



TANTALIZING TESSELLATIONS – Irregular Polygons, Colour

Students use translation to create an irregular shape that will tessellate and use the shape to create a design filled with blended colour.

Required Time
80 Minutes

Grade Level
Grade 4 to Grade 7

Subject
Mathematics
Visual Arts

Vocabulary
colour
irregular polygon
plane
polygon
regular polygon
tessellation
transformation
translation
vertex

Materials

Crayola Marker and Watercolour Paper – 22.9 cm x 30.5 cm cm (9" X 12")

Clear tape

Scissors

Heavy Weight Paper 7.6 cm x 7.6 cm (3" x 3") 1 piece per student

Fine Line Marker

Crayons

Twistable Crayons

Shop Crayola Products



Marker & Watercolour Pad, 60 Pages



Twistables Crayons, 12 Count

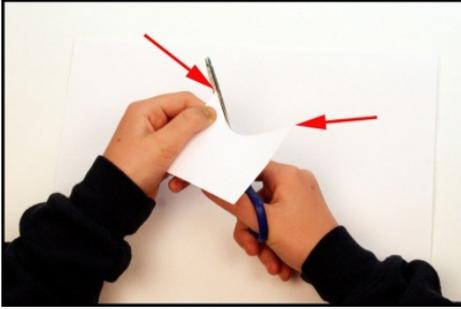


Pointed Tip Metal Scissors



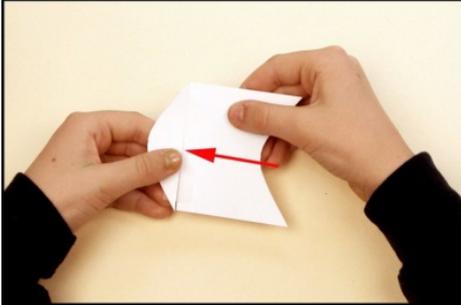
Fine Line Markers, 12 Count

Steps



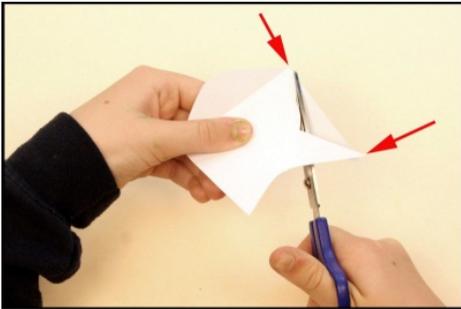
Step One

1. Start with a square of heavy weight paper 7.5 cm x 7.5 cm.
2. Cut out a section of the square.
3. Start at one vertex and end at the vertex beside it.



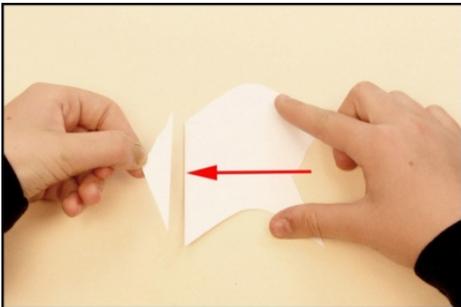
Step Two

1. Translate the shape by sliding it to the opposite side of the square.
2. Tape the shape to the square being sure to fit it right up against the edge of the square.



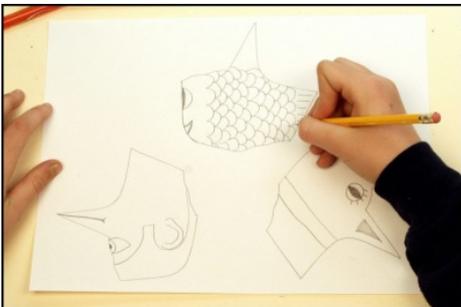
Step Three

1. Cut out a new shape from the straight side of the square.



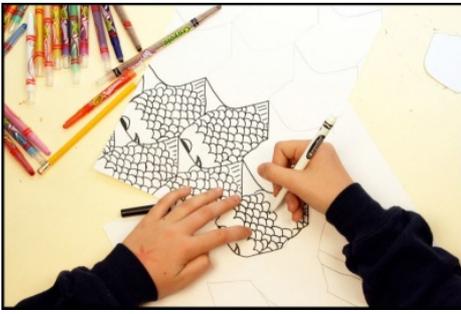
Step Four

1. Slide it across to the other side and tape it in place.



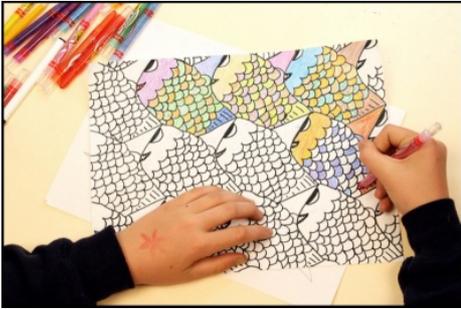
Step Five

1. Trace your new shape in at least 3 different positions on a piece of drawing paper.
 2. See what they remind you of.
-



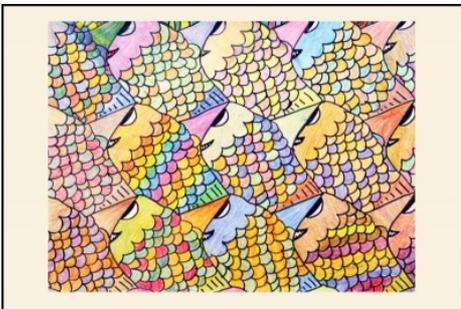
Step Six

1. Choose the idea you like the best and use it to tessellate the shape across your paper.
2. Draw the shape and details with marker.



Step Seven

1. Use twistable crayons to fill in the design.
2. Blend at least 2 colours together in each space.



Step Eight

1. Decide how you want to display your finished design.

Learning Goals

Students will be able to:

1. Use translation to create an irregular shape that will tessellate;
2. Create a design filled with blended colour;
3. Add details to the shape to make it interesting;
4. Explain why the tessellation works; and
5. Demonstrate technical accomplishment and creativity.

Extensions

1. Have students create a *Mathematics of Tessellation* book that includes all or some of the following shapes used in tessellations with explanations of why the shapes tessellate:
 - repeated use of ONE regular polygon
 - repeated use of a unit of shape made up of TWO OR MORE different regular polygons
 - triangles or quadrilaterals
 - irregular shapes created by transformation and rotation
2. Have students select an art image by M. C. Escher and explain how it works.
3. Have students use the work of M. C. Escher as inspiration for their own tessellating artwork.

Prepare

1. Prior to this lesson have students explore tessellations involving repeated use of one polygon and shapes made up of 2 or more different polygons.
2. Download tessellations in nature images from the Internet.
 - Pineapple
 - Honeycomb
 - Fish Scales
 - Snake
3. Download M. C. Escher images from the Internet.
 - Den Haag
 - Princessehof
 - VoorHout
 - Alhambra
 - Ahmedabad
4. Gather books and pictures of tessellations, for example, *Toads and Tessellations: A Math Adventure*, by Sharon Morrisette; *An Optical Artist: Exploring Patterns and Symmetry*, by Greg Roza; *Tessellations: The History and Making of Symmetrical Designs*, by Pam Stephens; *Introduction to Tessellations*, by Dale Seymour and Jill Britton
5. Create a sample irregular shape that will tessellate.

Introduction

1. View the images of tessellations in nature and discuss them. Review and/or introduce the term tessellation and have students describe the characteristics of a tessellation, e.g.,
 - patterns of repeated shapes that cover a flat surface with no gaps and no overlaps
2. Discuss what kinds of regular shapes can tessellate and why
 - regular polygons (triangles, squares or hexagons)
3. Discuss how to use translation to create an irregular shape that will tessellate.
 - a translation is when the shape is slid across the paper and drawn again in another place
4. - regular polygons can only tessellate if the sum of the interior angles is 360 degrees
5. View and discuss the images of Escher's art.
6. Introduce the challenge.

Activities

The Challenge

1. Use translation to create an irregular shape that will tessellate.
2. Create a design filled with blended colour.
3. Add details to the shape to make it interesting.
4. Explain why the tessellation works.
5. Demonstrate technical accomplishment and creativity.

The Process

1. Make sure everyone understands the challenge.
2. Establish success criteria with your students, for example,

I know I am successful when:

- *I used translation to create the shape*
- *the repeated shape covers the paper without any gaps or overlaps*
- *the use of blended colours is effective*
- *I added details to the shape to make it interesting*
- *the paper is in good condition*
- *I can explain why the shape tessellates*

3. Guide students through the steps outlined in this lesson plan.
4. Observe students as they work.
5. Provide individual assistance and encouragement.

Sharing

1. Once all the designs are complete display them for a group discussion.
 - *Look closely at the tessellations.*
 - *Choose one that interests you for some reason.*
 - *Share thoughts about the work.*
2. During the discussion include references to:
 - *blended colours - How does the use of blended colours contribute to the effectiveness of the overall design?*
 - *design - How does the use of detail contribute to the effectiveness of the overall design?*
 - *technique - How and why does the tessellation work?*

Assessment

1. Observe students as they work - thoughtful focus, discriminating, seeking more information, elaborating, experimenting
2. Observe students as they discuss the art works - active listening, insightful contributions, supporting ideas with evidence found in the artwork and from personal experience.
3. Use a checklist to track progress. (Downloads - TESSELLATION_tracking.pdf)
4. Have students use the self-assessment form to evaluate their work. (Downloads - Tessellation_self-assessment.pdf)