An Introduction to Self-Similar and Combinatorial Tiling
Part 1

Sheena Yuen

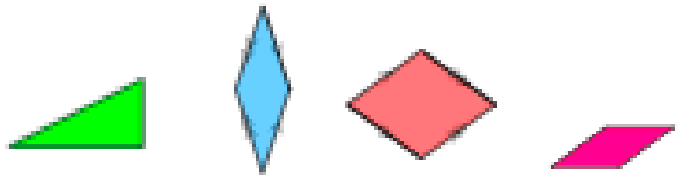
Vassar College

April 6, 2013

Introduction

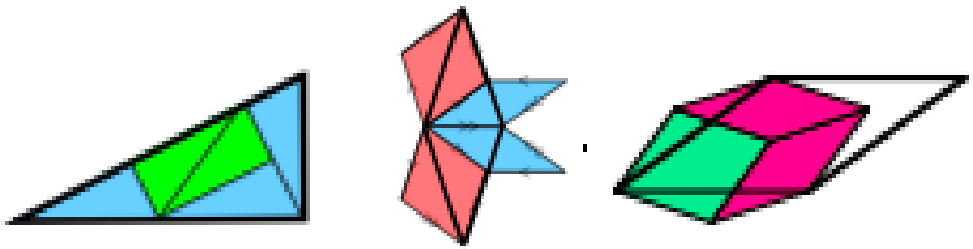
Tile: A set that is a closure of its interior.

Example:

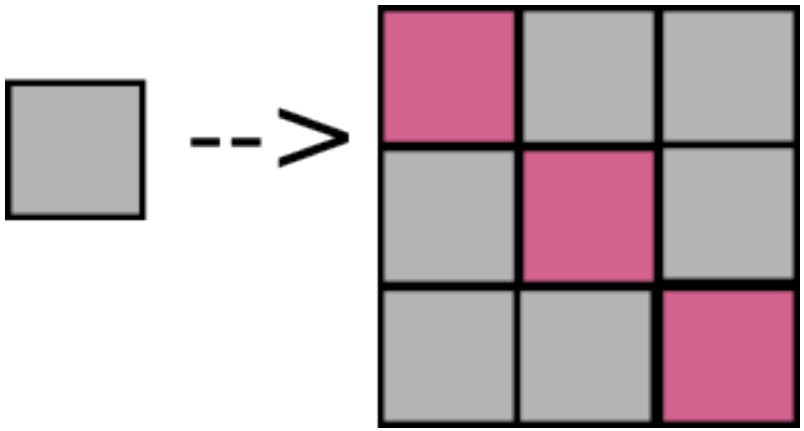


Patch: A finite union of tiles that do not intersect.

Example:

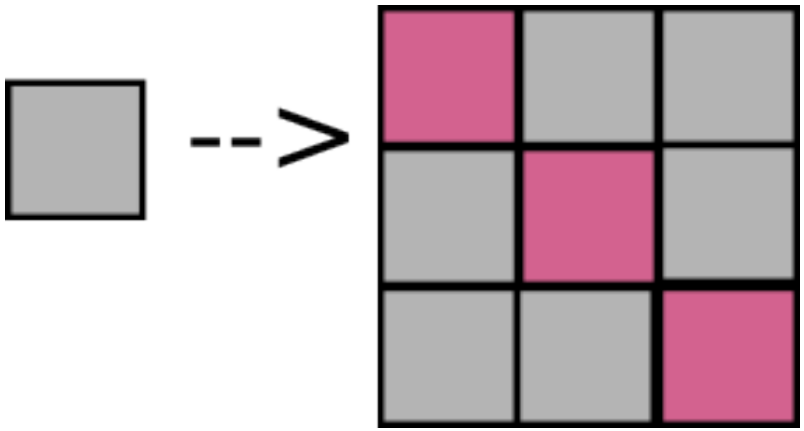


Inflate and Subdivide



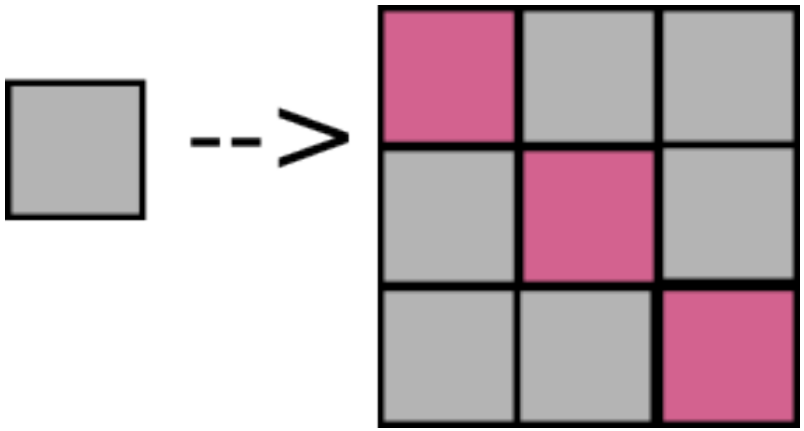
- Inflate and Subdivide: Map a tile to a union of tiles.

Inflate and Subdivide



- Inflate and Subdivide: Map a tile to a union of tiles.
- Inflates by using an expanding similarity of the plane.

Inflate and Subdivide



- Inflate and Subdivide: Map a tile to a union of tiles.
- Inflates by using an expanding similarity of the plane.
- Subdivides by dividing the image into a union of the original tile.

In this example, inflate and subdivide is present.

An Example of a Substitution Rule

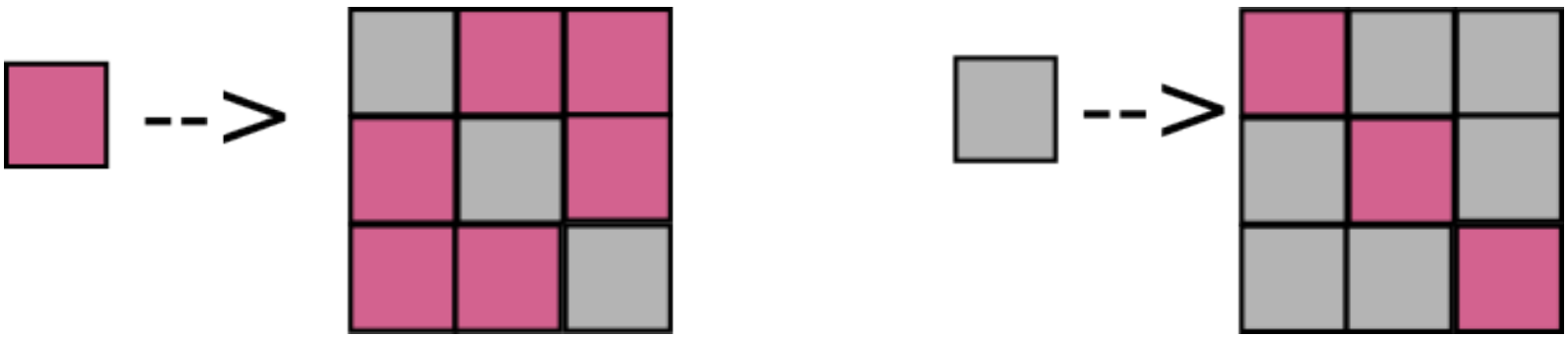
- Substitution rule: Rule used to construct infinite tiling using a finite number of tiles.

An Example of a Substitution Rule

- Substitution rule: Rule used to construct infinite tiling using a finite number of tiles.
- We will define a substitution to generate larger patches. Our rule is:

- This is a combinatorial substitution and it does not have a single expanding similarity.

Inflate and Subdivide and Substitution Rule



This example is both a substitution rule and inflate and subdivide rule.

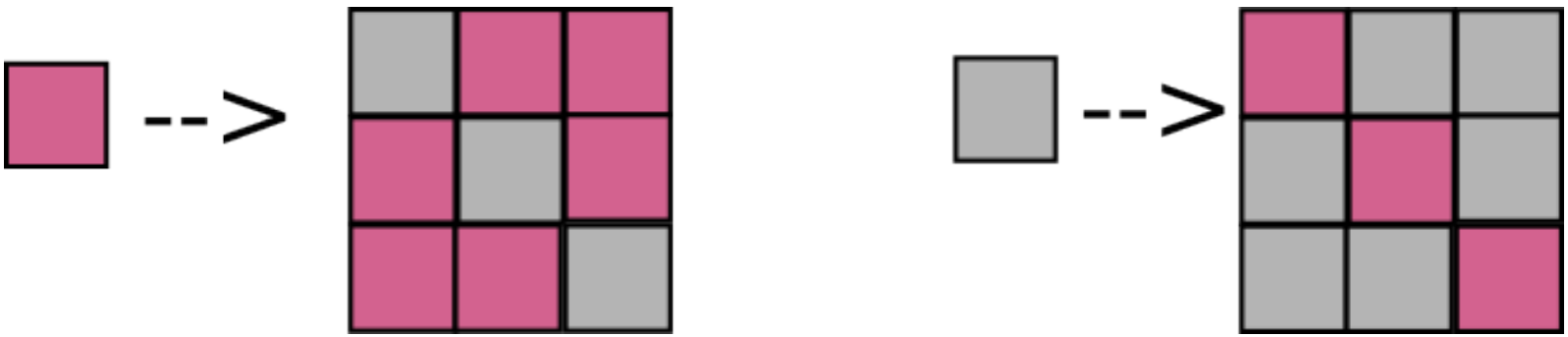
Self-Similar Tiling

- Self-similar tiling substitution: Substituted with a linear expansion of itself.

Self-Similar Tiling

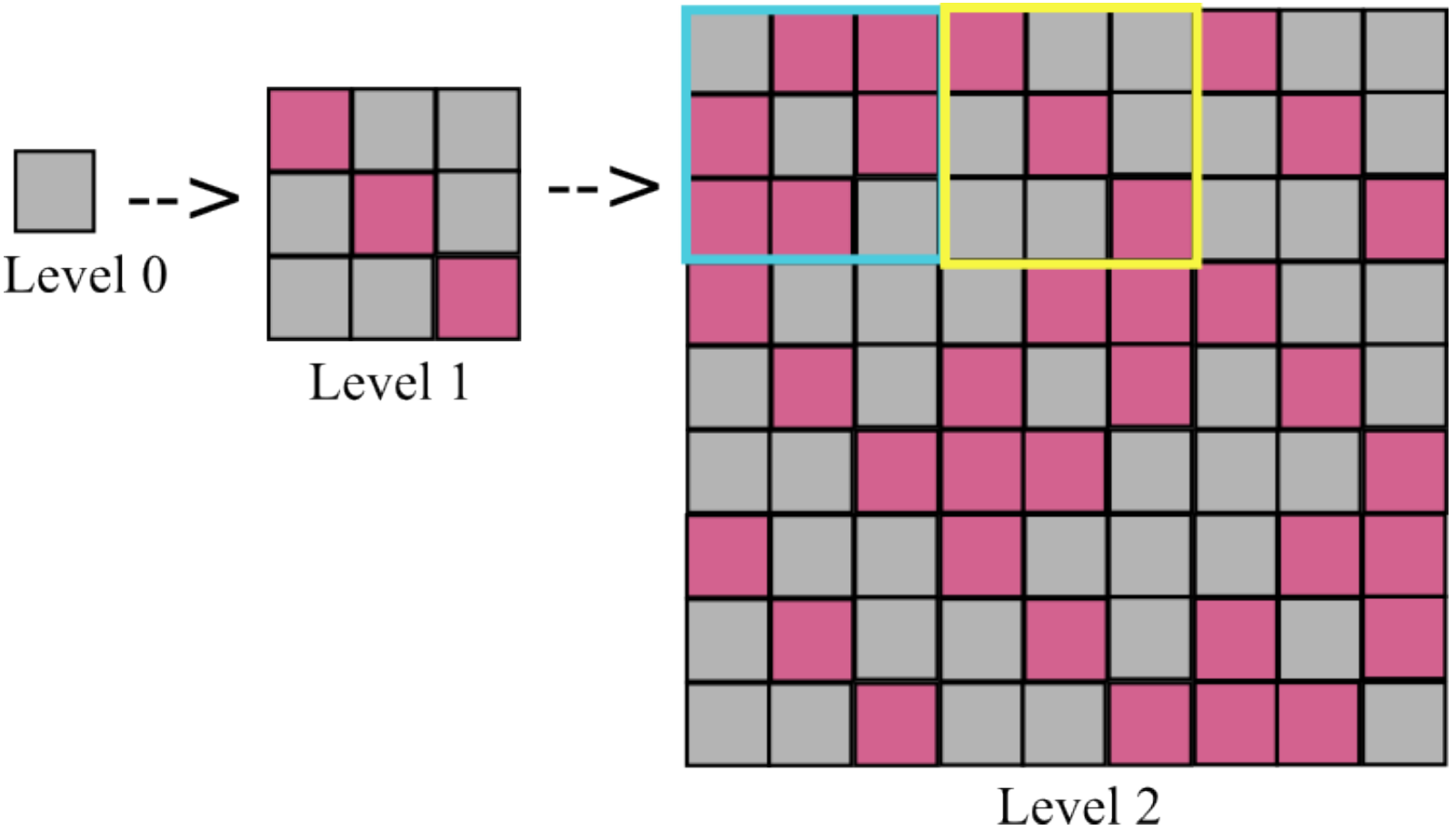
- Self-similar tiling substitution: Substituted with a linear expansion of itself.
- There is only one linear expansion for each substitution.

Example:



Create Level-n Patches

Level-n tiles: The level after substituting n times.

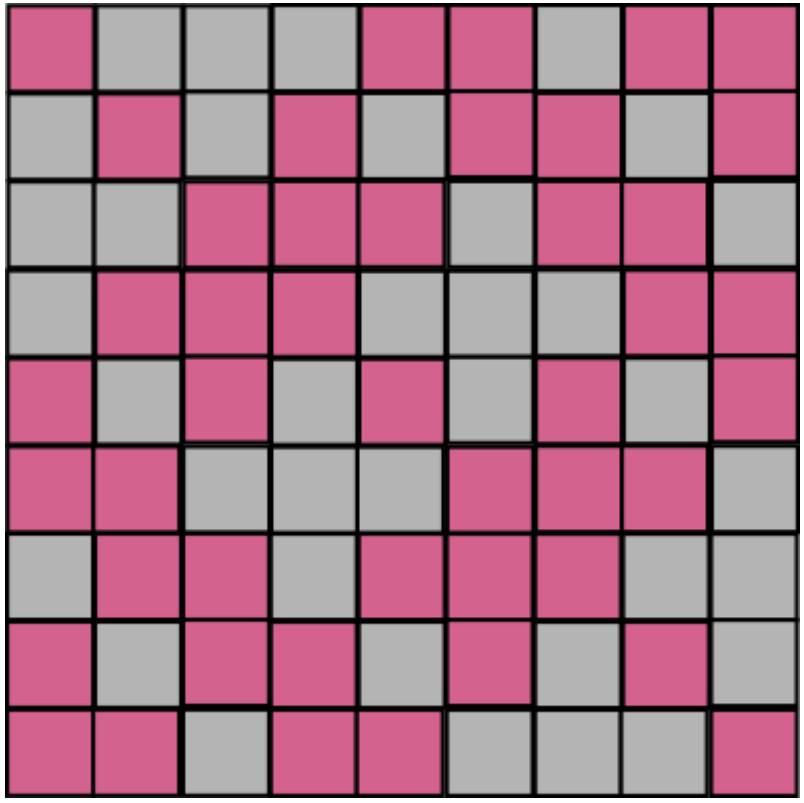


Level 0

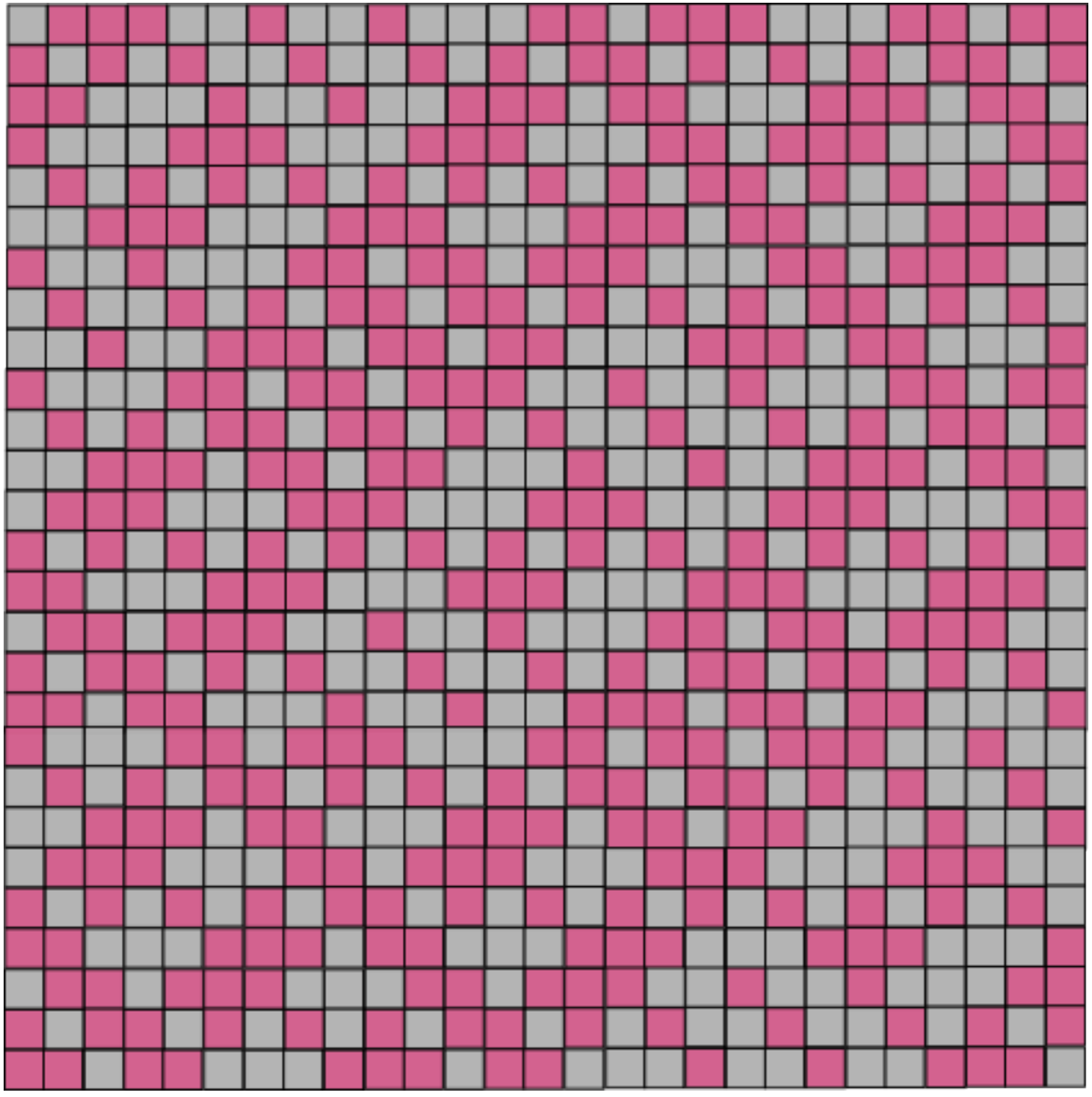
Level 1

Level 2

Self-Similar Tiling Activity

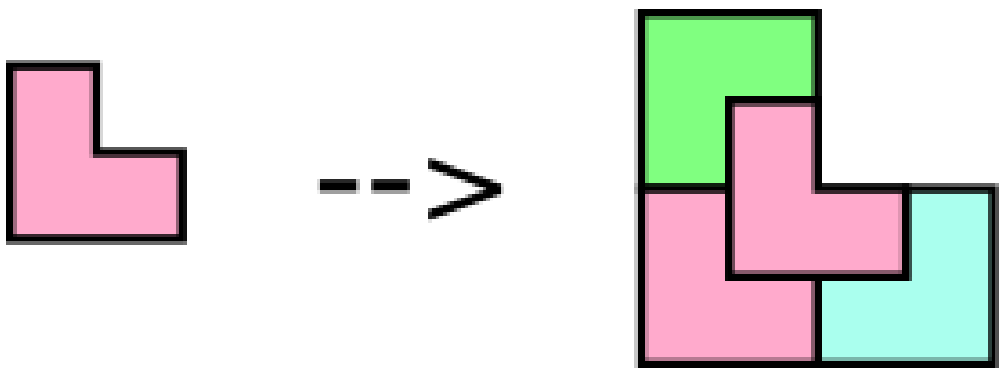


Self-Similar Tiling Activity



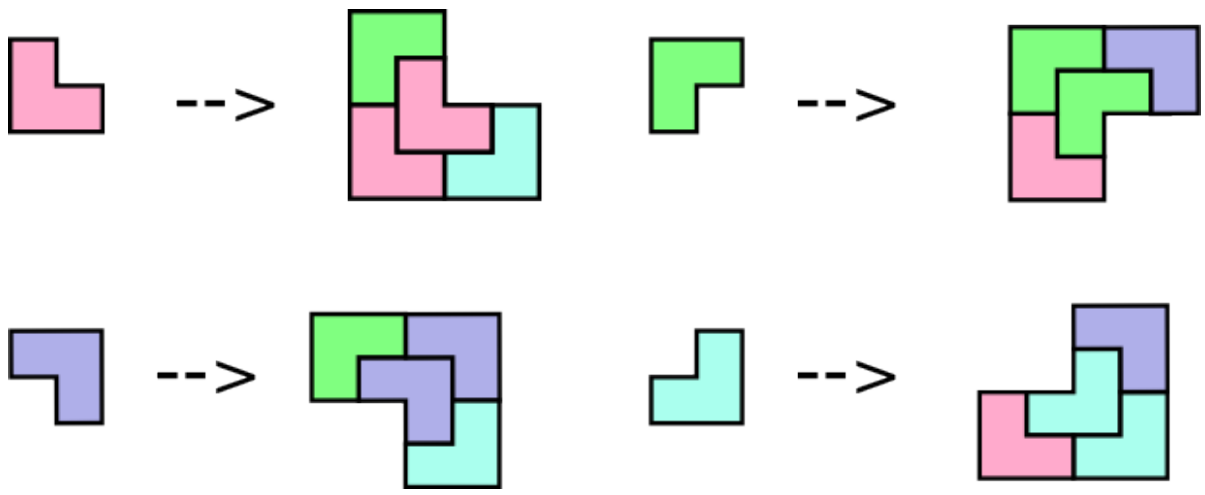
Chair Tiling: Inflate and Subdivide

The chair tiling has inflate and subdivide present.



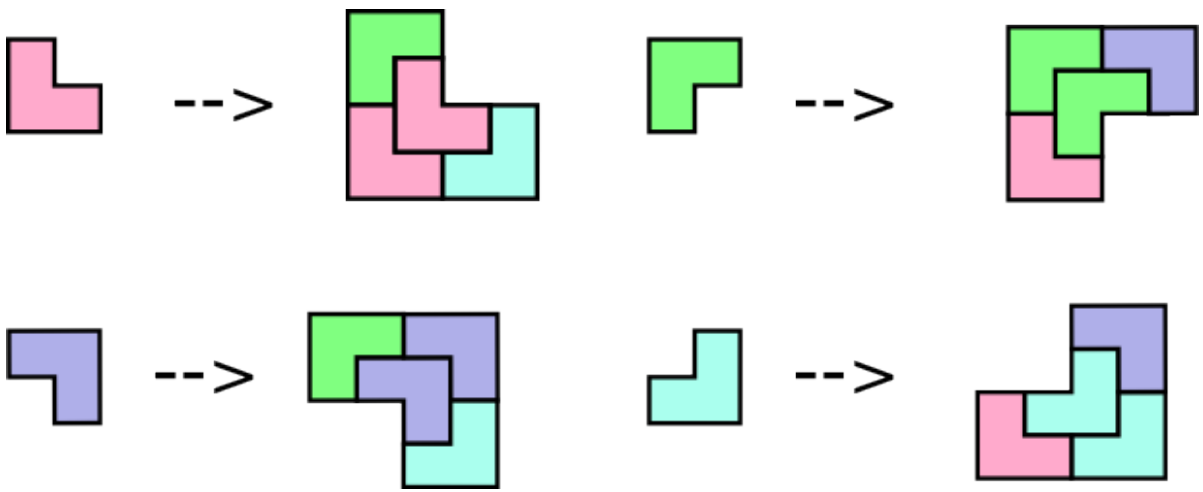
Chair Tiling: Substitution Rule

We will use inflate and subdivide to create a substitution rule to produce the chair tiling. The substitution rule for the chair tiling is:

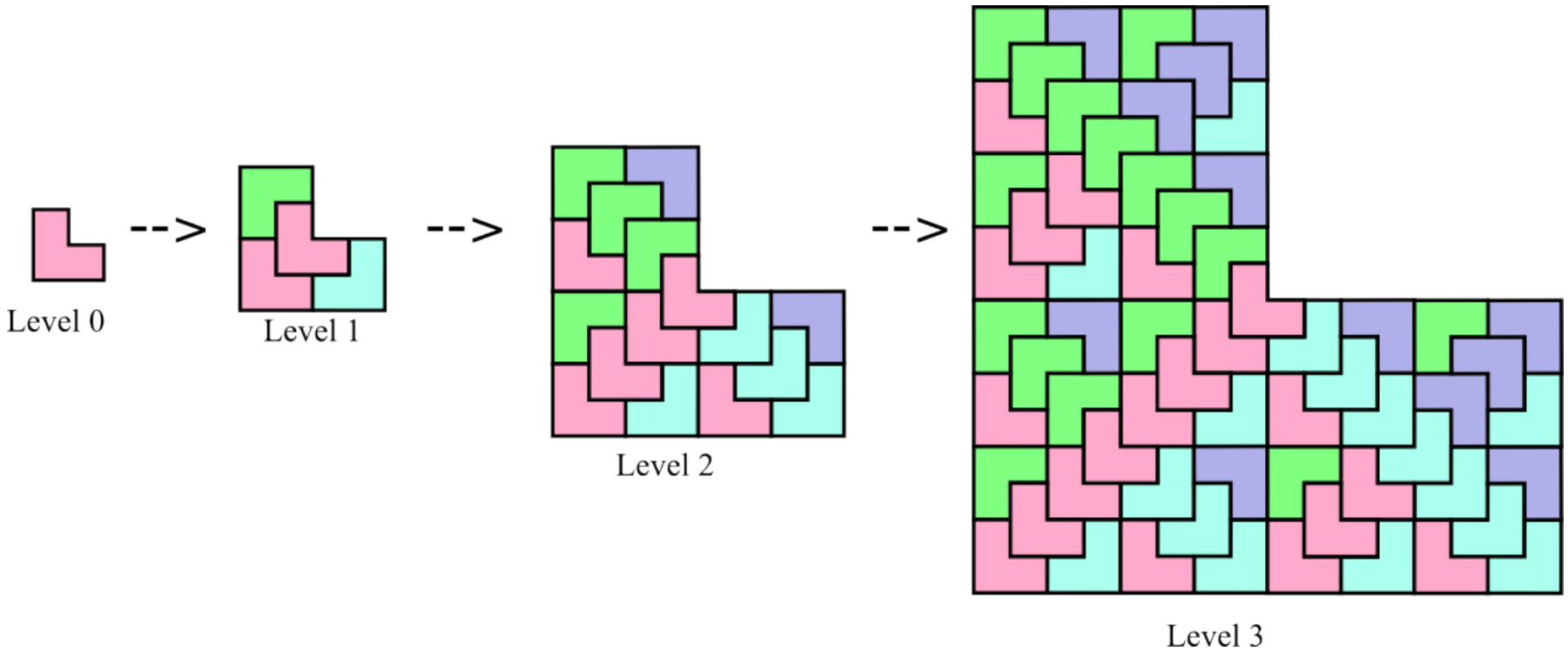


Chair Tiling: Self-Similar Tiling

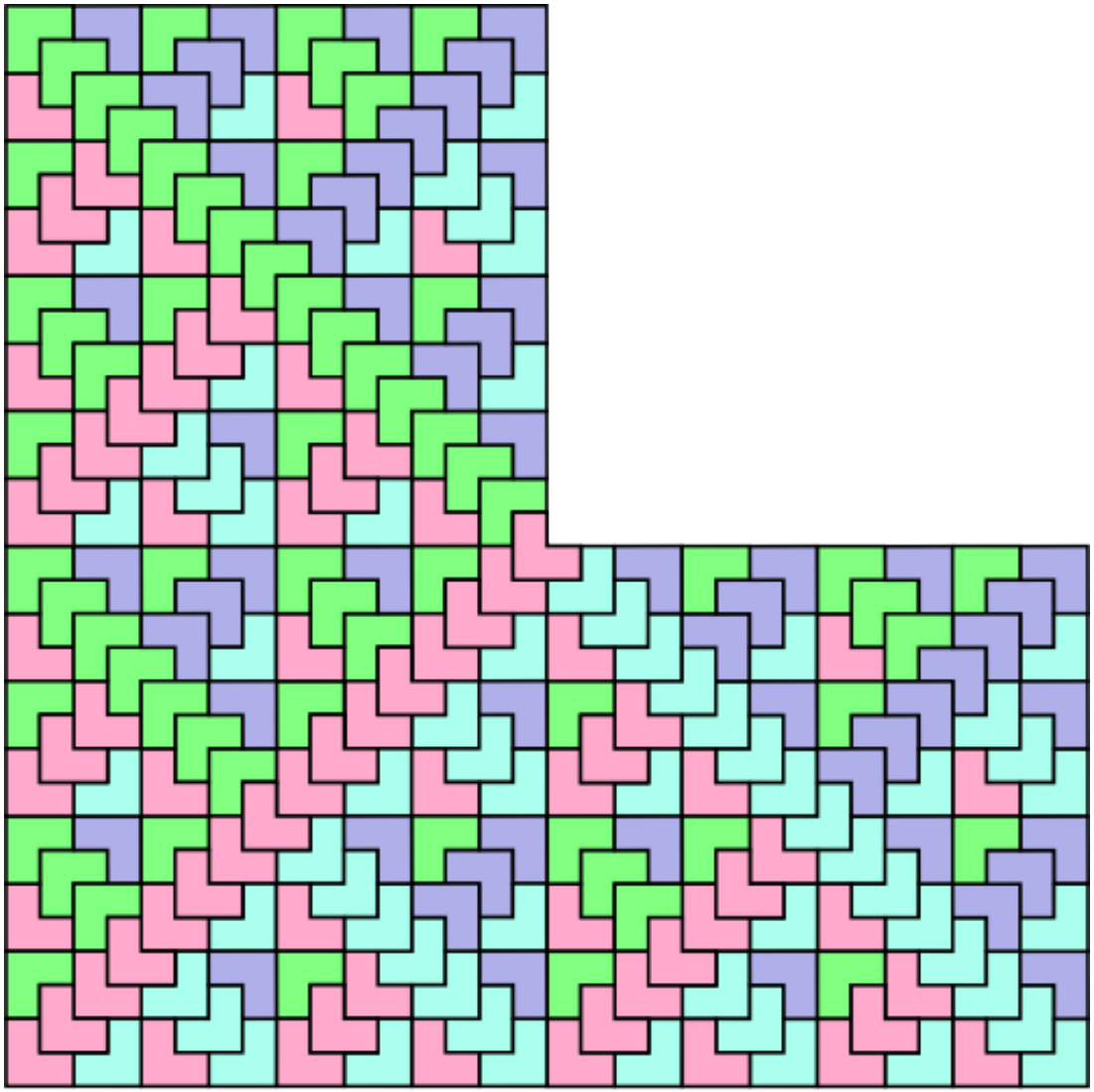
The chair tiling is a more advanced self-similar tiling.



Self-Similar Tiling: Chair Tiling Activity



Self-Similar Tiling: Chair Tiling Level 4



Level 4

Conclusion

- This leads into our second talk which is on combinatorial tiling.

Conclusion

- This leads into our second talk which is on combinatorial tiling.
- Combinatorial tiling substitution: Substitution rule that replaces a tile by some arrangement of tiles.

Conclusion

- This leads into our second talk which is on combinatorial tiling.
- Combinatorial tiling substitution: Substitution rule that replaces a tile by some arrangement of tiles.
- Does not have a geometric resemblance to the original tile.

Conclusion

- This leads into our second talk which is on combinatorial tiling.
- Combinatorial tiling substitution: Substitution rule that replaces a tile by some arrangement of tiles.
- Does not have a geometric resemblance to the original tile.
- Does not keep the constant length of the original tile.

Conclusion

- This leads into our second talk which is on combinatorial tiling.
- Combinatorial tiling substitution: Substitution rule that replaces a tile by some arrangement of tiles.
- Does not have a geometric resemblance to the original tile.
- Does not keep the constant length of the original tile.
- Our second talk will be presented by Moises Rivera.

References

- For more information on self-similar tiling:

References

- For more information on self-similar tiling:
- Tiling Encyclopedia: http://tilings.math.uni-bielefeld.de/

References

- For more information on self-similar tiling:
- Tiling Encyclopedia: http://tilings.math.uni-bielefeld.de/
- A Primer of Substitution Tilings of the Euclidean Plane by Natalie Frank
  Frank, Natalie Priebe. A Primer of Substitution Tilings of the Euclidean Plane, Expositiones Mathematicae. 26 (2008) 295-326

References

- For more information on self-similar tiling:
- Tiling Encyclopedia: http://tilings.math.uni-bielefeld.de/
- A Primer of Substitution Tilings of the Euclidean Plane by Natalie Frank
  Frank, Natalie Priebe. A Primer of Substitution Tilings of the Euclidean Plane, Expositiones Mathematicae. 26 (2008) 295-326