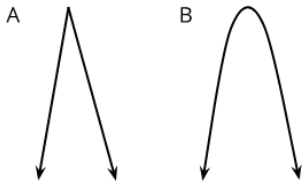
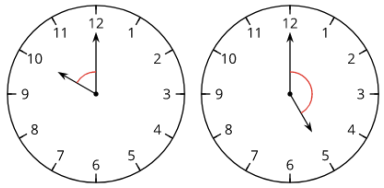
Course Title: Mathematics	Full Year	Required
Course Description: The mathematical work for Grade 4 is partitioned into 9 units: ● Understanding Factors and Multiples ● Fraction Equivalence and Comparison ● Extending Operations to Fractions ● From Hundredths to Hundred-thousands ● Multiplicative Comparison and Measurement ● Multiplying and Dividing Multi-digit Numbers ● Angles and Angle Measurement ● Properties of Two-dimensional Shapes ● Putting it All Together		
Additional Course Information: The big ideas in Grade 4 include: ● 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)	**Core Resources:** **Illustrative Mathematics** **Instructional Routines and Math Language Routines** **Grade 4 Glossary** **Grade 4 Unit 7 Glossary** **Required Materials** **IM en Español:** **Grade 4 en Español** **Developing a Mathematical Community**	Grade 4 Scope and Sequence - This document should be reviewed at the start of the year and each unit for information on language routines, expectations, and possible misconceptions. Pacing Guide and Dependency Diagrams K-5

Unit 7: Angles and Angle Measurement	Duration: 24-25 days
Unit Overview - FOCUS: Students learn to draw and identify points, rays, segments, angles, and lines, including parallel and perpendicular lines. Students also learn how to use a protractor to measure angles and draw angles of given measurements, and identify acute, obtuse, right, and straight angles in two-dimensional figures. In this unit, students deepen and refine students' understanding of geometric figures and measurement. In earlier grades, students learned about two-dimensional shapes and their attributes, which they described informally early on but with increasing precision over time. Here, students formalize their intuitive knowledge about geometric features and draw them. They identify and define some building blocks of geometry (points, lines, rays, and line segments), and develop concepts and language to more precisely describe and reason about other geometric figures.  Jada says figure A shows an angle, but figure B does not. Do you agree? Students analyze cases where lines intersect and where they don't, as in the case of parallel lines. They learn that an angle is a figure composed of two rays that share an endpoint. Later, students compare the size of angles and consider ways to quantify it. They learn that angles can be measured in terms of the amount of turn one ray makes relative to another ray that shares the same vertex. Students come to see that a 1-degree angle is of a full turn or full circle and can be used to measure angles. They use a protractor to measure angles in whole-number degrees. Students also learn that angles are additive. When an angle is composed of multiple non-overlapping parts, the measure of the whole is the sum of the angle measures of the parts. These insights enable students to classify angles (as acute, obtuse, right, or straight) and to solve problems about missing angle measurements in concrete and abstract contexts.	**Topic Titles:** ● **Section A: Points, Lines, Segments, Rays, and Angles** ○ Draw and identify points, lines, rays, segments, and parallel and intersecting lines in geometric figures. ○ Recognize that angles are formed wherever two rays share a common endpoint and identify angles in two-dimensional figures. ● **Section B: The Size of Angles** ○ Recognize that angles can be measured in degrees, and can be found using addition and subtraction. ○ Use a protractor to measure and draw angles, and recognize that perpendicular lines meet or cross at a right angle. ● **Section C: Angle Analysis** ○ Draw and identify acute, obtuse, right, and straight angles in two-dimensional figures. ○ Write equations to represent angle relationships and reason

How many degrees is each marked angle on the clock? Show your reasoning. 	about and find unknown measurements.

Coherence: How does this unit build on and connect to prior knowledge and learning?

In third grade, students learned to describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes.

In earlier grades, students examined, described, compared, and contrasted attributes of two-dimensional figures. They may have used geometric terms such as point, line, and segment intuitively and informally.

In this unit, students will draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. In the following unit, students will be able to take these skills to then identify and classify two-dimensional figures.

Essential Questions:	**Enduring Understanding:**
1. What is an angle? 2. How can we accurately describe angles?	1. **An angle is a geometric figure made up of two rays that share the same endpoint.** Angles consist of points, rays, and a vertex. In order to create different angles, we need to understand the concepts of points, rays, lines, line segments, vertices, intersecting and parallel lines. Angles are ubiquitous and can have different sizes. 2. **Tools such as rulers and a protractor can help us to accurately describe angles by being able to measure lengths and angle measurements**. By utilizing more precise tools, we are able to determine more characteristics such as obtuse, right, and acute as well as find missing measurements.

What Students Will Know:	**What students will do:**	**Unit Specific Vocabulary:**
		protractor

• A line segment is part of a line, so it has a start point and an endpoint • A ray is different from a line segment, but like a segment, it is also part of a line • Lines typically have arrows at both ends, which represents that they go on in each direction • We can find examples of parallel and intersecting lines in our world–such as in the map of a neighborhood, the letters in an alphabet, some places in our classroom, and familiar logos • An angle is a geometric figure made up of two rays and share the same endpoint, which we refer to as the vertex of the angle • 360 degrees is the measurement of a full rotation of a ray about a fixed point. • A protractor is a tool of measurement that allows us to create angles of particular degrees • A 1-degree angle measures a turn through 1/360 of a circle • Intersecting lines that form 90 degree angles are perpendicular • We can classify angles by their size and can identify angles as acute or obtuse • 180 degrees is called a straight angle • An angle is not determined by the length of the segments that form it • Angles are additive	• Draw points, lines, and line segments, and identify them in geometric figures. • Draw points, lines, rays, and segments. • Identify points, lines, rays, and segments in geometric drawings. • Draw parallel and intersecting lines. • Identify parallel and intersecting lines. • Draw figures with parallel and intersecting lines. • Identify parallel and intersecting lines in figures and drawings. • Identify angles in two-dimensional figures. • Recognize angles as geometric figures that are formed wherever two rays share a common endpoint. • Compare angles in ways that make sense to students. • Reason about how to describe the size of angles. • Describe the size of an angle as a turn of one ray from the other. • Use the features of an analog clock to describe and compare the size of angles. • Use benchmark angle measurements to reason about and estimate the size of angles in degrees. • Recognize that 1 degree is a measurement of a turn through a full circle. • Use tools to measure angles. • Recognize that perpendicular lines meet or cross at a right angle. • Use a protractor to measure angles. • Use a protractor to draw angles of given measurements. • Draw acute and obtuse angles. • Identify acute, obtuse, right, and straight	**Academic vocabulary** acute angle angle intersecting lines line line of symmetry obtuse angle parallel lines perpendicular lines point ray right angle right triangle segment or line segment straight angle symmetry vertex

<table>
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- Angles are ever present on an analog clock
- We can use equations to reason about unknown angles

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angles in two-dimensional figures.

- Compose and decompose angles to determine their measurements.
- Draw angles of given measurements.
- Reason about angle measurements within a circle.
- Represent angle relationships and solve for unknown angle measurements.
- Draw and identify acute, obtuse, right, and straight angles in two-dimensional figures.
- Draw and identify points, lines, rays, segments, and parallel and intersecting lines in geometric figures.

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Entry Level Assessment and Connection to Unit:

Unit 7 Entry Level Assessment: Angles and Angle Measurement

Task: Accurately draw and label 3 geometric figures on a grid. Lastly, identify and defend reasoning for geometric figures using grade level appropriate vocabulary

Purpose: Student misconceptions may be identified as well as appropriate vocabulary needed for future lesson

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Unit Materials, Resources and Technology:

- **Unit 7 Teacher Guides**
- **Illustrative Mathematics**
- **Instructional Routines and Math Language Routines**
- **Grade 4 Glossary**
- **Required Materials**
- **IM en Español**
- **Pacing Guide and Dependency Diagrams K-5**.

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Opportunities for Interdisciplinary Connections:

See these Videos for connections to reading and language arts.
The Greedy Triangle
Sir Cumference and the Knight of Angleland

Explore interdisciplinary activities involving angles.
Angle Activities

Any links, attachments and resources:	**Planning Ideas:**
Instructional Routines Document Family Support Materials Unit 7	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

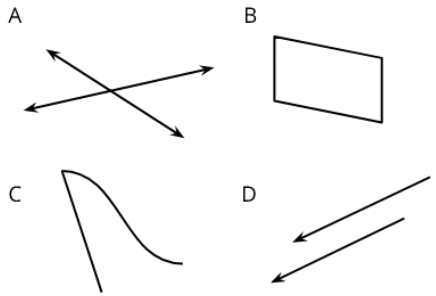
Topic # 1 (Section A)	Topic Name: Section A - *Points, Lines, Segments, Rays, and Angles*	Duration: 5 days (5 lessons)

Topic Description:

In this section, students are introduced to the building blocks of geometric figures and the language to describe them. Students start by describing images that contain lines for others to draw and drawing images relying only on others' descriptions. The experience motivates a need for more precise vocabulary to describe geometric parts. They learn to distinguish points as locations in space, rays as lines that are bounded by one point, and line segments as lines that are bounded by two points.
Students are familiar with lines that cross or intersect. Here, they identify and then draw parallel lines, lines that never intersect.

Students also learn that an angle is a figure that is made up of two rays that share the same endpoint, called the vertex of the angle. They then practice identifying angles, noticing that angles are ubiquitous around us and can have different sizes.

Decide if each figure shows at least one angle.



Section Learning Goals

- Draw and identify points, lines, rays, segments, and parallel and intersecting lines in geometric figures.
- Recognize that angles are formed wherever two rays share a common endpoint and identify angles in two-dimensional figures.

Competencies Addressed:	Essential Question and Enduring Understanding Addressed in this Topic:
● I can reason with shapes and classify them based on their properties (4.G.1) ● I can use my understanding of place value and properties of operations to add and subtract whole numbers (4.NS.3) ● I can use my understanding of place value and properties of operations to multiply and divide whole numbers (4.NS.4)	**Essential Question** What is an angle? **Enduring Understanding**

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<tr><td>

- I understand concepts of lines and angles and can apply them to solve real world and mathematical problems (4.MD.3)

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An angle is a geometric figure made up of two rays that share the same endpoint. Angles consist of points, rays, and a vertex. In order to create different angles, we need to understand the concepts of points, rays, lines, line segments, vertices, intersecting and parallel lines. Angles are ubiquitous and can have different sizes.

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In this Topic, students will know:

- A line segment is part of a line, so it has a start point and an endpoint
- A ray is different from a line segment, but like a segment, it is also part of a line
- Lines typically have arrows at both ends, which represents that they go on in each direction
- We can find examples of parallel and intersecting lines in our world–such as in the map of a neighborhood, the letters in an alphabet, some places in our classroom, and familiar logos
- An angle is a geometric figure made up of two rays and share the same endpoint, which we refer to as the vertex of the angle

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Topic Vocabulary:
Doing Math
Math Community

Academic vocabulary
Line of symmetry
Ray
Segment or line segment
Vertex

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In this Topic, students will be able to:

- Identify points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines
- Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines

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Plan for Student Reflection:

Student Journal Prompts and Reflection Practices

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Plan for Teacher Reflection:

- Reviewing formative assessments
- Developing scaffolds
- Collaborative scoring
- PLCs

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	● Planning for small groups **Teacher Reflecting Questions:** ● This is the first time students have formally encountered geometry in grade 4. What vocabulary did students bring to the lesson? How might you use their informal language to make formal connections in the next lesson? ● Who participated in math class today? Who did not participate and why might this be? How can you leverage each of your student's ideas to support them in being seen and heard in tomorrow's class? ● In the next unit, students will analyze and categorize two-dimensional figures based on whether they have parallel and perpendicular as attributes. How does this lesson prepare that upcoming work? ● What strategy did most students use in their work today? What strategy did you anticipate today? Which did you not anticipate? ● What was the best question you asked students today? Why would you consider it the best one based on what students said or did?

Topic 1 (Section A) Task Development

<table>
<tr><td>Task Title: Section A: Points, Lines, Segments, Rays, and Angles</td><td>Grade Level and Unit: Grade 4, Unit 7</td></tr>
<tr><td>Description of Task:
In this activity, students work with a partner to replicate images of angles. One partner describes the figure and the other draws based on the verbal descriptions. In this synthesis, students learn that an angle is a geometric figure that is made up of two rays that share the same endpoint. Students may also become aware that they need a clear way to describe the size of the figure. Save the chart that shows the words students use to describe angles during the activity to revisit in future lessons.</td><td>Purpose of Task:
The purpose of the activity is to draw students’ attention to how they use the vocabulary they have learned from previous lessons to describe the figures (MP6).</td></tr>
<tr><td>Background of Students/Learning Progression:
In earlier grades, students examined, described, compared, and contrasted attributes of two-dimensional figures. They may have used geometric terms such as point, line, and segment intuitively and informally.</td><td>Ensure all competencies are addressed in the task:

▢ Yes, all competencies are addressed
▢ No - Task needs modification</td></tr>
<tr><td colspan="2">Getting Started:
Show students the following image:

  </td></tr>
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Ask students, “What questions about lines, angles, or shapes can you ask about the picture?” Record students’ questions as they share with the class.

Learning Cycle Model
Section A

IM Lesson	L1: How Would You Describe These Figures?	L2: Points, Lines, Rays, and Segments	L3: Two or More Lines	L4: Points and Lines All Around	L5: What is an Angle?
Learning Cycle Model	**Making Meaning**	**Making Meaning**	**Investigation**	**Investigation**	**Create & Produce**
Naugatuck Math Competency	4.G.1	4.G.1 4.NS.3 4.NS.4	4.G.1	4.G.1	4.G.1 4.MD.3
Math Practice Standards	MP6	MP6	MP3 MP7	MP4 MP6	MP6
Lesson Purpose	The purpose of this lesson is to motivate the need for geometric language for describing and drawing images and to introduce points, lines, and segments.	The purpose of this lesson is for students to identify and draw lines, segments, and rays.	The purpose of this lesson is for students to identify and draw parallel and intersecting lines.	The purpose of this lesson is for students to practice identifying parallel and intersecting lines and drawing them.	The purpose of this lesson is to introduce angles and to motivate a need for vocabulary to describe what they are and their size.
Vocabulary Focus	Segment Lines Points	Segment Lines Points Rays	Intersecting Parallel	Segment Lines Intersecting Parallel	Angle Vertex
Lesson Materials/ Resources	Lesson 1 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Chart paper to create poster for synthesis ● Index cards (4 per group) ● Each student needs a ruler or straightedge ● Each group of two needs four sets of Do You See What I see?	Lesson 2 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Each group of 2 needs one set of Card Sort: Who Am I? **Activity 2:** ● Each student needs a ruler	Lesson 3 Slides Teacher Presentation Materials Student Pages **Activities 1 and 2:** ● Each student needs a ruler Synthesis: ● Each student needs a copy of Word Wall Graphic Organizer (save for future lessons)	Lesson 4 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Display charts from prior lessons ● Each student needs their personal word walls (lesson 3) ● Each student needs a ruler	Lesson 5 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Each group fo two needs one set of Tricky Figures **Activity 3:** ● Each student needs a ruler

	Activity 2: ● Each student needs a ruler **Cool-down: Lines and More**	**Cool-down: True or False: What's the Point?**	**Cool-down: Parallel and Not Quite Parallel**	**Activity 2:** ● Each student needs a ruler **Cool-down: Word Fun**	**Cool-down: Spot the Angles**
Assessment	**Formative Assessment Strategies: observation, questioning, student discourse.** **See Section A Checkpoint , Section A Checkpoint Teacher Guide**				
					Section A Practice Problems
Centers Materials	Rolling for Fractions (3-5), Stage 2: Multiply a Fraction by a Whole Number (Supporting) Compare (1-5), Stage 7: Multi-digit Operations (Supporting)	Rolling for Fractions (3-5), Stage 2: Multiply a Fraction by a Whole Number (Supporting) Compare (1-5), Stage 7: Multi-digit Operations (Supporting)	Rolling for Fractions (3-5), Stage 2: Multiply a Fraction by a Whole Number (Supporting) Compare (1-5), Stage 7: Multi-digit Operations (Supporting)	Target Measurements (2-5), Stage 4: Degrees (Addressing) Compare (1-5), Stage 5: Fractions (Supporting)	Target Measurements (2-5), Stage 4: Degrees (Addressing) Compare (1-5), Stage 5: Fractions (Supporting)

Making Meaning:

Lesson 1 serves two goals. The first is to elicit the language students have for talking about geometric figures, motivating a need to develop more precision in using geometric terminology (MP6). The second is to enable students to see that a line segment is a part of a line, so it has a start point and an endpoint. The cool-down for this lesson is designed to determine the types of words students use to describe figures. Students may choose to use informal or formal language.

In the next lesson, students will encounter the formal definitions of these geometric terms, but for now, the aim is simply to engage them in noticing and drawing these geometric figures. It is not necessary to expect students to distinguish between line segments and lines in this lesson.

In Lesson 2, students begin to connect points, lines, and line segments with formal definitions. They also encounter rays and learn that a ray is different from a line segment, but, like a segment, it is also a part of a line. The first activity, a Card Sort, encourages students to look for these distinctions.

In the second activity, students draw segments and rays that form other shapes and figures. An isometric dot paper is used for drawing to reinforce the idea of segments and rays having endpoints.

To support students with the vocabulary in this unit, consider making time for them to build a personal illustrated "word wall" at the end of each lesson in which new terms are introduced. Allow a few minutes for students to add new terms, illustrations, and definitions in their own words to an organizer as shown in the blackline master.

Lesson 1: How Would You Describe These Figures?

- The purpose of this lesson is to motivate the need for geometric language for describing and drawing images and to introduce points, lines, and segments.
- Teacher Presentation Materials
- Lesson 1 Slides

Lesson 2: Points, Lines, Rays, and Segments

- The purpose of this lesson is for students to identify and draw lines, segments, and rays.
- Teacher Presentation Materials
- Lesson 2 Slides

Investigation:

In previous lessons, students identified and drew rays, lines, and segments. In Lesson 3, they turn their attention to lines that intersect, or cross, and those that never do.

In the first activity, students draw two kinds of quadrilaterals, one of which is a rectangle. The task motivates them to consider the relationship between lines—whether they would intersect at some point or never. Students are introduced to parallel lines in this context. Lines typically have arrows at both ends, which represents that they go on in each direction. In this unit, arrows are at the ends of lines when it is important that students distinguish lines from segments and other features.

In the second activity, students draw parallel and intersecting lines. They also practice constructing an argument for how they know that two lines are parallel (MP3). In an upcoming unit, students will classify shapes based on whether they have parallel and perpendicular sides.

To support students with the new vocabulary in this lesson, consider making time for them to add to their "word wall" during the lesson synthesis. Allow a few minutes for students to add new terms, illustrations, and definitions in their own words to an organizer as shown in the blackline master.

In Lesson 4, students identify parallel and intersecting lines in the world around them—in a map of a neighborhood, in the letters of the alphabet, in some part of their classroom, and in familiar logos. They apply their understanding to represent and draw a part of their environment that shows such lines and to create a new logo with these types of lines. The synthesis of this lesson further highlights the presence and necessity of parallel and intersecting lines in real life.

In future lessons, students will use their understanding of lines that intersect to talk about angles.

Lesson 3: Two or More Lines

- The purpose of this lesson is for students to identify and draw parallel and intersecting lines.
- Teacher Presentation Materials
- Lesson 3 Slides

Lesson 4: Points and Lines All Around

- The purpose of this lesson is for students to practice identifying parallel and intersecting lines and drawing them.
- Teacher Presentation Materials
- Lesson 4 Slides

Create and Produce:

In this lesson, students are introduced to angles. They learn that an angle can be defined in terms of the geometric parts they have been working with in this unit.

In previous grades, students have used "square corners" to describe right angles within two-dimensional shapes. They may have considered an angle as the space within a square corner or the "pointy" corner itself. Here, students learn that an angle is a geometric figure made up of two rays that share the same endpoint, which we refer to as the vertex of the angle.

Throughout the lesson, students use the vocabulary they have developed to describe other geometric figures to identify and describe angles. Monitor for the ways students reason about how to describe the size of angles. Students will compare and measure angles in future lessons.

Lesson 5: What is an Angle?

- The purpose of this lesson is to introduce angles and to motivate a need for vocabulary to describe what they are and their size.
- Teacher Presentation Materials
- Lesson 5 Slides

Communicate and Present:

- "How are the two drawings on each card the same?" (They each have 2 rays. The rays start at the same point. One ray is pointing in the same direction in both drawings.)
- "How are they different?" (The rays are pointing in different directions on some cards. The rays are farther apart in some cards.)
- "How did you describe what you saw? What terms did you use to help you describe the directions of the rays?" (We tried to explain by describing the hands on a clock. We tried using words like north, south, east, and west. We described them in relation to vertical and horizontal.)
- As students share responses, update the display, by adding (or replacing) language, diagrams, or annotations.
- Remind students to borrow language from the display as needed.
- "Did anyone use the term 'angle?' Did anyone measure something or use measurements?"
- "The figures that you drew are angles. An angle is a figure that is made up of two rays that share the same endpoint."
- "The point where the two rays meet is called the vertex of the angle."

Reflection:

"Today we learned that an angle is a figure made up of two rays that share the same endpoint, and that the shared point is the vertex of the angle."

"Use the words 'sometimes', 'always', or 'never' to respond to each statement about angles and lines:"

- "Intersecting lines form angles." (Always, because they make rays that share the same endpoint.)
- "Parallel lines can form angles." (Never, because they will never meet or share a point.)
- "Angles can be formed by curves." (Never, because a ray is a part of a line, which is always straight.)

"In upcoming lessons, we'll learn more about how to describe angles and how to measure them."

"Take 1–2 minutes to add the new words from today's lesson to your word wall. Share your new entries with a neighbor and add any new ideas you learn from your conversation."

Notes:

Complete File with Resources and Task:

Task-Based Learning Plan Format for Topic 1

Topic # 2 (Section B)	Topic Name: Section B - The Size of Angles	Duration: 6 days (6 lessons)

Topic Description:

Section Learning Goals

- Recognize that angles can be measured in degrees, and can be found using addition and subtraction.
- Use a protractor to measure and draw angles, and recognize that perpendicular lines meet or cross at a right angle.

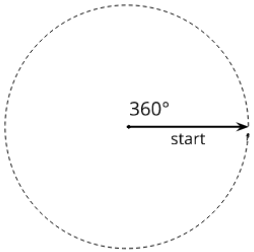
In this section, students learn two main ideas: that angles can be measured, with degrees as the unit of measurement, and that angles can be composed and decomposed, and are therefore additive. They also learn to use a protractor to measure and draw angles.

Students begin by comparing angles visually and exploring ways to describe their size. They then try to describe angles made by the hour and minute hands of an analog clock, using the numbers and tick marks on the clock or units of time to quantify the size of angles. This experience reinforces the idea of an angle as a figure formed when a ray rotates around a vertex shared with another ray. It also motivates the need for a more precise unit for measuring angles.

Students learn that a ray that makes a full turn around a point makes a 360º angle. Decomposing this angle into halves gives a 180º angle. Half of that angle is a 90º angle or a right angle. Composing three 90º angles gives a 270º angle.

Students then use these benchmark angles to estimate and measure the sizes of other angles. For example, decomposing a right angle into halves gives 45º angles. Composing three copies of a 45º angle makes a 135º angle, and so on.

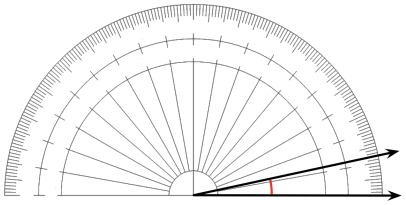
Students also learn that angles are formed by perpendicular lines.



Later, students make sense of a 1 degree angle and see that it is 1/360 of a full turn. They use a protractor and 1 degree as a unit for measuring and drawing angles of all sizes.

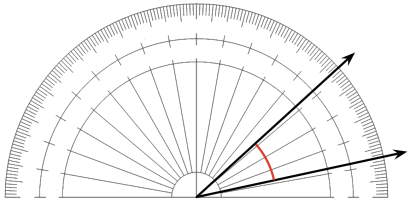
How many degrees is this angle?

Explain how you know.



An angle contains thirty 1° angles, as shown.

How many degrees is this angle?



Throughout the section, students build their understanding of angles of different sizes using tactile tools such as paper cutouts and patty paper, and by folding, cutting, marking, and assembling pieces of paper.

Competencies Addressed:

- I can reason with shapes and classify them based on their properties (4.G.1)
- I can use my understanding of place value and properties of operations to multiply and divide whole numbers (4.NS.4)
- I understand concepts of lines and angles and can apply them to solve real world and mathematical problems (4.MD.3)

Essential Question and Enduring Understanding Addressed in this Topic:

Essential Question

How can we accurately describe angles?

Enduring Understanding

Tools such as rulers and a protractor can help us to accurately describe angles by being able to measure lengths and angle measurements. By utilizing more precise tools, we are able to determine more characteristics such as obtuse,

<table>
<tr><td></td><td>right, and acute as well as find missing measurements.</td></tr>
<tr><td>In this Topic, students will know:
360 degrees is the measurement of a full rotation of a ray about a fixed point.
A protractor is a tool of measurement that allows us to create angles of particular degrees
A 1-degree angle measures a turn through 1/360 of a circle
Intersecting lines that form 90 degree angles are perpendicular</td><td>Topic Vocabulary:
Doing Math
Math Community

Academic vocabulary
Perpendicular lines
Right Angle</td></tr>
<tr><td rowspan="2">In this Topic, students will be able to:
Use a protractor to measure and draw angles, and recognize that perpendicular lines meet or cross at a right angle.</td><td>Plan for Student Reflection:

Student Journal Prompts and Reflection Practices</td></tr>
<tr><td>Plan for Teacher Reflection:
Reviewing formative assessments
Developing scaffolds
Collaborative scoring
PLCs
Planning for small groups
Reflecting Questions
In today’s lesson, students had the opportunity to compare angles using the language that makes sense to them. What language did they use to describe the size of angles? How can you build on this language in the next lesson when</td></tr>
</table>

	the size of an angle is described as a turn from one ray from the other? ● What student questions about angles or angle measurement were addressed in this lesson? What can you do to help students refine their emerging understanding of angle measurement or resolve any questions that were not answered? ● How did students connect the angles they created in the second activity to the fractions of a circle? How can you help students make connections between degrees and a fraction of a circle in upcoming lessons? ● The first two activities offered opportunities for students to take multiple solution paths. Were all unique perspectives or strategies heard? Which students were able to share their ideas? Which didn't get a chance? How can their voices be added into the conversation tomorrow? ● In the past few lessons, students may have made assumptions (correct or incorrect) about angle sizes based on their appearance. In this lesson, they may have done the same when looking for perpendicularity. What questions can you ask, or what instructional moves can you consider, to encourage students to check their assumptions? ● What were some of the challenges students encountered when measuring and drawing angles? What support might help students overcome those hurdles?

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: The Size of Angles	**Grade Level and Unit: Grade 4, Unit 7**
Description of Task: In this activity, students continue to draw angles but with less guidance (compared to the first activity in the lesson). For each drawing, students are given only a range of angle measurements and no other criteria. After drawing, students trade their cards and use a protractor to measure and check one another's angles.	**Purpose of Task:** Through this activity, students will develop critical thinking skills due to the lack of guidance given when being asked to create angles. Through the little guidance, students will need to make decisions on where the vertex of the angle should be, how the first ray or line should be oriented, and so on. This activity promotes problem-solving as well as integrates key aspects discussed in the unit thus far.
Background of Students/Learning Progression: In previous lessons, students identified and described lines, line segments, rays, and angles in geometric and real-world contexts.	**Ensure all competencies are addressed in the task:** ▢ Yes, all competencies are addressed ▢ No - Task needs modification
Getting Started: To reinforce previously learned concepts, utilize the following warmup. Display the image on the board:	

With a partner, ask students to discuss, “Where do you see parallel and perpendicular lines? Where do you see acute, obtuse, and right angles?” After several minutes, ask students to share out with the class. As students are sharing, record their responses.

Learning Cycle Model:
Section B

IM Lesson	L6: Compare and Describe Angles	L7: The Size of Angles on a Clock	L8: The Size of Angles in Degrees	L9: Use a Protractor to Measure Angles	L10: Angle Measurement and Perpendicular Lines	L11: Use a Protractor to Draw Angles
Learning Cycle Model	**Making Meaning**	**Making Meaning**	**Making Meaning**	**Investigation**	**Investigation**	**Create & Produce**
Naugatuck Math Competency	4.G.1 4.MD.3	4.MD.3	4.MD.3	4.NS.4 4.MD.3	4.NS.4 4.MD.3 4.G.1	4.MD.3 4.G.1
Math Practice Standards	MP3 MP7	MP6	MP7	MP6	MP6 MP7	MP6
Lesson Purpose	The purpose of this lesson is for students to consider ways to compare angles and describe the size of angles.	The purpose of this lesson is for students to describe the size of an angle as a turn of one ray to the other.	The purpose of this lesson is for students to understand that angles can be measured in degrees and use benchmark	The purpose of this lesson is for students to understand as a measurement of a turn through a circle and to	The purpose of this lesson is for students to practice using a protractor to measure angles and to learn that lines that intersect	The purpose of this lesson is for students to use a protractor to draw angles of given measurements.

			angle measurements to make sense of the new unit.	use a protractor to measure angles.	at a right angle are perpendicular lines.	
Vocabulary Focus	Angle	Angle	Angle Degree Right Angle	Angle Protractor	Angle Protractor Perpendicular	Angle
Lesson Materials/ Resources	Lesson 6 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Create a set of cards from the blackline master (Card Sort: Angles) for each group of 2 students **Activity 2:** ● Make sure each group of 2 has the angle cards from the previous activity ● Make patty paper available, if requested **Cool-down: Compare Two Angles**	Lesson 7 Slides Teacher Presentation Materials Student Pages **Warm-Up:** ● Utilize patty paper to demonstrate equal-size angles during the synthesis **Activity 1:** ● Give students access to rulers or straightedges **Cool-down: Which Angle is Larger? By How Much?**	Lesson 8 Slides Teacher Presentation Materials Student Pages **Activity 2:** ● Create a paper half-circle from the blackline master for each student (Making a Measuring Tool) ● Give students access to rulers or straightedges **Cool-down: Estimate Angle Size in Degrees**	Lesson 9 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each student a protractor **Cool-down: Measure the Angles**	Lesson 10 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each student a protractor and access to rulers or straightedges **Activity 2:** ● Prepare at least 2 pieces of paper (or sticky notes) for each student ● Give each student colored pencils and access to straightedges or rulers **Cool-down: Size Up Angles**	Lesson 11 Slides Teacher Presentation Materials Student Pages **Activity 1:** ● Give each student a protractor and access to rulers or straightedges **Activity 2:** ● Give each student one protractor and 4 blank (unlined) index cards ● Give students access to rulers or straightedges *Save student angle cards for Lesson 12 **Cool-down: A Ray or Two**
Assessment	**Formative Assessment Strategies: observation, questioning, student discourse.** **Checkpoint B , Checkpoint B Teacher Guide**					
						Section B Practice Problems
Centers Materials	Compare (1-5), Stage 5: Fractions (Supporting) Target Measurements	Compare (1-5), Stage 5: Fractions (Supporting) Target Measurements	Compare (1-5), Stage 5: Fractions (Supporting) Target Measurements	Target Measurements (2-5), Stage 4: Degrees (Addressing)	Target Measurements (2-5), Stage 4: Degrees (Addressing)	Target Measurements (2-5), Stage 4: Degrees (Addressing)

	(2-5), Stage 4 Degrees (Addressing)	(2-5), Stage 4 Degrees (Addressing)	(2-5), Stage 4 Degrees (Addressing)	Compare (1-5), Stage 5: Fractions (Supporting)	Compare (1-5), Stage 5: Fractions (Supporting)	Compare (1-5), Stage 5: Fractions (Supporting)

Making Meaning:

In previous lessons, students identified and described lines, line segments, rays, and angles in geometric and real-world contexts. The purpose of the exploratory work in Lesson 6 is for students to make sense of which attributes define an angle (rays at a common endpoint) and which attributes do not (length of the line segments). The activities in the lesson intentionally elicit students' ideas for how to describe an angle's size.

Throughout the lesson, monitor for the ways students distinguish visible line segments from the rays that compose the angles and the language they use to describe the size of angles.

In Lesson 7, students use an analog clock as a tool to describe the size of angles. They begin by using the clock to help describe how to draw a given angle, which involves describing the positions of the two hands of the clock. This work encourages students to relate the turning of the hands in a circular arc to the turning of rays of an angle around their shared endpoint.

Students then use language that suggests rotational movement to describe and compare the size of angles on a clock. To describe whether an angle is greater or smaller than another, they reference the amount of turn made by one or both rays. Students will connect the ideas developed in this lesson to the standard measurement of an angle (in degrees) in subsequent lessons.

In Lesson 8, students learn about degrees as a unit for measuring angles. In the first activity, students are introduced to 360 degrees as the measurement of a full rotation of a ray about a fixed point. They use this to interpret and describe other benchmark angle measurements (90, 180, 270). They then use these benchmarks to estimate and sketch new angles with given measurements in degrees.

Next, students use these reference angles to create an angle measurement tool from paper. They partition the straight angle of a semi-circle into smaller angles by folding. In doing so, they draw from their experience with the clock, where each hour or each minute can be thought of as equal-size parts around the center point of the clock.

Throughout the lesson, listen for the way students make connections to their work with clocks and to their understanding of fractions of a circle as they reason about how to estimate and sketch angles in degrees using an understanding that a full rotation is 360 degrees.

Lesson 6: Compare and Describe Angles

- The purpose of this lesson is for students to consider ways to compare angles and describe the size of angles.
- Teacher Presentation Materials
- Lesson 6 Slides

Lesson 7: The Size of Angles on a Clock

- The purpose of this lesson is for students to describe the size of an angle as a turn of one ray to the other.
- Teacher Presentation Materials
- Lesson 7 Slides

Lesson 8: The Size of Angles in Degrees

- The purpose of this lesson is for students to understand that angles can be measured in degrees and use benchmark angle measurements to make sense of the new unit.
- Teacher Presentation Materials
- Lesson 8 Slides

Investigation:

Before these lessons, students have compared and measured angles using informal tools (analog clocks) and reference angles, all of which were multiples of 5 degrees or multiples of 10 degrees. In Lesson 9, students transition to measuring angles in units of 1 degree.

Students then make sense of one-degree angles in terms of a fraction of a 360 degree turn and are introduced to the protractor as a tool of measurement. They make sense of the numbers on the tool and how 1 degree angles are shown. They learn to read the measurement of angles whose vertices have been pre-aligned to the center point of a protractor.

Students will continue to add new vocabulary to their personal word walls.

In Lesson 10, students practice using a protractor to measure a variety of angles—angles formed by rays or line segments and those that are in other two-dimensional figures. Students consider how to position the tool, which set of numbers to use, and whether their measurements make sense.

Next, students are prompted to fold paper to create two lines that form right angles. They learn that intersecting lines that form 90 degree angles are perpendicular. They then practice identifying perpendicular lines and segments.

Lesson 9: Use a Protractor to Measure Angles

- The purpose of this lesson is for students to understand as a measurement of a turn through of a circle and to use a protractor to measure angles.
- Teacher Presentation Materials
- Lesson 9 Slides

Lesson 10: Angle Measurement and Perpendicular Lines

- The purpose of this lesson is for students to practice using a protractor to measure angles and to learn that lines that intersect at a right angle are perpendicular lines.
- Teacher Presentation Materials
- Lesson 10 Slides

Create and Produce:

In earlier lessons, students reasoned about angle measurements, learned to use a protractor, and measured given angles. They have sketched angles by referring to clock faces and sketched estimates of angles of a given size based on benchmark angles.

In this lesson, students use a protractor to draw angles of specified measurements (not limited to benchmark angles) and to verify the size of angles in their peers' drawings. They begin to use known angle measurements to reason about unknown measurements and notice relationships between the measurements of angles that share a common endpoint.

Lesson 11: Use a Protractor to Draw Angles

- The purpose of this lesson is for students to use a protractor to draw angles of given measurements.
- Teacher Presentation Materials
- Lesson 11 Slides

Communicate and Present:

- Invite students to share 1–2 examples of an angle that meets each requirement.
- Consider asking:
  - "Can you tell just by looking that this angle is _____?"
  - "If you say yes, explain."
  - "If you say no, what would you need to make sure it is _____?"

Reflection:

"Today we used protractors to draw angles of different sizes and to check one another's drawings."

"What were some challenges in drawing angles precisely?" (Some possible challenges:

- The distance between the closest tick marks, showing 1 degree angles, is very small. It's easy to misread the marks.
- If the first ray is not lined up correctly at 0 degrees or 180 degrees, or if the vertex is not

	lined up exactly at the center point of the protractor, then the created angle would be off.) “In the last activity, you drew a bunch of angles, some smaller, some larger. Did you find some sizes of angles easier to draw than others? Why or why not?” “If we were explaining to a classmate how to use a protractor to measure angles, what should we say?”
Notes:	**Complete File with Resources and Task:** Unit 7 Tasked-Based Learning Plan Topic 2

Topic # 3 (Section C)	Topic Name: Section C - Angle Analysis	Duration: 5 days (5 lessons)

Topic Description:

Section Learning Goals

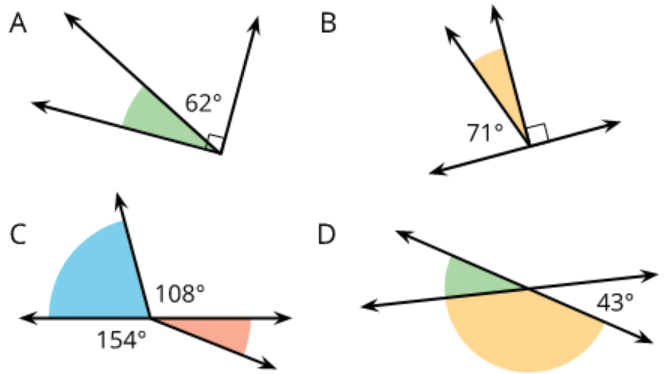
- Draw and identify acute, obtuse, right, and straight angles in two-dimensional figures.
- Write equations to represent angle relationships and reason about and find unknown measurements.

In this section, students continue to draw and analyze angles and reason about their measurements.

They first classify angles by their size and identify acute, obtuse, and straight angles. Then, they further develop the idea that an angle is additive by composing and decomposing angles, using tactile tools and drawings, and writing expressions or equations to support their reasoning.

Students solve problems about angles in different contexts, both concrete and abstract. They use their understanding of right angle and straight angle to reason about unknown angle measurements.

Find the measurement of each shaded angle. Show how you know.



Competencies Addressed:	Essential Question and Enduring Understanding Addressed in this Topic:
● I understand concepts of lines and angles and can apply them to solve real world and	

<table>
<tr>
<td>mathematical problems (4.MD.3)
● I can reason with shapes and classify them based on their properties (4.G.1)</td>
<td>Essential Question
How can we accurately describe angles?

Enduring Understanding
Tools such as rulers and a protractor can help us to accurately describe angles by being able to measure lengths and angle measurements. By utilizing more precise tools, we are able to determine more characteristics such as obtuse, right, and acute as well as find missing measurements.</td>
</tr>
<tr>
<td>In this Topic, students will know:
● We can classify angles by their size and can identify angles as acute or obtuse
● 180 degrees is called a straight angle
● An angle is not determined by the length of the segments that form it
● Angles are additive
● Angles are ever present on an analog clock
● We can use equations to reason about unknown angles</td>
<td>Topic Vocabulary:
Doing Math
Math Community

Academic vocabulary
Right Angle
Acute Angle
Obtuse Angle
Straight Angle</td>
</tr>
<tr>
<td rowspan="2">In this Topic, students will be able to:
● Draw and identify acute, obtuse, right, and straight angles in two-dimensional figures.
● Write equations to represent angle relationships and reason about and find unknown measurements.</td>
<td>Plan for Student Reflection:

Student Journal Prompts and Reflection Practices</td>
</tr>
<tr>
<td>Plan for Teacher Reflection:

● Reviewing formative assessments
● Developing scaffolds</td>
</tr>
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- Collaborative scoring
- PLCs
- Planning for small groups

Reflecting Questions

- Before this point, students have had experiences of sorting mathematical objects relative to some benchmarks. In this lesson, angles are categorized by their size and relative to two benchmarks: 90º and 180º. How readily did students conceptualize angles this way? Which past experiences of classifying objects would help to make this idea more intuitive?
- The work of finding angle measurements in this lesson offered opportunities to reason about equal groups. Did you hear students use this type of reasoning? What were some other ways students reasoned about the angle sizes?
- How did students' understanding about time—how to tell time and find elapsed time—help their work with angles on the clock?
- As you finish up this unit, reflect on the norms and activities that have supported students' development as thinkers. How have students grown in their ability to reason more abstractly and logically? What instructional strategies or routines worked well in supporting this development? What will you continue to do and improve on in Unit 7, and what will you adjust?
- Which students had opportunities to

	share their diagrams and thinking during the whole-class discussion? How did you select these students?

Topic 3 (Section C) 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 3 - Section C: Angle Analysis	**Grade Level and Unit: Grade 4, Unit 7**
Description of Task: In this task, students have the opportunity to practice drawing and describing figures with points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.	**Purpose of Task:** Students draw two-dimensional figures and then describe it to their partner. Their partner attempts to draw the figure without seeing it, making it important to use precise language to communicate important features of the figure (MP6).
Background of Students/Learning Progression: In previous lessons, students learned to measure angles and draw angles of given measurements. They saw that a 90 degree angle is called a right angle and is formed by two perpendicular lines. Students are also familiar with some benchmark angle measurements.	**Ensure all competencies are addressed in the task:** ▢ Yes, all competencies are addressed ▢ No - Task needs modification
Getting Started: Display the following image to the class: 	

Ask students, “Describe the angles you see in the letters M and E in the picture. How many, or about how many, degrees is each angle?” As students share, record their responses.

Learning Cycle Model:
Section C

IM Lesson	L12: Types of Angles	L13: Find Angle Measurements	L14: Reasoning about Angles (Part 1)	L15: Reasoning about Angles (Part 2)	L16: Guess the Figure (optional)
Learning Cycle Model	**Make Meaning**	**Investigation**	**Investigation**	**Investigation**	**Create & Produce**
Naugatuck Math Competency	4.G.1 4.MD.3	4.MD.3	4.MD.3	4.G.1 4.MD.3	4.G.1
Math Practice Standards	MP7	MP7	MP6	MP1 MP6 MP7	MP6
Lesson Purpose	The purpose of this lesson is for students to classify angles as acute, obtuse, and straight, and to identify and draw acute and obtuse angles.	The purpose of this lesson is for students to find unknown angle measurements by composing or decomposing known measurements, and to see that an angle is not determined by the length of the segments that form it.	The purpose of this lesson is twofold: for students to use known angles to reason about unknown angles on a clock, and for them to practice drawing angles of given measurements.	The purpose of this lesson is to use known angles to reason about unknown angles and write equations to reason about unknown angles.	The purpose of this lesson is for students to apply their understanding of geometric figures and measurements to draw, describe, and identify two-dimensional figures.
Vocabulary Focus	Angle Acute Angle Obtuse Angle Straight Angle Right Angle	Angle	Angle	Angle	Ray Line Segment Acute Angle Obtuse Angle Straight Angle Right Angle Perpendicular Parallel
Lesson Materials/ Resources	Lesson 12 Slides Teacher Presentation Materials Student Pages	Lesson 13 Slides Teacher Presentation Materials Student Pages	Lesson 14 Slides Teacher Presentation Materials Student Pages	Lesson 15 Slides Teacher Presentation Materials Student Pages	Lesson 16 Slides Teacher Presentation Materials Student Pages

	Activity 1: ● Each students needs their angle cards from L11 ● Use same partners as L11 **Activity 2:** ● Each student needs a protractor **Activity 3:** ● Each group of 2 students need access to protractors and pattern blocks **Cool-down: Obtuse, Acute, and Straight Angles**	**Activity 1:** ● Each student needs 2 pieces of patty paper ● Each group of 2 needs a copy of How Big Are These Angles? **Activity 2:** ● Each student needs one sheet of origami paper **Cool-down: Sets of Three Angles**	**Activity 1:** ● Each student needs one protractor and a straightedge or a ruler. **Activity 2:** ● Each student needs a protractor **Cool-down: One Angle at a Time**	**Activity 1:** ● Each group of 2 needs a set of Info Gap: Whole Bunch of Angles **Cool-down: Heart to Heart**	**Activity 1:** ● Each group of 2 needs a set of Make a Change **Activity 2:** ● Students need rulers or straightedges
Assessment	**Formative Assessment Strategies: observation, questioning, student discourse** **See Section C Checkpoint , Section C Checkpoint Teacher Guide** **End-of-Unit Assessment , End-of-Unit Assessment Teacher Guide**				
					Section C Practice Problems
Centers Materials	Which One? (K-5), Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? (1-5), Stage 4: Area and Perimeter (Supporting)	Target Measurements (2-5), Stage 4: Degrees (Addressing) Compare (1-5), Stage 5: Fractions (Supporting)	Which One? (K-5), Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? (1-5), Stage 4: Area and Perimeter (Supporting)	Which One? (K-5), Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? (1-5), Stage 4: Area and Perimeter (Supporting)	Which One? (K-5), Stage 4: Grade 3 Shapes (Supporting) Can You Draw It? (1-5), Stage 4: Area and Perimeter (Supporting)

Making Meaning

In this lesson, students classify angles by their size and identify angles as acute or obtuse in a variety of contexts. Students also learn that a 180 degree angle is called a straight angle.

Lesson 12: Types of Angles

- The purpose of this lesson is for students to classify angles as acute, obtuse, and straight, and to identify and draw acute and obtuse angles.
- Teacher Presentation Materials

- Lesson 12 Slides

Investigation:

In Lesson 13, students use tactile tools to find angle measurements and observe more clearly that angles are additive. They compose and decompose angles by arranging paper cutouts, by folding paper or tracing, and by drawing diagrams. Students arrange smaller angles whose sizes are unknown into larger angles with familiar sizes and features (90 degrees, 180 degrees, and 360 degrees). Once the measurement of an angle is known, they use it to find those of other angles. For example, if two copies of angle x form a right angle, angle x must be 45 degrees. If another angle, z, can be decomposed into three of these 45 degree angles, then z must be 135 degrees.

Encourage students to continue to collect, define, and illustrate new terms to support communication and reasoning at the end of each lesson.

Angles are ever present on an analog clock. In Lesson 14, students investigate and solve problems about the angles formed by a clock's hour and minute hands. Students reason about the number of degrees between the two hands or the number of degrees the minute hand has turned over some specified time. To do so, students rely on their understanding of fractional parts (for example, a round clock can be divided into 12 and 60 equal parts), their ability to tell time and elapsed time, and their knowledge of angle types and measurements.

In Lesson 15, students use what they know about angles and their measurements to solve problems that are increasingly more complex and abstract. To find measurements of unknown angles, students need to look for structure in the diagrams, reason about the relationships of the angles (including writing equations to represent the relationships), and perform addition, subtraction, and sometimes division.

The problems in the lesson can be solved in more than one way and in different orders, but a small handful of the angles can only be quantified after the values of some other angles are known. Students pay attention to the process and explain why sometimes a certain sequence is necessary.

Lesson 13: Find Angle Measurements

- The purpose of this lesson is for students to find unknown angle measurements by composing or decomposing known measurements, and to see that an angle is not determined by the length of the segments that form it.
- Teacher Presentation Materials
- Lesson 13 Slides

Lesson 14: Reasoning about Angles (Part 1)

- The purpose of this lesson is twofold: for students to use known angles to reason about unknown angles on a clock, and for them to practice drawing angles of given measurements.
- Teacher Presentation Materials
- Lesson 14 Slides

Lesson 15: Reasoning about Angles (Part 2)

- The purpose of this lesson is to use known angles to reason about unknown angles and write equations to reason about unknown angles.
- Teacher Presentation Materials
- Lesson 15 Slides

Create and Produce:

This lesson is optional because it does not address any new mathematical content standards. This lesson does provide students with an opportunity to apply precursor skills of mathematical modeling.

In the first activity, students practice using the geometric vocabulary they acquired during the unit to describe changes they notice in a given figure. In the second activity, students first draw a two-dimensional figure and then describe it to a partner without showing it to them. The partner attempts to draw the figure based solely on the description. Students have an opportunity to compare the original and drawn figure.

Lesson 16: Guess the Figure

- The purpose of this lesson is for students to apply their understanding of geometric figures and measurements to draw, describe, and identify two-dimensional figures.
- Teacher Presentation Materials
- Lesson 16 Slides

Communicate and Present:

- Invite previously selected students to share.
- "What would have helped your partner make a more accurate drawing?" (If I described the measure of the angle, measure of the line segment, the location, a grid, using a straight edge)

Reflection:

"Today, we described and drew two-dimensional figures."

"In this unit, we learned about different geometric features and measurement of two-dimensional figures.

	What are the most important things to remember about what we learned?" (Students may mention different vocabulary, how to measure angles with a protractor, and types of angles they learned in this unit.)
Notes:	**Complete File with Resources and Task:** Grade 4 Unit 7 Task-Based Learning Plan Topic 3