

# How Mathematicians Can Help Teachers with the Common Core

James King

Department of Mathematics

University of Washington

[www.math.washington.edu/~king](http://www.math.washington.edu/~king)

king@uw.edu

# How Mathematicians Can Help Teachers with the Common Core

## An Example: Transformations

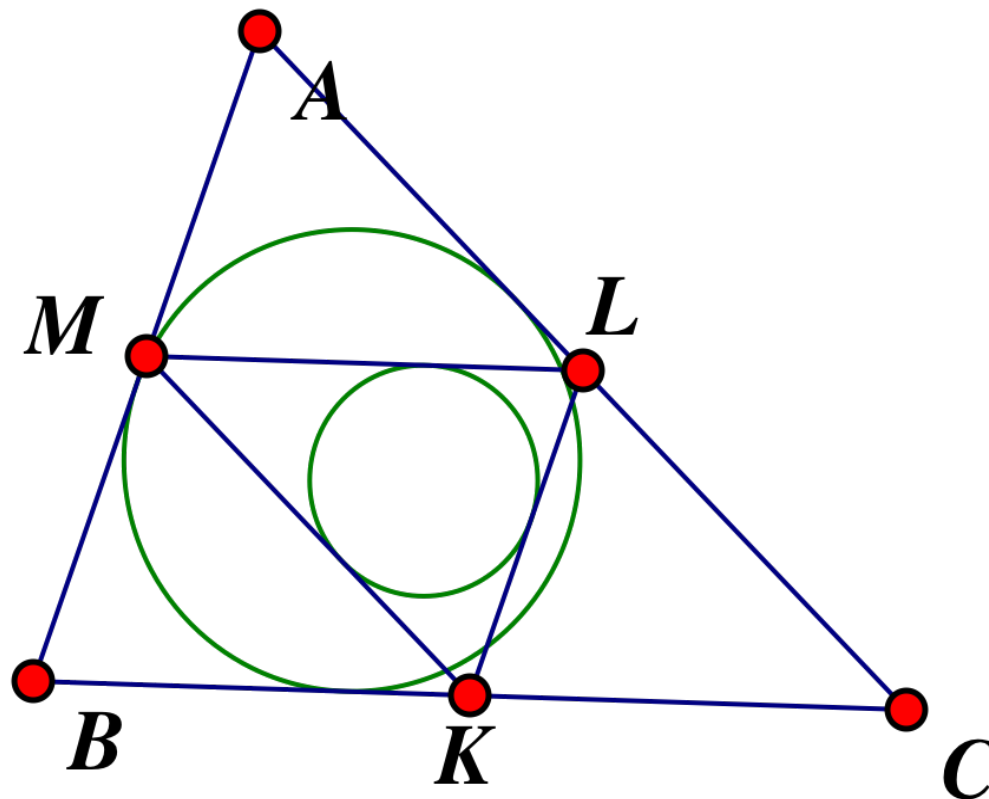
# Common Core and Transformations

- In Grade 8 students learn some properties of rotations, translations, and line reflections and explain congruence by means of sequences of these transformations.
- Similarity of figures is defined via composition of rigid motions and dilations
- In High School students develop considerably more properties, including triangle congruence criteria.

# Help with Context and Overview

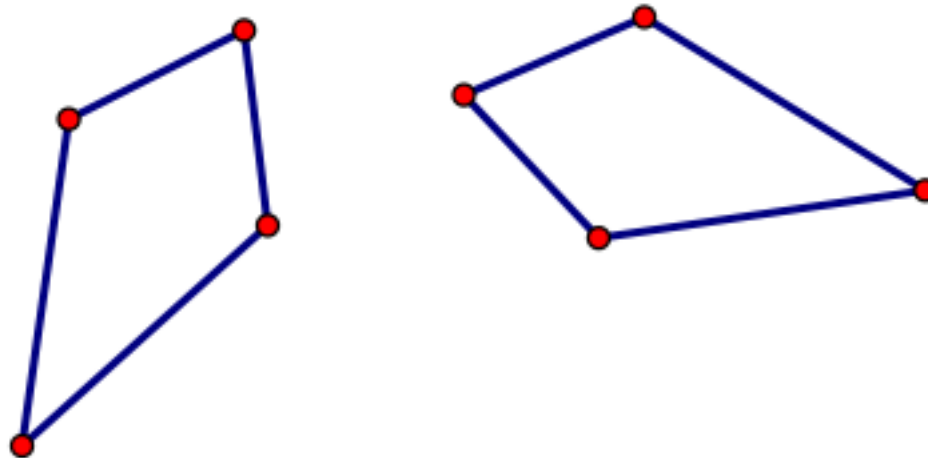
- Teacher concerns and alarms:
  - Is this “Transformational Geometry” that replaces the geometry we are teaching now?
  - What is the reason for doing this? What is gained?
  - How are dilations related to the way we currently teach similarity?

# Motivation Example: Similarity of these circles



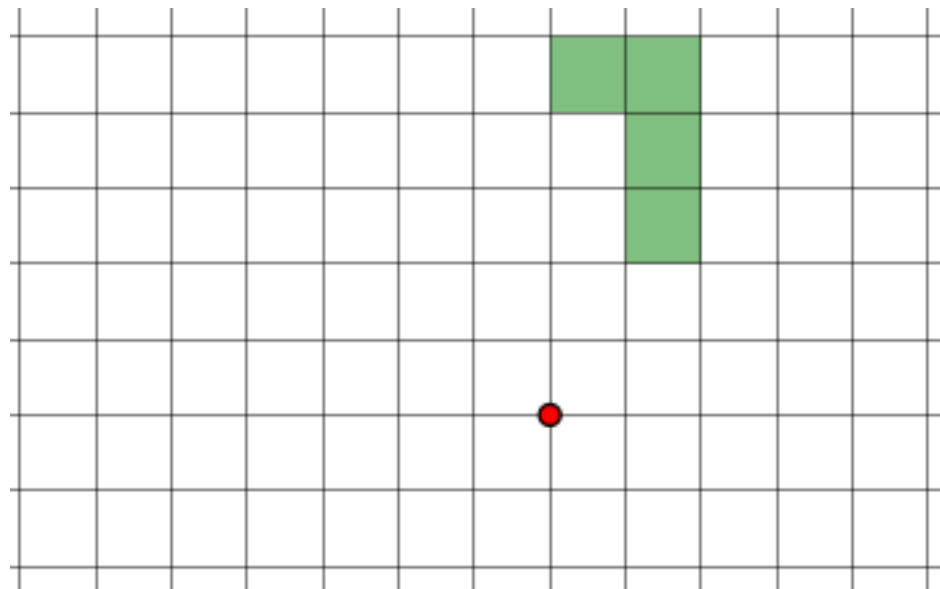
# Reasoning with Rigid Motions and Dilations

- A Mathematical Concern:
  - What kind of reasoning will be used to show that a particular rigid motion maps one figure to another?



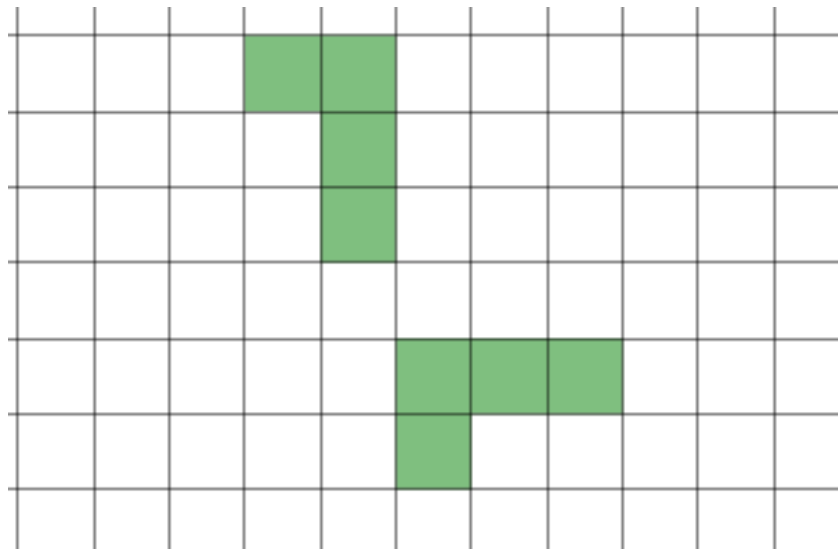
# Activities on the Basics

- Example 1: On graph paper, rotate a shape by 90 degrees with a given center (at some distance from the shape)



# Activities on the Basics

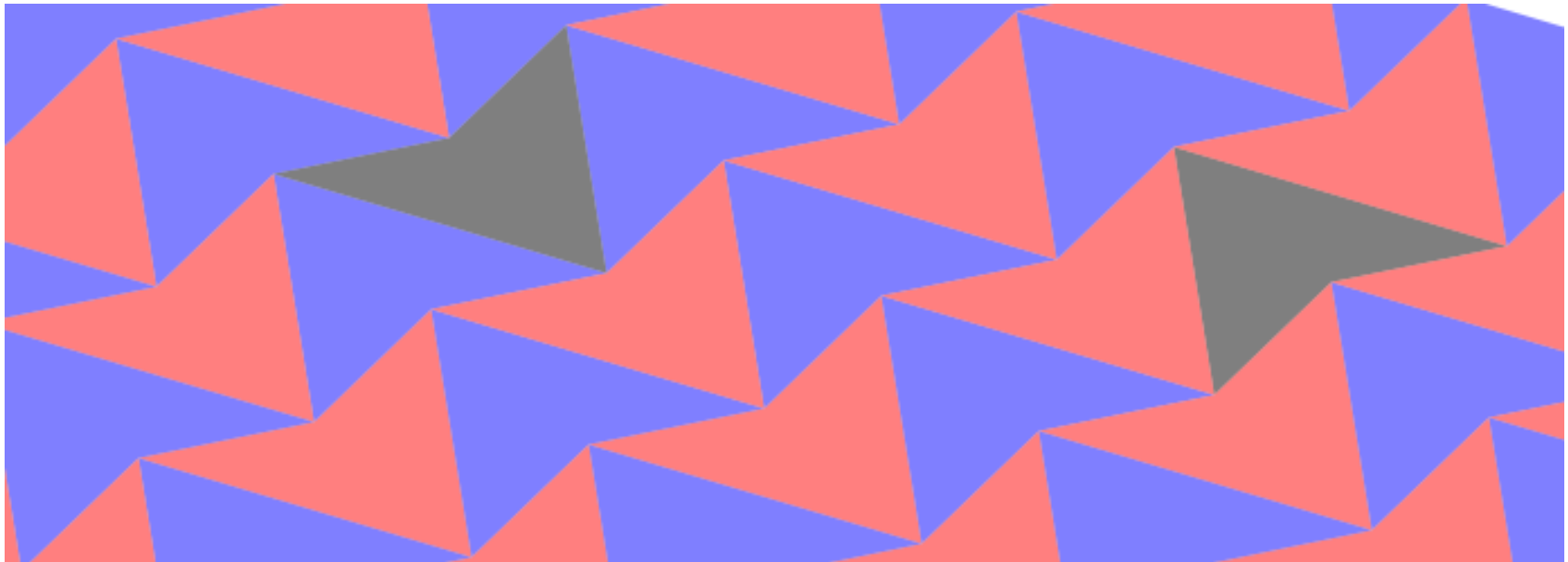
- Example 2: Find the center and angle of the rotation relating these two congruent figures.





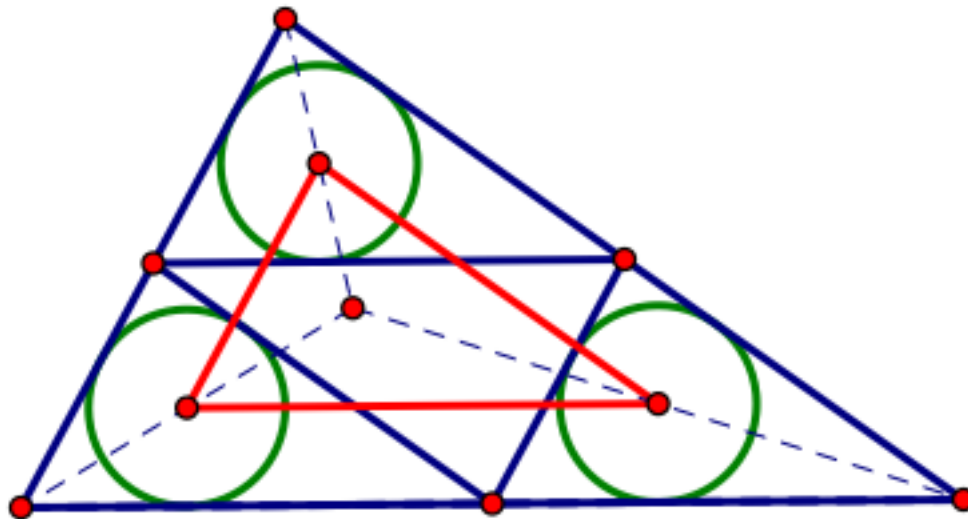
# Activities on the Less Basic

- Find a rigid motion or a sequence of rigid motions that move one dark quadrilateral to the other.



# Advanced Dilation Reasoning

- The vertices of the red triangle are the incenters of the corner midpoint triangles. Show the red triangle is congruent to the midpoint triangle of the large triangle.



# The Role of Technology

- Teaching tools:
  - Transformations do not make your life easier if you have to construct them with classical drawing tools. Software opens up a whole world of exploration.
- Motivation and Real-World Examples:
  - Dilations occur whenever one zooms in on a photo or a map on a smart phone. The figures that one can transform can be digital images, not just polygons with a few sides.

# Listen and Observe

- From a mathematician's perspective, the difficulties and sticking points for the transformational items in CCSS may be different from what you expect. Listen for what is really going on.
- Also, read carefully what is in CCSS. Resist adding stuff. There is a lot in Felix Klein or Bourbaki that is not in CCSS – for good reason!