

Course Title: Mathematics	Full Year	Required
<p>Course Description: The mathematical work for Grade 4 is partitioned into 9 units:</p> <ul style="list-style-type: none"> ● Understanding Factors and Multiples ● Fraction Equivalence and Comparison ● Extending Operations to Fractions ● From Hundredths to Hundred-thousands ● Multiplicative Comparison and Measurement ● Multiplying and Dividing Multi-digit Numbers ● Angles and Angle Measurement ● Properties of Two-dimensional Shapes ● Putting it All Together 		
<p>Additional Course Information:</p> <p>The big ideas in Grade 4 include:</p> <ul style="list-style-type: none"> ● generalizing place value understanding for multi-digit whole numbers. ● using place value understanding and properties of operations to perform multi-digit arithmetic and solve problems. ● developing understanding and fluency with multi-digit multiplication ● developing understanding of dividing to find quotients involving multi-digit dividends ● building fractions from unit fractions by applying and extending previous understandings of operations with whole numbers. ● developing an understanding of fraction equivalence and ordering, as well as addition and subtraction of fractions with like denominators ● multiplication of fractions by whole numbers ● understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry. ● Required fluency: Add and subtract within 1,000,000 (4.NBT.B.4) 	<p>Core Resources:</p> <p>Illustrative Mathematics</p> <p>Instructional Routines and Math Language Routines</p> <p>Grade 4 Glossary</p> <p>Required Materials</p> <p>IM en Español: (Grade 4 en Español)</p> <p>Developing a Mathematical Community</p>	<p>Are there any attachments <u>at the course level</u> that teachers will need?</p> <p>Grade 4 Scope and Sequence</p> <p>Pacing Guide and Dependency Diagrams K-5</p>

Unit Overview - FOCUS:

Students classify triangles and quadrilaterals based on the properties of their side lengths and angles, and learn about lines of symmetry in two-dimensional figures. They use their understanding of these attributes to solve problems, including problems involving perimeter and area.

In this unit, students deepen their understanding of the attributes and measurement of two-dimensional shapes.

Prior to this unit, students learned about some building blocks of geometry—points, lines, rays, segments, and angles. They identified parallel and intersecting lines, measured angles, and classified angles based on their measurement. Here, they apply those insights to describe and reason about characteristics of shapes.

In the first half of the unit, students analyze and categorize two-dimensional shapes—triangles and quadrilaterals—by their attributes. They classify two-dimensional shapes based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Students also learn about symmetry. They identify line-symmetric figures and draw lines of symmetry.

Quadrilaterals N, U, and Z are parallelograms.

Quadrilaterals AA, EE, and JJ are rhombuses.



Write 4–5 statements about the sides and angles of the quadrilaterals in each set.

Each statement must be true for all the shapes in the set.

The second half of the unit gives students opportunities to apply their understanding of geometric attributes to solve problems about measurements (side lengths, perimeters, and angles).

Included in this unit are three optional lessons that offer opportunities for students to strengthen and extend their understanding of symmetry and other attributes of two-dimensional shapes.

Topic Titles:

- **Section A: Side Lengths, Angles, and Lines of Symmetry**
 - Classify triangles (including right triangles), parallelograms, rectangles, rhombuses, and squares based on the properties of their side lengths and angles.
 - Identify and draw lines of symmetry in two-dimensional figures.
- **Section B: Reason about Attributes to Solve Problems**
 - Solve problems involving unknown side lengths, perimeter, area, and angle measurements using the known attributes and properties of two-dimensional shapes.

<p>Unit Learning Goals Students classify triangles and quadrilaterals based on the properties of their side lengths and angles, and learn about lines of symmetry in two-dimensional figures. They use their understanding of these attributes to solve problems, including problems involving perimeter and area.</p>		
<p>Coherence: How does this unit build on and connect to prior knowledge and learning?</p> <p>In third grade, students learned that shapes in different categories (e.g., rhombuses, 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 rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.</p> <p>In this unit, they will classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. In addition, students will be able to recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.</p>		
<p>Essential Questions:</p> <ol style="list-style-type: none"> 1. In what ways are geometric shapes similar and different from one another? 2. How can we use the attributes of shapes to find unknown information? 	<p>Enduring Understanding:</p> <ol style="list-style-type: none"> 1. In order to determine similarities and differences, we can compare the number of sides, side lengths, presence of parallel and perpendicular lines, angle measurements and lines of symmetry. By analyzing these attributes, we can classify shapes based on their properties. We can use this information to solve real-world problems with missing information. 2. We can use the number of sides, side lengths, presence of parallel and perpendicular lines, angle measurements, and lines of symmetry to find unknown information. We can find triangles, quadrilaterals, and polygons in many of the objects around us, such as in our homes, in our schools, and in our communities. Geometric shapes have attributes that are similar and different from one another. Being able to identify the attributes in particular shapes allow us to find unknown side lengths, perimeters, areas, and angle measurements. 	
<p>What Students Will Know:</p>	<p>What students will do: (based on the competencies)</p>	<p>Unit Specific Vocabulary:</p>

<ul style="list-style-type: none"> ● Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. ● Recognize right triangles as a category, and identify right triangles. ● Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. ● Understand perimeter as the measurement around something, and area as the measurement of the flat surface inside the perimeter of something. 	<ul style="list-style-type: none"> ● Use the properties of lines or angles to name two-dimensional shapes or figures such as rectangles, parallelograms, trapezoids, and triangles. ● Use the properties of lines or angles to categorize or compare two-dimensional shapes or figures ● Draw and identify two-dimensional shapes using their properties (e.g., number of sides, equal sides, number of right angles) as a guide ● Locate the line of symmetry if possible. ● Identify the most common symmetrical shapes: circles, squares, rectangles, ovals, equilateral triangles (three equal sides), isosceles triangles (two equal sides), hexagons, and octagons. ● Find perimeter and area to solve real-world problems. 	<p>Academic vocabulary</p> <p>point line segment or line segment angle right angle acute angle obtuse angle straight angle parallel lines halves triangle right triangle quadrilateral rhombus parallelogram square rectangle trapezoid symmetry line of symmetry perimeter area</p>
<p>Entry Level Assessment and Connection to Unit:</p> <p>Unit 8 Entry Level Assessment</p> <p>Purpose: Student misconceptions may be identified as well as appropriate vocabulary needed for future lesson</p>	<p>Unit Materials, Resources and Technology:</p> <ul style="list-style-type: none"> ● Unit 8 Teacher Guide ● Illustrative Mathematics ● Instructional Routines and Math Language Routines ● Grade 4 Glossary ● Required Materials ● IM en Español ● Pacing Guide and Dependency Diagrams K-5. 	

Opportunities for Interdisciplinary Connections:

These read-alouds are related to the concepts of the unit.

[*The Greedy Triangle by Marilyn Burns*](#)

[*If You Were A Polygon by Marcie Aboff*](#)

Any links, attachments and resources:

[Instructional Routines Document](#)

[Family Support Materials](#)

Planning Ideas:

[Components of a Typical IM Lesson](#)

[What To Know About IM When Planning](#)

[Gr 4 Where to Find the Mathematical Practices in the Units](#)

[Assessing the Mathematical Practices](#)

Topic # 1 (Section A)	Topic Name: Section A: Side Lengths, Angles, and Lines of Symmetry	Duration: Recommended 6 days (6 lessons)
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Topic Description:

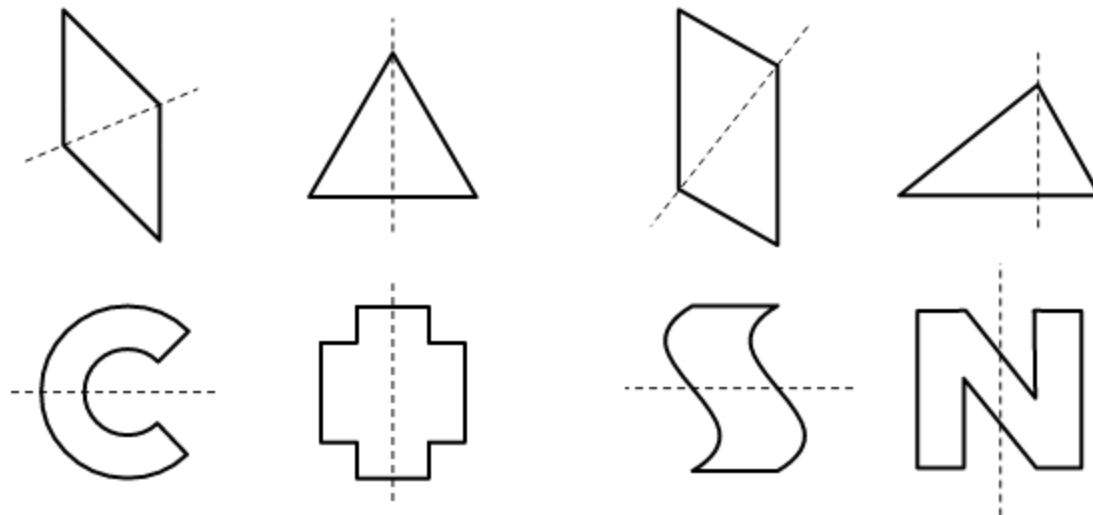
Section Learning Goals

- Classify triangles (including right triangles), parallelograms, rectangles, rhombuses, and squares based on the properties of their side lengths and angles. Identify and draw lines of symmetry in two-dimensional figures.
- Share mathematical ideas with a partner.

This section prompts students to consider different ways of looking at two-dimensional shapes: by the number of sides, length of sides, size of angles, presence of parallel or perpendicular lines, and symmetry. Students examine these attributes in shapes, classify the shapes by the attributes, and explain their classifications. For example, they identify quadrilaterals as parallelograms if they have two pairs of parallel sides, as squares if they have four equal sides and four right angles, and so on.

In studying symmetry, students characterize shapes based on whether they can be folded into two equal halves that match up exactly, draw lines of symmetry, and complete drawings of figures that are halved by a line of symmetry.

Lin folds pieces of paper in different shapes. She sorts them into two categories based on the folding lines.



folding line is a line of symmetry

folding line is not a line of symmetry

Study the shapes in each category. What do you think a 'line of symmetry' means?

The section includes one optional lesson in which students apply their understanding of two-dimensional shapes to complete or create drawings of figures with specified attributes.

Competencies Addressed:

Reasoning With Geometry

- **4.G.1** - I can reason with shapes and classify them based on their properties. **(4.G.A.1-3)**

Measurement and Data Investigations

- **4.MD.3** - I understand and can measure angles to solve real world and mathematical problems. **(4.MD.C.5-7)**

Understanding and Applying Number Sense

- **4.NS.4** - I can use strategies to multiply and divide whole numbers. **(4.NBT.B.5)**
- **4.NS.6** - I can add and subtract mixed numbers with like denominators to solve word problems. **(4.NF.B.3.C)**
- **4.NS.7** - I can use my understanding of operations with whole numbers to multiply a fraction by a whole number to solve problems. **(4.NF.B.4)**

Essential Question and Enduring Understanding Addressed in this Topic:

Essential Question

In what ways are geometric shapes similar and different from one another?

Enduring Understanding

In order to determine similarities and differences, we can compare the number of sides, side lengths, presence of parallel and perpendicular lines, angle measurements and lines of symmetry. By analyzing these attributes, we can classify shapes based on their properties. We can use this information to solve real-world problems with missing information.

In this Topic, students will know:

- Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size.
- Recognize right triangles as a category, and identify right triangles.
- Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Topic Vocabulary:

Doing Math
Math Community





Academic vocabulary

point
line
segment or line segment
angle
right angle
acute angle

	<p>obtuse angle straight angle parallel lines halves triangle right triangle quadrilateral rhombus parallelogram square rectangle trapezoid symmetry line of symmetry</p>
<p>In this Topic, students will be able to:</p> <ul style="list-style-type: none"> ● Use the properties of lines or angles to name two-dimensional shapes or figures such as rectangles, parallelograms, trapezoids, and triangles. ● Use the properties of lines or angles to categorize or compare two-dimensional shapes or figures ● Draw and identify two-dimensional shapes using their properties (e.g., number of sides, equal sides, number of right angles) as a guide ● Locate the line of symmetry if possible. ● Identify the most common symmetrical shapes: circles, squares, rectangles, ovals, equilateral triangles (three equal sides), isosceles triangles (two equal sides), hexagons, and octagons. 	<p>Plan for Student Reflection:</p> <p>Student Journal Prompts and Reflection Practices</p> <hr/> <p>Plan for Teacher Reflection:</p> <p>Reflecting Questions:</p> <ul style="list-style-type: none"> ● Students learned about angle measurement and parallel lines in an earlier unit. In what ways did you see and hear students building on those ideas when they described and sorted the shapes in this lesson? ● What question went unanswered in this lesson? How will you revisit the ideas underlying this question in the lessons that follow? ● Who participated in math class today? How can you leverage each of your students’

	<p>ideas to support them in being seen and heard in tomorrow's math class?</p> <ul style="list-style-type: none">● What ideas do students have about symmetry? How will you leverage those ideas in the next lesson?● What connections did students make between the different strategies shared? What questions did you ask to help make the connections more visible?● How did you hear students use the vocabulary they have learned in previous lessons as they created and described shapes and figures in today's lesson? What can you do to encourage students to use geometric vocabulary in upcoming lessons and outside of math class? <p>Utilize additional strategies for Teacher Reflection:</p> <ul style="list-style-type: none">● Reviewing formative assessments● Developing scaffolds● Collaborative scoring● PLCs● Planning for small groups
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Topic 1 (Section A) Task Development

<p>Task Title: Section A: Side Lengths, Angles, and Lines of Symmetry</p>	<p>Grade Level and Unit: Grade 4, Unit 8</p>
<p>Description of Task: In this activity, students apply their understanding of symmetry, parallel and perpendicular lines, and types of quadrilaterals to create shapes with certain attributes on isometric dot paper. The arrangement and equal spacing of the dots give students structure for drawing parallel and perpendicular lines and to determine symmetry.</p>	<p>Purpose of Task: To create their own figures, students rely on their understanding of symmetry and parallel lines. They consider where possible lines of symmetry could be, how many segments to add, and where to place them. They may also experiment, rely on familiar shapes and their lines of symmetry, or imagine a line of symmetry and what it would tell them about the figure. As they do so, they look for and make use of structure (MP7).</p>
<p>Background of Students/Learning Progression: In grades 2 and 3, students studied some attributes of two-dimensional figures. In a previous unit, they investigated lines, rays, and segments, and drew and measured angles. They learned what it means when two lines or segments are parallel and perpendicular.</p>	<p>Ensure all competencies are addressed in the task:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Yes, all competencies are addressed <input type="checkbox"/> No - Task needs modification
<p>Getting Started: This warm-up prompts students to compare four geometric figures. It encourages students to carefully examine each figure and to use language precisely (MP6). It also gives the teacher an initial opportunity to hear the terminology students use to describe and compare the attributes of two-dimensional figures and to make comparisons. When students explain their thinking, ask them to clarify the terminology they use. For instance, if they say, “same sides” or “square corners,” urge them to elaborate on what each phrase means.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end; margin-top: 20px;"> <div style="text-align: center;"> <p>A</p>  </div> <div style="text-align: center;"> <p>B</p>  </div> <div style="text-align: center;"> <p>C</p>  </div> <div style="text-align: center;"> <p>D</p>  </div> </div>	
<p>Learning Cycle Model:</p>	

Section A						
IM Lesson	L1: Ways to Look at Figures	L2: Ways to Look at Triangles	L3: Ways to Look at Quadrilaterals	L4: Symmetry in Figures (Part 1)	L5: Symmetry in Figures (Part 2)	L6: All Kinds of Attributes (Optional)
Learning Cycle Model	Making Meaning	Making Meaning	Making Meaning	Investigate	Investigate	Create & Produce
Naugatuck Math Competency	4.G.1	4.G.1, 4.NS.6, 4.NS.B.7	4.G.1, 4.MD.1	4.G.1	4.G.1, 4.NS.4	4.G.1
Math Practice Standards	MP6 MP7	MP5 MP8	MP6 MP7	MP5 MP6 MP8	MP3 MP5	MP7
Lesson Purpose	The purpose of this lesson is for students to analyze two-dimensional figures and sort them into different categories based on their attributes.	The purpose of this lesson is for students to classify triangles based on their side lengths and the size of their angles. Students identify triangles with a right angle as right triangles.	The purpose of this lesson is for students to classify quadrilaterals by the size of their angles, the length of their sides, and the presence of parallel and perpendicular sides.	The purpose of this lesson is to introduce the concept of line symmetry and for students to identify lines of symmetry in two-dimensional figures.	The purpose of this lesson is for students to identify figures with line symmetry and to complete line-symmetric figures.	The purpose of this optional lesson is for students to use what they know about symmetry and parallel and perpendicular lines to complete or draw figures with those attributes on a grid.
Vocabulary Focus	Attribute, figure, shape, sides, angles	Expression, triangle, angle, right angle, parallel, perpendicular, obtuse angle, acute angle, right triangle	Parallel sides, quadrilaterals, right angles, perpendicular sides, obtuse angles, rectangles, parallelograms, rhombuses, attribute	Symmetry, lines of symmetry, flat figures	Expression, line symmetry, triangle, figure, vertical	Right triangles, parallelograms, rectangles, rhombuses, squares, line of symmetry
Lesson Materials/Resources	Lesson 1 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Protractors (provide access to each group) Rulers (provide access to each group) 	Lesson 2 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Each group needs a set of shape cards from Lesson 1. If time permits, separate the triangle cards from each set 	Lesson 3 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Each group needs a set of shape cards from Lesson 1. If time permits, separate the quadrilateral cards 	Lesson 4 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Make copies of the Perfect Matches figures in the second question available for cutting and for demonstration 	Lesson 5 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Give patty paper and a ruler or straightedge to each student. For Activity 2:	Lesson 6 Slides Teacher Presentation Materials Student Pages For Activity 1: <ul style="list-style-type: none"> Provide access to straightedges

	<ul style="list-style-type: none"> ● Sticky notes (each group will need 8-10 sticky notes) ● Create a set of cards for each group: Shape Cards Grade 4 <p>*Save the Collect and Display Chart and Vocabulary Chart created in this lesson</p> <p>For Activity 2: Shape Cards from Activity 1</p> <p>Cool-down: What Do They Have in Common?</p>	<p>in advance.</p> <ul style="list-style-type: none"> ● The Collect and Display chart from the Lesson 1 for display in the activity synthesis. ● Vocabulary chart (make available the chart with vocabulary from the previous lesson for reference during this lesson) <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● protractors ● rulers <p>For Activity 2: Provide access to each group:</p> <ul style="list-style-type: none"> ● index cards ● patty paper ● Protractors <p>Cool-down: Which Would Fit in the Set?</p>	<p>from each set in advance.</p> <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Protractors ● Rulers <p>For Activity 2:</p> <ul style="list-style-type: none"> ● Each group needs a set of shape cards from activity 1. ● Paper: Each group will need 4 large sheets of paper for each shape (square, rectangle, rhombus, parallelogram) <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Protractors ● Rulers ● Tools for creating a visual display <p>Cool-down: Quadrilaterals Rule</p>	<p>during the lesson synthesis</p> <ul style="list-style-type: none"> ● Give a ruler or straightedge to each student <p>Provide access to:</p> <ul style="list-style-type: none"> ● patty paper ● Protractors ● Scissors ● Copies of the shapes in the second question. <p>For Activity 2:</p> <ul style="list-style-type: none"> ● Sort the shape cards from the previous lessons into three groups of cards (A-L, M-X, and Y-JJ) and give each group a set of the 12 shape cards <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Protractors ● Rulers <p>For Activity 3: Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Rulers <p>Cool-down: One Line or More than One?</p>	<ul style="list-style-type: none"> ● Give a ruler or straightedge to each student. <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Protractors ● Scissors ● Paper for cutting <p>Activity 3 (Optional):</p> <ul style="list-style-type: none"> ● Two Symmetrical Figures 2 sets per group of 2 <p>Provide access to each group:</p> <ul style="list-style-type: none"> ● Patty paper ● Protractors ● Scissors ● Paper for cutting <p>Cool-down: Make Them Whole</p>	<p>Cool-down: Can You See It?</p>
Assessment	<p align="center">Formative Assessment Strategies: observation, questioning, student discourse - Monitoring Sheet</p> <p align="center">See Section A Checkpoint , Section A Checkpoint: Teacher Guide</p>					

						Section A Practice Problems
Suggested Centers	Picture Books Stage 3: Find Shapes (Supporting)	Picture Books Stage 3: Find Shapes (Supporting)	Which One? Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? Stage 4: Area and Perimeter (Supporting)	Which One? Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? Stage 4: Area and Perimeter (Supporting)	Symmetrical Designs, Stage 1: Lines of Symmetry (Addressing) Which One? Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? Stage 4: Area and Perimeter (Supporting)	Symmetrical Designs (4), Stage 1: Lines of Symmetry (Addressing) Compare (1-5), Stage 5: Fractions (Supporting) Compare (1-5), Stage 7: Multi-digit Operations (Supporting)

Making Meaning:

Throughout this series of lessons, students will use their understanding of shapes to examine attributes of two-dimensional shapes and sort the shapes into categories. As long as students can explain their rationale, they may choose to categorize the shapes using any attribute or combination of attributes—for instance, by the number of sides or angles, measurement of sides or angles, presence of parallel or perpendicular lines, and so on. Although each activity is designed to be open-ended, monitor for students who look for ways to describe or sort their shapes based on the presence or absence of angles of a specified size (right, obtuse, acute), parallel sides, or perpendicular sides.

Along the way, students will begin to notice new attributes of triangles and make generalizations about them. They know that all triangles have three sides and three angles. Now they also see, for instance, that some triangles contain right angles, some triangles have equal sides and can be folded into two equal halves, triangles never seem to contain more than one obtuse angle, and so on. Students learn that right triangles are a subgroup of triangles and use what they know about identifying right angles and perpendicular sides to identify the properties of right triangles.

The process of sorting shapes and identifying attributes encourages students to look for structure (MP7), which students will use in later lessons to reason about symmetry and measurements in two-dimensional figures.

Continuing their learning, students will identify and sort quadrilaterals based on their angles and sides, including whether their sides are parallel. Students are introduced to the term parallelogram to describe quadrilaterals with two pairs of parallel sides, but they are not expected to use this term throughout the unit. In grade 5, students will continue the work of classifying polygons using these categories.

[Lesson 1: Ways to Look at Figures](#)

- The purpose of this lesson is for students to analyze two-dimensional figures and sort them into different categories based on their attributes.
- [Teacher Presentation Materials](#)
- [Lesson 1 Slides](#)

[Lesson 2: Ways to Look at Triangles](#)

- The purpose of this lesson is for students to classify triangles based on their side lengths and the size of their angles. Students identify triangles with a right angle as right triangles
- [Teacher Presentation Materials](#)
- [Lesson 2 Slides](#)

[Lesson 3: Ways to Look at Quadrilaterals](#)

- The purpose of this lesson is for students to classify quadrilaterals by the size of their angles, the length of their sides, and the presence of parallel and perpendicular sides.
- [Teacher Presentation Materials](#)
- [Lesson 3 Slides](#)

This unit will continue to introduce new vocabulary to students. They should be encouraged to add to their portable word walls throughout the unit to support successful acquisition of geometry terms.

Investigation:

Lesson 4 introduces students to symmetry as an attribute of two-dimensional figures. Students relate lines of symmetry to the lines of folding that create two identical halves: if a figure is folded along or mirrored across such a line, the two halves would overlap and match exactly. The idea of folding along or mirroring across a line is essential here, as there are some figures that could be decomposed into two identical halves but have no line symmetry.

After reasoning about the meaning of lines of symmetry from examples and non-examples, students work to identify figures that have line symmetry and draw lines of symmetry.

The work of Lesson 5 helps students develop mental images of figures with lines of symmetry. Students also consider how to use what they know about drawing line segments, points, and angles to complete their drawings. They make strategic decisions about how to use available tools to complete the shapes or justify how they know their figures are symmetrical (MP5). Students may copy the figure to another piece of paper, and follow with folding, cutting, or tracing. They may also use rulers or protractors to measure distances and angles.

[Lesson 4: Symmetry in Figures \(Part 1\)](#)

- The purpose of this lesson is to introduce the concept of line symmetry and for students to identify lines of symmetry in two-dimensional figures.
- [Teacher Presentation Materials](#)
- [Lesson 4 Slides](#)

[Lesson 5: Symmetry in Figures \(Part 2\)](#)

- The purpose of this lesson is for students to identify figures with line symmetry and to complete line-symmetric figures.
- [Teacher Presentation Materials](#)
- [Lesson 5 Slides](#)

Create and Produce:

This lesson is optional because it synthesizes all the sorting and classifying students have done up to this point. Grids are given here to encourage students to support students’ parallel lines, perpendicularity, and measurements and to support also thinking about attributes of figures. In upcoming lessons, students will use these lines of reasoning to solve problems about perimeter and angle measurements.

[Lesson 6: All Kinds of Attributes](#)

- The purpose of this optional lesson is for students to use what they know about symmetry and parallel and perpendicular lines to complete or draw figures with those attributes on a grid.
- [Teacher Presentation Materials](#)
- [Lesson 6 Slides](#)

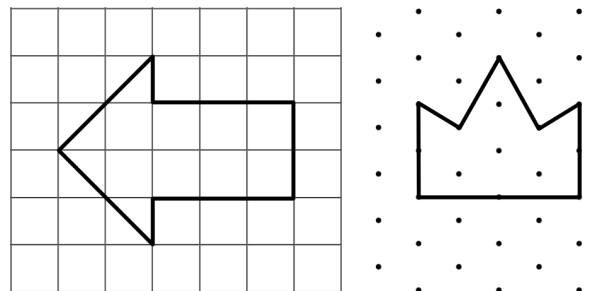
Communicate and Present:

Reflection:

“Today we used our understanding of the attributes of figures to draw figures with varying lines of symmetry

- Invite students to share their drawings. Highlight that many different drawings are possible for each description.
- “How did you make sure that the first two figures have line symmetry?” (Check that the figure has a line that splits it into two halves that mirror one another and match up when folded.)
- “How did you create parallel sides and know that they are indeed parallel?” (Use the spacing of the dots to draw segments that are the same distance apart.)
- “How did you create segments that are perpendicular?” (Connect dots that line up vertically and those that line up horizontally.)
- “What parts, specifically, did you need to draw to create a rectangle?” (2 sets of parallel segments—the same length for opposite sides—and 4 right angles)

and varying numbers of parallel or perpendicular sides.”
Display the images:



“When figures are shown on a line grid or dotted grid, we can often learn a lot about their attributes. Here are two figures, one on a square grid and the other on a dotted triangular grid.”

“How might we use grids to see if:

- two segments have the same length?” (On a grid with lines, we can count the units. On dot paper, we can use the distance between dots to see segments are the same length.)
- two segments are parallel?” (On a square grid, the horizontal lines are parallel, and so are the vertical lines. On dot paper, any two rows or columns of dots that are always the same distance apart are parallel.)
- two segments are perpendicular?” (On a square grid, the vertical and horizontal lines are perpendicular. On dot paper, there are vertical stacks of dots and horizontal rows.)

	<ul style="list-style-type: none">• a figure has line symmetry?" (Use the grid or the dots to check if the figure has two parts that are the same size and mirror each other across a line.)
Notes:	Complete File with Resources and Task: Task-Based Learning Plan Format for Topic 1

Topic # 2 (Section B)	Topic Name: Section B: Reason about Attributes to Solve Problems	Duration: 4 days (4 lessons)
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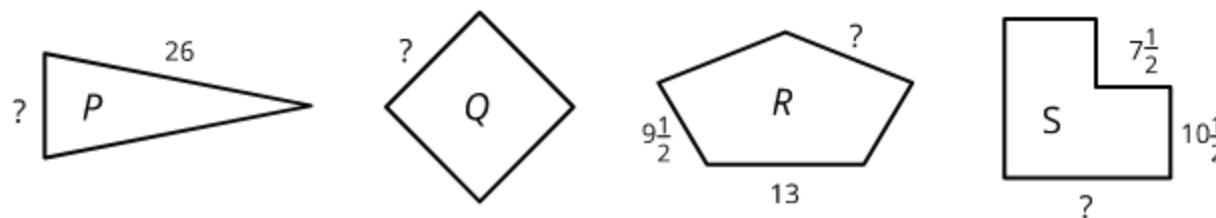
Topic Description:
Section Learning Goals

- Solve problems involving unknown side lengths, perimeter, area, and angle measurements using the known attributes and properties of two-dimensional shapes.

In this section, students apply their knowledge of geometric attributes to reason about measurements in various two-dimensional shapes. They find the perimeter of shapes where the side lengths are all given. Then, they move on to cases where the side lengths are not explicitly given but can be deduced based on information about the shapes.

Later, students are given the perimeter and some information about a shape and find any unknown side lengths. The activities also enable students to practice performing operations on whole numbers and fractions.

*Here are four figures, each with a perimeter of 64 inches.
 Figures P, Q, and R each have 1 line of symmetry. Figure Q has 4 lines of symmetry.*



Draw the lines of symmetry of each figure and find the unknown side length.

In the last two lessons, students use what they have learned about symmetry to solve problems related to perimeter and unknown angle measurements in two-dimensional shapes. This work deepens students' understanding of the concepts from this unit and offers opportunities to practice reasoning about angle measurement, but it is not required by grade 4 standards. These lessons are therefore optional.

Competencies Addressed:

Reasoning With Geometry

Essential Question and Enduring Understanding Addressed in this Topic:

- **4.G.1** - I can reason with shapes and classify them based on their properties. **(4.G.A.1-3)**
- Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. **4.G.A.1**
- Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. **4.G.A.2**
- Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. **4.G.A.3**

Measurement and Data Investigations

- **4.MD.1** -I can solve problems involving measurement (time, money, customary and metric, area, perimeter, conversion of measurements). **(4.MD.A.1-3)**
- **4.MD.3** - I understand and can measure angles to solve real world and mathematical problems. **(4.MD.C.5-7)**
- Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. **4.MD.A.3**
- Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. **4.MD.C.7**

Understanding and Applying Number Sense

- **4.NS.6** - I can add and subtract mixed numbers with like denominators to solve word problems. **(4.NBT.B.3.c)**
- **4.NS.7** - I can use my understanding of operations with whole numbers to multiply a fraction by a whole number to solve problems. **(4.NF.B.4a-c)**

Essential Question

How can we use the attributes of shapes to find unknown information?

Enduring Understanding

We can use the number of sides, side lengths, presence of parallel and perpendicular lines, angle measurements, and lines of symmetry to find unknown information. We can find triangles, quadrilaterals, and polygons in many of the objects around us, such as in our homes, in our schools, and in our communities. Geometric shapes have attributes that are similar and different from one another. Being able to identify the attributes in particular shapes allow us to find unknown side lengths, perimeters, areas, and angle measurements.

<ul style="list-style-type: none"> ● Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. $1/b$. 4.NF.B.3.c ● Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 4.NF.B.4 ● Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a)/b$.) 4.NF.B.4.b 	
<p>In this Topic, students will know:</p> <ul style="list-style-type: none"> ● Understand perimeter as the measurement around something, and area as the measurement of the flat surface inside the perimeter of something. 	<p>Topic Vocabulary: Doing Math Math Community</p> <p>Academic vocabulary perimeter area</p>
<p>In this Topic, students will be able to:</p> <ul style="list-style-type: none"> ● Find perimeter and area to solve real-world problems. ● Solve for unknowns. 	<p>Plan for Student Reflection:</p> <p>Student Journal Prompts and Reflection Practices</p> <p>Plan for Teacher Reflection:</p> <p>Reflecting Questions</p> <ul style="list-style-type: none"> ● Earlier in the unit, students looked closely at the attributes of two-dimensional figures. In what ways did you see students applying their understanding to find perimeter? How can you continue to foster connections between different geometric ideas in upcoming lessons?

- The tasks in this lesson prompted students to apply what they learned about adding fractions and multiplying fractions by a whole number. How comfortable were students with these operations? What ideas or strategies do students need more practice with?
- What was the best question you asked students today? Why would you consider it the best one based on what students said or did?
- Today's lesson presented many opportunities for divergent reasoning strategies. Think about which students haven't shared their strategies in class lately. Were there missed opportunities to highlight their thinking during recent lessons? How can you take advantage of those opportunities when they arise?

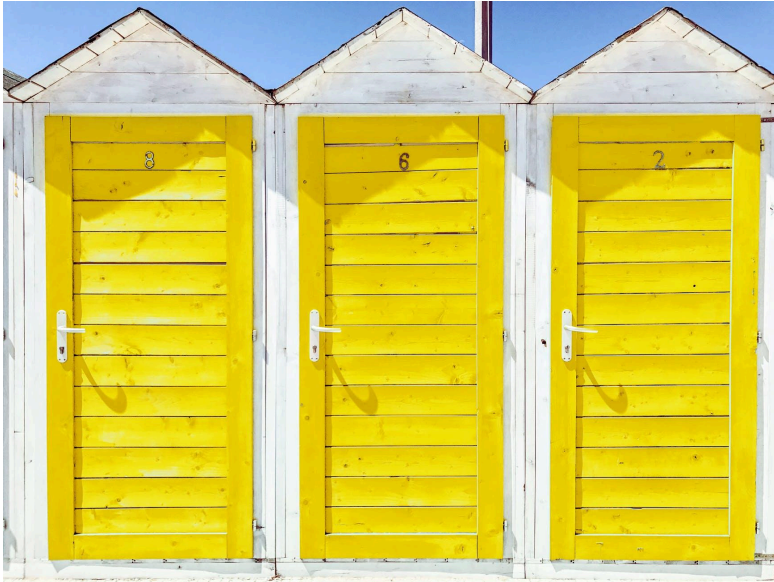
Utilize additional strategies for Teacher Reflection:

- Reviewing formative assessments
- Developing scaffolds
- Collaborative scoring
- PLCs
- Planning for small groups

Topic 2 (Section B) Task Development

Each Topic has its own Task that serves as a roadmap for instruction during the unit. The task follows the [Learning Cycle Model](#) that drives teaching and learning in Naugatuck Public Schools.

Task Title: Topic 2 - Section B: Reason about Attributes to Solve Problems	Grade Level and Unit: Grade 4, Unit 8
Description of Task: Assign a different shape for each group member to start with and ask students to draw as precisely as possible (MP6). Provide access to protractors and patty paper (MP5). Most students are likely to find Andre’s shape most challenging to draw. Differentiate the starting drawing for each student as needed	Purpose of Task: This activity serves several goals. Students continue to practice visualizing and drawing a complete shape given a line of symmetry and one half of the shape. As they do so, they practice drawing angles of certain measurements. Students also use symmetry to reason about unknown angle measurements in two-dimensional figures.
Background of Students/Learning Progression: In previous lessons, students examined the attributes of two-dimensional figures. They identified, sorted, and drew figures based on side length, angle size, presence of parallel or perpendicular sides, and symmetry.	Ensure all competencies are addressed in the task: <input type="checkbox"/> Yes, all competencies are addressed <input type="checkbox"/> No - Task needs modification
Getting Started: Utilize the following picture to support students in “Getting Started” with this section of the unit:	



Ask students, “Can you identify the following in the picture: line segments, angles (right, acute, obtuse), and perpendicular and parallel lines?”

Learning Cycle Model

Section B

IM Lesson	L7: Ways to Find Unknown Length (Part 1)	L8: Ways to Find Unknown Length (Part 2)	L9: Symmetry in Action (optional)	L10: Ways to Find Angle Measurements (optional)
Learning Cycle Model	Make Meaning	Make Meaning	Investigation	Create & Produce
Naugatuck Math Competency	4.G.A.3 4.MD.A.3	4.G.A.3 4.MD.A 4.NF.B.3.c 4.NF.B.4	4.G.A.1 4.G.A.2 4.G.A.3 4.MD.A.3	4.G.A.3 4.MD.C.7
Math Practice Standards	MP3 MP8	MP5 MP7	MP5 MP7	MP5 MP6 MP7
Lesson Purpose	The purpose of this lesson is for students to use the known attributes of two-dimensional figures (such as side lengths and symmetry) to reason about the perimeter of shapes.	The purpose of this lesson is for students to use the attributes of two-dimensional figures (such as perimeter and symmetry) to reason about side lengths.	The purpose of this optional lesson is for students to practice visualizing and drawing figures given lines of symmetry and to use symmetry to solve problems about side lengths and perimeter.	The purpose of this optional lesson is for students to use the attributes of figures (symmetry, equal side lengths, right angles) to reason about angle measurements.

Vocabulary Focus	Perimeter, expression, line of symmetry, parallel sides	Statement, perimeter, line of symmetry, parallelogram, parallel	Line of symmetry, parallel, segment, right triangle, expression, perimeter	Line of symmetry, unknown angle measurement
Lesson Materials/ Resources	<p>Lesson 7 Slides</p> <p>Teacher Presentation Materials</p> <p>Student Pages</p> <p>For Activity 2:</p> <ul style="list-style-type: none"> ● Provide access to patty paper for groups of 2 <p>For Activity 3:</p> <ul style="list-style-type: none"> ● Provide access to patty paper for groups of 2 <p>Cool-down: What's the Perimeter?</p>	<p>Lesson 8 Slides</p> <p>Teacher Presentation Materials</p> <p>Student Pages</p> <p>For Activity 1:</p> <ul style="list-style-type: none"> ● Each student needs a ruler ● Provide access to patty paper for groups of 2 <p>For Activity 2:</p> <ul style="list-style-type: none"> ● Give a ruler or a straightedge to each student ● Provide access to each group of 2: <ul style="list-style-type: none"> ● protractors ● patty paper <p>Cool-down: Stage Symmetry</p>	<p>Lesson 9 Slides</p> <p>Teacher Presentation Materials</p> <p>Student Pages</p> <p>For Activity 1:</p> <ul style="list-style-type: none"> ● Each student needs a ruler ● Provide access to each group of 2: <ul style="list-style-type: none"> ● protractors ● patty paper ● scrap paper ● scissors <p>For Activity 2:</p> <ul style="list-style-type: none"> ● Each student needs a ruler ● Provide access to each group of 2: <ul style="list-style-type: none"> ● protractors ● patty paper ● scrap paper ● scissors <p>Cool-down: Fold It Once</p>	<p>Lesson 10 Slides</p> <p>Teacher Presentation Materials</p> <p>Student Pages</p> <p>For Activity 1:</p> <ul style="list-style-type: none"> ● Each student needs a ruler ● Provide access to patty paper for groups of ● Provide access to each group of 2: <ul style="list-style-type: none"> ● protractors ● patty paper ● scrap paper ● scissors <p>Cool-down: Stage Symmetry, Revisited</p>
Assessment	<p>Formative Assessment Strategies: observation, questioning, student discourse - Monitoring Sheet</p> <p>See Section B Checkpoint , Section B Checkpoint: Teacher Guide</p> <p>End-of-Unit Assessment , End-of-Unit Assessment: Teacher Guide</p>			
Suggested Centers	<p>Which One? (K-5) Stage 5: Grade 4 Shapes (Addressing)</p> <p>Can You Draw It? (1-5) Stage 5: Grade 4 Shapes (Addressing)</p>	<p>Which One? (K-5), Stage 5: Grade 4 Shapes (Addressing)</p> <p>Can You Draw It? (1-5), Stage 5: Grade 4 Shapes (Addressing)</p>	<p>Which One? (K-5), Stage 5: Grade 4 Shapes (Addressing)</p> <p>Can You Draw It? (1-5), Stage 5: Grade 4 Shapes (Addressing)</p>	<p>Section B Practice Problems</p> <p>Which One? (K-5), Stage 5: Grade 4 Shapes (Addressing)</p> <p>Can You Draw It? (1-5), Stage 5: Grade 4 Shapes (Addressing)</p>

	Compare (1-5) Stage 5: Fractions (Supporting)	Compare (1-5), Stage 5: Fractions (Supporting)	Compare (1-5), Stage 5: Fractions (Supporting)	Compare (1-5), Stage 5: Fractions (Supporting)
	Compare (1-5), Stage 7: Multi-Digit Operations (Supporting)	Compare (1-5), Stage 7: Multi-Digit Operations (Supporting)	Compare (1-5), Stage 7: Multi-Digit Operations (Supporting)	Compare (1-5), Stage 7: Multi-Digit Operations (Supporting)

Making Meaning:

The purpose of these lessons is for students to use the attributes of two-dimensional figures (such as side lengths, perimeter and symmetry) to reason about side lengths and perimeter.

In Lesson 7, students use their understanding of attributes to find the perimeter of different shapes. In the first activity, students find the perimeter of shapes when all side lengths are given and connect the perimeter of different shapes to equations. In the second activity, students are asked to find the perimeter of shapes when some side lengths are not given. Students use what they have learned about analyzing the attributes of shapes to determine if the perimeters can be found or if they need more information.

Students continue to make meaning by finding unknown lengths in Lesson 8. In Lesson 8, students reason in the other direction—given the perimeter and information about symmetry, they find the side lengths of two-dimensional figures. Students also practice completing a figure given a line of symmetry and half of the figure, and then reason about the perimeter of the whole figure. Along the way, students reinforce their ability to add fractions and to multiply fractions by whole numbers.

[Lesson 7: Ways to Find Unknown Length \(Part 1\)](#)

- The purpose of this lesson is for students to use the known attributes of two-dimensional figures (such as side lengths and symmetry) to reason about the perimeter of shapes.
- [Teacher Presentation Materials](#)
- [Lesson 7 Slides](#)

[Lesson 8: Ways to Find Unknown Length \(Part 2\)](#)

- The purpose of this lesson is for students to use the attributes of two-dimensional figures (such as perimeter and symmetry) to reason about side lengths.
- [Teacher Presentation Materials](#)
- [Lesson 8 Slides](#)

Investigation:

In this lesson, students continue to work with line-symmetric figures in the context of paper folding. Students are given the result of folding paper along their lines of symmetry and reason about the original figure and its perimeter. As they think about the lengths of segments in line-symmetric shapes and find perimeters, students practice looking for and making use of structure (MP7).

This lesson is optional because the work here deepens and extends students' understanding of line-symmetric figures and perimeter beyond what is required by the standards.

[Lesson 9: Symmetry in Action](#)

- The purpose of this optional lesson is for students to practice visualizing and drawing figures given lines of symmetry and to use symmetry to solve problems about side lengths and perimeter.
- [Teacher Presentation Materials](#)
- [Lesson 9 Slides](#)

Create and Produce:

Previously, students analyzed the attributes of two-dimensional figures and used them to find side lengths and perimeters. In this lesson, students use the attributes of figures to find unknown angle measurements and to practice drawing line-symmetric shapes. Both activities in the lesson deepen students' understanding of line symmetry. They also allow students to apply knowledge of angles from an earlier unit and integrate it with newer ideas from this unit. Because the work here is not required by the standards, however, this lesson is optional.

[Lesson 10: Ways to Find Angle Measurement](#)

- The purpose of this optional lesson is for students to use the attributes of figures (symmetry, equal side lengths, right angles) to reason about angle measurements.
- [Teacher Presentation Materials](#)
- [Lesson 10 Slides](#)

Communicate and Present:

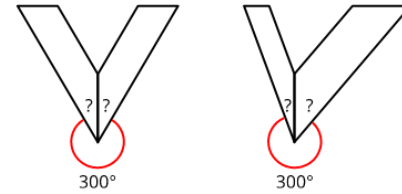
Display the drawings that students completed and select students to share how they found the angles inside each shape.

Highlight that lines of symmetry can be used to identify angles that have the same size as a given angle, or angles that are twice the size of a given angle.

Reflection:

"Today we saw that lines of symmetry can be handy for finding unknown angle measurements."

Display:



“Here are two V-shaped figures—one has line symmetry and the other does not. In each diagram, one angle measurement is known.”

“Can you find the size of each angle marked with a question mark? Why or why not?” (Yes for the first one, but no for the second. The first one has a vertical line of symmetry, so the two unknown angles are the same size. In the second figure, the two angles are different sizes.)

“How would you find the angle measurements in the first figure?” (The two unknown angles plus 300 degrees make 360 degrees. Since the two angles are the same size, each one is 30 degrees.) “What do we know about the two angles in the second figure?” (They also add up to 60 degrees. One is less than 30 degrees and the other is greater than 30 degrees.)

Notes:

Complete File with Resources and Task:
Task-Based Learning Plan Format for Topic 2