Name Date Time

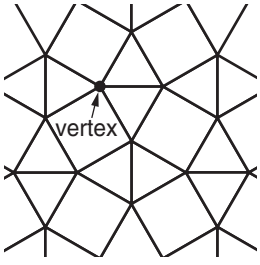
STUDY LINK 9•14

Unit 10: Family Letter

Geometry Topics

Unit 10 includes a variety of activities involving some of the more recreational, artistic, and lesser-known aspects of geometry. In *Fifth Grade Everyday Mathematics*, students explored same-tile **tessellations.** A tessellation is an arrangement of closed shapes that covers a surface completely, without gaps or overlaps. Your kitchen or bathroom floor may be an example of a tessellation. A regular tessellation involves only one kind of regular polygon. Three examples are shown at the right.

In Unit 10 of *Sixth Grade Everyday Mathematics*, your child will explore semiregular tessellations. A **semiregular tessellation** is made from two or more kinds of regular polygons. For example, a semiregular tessellation can be made from equilateral triangles and squares as shown below.



The angles around every vertex point in a semiregular tessellation must be congruent to the angles around every other vertex point. Notice that at each vertex point in the tessellation above, there are the vertices of three equilateral triangles and two squares, always in the same order.

The artist M. C. Escher used **transformation geometry**—translations, reflections, and rotations of geometric figures—to create intriguing tessellation art. Ask your child to show you the translation tessellation that students created in the style of Escher.

Your child will also explore topology. **Topology**, sometimes called *rubber-sheet geometry,* is a modern branch of geometry that deals with, among other topics, properties of geometric objects that do not change when the objects' shapes are changed. Ask your child to share with you some ideas from topology, such as Möbius strips.

Please keep this Family Letter for reference as your child works through Unit 10.

Math Tools

Your child will use the **Geometry Template** to explore and design tessellations. This tool includes a greater variety of shapes than the pattern-block template from previous grades. It might more specifically be called a geometry-and-measurement template. The measuring devices include inch and centimeter scales, a Percent Circle useful for making circle graphs, and a full-circle and a half-circle protractor.

Vocabulary

Important terms in Unit 10:

genus In *topology,* the number of holes in a geometric shape. Shapes with the same genus are topologically equivalent. For example, a doughnut and a coffee cup are equivalent because both are genus 1.

Genus 0 Genus 1

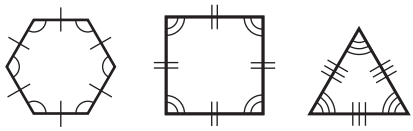
Möbius strip (Möbius band) A 3-dimensional figure with only one side and one edge, named for the German mathematician August Ferdinand Möbius (1790–1868).

Möbius strip

order of rotation symmetry The number of times a rotation image of a figure coincides with the figure before completing a 360° rotation.

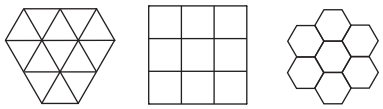
A figure with order 5 rotation symmetry

regular polygon A polygon in which all sides are the same length and all angles have the same measure.



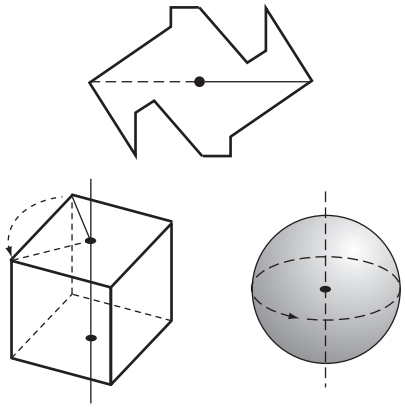
Regular polygons

regular tessellation A tessellation of one *regular polygon.* The three regular tessellations are shown below.



The three regular tessellations

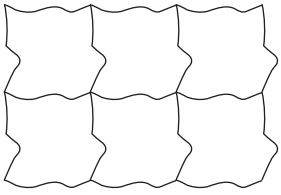
rotation symmetry A figure has rotation symmetry if it is the rotation image of itself after less than a full turn around a center or axis of rotation.



Shapes with rotation symmetry

topological transformation A transformation that pairs a figure with its image after shrinking, stretching, twisting, bending, or turning inside out. Tearing, breaking, and sticking together are not allowed. Shapes that can be changed into one another by a topological transformation are called "topologically equivalent shapes." For example, a doughnut is topologically equivalent to a coffee cup.

translation tessellation A *tessellation* made of a tile in which one or more sides is a translation image of the opposite side(s). Dutch artist M. C. Escher (1898–1972) created many beautiful and elaborate translation tessellations.



A translation tessellation

vertex point A point where the corners of tessellation tiles meet.

Do-Anytime Activities

To work with your child on the concepts taught in this unit, try these interesting and rewarding activities:

1. Familiarize yourself with the definition of *regular tessellation* (p. 326). Encourage your child to find tessellations in your home, such as floor tile patterns, wallpaper patterns, and wall tile patterns. Have your child identify the shapes that make up the pattern.
2. Encourage your child to use the local library or the Internet to find examples of M. C. Escher's artwork.
3. If you have art software for your home computer, allow your child time to experiment with computer graphic tessellations. Encourage him or her to share the creations with the class.

Building Skills through Games

In Unit 10, your child will reinforce skills and concepts learned throughout the year by playing the following games:

Angle Tangle See *Student Reference Book,* page 306
Two players will need a protractor, straightedge, and blank paper to play *Angle Tangle.* Skills practiced include estimating angle measures as well as measuring angles.

Name That Number See *Student Reference Book,* page 329
This game provides your child with practice in writing number sentences using order of operations. Two or three players need 1 complete deck of number cards to play *Name That Number.*

As You Help Your Child with Homework

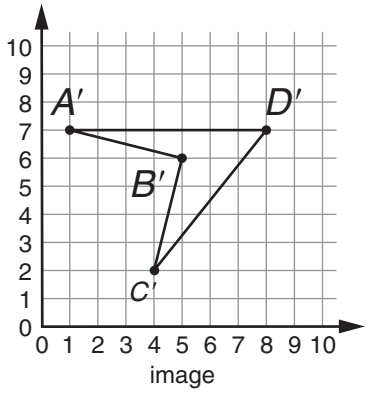
As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Unit 10 Study Links.

Study Link 10•1

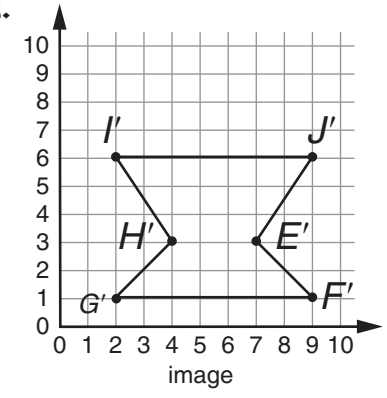
1. rotation
2. translation
3. Answers vary.
4. Answers vary.
5. 114.534
6. 35.488
7. 0.0338
8. 31.7025

Study Link 10•2

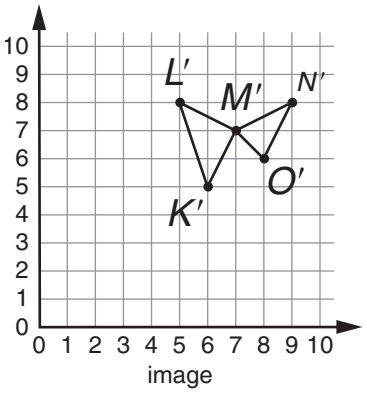
1.



2.



3.



4. 0.8
5. 1.6
6. 8.9
7. 5.1

Study Link 10•3

1. 2
2. 1
3. 4
4. 6
5. 2
6. infinite
7. 2, 3, 5, 6, 9, 10
8. 2, 3, 6,

Study Link 10•5

Sample answers:

1. The paper clips are linked to one another.
2. The paper clips and the rubberband are linked.
3. All the paper clips are linked.
4. 60
5. 50
6. 63
7. 493