

Identifying Geometric Patterns in Quilts

Grade Level: **K-3** | Time Required: **50-90 minutes** | Subject Area: **Visual Arts and Math**

Overview:

This lesson aims to combine math and visual art concepts to enrich understanding of both. Students will practice visual analysis and pattern recognition skills in observation and discussion of quilts, refining their analysis and geometry skills by reproducing observed patterns and then creating their own.

Lessons Objectives:

By the end of the lesson, students will be able to:

1. Identify the simple shapes making up the pattern in an image.
2. Identify the essential characteristics of shape, color and repetition in a provided pattern.
3. Recreate and extend demonstrated patterns using simple shapes.
4. Create their own patterns, utilizing shape, color and repetition.



Essential Questions:

- What makes a pattern a pattern?
- How can simple shapes combine to form patterns?

Materials:

- Quilt images (see provided materials pages 7-10)
 - 4 quilts from the International Quilt Museum's collection
- Shape templates, 1 per student (see provided materials page 11),
 - Optional: envelopes for students to keep the cut-out template pieces in.
- Puzzle Prompts (see provided materials pages 12-14)
- Paper (plain), 1-2 sheets per student
 - Optional: Colored construction paper, 2-3 sheets per student, in different colors
- Writing and Coloring tools (pencil, crayon, marker, etc.)
- Scissors and Glue or Glue Stick

Background information for educators

- **General background:**

- Quilts are often composed of repeating patterns, sometimes visible in the construction of each quilt block, and sometimes in the shapes created when blocks are sewn together. Sometimes these patterns are colorful and highly visible, and sometimes they are more subtle, defined by piecing or quilting stitches alone. This lesson will focus on the more colorful patterns, for ease of student identification.

- **Assessment:**

- Students will demonstrate their understanding of the relationships between shapes and patterns by completing puzzle prompts (provided). Students will be assessed based on successful completion of each prompt.
- Students will be assessed on their understanding of the roles of shape, color and repetition in patterns based on their use of these elements in creating their own patterns from drawings or cut-out shapes.

- **Pre-Lesson Preparation:**

- Print out or prepare for virtual display: quilt images, puzzle prompt worksheet (pages 7-10 and 12-14).
- Gather classroom materials: plain or colored paper, scissors, coloring tools, glue
- Print out templates, page 11 (1 page contains 2 template sets), or prepare pre-cut shapes.
 - For a virtual or hybrid version of this activity, ask students to make their own physical template sheets at home, or use a google slides template with drag-and-drop shapes.

- **Possible adjustments or expansions:**

- For young students, additional background in identifying shapes may be necessary (see “What Shape is This?” page 15). Depending on your students’ scissor skills, you may also wish to cut out the template shapes beforehand, or provide similar die-cut shapes.
- For older students, this lesson could be expanded to include rhomboid patterns and optical illusions (see provided materials pages 16-18).

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Geometric Patterns in Quilts: Lesson Outline

1. Warm Up (5 minutes):

Guiding question: What is a pattern?

Solicit student responses, facilitating brief discussion of the main elements of a geometric pattern (color, shape, repetition).

2. Introduction of ideas and background (5 minutes)

Confirm student responses, or introduce ideas as necessary.

Sample script: “Patterns are an important part of quilt-making. What is a quilt?”

Important takeaways: 1) a quilt is like a blanket sandwich, with 3 layers sewn together. 2) many quilts are made from lots of small pieces of fabric sewn together to make a pattern.

“Today, we’re going to be looking at quilts to practice seeing patterns. After we’ve practiced, we’ll solve some puzzles, and then you’ll have a chance to make your own patterns.”

Vocabulary terms: Geometric Pattern – a repeating design made from shapes and colors

Repetition – when something is done or said over and over

For beginning students: Triangle, Square, Rectangle, Star (see pages 6 and 15)

For advanced students: Quadrilateral, Parallelogram, Tessellation, Optical Illusion, Radial Symmetry (see page 6)

3. Quilt viewing and pattern analysis (10 minutes)

Examine the quilts as a class. Ask students about the shapes and colors they see, and how they would describe the pattern. (Guiding questions are provided with each image.)

4. Activity introduction and explanation (5-10 minutes)

Sample script: “Now that you have seen some patterns in quilts, we’re going to practice drawing them by solving some puzzles. An important part of many quilt patterns is that the shapes are the same size each time they are repeated. This is part of why math is so important in quilting. Quilters use templates to make sure all their fabric pieces are the right sizes. We’re going to cut out templates of our own to trace our patterns on paper. Later, you’ll use these templates to make your own patterns for your own quilt blocks.”

Pass out student template sheets or pre-cut template shapes.

Template cut-out time:

Students cut out their template pieces to help them create regular patterns in the following two activities.

6. Pattern Puzzle Prompts (10 minutes)

Hand out or digitally share the puzzle prompts (pages 12-14). Students should work independently or in small groups to extend, reproduce and solve the patterns they see in the prompts.

7. Create your own quilt pattern (15 minutes +)

This part of the lesson could also be moved to a second day to revisit the topic and check for retained understanding. Students do not need to use the template shapes for this project, but may need an envelope to store those pieces if they wish to.

Tell students that they will now use their knowledge to create their quilt block pattern. They could color their designs, cut out and glue them on a single piece of paper, or mimic the three-layer nature of a quilt with a base piece of construction paper, a middle piece of plain paper, and a construction-or-hand-colored-paper-pieces top, with glue in place of stitches. Pass out plain and colored paper as appropriate.

➔ Decide whether students should continue to use the cut-out templates.

Sample script: “Think of a piece of paper as your quilt. It’s a rectangle, like the quilts you’ve looked at in this lesson. How can you use shape and color to make a new pattern for your own quilt? Remember the keywords we talked about in this lesson. A quilter uses shape, color and repetition to make a pattern. Try to make a quilt that uses all three for your own pattern.”

Background information for students

- **General background:**

- Patterns are an important part of quilt making. A quilt is like a blanket, but is made from three layers of cloth sewn together like a sandwich. The top layer of fabric often has a design on it. Many quilt top designs are made from a lot of small pieces of fabric sewn together. When a quilter makes a quilt, they put the fabric in patterns using repeating shapes and colors. Some of these patterns have special names, like Flying Geese, Nine Patch, and Feathered Star. Today, you're going to be looking at quilts to practice seeing patterns. After you've practiced, we'll solve some puzzles, and then you'll have a chance to make your own patterns.

- **Vocabulary Terms:**

- Geometric Pattern - "geometric" means having to do with shapes and lines. A geometric pattern is a repeating design that uses shapes, line and color.
- Repetition – when something is done or said over and over

Simplified vocabulary (see page 15):

- Triangle – a closed shape with three sides and three corners.
- Square - a closed shape with four equal-length sides and four corners
- Rectangle – a closed shape with four corners, two equal-length short sides and two equal-length long sides.
- Star - a shape with five or more points pushing out from a center.

Expanded vocabulary:

- Quadrilateral – any closed shape with four sides and four corners.
- Parallelogram – a quadrilateral whose opposite sides are parallel and equal
- Rhombus – a quadrilateral parallelogram with four equal sides and no right angles (plural = rhombi)
- Tessellation – a covering of infinite geometric shapes without gaps or overlaps
- Optical Illusion – a misleading image, sometimes one which implies 3 dimensions in a 2-Dimensional image.
- Radial Symmetry – to be the same shape in every direction

Flying Geese

IQM 2008.034.0203

This quilt was made between 1880 and 1910. It is small, intended for a baby's crib or a doll bed.

Guiding Questions: What shapes do you see in this quilt?

How many of each shape do you see?

How many sides and corners do those shapes have?

What colors do you see?

Where do you see repetition in this quilt?

Why do you think this pattern is called "Flying Geese"?



Nine Patch

IQM 2003.003.0185E

This quilt was made between 1850 and 1870. The quilt block pattern is called "Nine Patch" because each block you see (bordered by yellow) is made of three rows of three "patches" of fabric, so each they add up to nine patches.

Guiding Questions: What shapes do you see in this quilt?

How do you know if a shape is a square or a rectangle?

Where do you see repetition in this quilt?

If you had to describe this quilt to someone who'd never seen it, what would you say?



Sunshine and Shadow

IQM 2000.007.0001

This quilt was produced by an Amish community, possibly in Ohio, USA, between 1920 and 1940. Amish quilts are famous for using simple shapes with rich colors.

Guiding Questions: What are the main shapes in this quilt?
Where do you see repetition in this quilt?
Why is color important to this quilt's pattern?



Feathered Star

IQM 1997.007.0288

This quilt was made between 1890 and 1910. This is one version of an eight-pointed star. In quilting we say a shape is "feathered" when it is outlined by small triangles. So in this quilt, not only are the stars feathered, but every triangle that makes up each star is feathered, and all the lines and borders are feathered too.

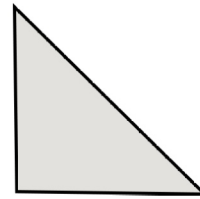
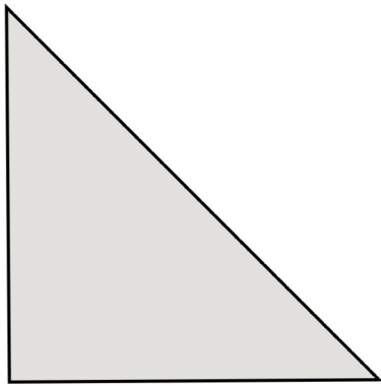
Guiding questions: What are three things that show repetition in this quilt?

Besides stars and triangles, what other shapes do you see in this quilt?



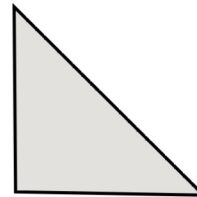
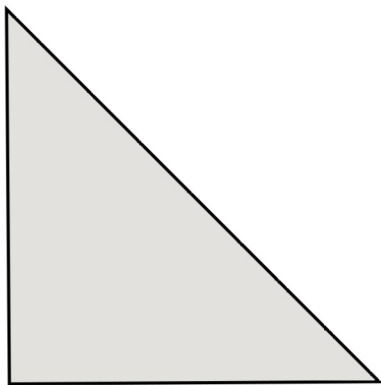
Quilt Block Pieces

Cut out these shapes to solve puzzles and make your own quilt block pattern.



Quilt Block Pieces

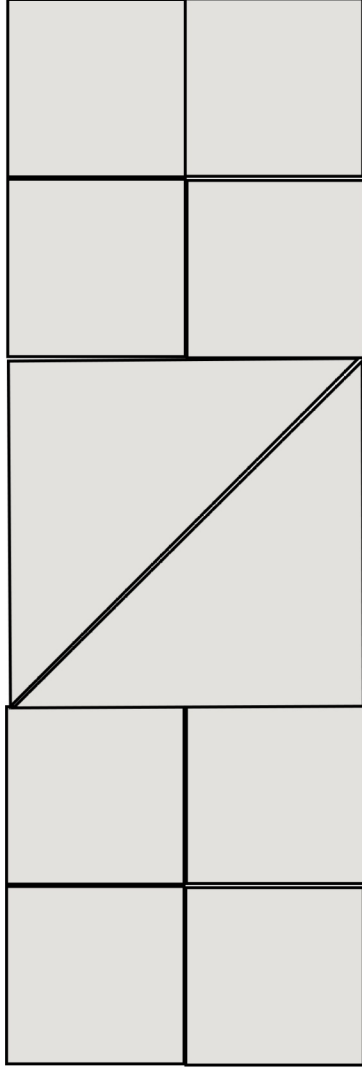
Cut out these shapes to solve puzzles and make your own quilt block pattern.

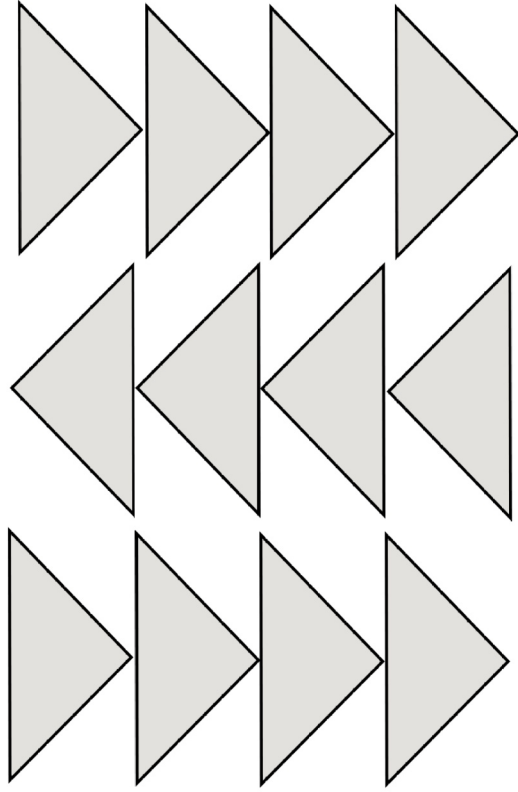




Pattern Puzzle Prompts

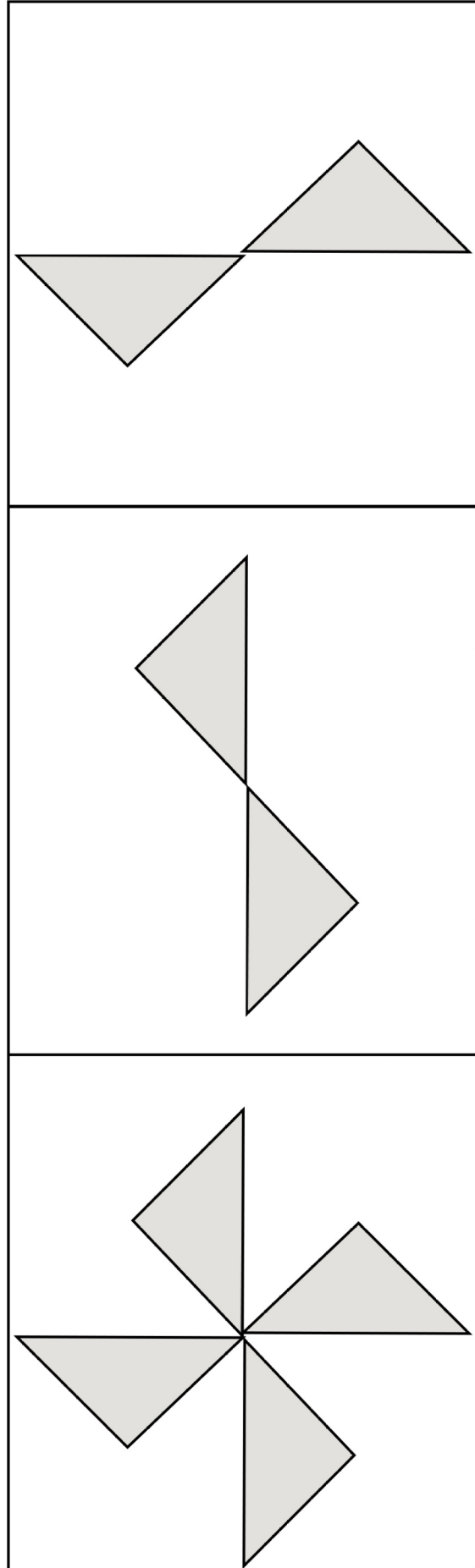
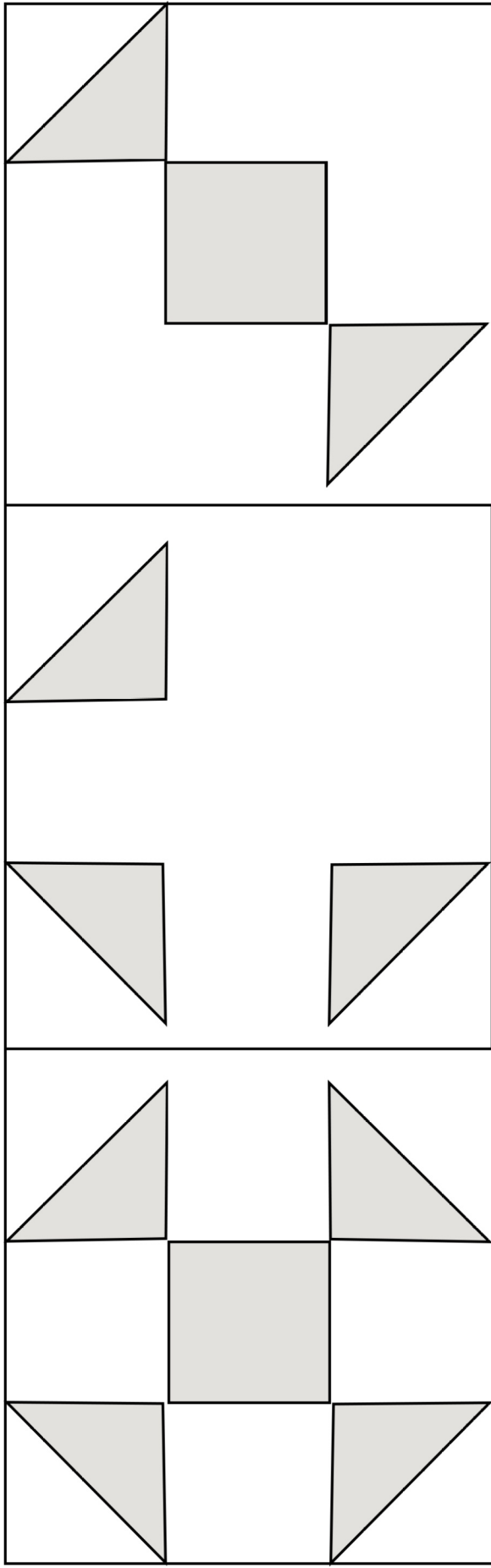
Trace your cut-out shapes to extend these patterns:





Pattern Puzzle Prompts

What's missing from these patterns? Fill in the shapes.





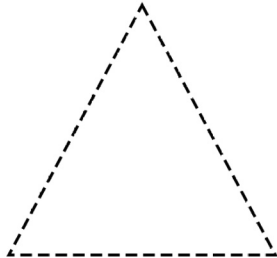
Pattern Puzzle Prompts

Recreate these shapes by tracing your templates.



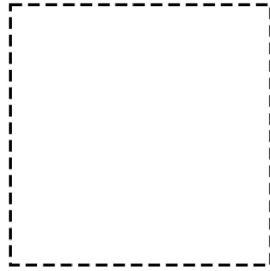
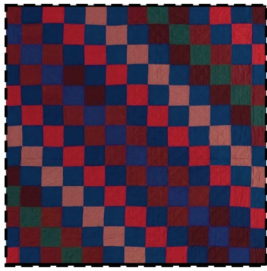
What Shape is This?

What shape has three sides and three corners?



Answer:

What shape has four equal sides and four corners?



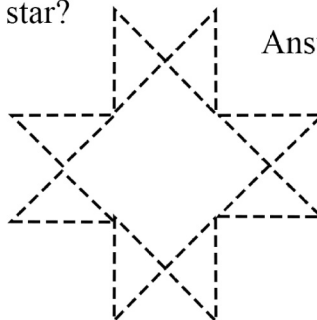
Answer:

What shape has two short sides, two long sides and four corners?



Answer:

What shapes combine to make this star?



Answer:

Tumbling Blocks

IQM 1997.007.0337

This quilt was made between 1900 and 1920. The pattern, sometimes called tumbling blocks and sometimes called baby blocks, creates a tessellating optical illusion.

Guiding questions: What is the shape the pieces of fabric are cut into?

What 3D shapes do you see?

How does color help you see that 3D shape?



Lone Star

IQM 2012.015.0115

This quilt was made in the 1970s. The Lone Star pattern, sometimes also called the Star of Bethlehem, has many variations. This quilt shows one of the most common versions: A central star with eight points, made from the combination of many small rhombi (or diamonds) sewn into eight larger rhombi and arranged to form a star.

Guiding questions: How would you describe this pattern to someone who had never seen it?
What repeated shapes do you see in this quilt?
What colors do you see? Why are they important in the pattern?



Boxed Illusion

IQM 2010.014.0024

This quilt was made by Jean Ray Laury in 1981. Instead of a traditional quilt block repetition pattern, she used a combination of many different quadrilaterals and colors to create a 3D illusion. Rather than one big pattern, this quilt uses several small patterns to create a larger image.

Guiding questions: How many types of quadrilateral do you see?

How does the artist use rhombi to create an illusion of depth?

Why is color important in this quilt?



Assessment

Students should aim to:

- Successfully identify the shapes used in a pattern.
- Successfully extend patterns (Puzzle Pattern Prompts 1)
- Successfully recreate patterns based on an example image (Puzzles Prompts 2 and 3)
- Successfully creates a new pattern, utilizing shape, color and repetition (Independent pattern creation).

Criteria	4 - Exemplary	3 - Accomplished	2 - Developing	1 - Beginning
Shape Identification <i>(Class discussion, Pattern Puzzle Prompts 1, 2 and 3)</i>	Student correctly identifies the shapes that make up a pattern all of the time.	Student correctly identifies the shapes that make up a pattern most of the time.	Student correctly identifies the shapes that make up a pattern some of the time.	Student rarely identifies the shapes that make up a pattern.
Pattern Extension <i>(Pattern Puzzle Prompts 1 and 2)</i>	Student successfully extends patterns all of the time.	Student successfully extends patterns most of the time.	Student successfully extends patterns some of the time.	Student rarely extends patterns successfully.
Pattern Recreation <i>(Pattern Puzzle Prompts 3)</i>	Student successfully recreates a pattern all of the time.	Student successfully recreates a pattern most of the time.	Student successfully recreates a pattern some of the time.	Student rarely recreates patterns successfully.
New Pattern Creation <i>(Independent pattern project)</i>	Student successfully and consistently utilizes all three elements of shape, repetition and color in the creation of a new pattern.	Student successfully creates a new pattern that consistently utilizes two elements of shape, color, or repetition.	Student creates a new pattern that utilizes shape, color, and repetition inconsistently.	Student utilizes shape, color, or repetition but not in a way that creates a visual pattern.

Education Standards Supported

Nebraska State Standards:

Visual Arts

Grades K-2

FA 2.2.3.b Identify use of elements and principles in works of art (e.g., recognize use of pattern, symmetry).

FA 2.2.1.e Explore various techniques, skills, and the importance of craftsmanship/workmanship (e.g., properly hold scissors, while turning paper, to create a well-defined shape)

Grades 3-5

FA 5.2.1.d Identify and use elements of art and principles of design to brainstorm visual possibilities (e.g., create symmetrical and asymmetrical balance using line and shape).

FA 5.2.1.e Apply various techniques to develop craftsmanship skills (e.g., use cutting and gluing techniques to produce clean edges without visible glue).

Mathematics

Kindergarten - *Geometric Characteristics:*

MA 0.3.1.a Describe real-world objects using names of shapes, regardless of their orientation or size (e.g., squares, circles, triangles, rectangles, hexagons, cubes, cones, spheres, and cylinders).

Grade 1 - *Geometric Characteristics:*

MA 1.3.1.c Use two-dimensional shapes (e.g., rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) and three-dimensional shapes (e.g., cubes, rectangular prisms, cones, and cylinders) to compose and describe new shapes.

Grade 2 - *Geometric Characteristics:*

MA 2.3.1.a Recognize and draw shapes having a specific number of angles, faces, or other attributes, including triangles, quadrilaterals, pentagons, and hexagons.

Grade 3 - *Geometric Characteristics:*

MA 3.3.1.a Identify the number of sides, angles, and vertices of two-dimensional shapes.

MA 3.3.1.b Sort quadrilaterals into categories (e.g., rhombi, squares, and rectangles).

Common Core Standards

Visual Arts

Creating: Anchor Standard 1: Generate and conceptualize artistic ideas and work.

Grade 1 - VA:Cr1.2.1a Use observation and investigation in preparation for making a work of art.

VA:Cr2.1.1a Explore uses of materials and tools to create works of art or design.

Creating: Anchor Standard 2: Organize and develop artistic ideas and work.

Grade 3 - VA:Cr2.1.3a Create personally satisfying artwork using a variety of artistic processes and materials.

Mathematics

Kindergarten: *Identify and describe shapes.*

CCSS.Math.Content.K.G.A.2

Correctly name shapes regardless of their orientations or overall size. Analyze, compare, create, and compose shapes.

CCSS.Math.Content.K.G.B.6

Compose simple shapes to form larger shapes.

Grade 1 - *Geometry: Reason with shapes and their attributes.*

1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

Grade 2 - *Geometry: Reason with shapes and their attributes.*

1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

Grade 3 - *Geometry: Reason with shapes and their attributes.*

1. Understand that shapes in different categories (e.g., rhombi, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombi, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.



About the International Quilt Museum

The International Quilt Museum home to the world’s largest publicly held quilt collection, consisting of more than 7,000 quilts from over 60 countries. We are located at the intersection of 33rd and Holdrege in Lincoln, Nebraska, on the University of Nebraska, Lincoln’s East Campus. Our mission is to celebrate the cultural and artistic significance of quilts, and every person has something to gain from and offer to our community of learning, discovery and outreach. All are welcome here.

For more about our educational programs, please visit:
<https://www.internationalquiltmuseum.org/education-outreach>

For making this program possible, we would like to thank the Mark and Diann Sorensen IQM Education and Outreach Fund, and give special recognition to the Cooper Foundation, the Mary Ann Beavers Education Support Fund, and the Mary Ann Beavers Fund for Public Programming & Outreach for their dedication and stalwart support of the International Quilt Museum’s education programs.