Pattern Formation

**Necessary and Sufficient Condition
on the Set of Initial Configurations (with chirality)**

Pattern formation (with chirality)

If we know the initial configuration is not symmetric, can we form a pattern that is not a regular n-gon?

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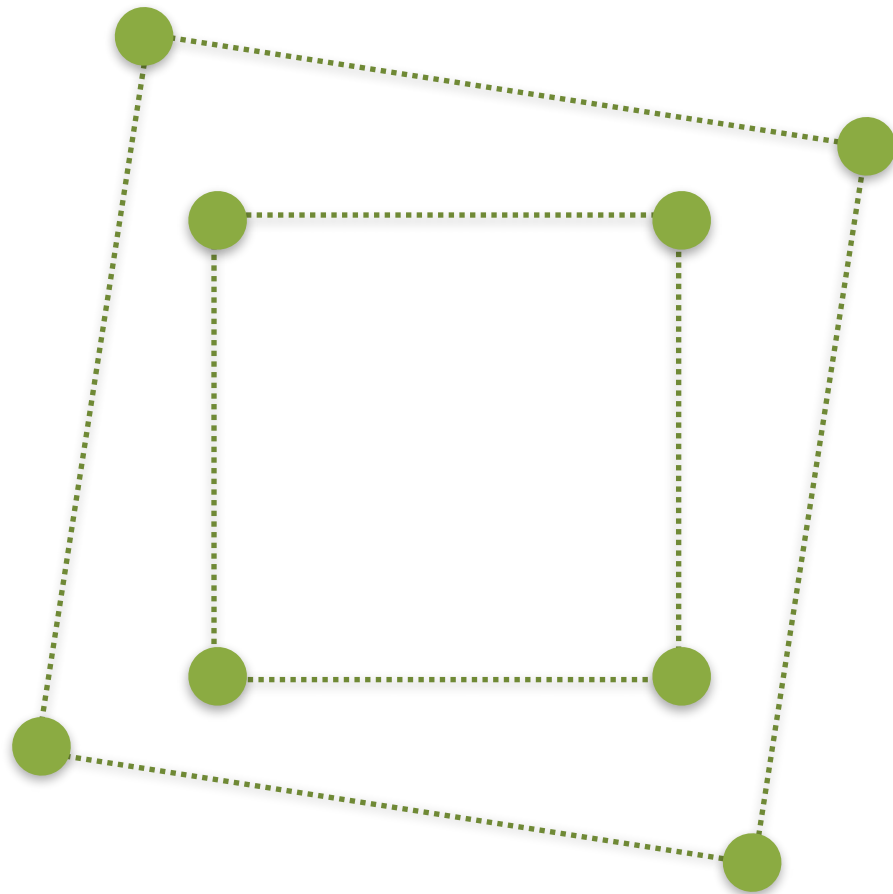
Yes!

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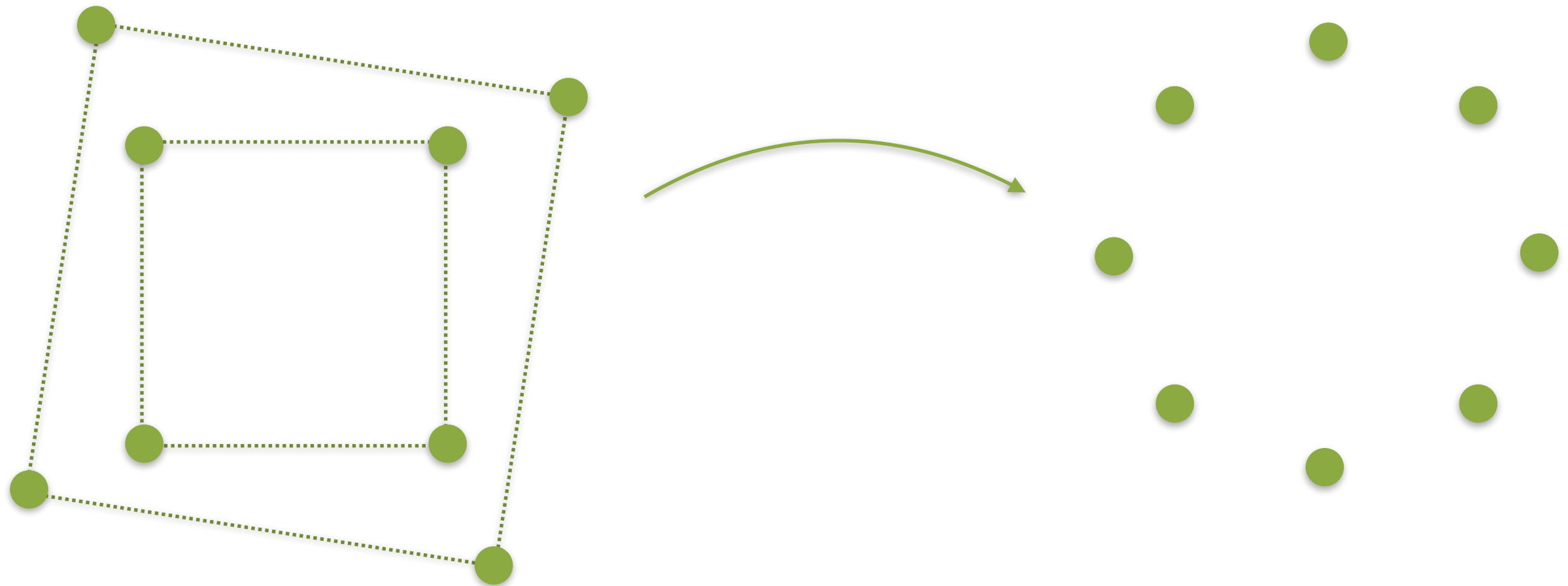
Yes!

What are the conditions on the initial configuration and on the pattern so that the problem is solvable?
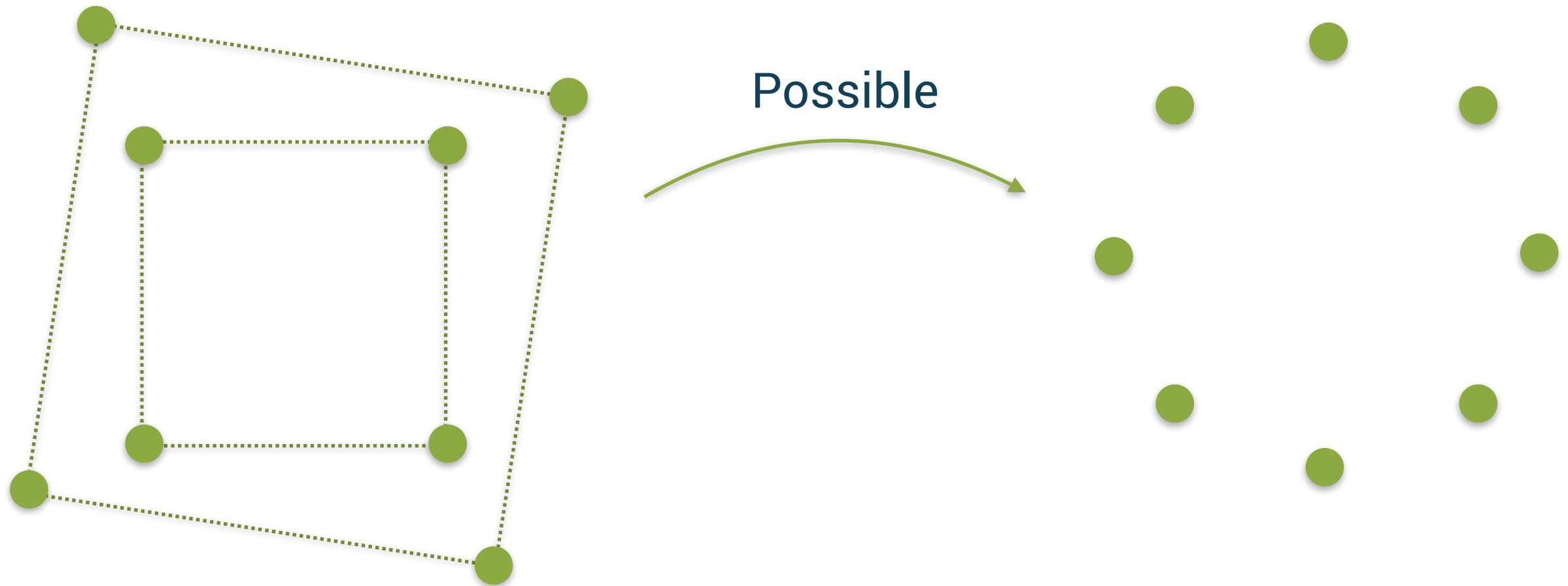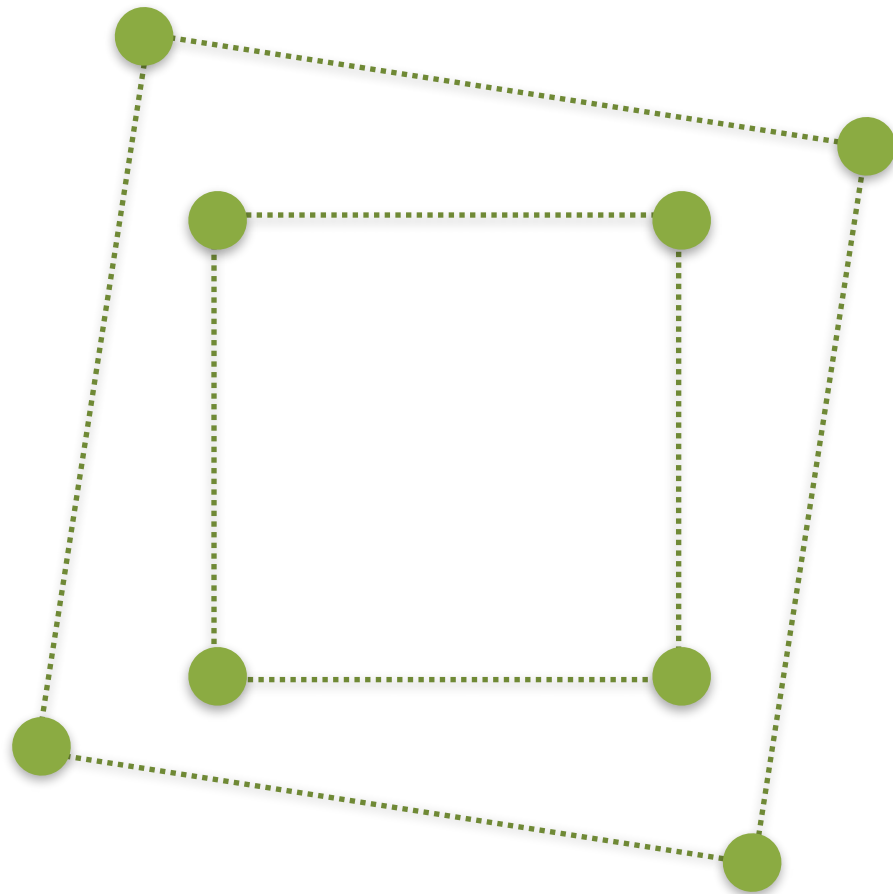
Examples

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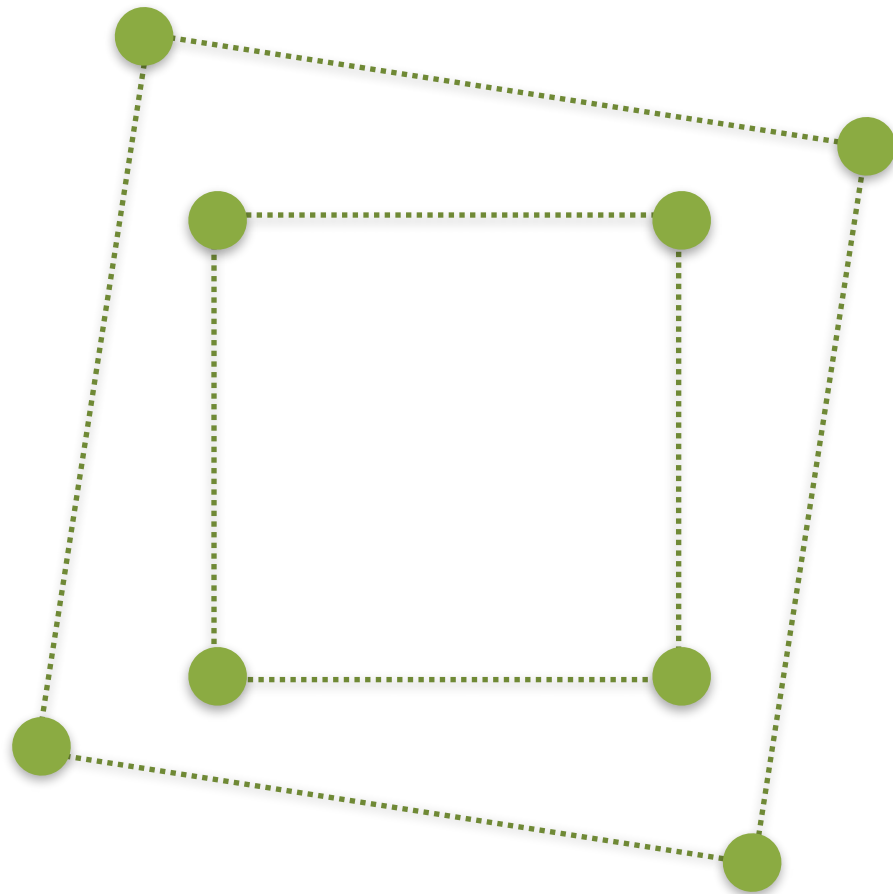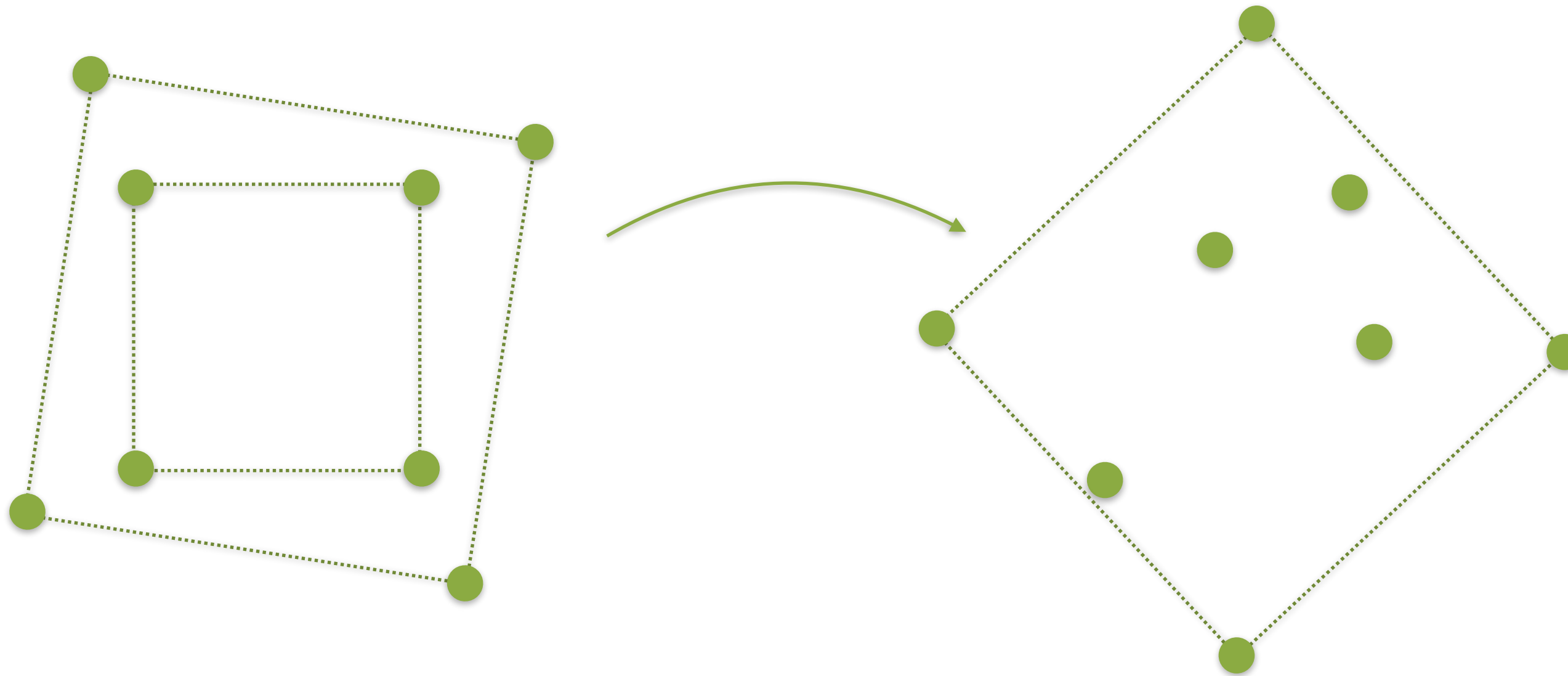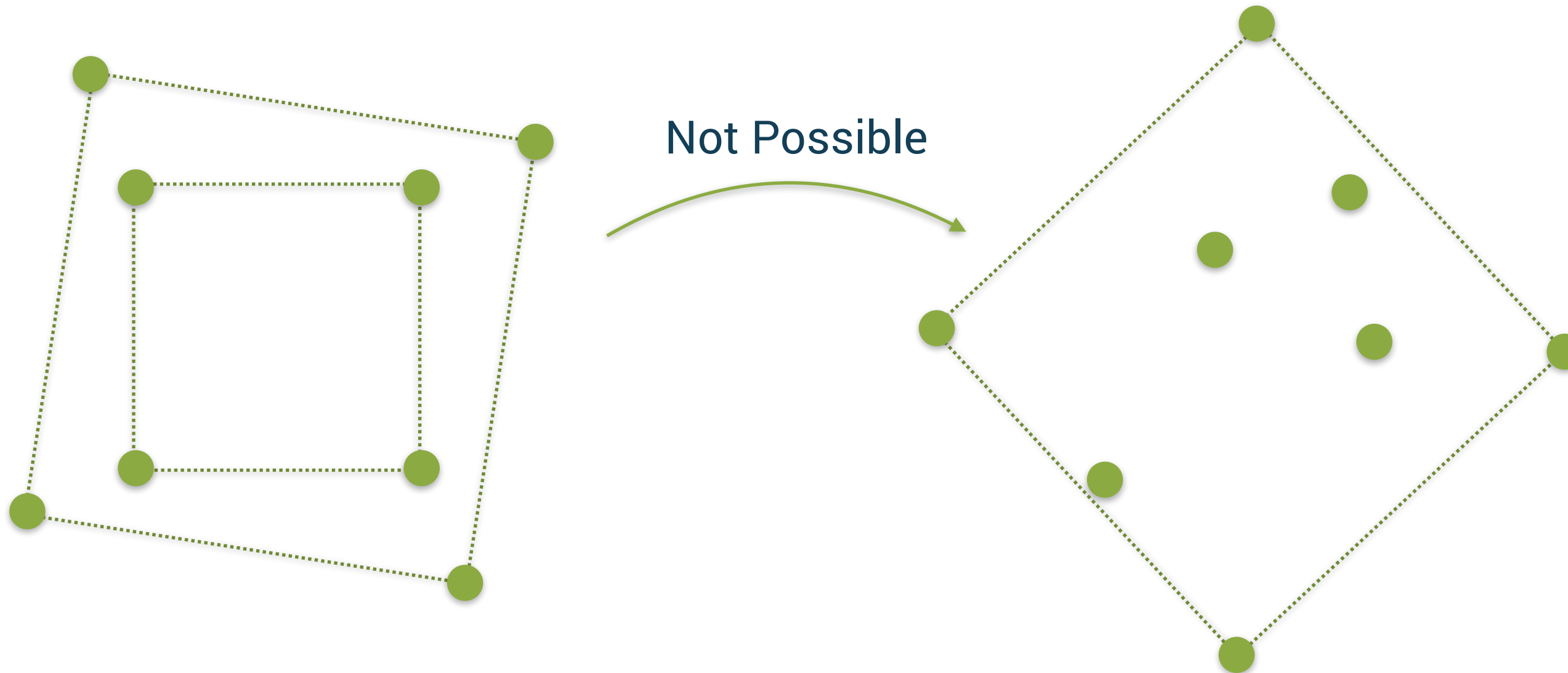
Examples
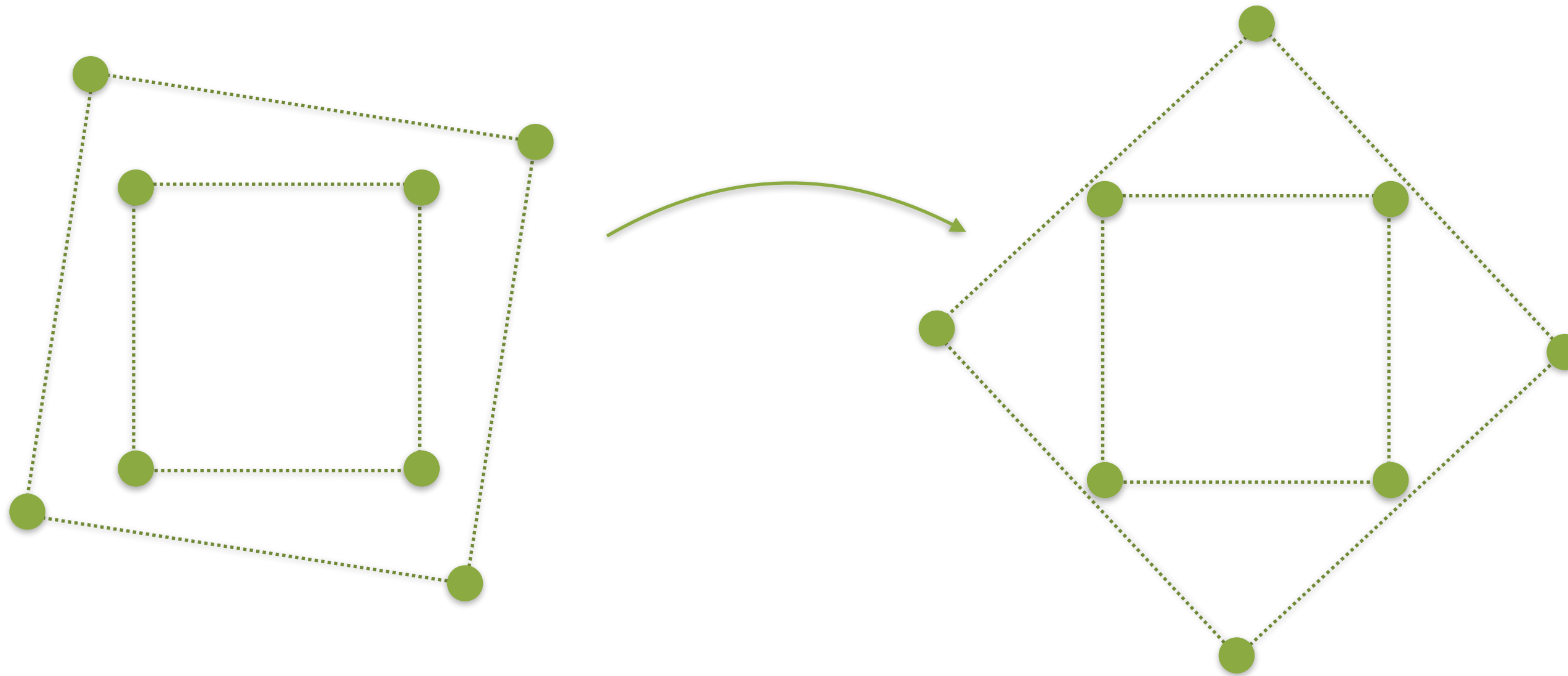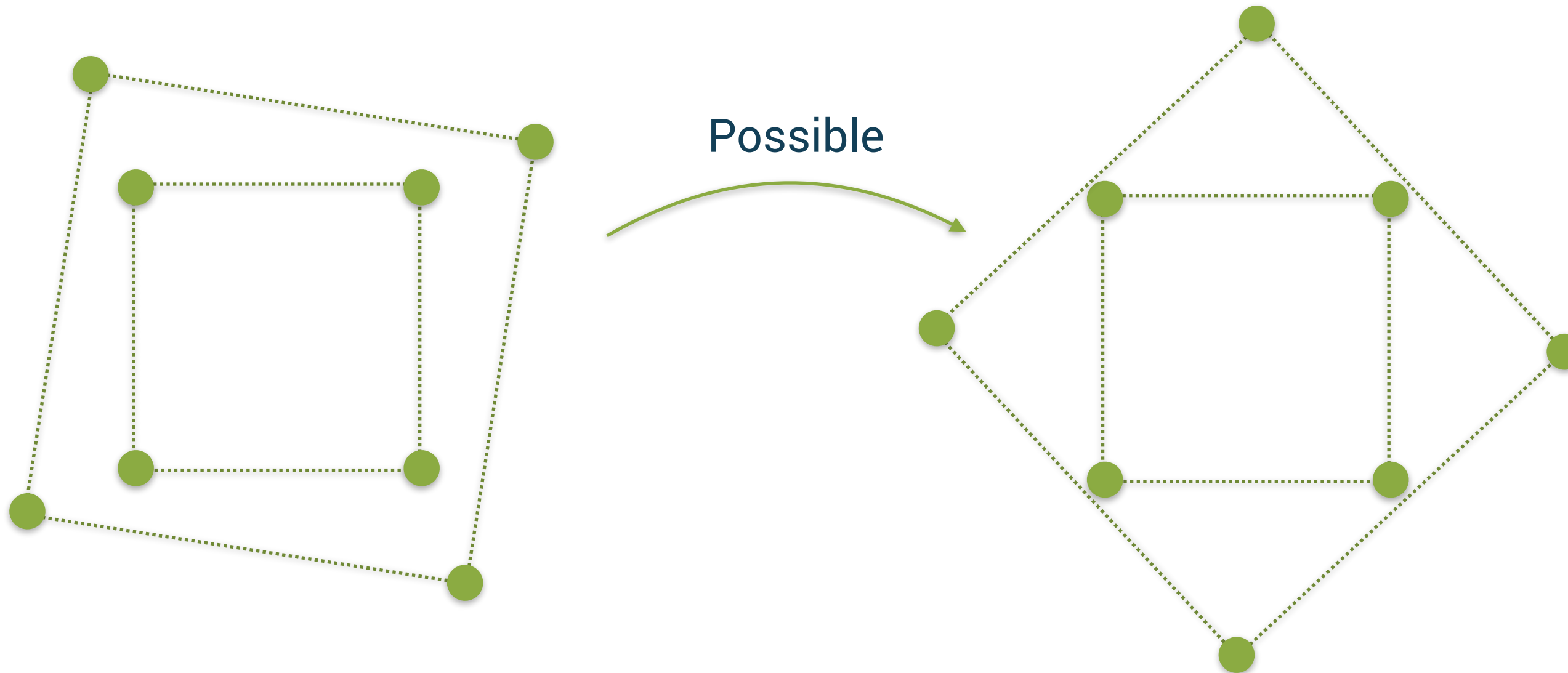

Possible

Examples

Examples

Examples

Possible

Examples

Examples

Examples

Not Possible

Examples

Not Possible

More symmetry here than here

Symmetricity

Symmetricity

Symmetricity
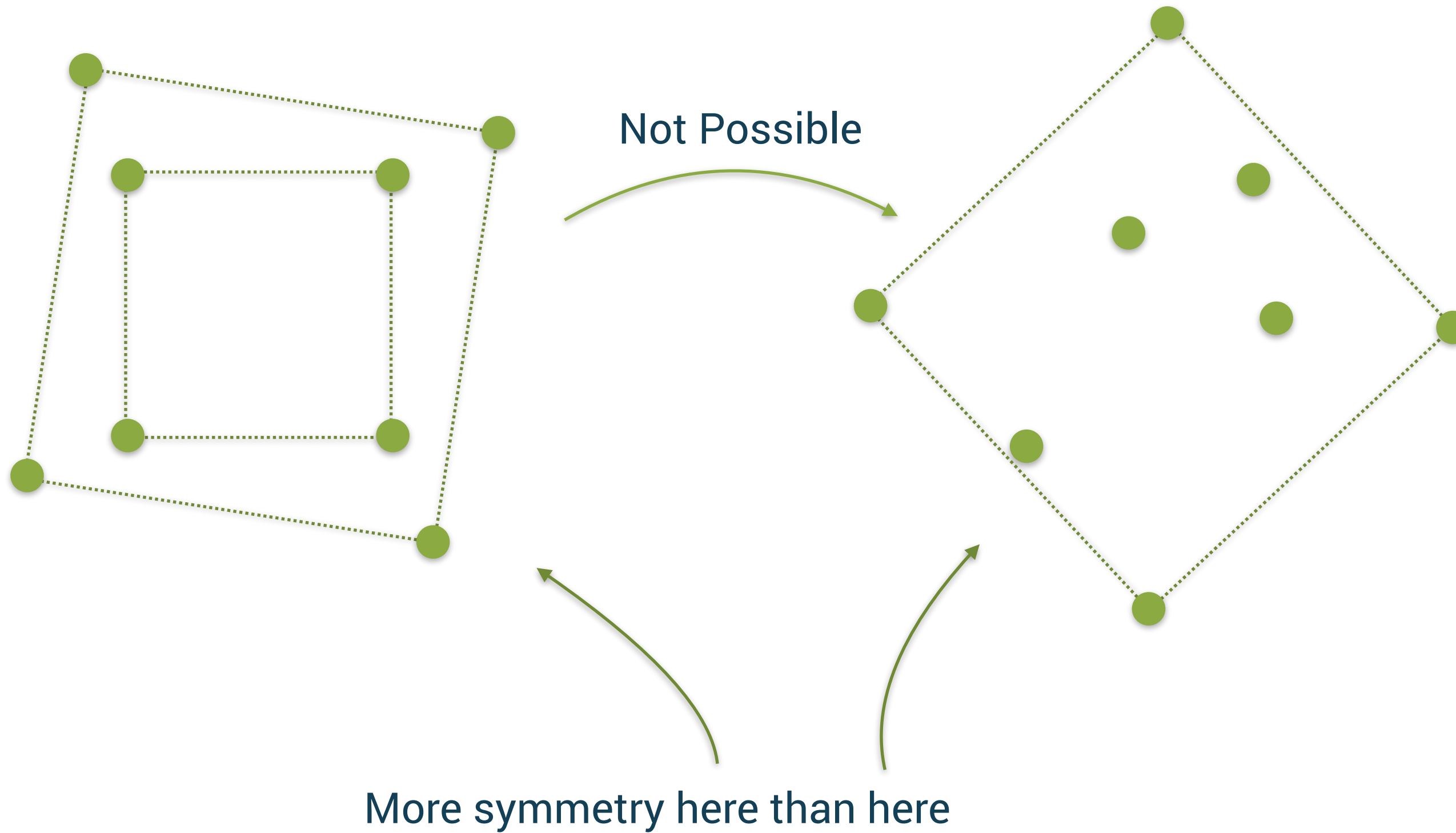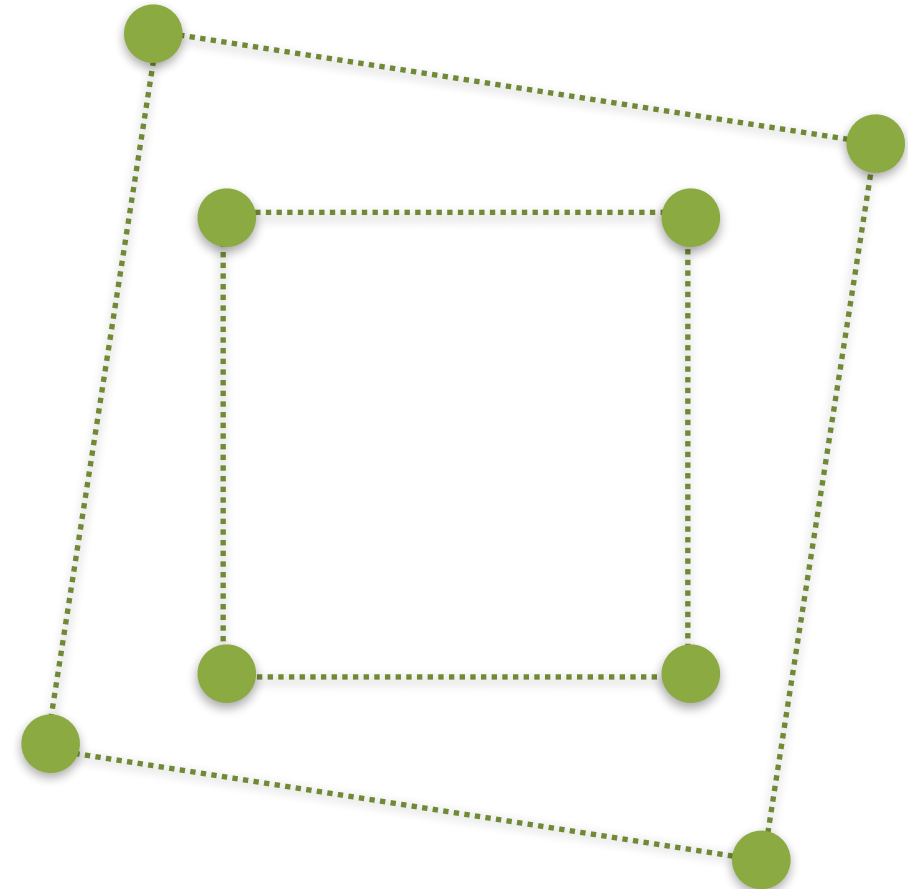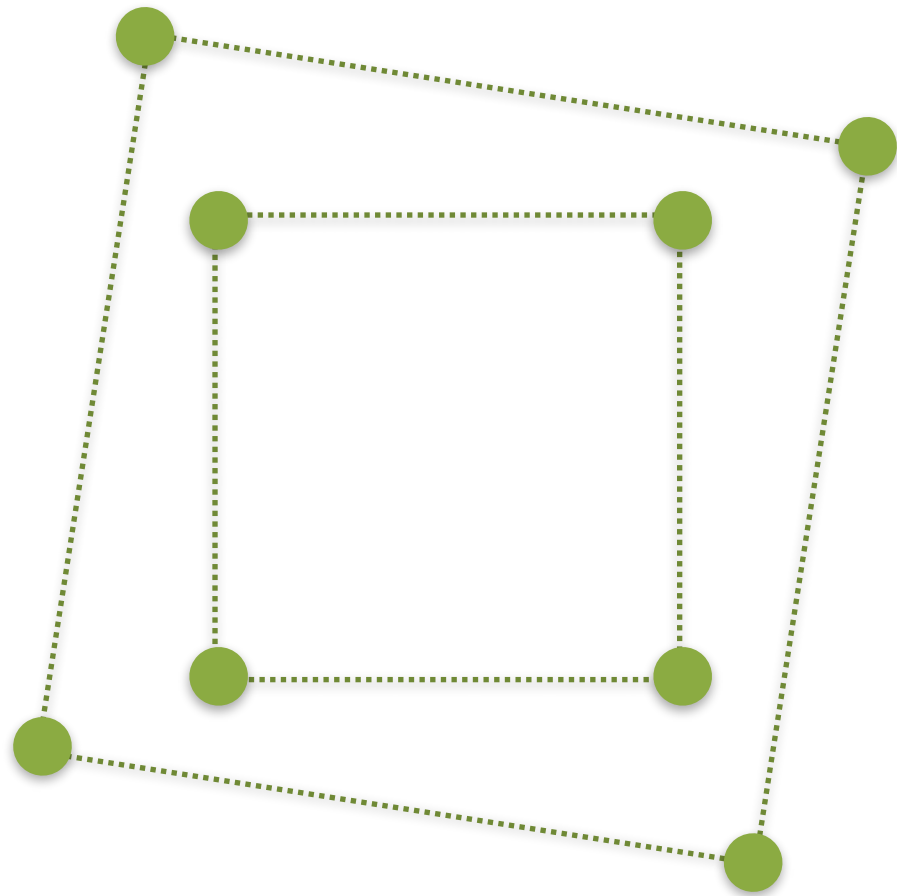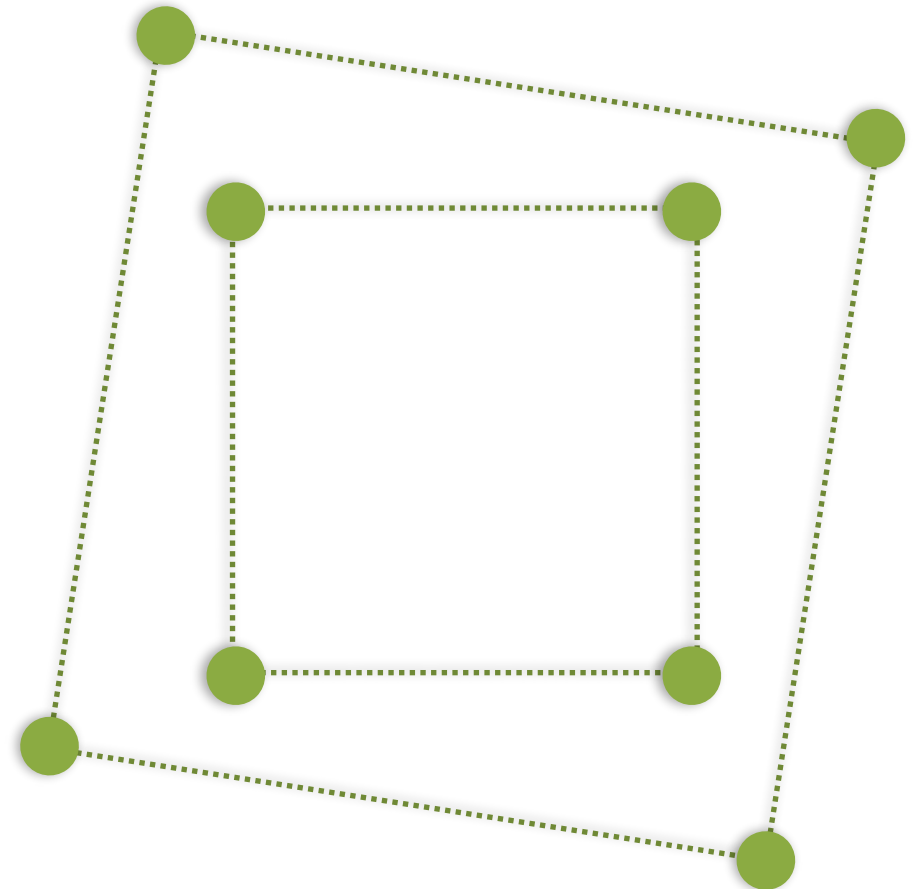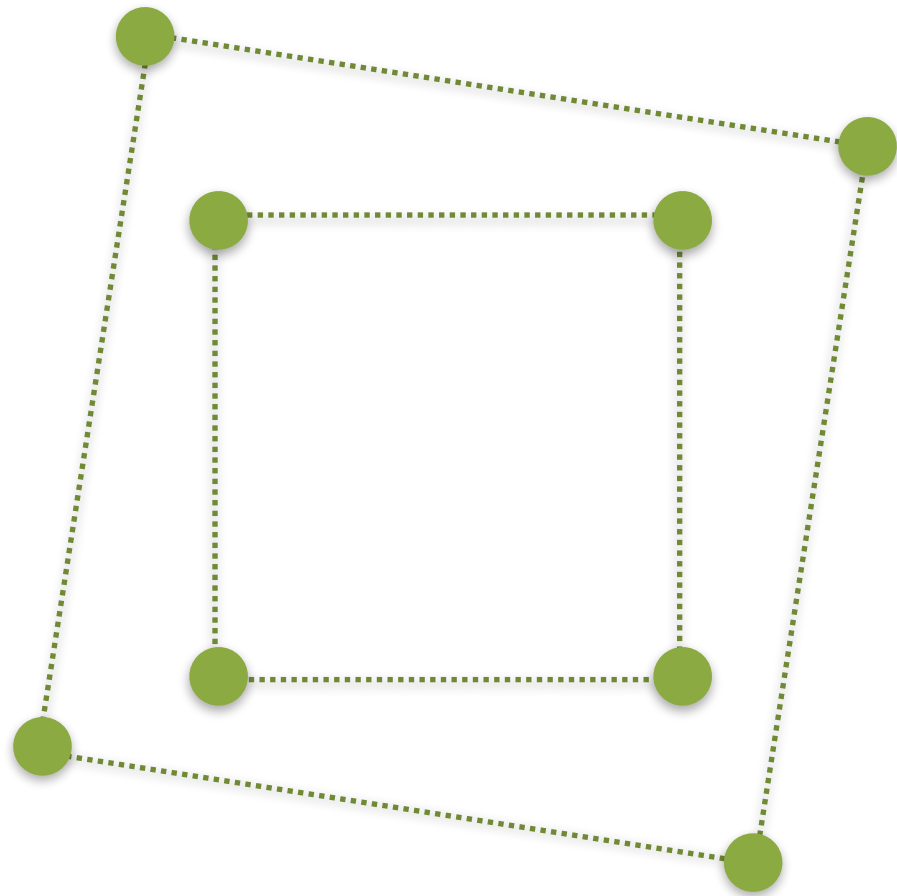
Definition: the symmetricity ρ of a configuration is the number of rotations for which the configuration is invariant.
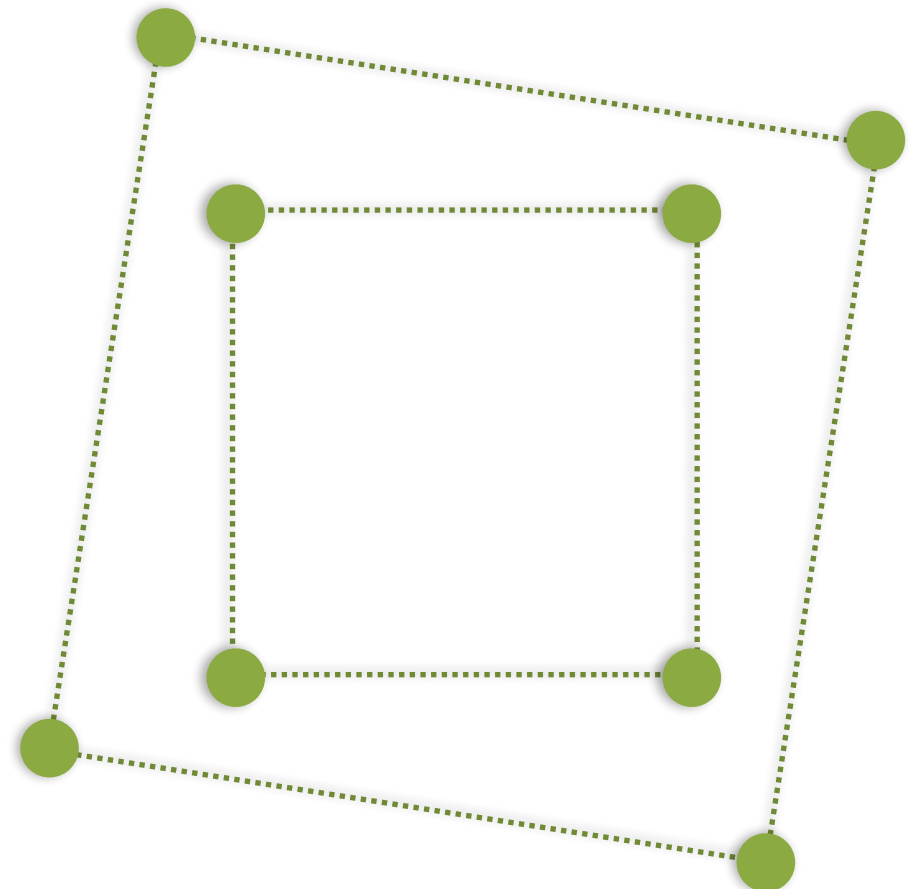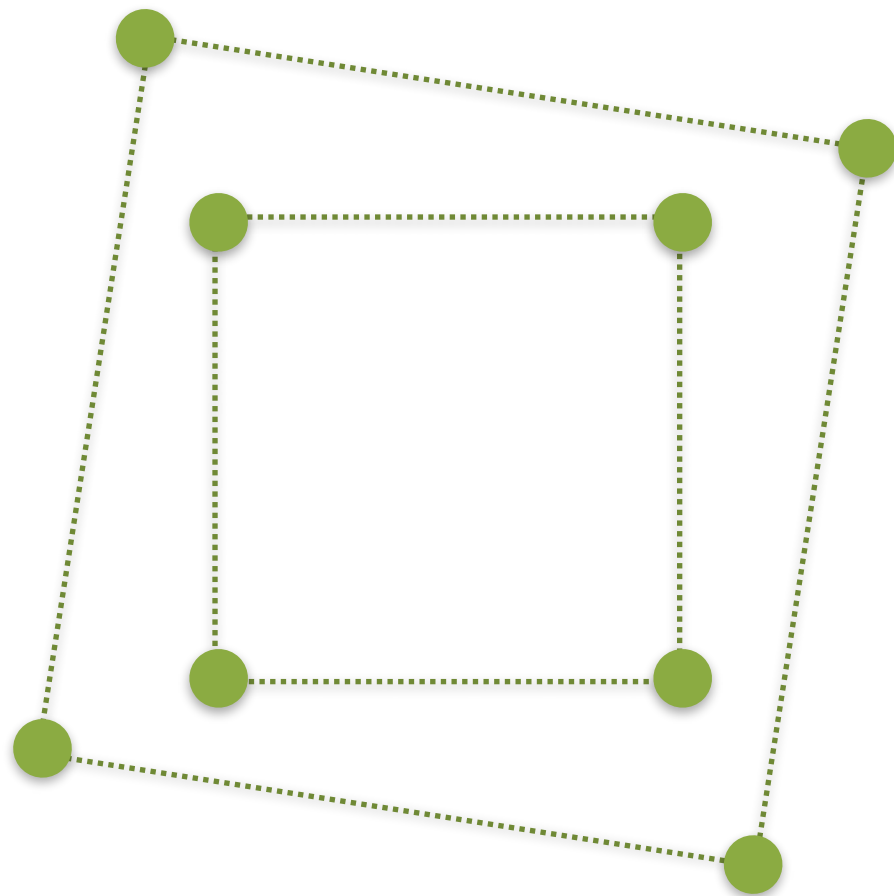if a robot is in the center of the SEC, then the symmetricity is one.
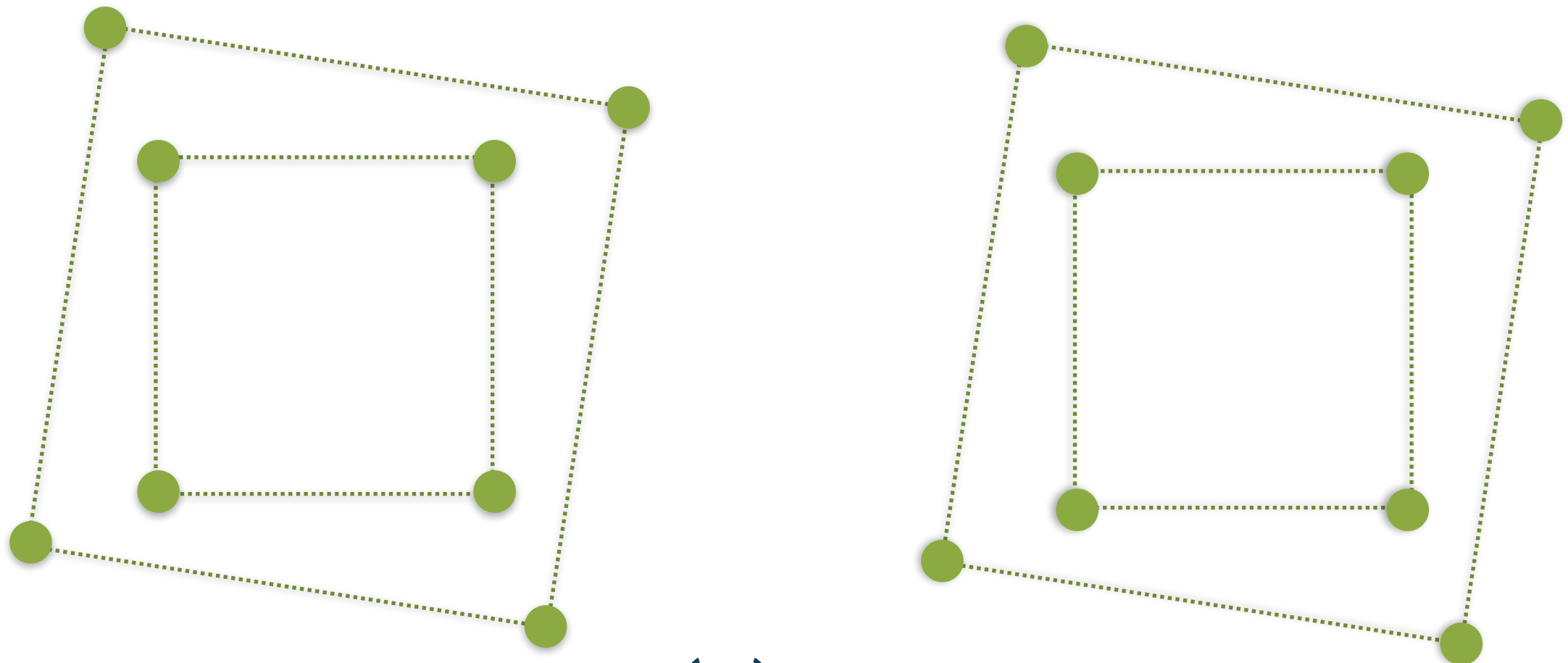
Symmetricity

$$\rho(C) = 4$$

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Necessary condition

Theorem: The pattern formation problem is solvable in FSYNC **only if** the symmetricity of the initial configuration divides the symmetricity of the pattern