

Making a Kaleidoscope: Exploring Rotations

Description: Students create virtual kaleidoscopes by rotating quadrilaterals and then animating them. Students learn that rotated figures keep their size and shape; only their orientation changes. Students make a variety of kaleidoscopes, each with a different number of quadrilaterals and amount of rotation.

Technology Strength: Learning about rotations by making and animating a Sketchpad kaleidoscope is especially appealing to students. Properties of rotation arise naturally as students construct their kaleidoscope models.

Objectives: Understand that a rotated figure keeps its size and shape but changes its orientation; learn that rotated figures can be evenly spaced around a center point if the amount of rotation is a factor of 360

Prerequisites: Familiarity with quadrilaterals and how to name them by their vertices

Suggested Grade Level: 3 to 5

Sketchpad Level: Intermediate

Suggested Duration: 60 minutes

Suggested Classroom Setting: Whole Class, Student Pairs. This activity, designed for use by student pairs, can be easily modified for whole-class use.

Preparation: Review the Activity Notes. Preview the student sketch. Work through the steps on the worksheet and make a copy of the worksheet for each student.

Materials: One or more hands-on kaleidoscopes (optional)

Student Worksheet(s): Making a Kaleidoscope

Student Sketch: Making a Kaleidoscope.gsp

Presentation Sketch: None

Vocabulary: Quadrilateral, rotate, rotation, center of rotation, concentric circles

Sketchpad Version: GSP5

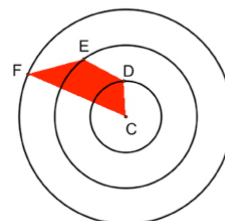
Using the Sketch:

Starting with three concentric circles, students construct quadrilateral $CDEF$ with one vertex at the center of the circles and the other three vertices sitting on the circles themselves.

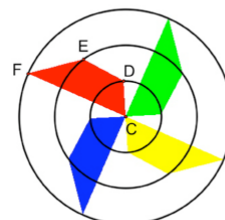
Students rotate the quadrilateral interior by 90° about point C , and continue by rotating the new quadrilateral by 90° again. Repeating this process one more time yields four evenly-spaced quadrilaterals.

Students set the kaleidoscope in motion by animating points D , E , and F . They watch the kaleidoscope in action, observing how the quadrilaterals change shape. To conclude, students start again with a quadrilateral, but now they rotate the quadrilateral repeatedly by 60° to obtain six evenly-spaced quadrilaterals.

Construct a kaleidoscope by rotating by 90° .



Construct a kaleidoscope by rotating by 90° .



Sketch Tips:

Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	Tip Sheet or Tip Video
Undo actions using Edit Undo	Undoing and Redoing
Redo actions you have undone, using Edit Redo	Undoing and Redoing
Step 1: Open, print, and save a document	Working with Documents
Step 1: Change to a different page using page tabs	Moving Between Pages
Step 2: Construct a point with the Point tool	Using the Point Tool
Step 3: Label an object with the Text tool	Using the Text Tool
Step 4: Construct a polygon interior using Construct Interior	Constructing Interiors
Step 5: Mark a point as a center of rotation using Transform Mark Center	Rotating and Dilating
Step 5: Rotate an object using Transform Rotate	Rotating and Dilating
Step 8: Color an object using Display Color	Changing Color
Step 10: Animate an object using Display Animate	Animating