- Take turns moving one unhappy Polygon at at time on the board.
- Check the immediate neighborhood around where it moved from and where it moved to. Mark the neighboring polygons are happy or upset as appropriate.
- Note any observations about the overall board.

How might you Modify the game?

- Change the fraction 1/3 to 1/4:
  This means the Polygons are unhappy if fewer than 1/4 of their neighbors are like them.
- Assume Polygons are unhappy if fewer than 1/4 of their neighbors are like them and also unhappy if more than 3/4 of their neighbors are like them.
- Assume there are Triangles, Squares, and Pentagons.



Which questions do you have? In what ways might you generalize the game?

Play with new assumptions, and see what happens!

Parable of the Polygons

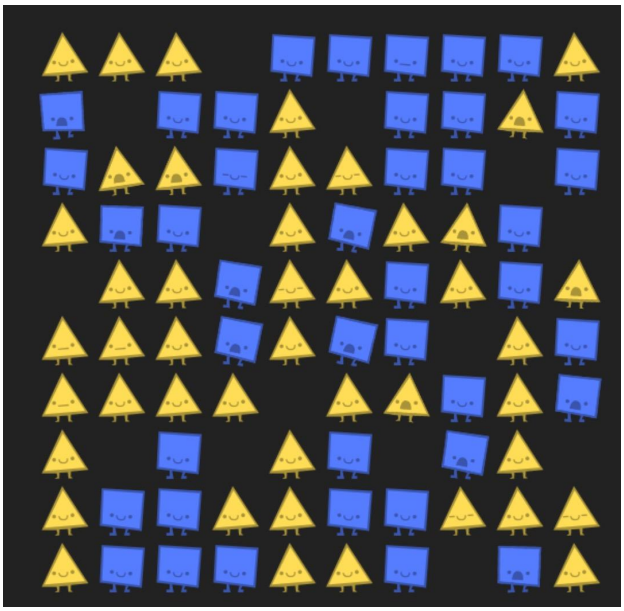
- Introduce a third neutral state in which Polygons are neither happy nor upset.

- Polygons are only *slightly* shapist and actually prefer a diverse neighborhood:
  - They are unhappy if <1/3 of their neighbors are like them.
  - They are indifferent if they have no neighbors.
  - They are indifferent if 100% of their neighbors are similar.
- Goal: Make sure all the polygons are NOT upset.

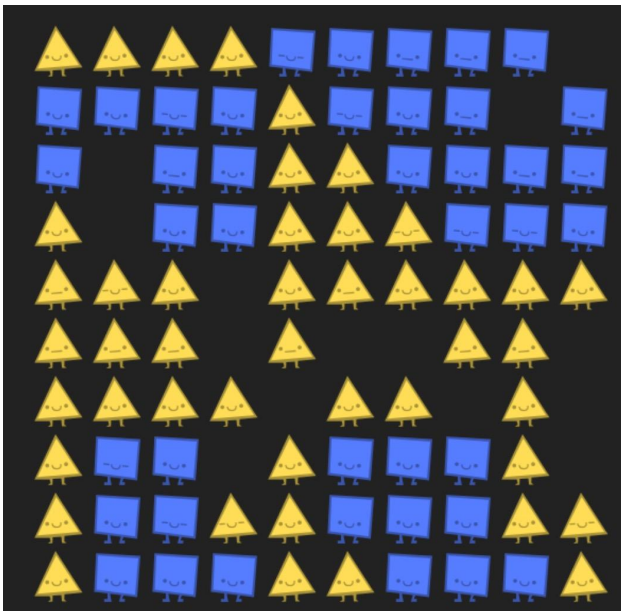
http://ncase.me/polygons/

Example of a Solution

Initial board



Solution board



Harmless or not so much?

Every Polygon only has a small bias, but you should notice in your original game solution that the Polygon neighborhood has become segregated overall.

These are friendly shapes. Why is this happening?

Small individual biases
can lead to large collective biases.

What can they do?

The neighborhood looks different when Polygons believe: “I’ll move if <10% or >80% of my neighbors are like me.”

A change in perception
and demanding a bit of diversity
can change the world.

Our Turn!

1. Which situations do we see issues arise from the lack of diversity?
2. What can we do?
3. How can we use these tools in classrooms?

Remember: this is just a simulation based on a math model and doesn’t 100% reflect the world!

References

- Parable of the Polygons (by Vi Hart and Nicky Case): http://ncase.me/polygons/
- Polygons with Pentagons (by Duncan McDougall): http://ncase.me/polygons-pentagons/play/automatic/automatic_sandbox_frame.html
- “Dynamic Models of Segregation (by Thomas Schilling): http://www.stat.berkeley.edu/~aldous/157/Papers/Schelling_Seg_Models.pdf
- Project Implicit: https://implicit.harvard.edu/implicit/index.jsp
- Social Justice Standards (by grade level): http://www.tolerance.org/sites/default/files/general/TT_Social%20Justice%20Standards_web.pdf
- John Oliver on segregated schools: https://www.youtube.com/watch?v=o8yiYCHMAlM

Email us with any questions!

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