



Unit Plan

Angles & Angle Measurement

Chester / Littleville Elementary / Grade 4 / Mathematics

[^](#) Week 29 - Week 32 | 5 Curriculum Developers | Last Updated: Mar 20, 2024 by LeBlanc, Deanna

[Style Guide](#)

What is the purpose of the unit? What are the major take-aways?

Standards

MA: Mathematics (2017)

MA: Grade 4

Number & Operations in Base Ten

4.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic of whole numbers less than or equal to 1,000,000.

- 4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
- 5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- 6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Measurement & Data

4.MD Geometric measurement: understand concepts of angle and measure angles.

- 7. 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.
- 5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
 - 5a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles.
 - 5b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
- 6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

Geometry

4.G Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

- 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
- 2. 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.

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Enduring Understandings

1. Angles are fundamental geometric constructs that arise from the meeting of two rays with a shared endpoint, known as the vertex, which can be quantified through measurement.
2. Understanding angles involves recognizing their presence in various forms and contexts, such as in objects, shapes, or the turning of an object, and recognizing that they are a measure of rotation.
3. Angle measurement is based on the concept of dividing a circle into 360 equal parts, where each part represents a degree; thus, allowing students to grasp that degrees quantify the amount of turn or opening between two rays.
4. The process of measuring angles with a protractor or by estimation reinforces the connection between geometrical figures and number sense, and the skills necessary for accurate measurement are built upon the foundational understanding of fractions and division of a circle.
5. Students will learn that angles are a practical component of mathematics that relate to various real-life contexts, such as construction, navigation, and technology, emphasizing the importance of accurate measurement and computation.
6. The concepts of adding, subtracting, multiplying, and dividing whole numbers are applicable in the context of angle measurement, where students may need to calculate angle measures by applying these arithmetic operations.
7. Mastery of angle measurement not only relies on an understanding of geometrical concepts but also on the procedure of correctly applying measurement tools and numerical operations, reinforcing the interrelatedness of arithmetic and geometry.
8. Recognizing the relationship between the different parts of a circle and angles can lead to a deeper understanding of angle measurement, aiding the visualization and comparison of different angles.
9. Through exploration and practice, students come to comprehend that angles are a type of measurement that, similar to length or weight, can be calculated precisely using mathematics, thereby expanding their ability to describe and analyze the shapes and patterns they encounter.

Essential Questions

1. How can we use addition and subtraction to solve problems involving the measurement of angles and their sums?
2. In what ways do multiplication and division help us understand the relationships between different angles?
3. How can angles be compared or added together using knowledge of whole numbers and arithmetic operations?
4. Why do we measure angles, and how does angle measurement relate to everyday life?
5. What is an angle, and how can we describe its size in a way that others can understand?
6. How is the concept of a circle relevant to measuring angles, and what does a degree tell us about an angle's rotation?
7. How can we illustrate angle measurements using visual models, such as circular arcs, and how do these models help us understand the size of an angle?
8. How do multiplication and division connect to the process of figuring out how many degrees are in an angle or finding the measure of an angle from a given part of a circle?
9. Can we predict the measure of an angle if we know certain properties of the angles around it or next to it?
10. How can recognizing patterns in angle measurements help us to more efficiently solve problems involving angle calculations?

Content

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.

Skills

Section A 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.

Section B Goals

- Recognize that angles can be measured in degrees, and can be found using addition and subtraction.

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 $\frac{1}{360}$ 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.

Throughout the unit

The Number Talk routines in this unit offer opportunities for students to look for structure to mentally perform subtraction, division, and multiplication. The numbers are chosen to reinforce students' familiarity with some benchmark angles and with factors of 180 and 360, which support their work as they reason about angle measurements.

- Use a protractor to measure and draw angles, and recognize that perpendicular lines meet or cross at a right angle.


Section C 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.

How will you gauge student learning?

Assessments

4.7 End-of-Unit Assessment | Summative | Written Test

 [Grade4-7-End-of-Unit-Assessment-assessment.pdf](#)

4 State Standards Assessed

How will students learn?

Learning Activities

Section A:

This section introduces students to some 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.

Section B:

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 360 degree angle. Decomposing this angle into halves gives a 180 degree angle. Half of that angle is a 90 degree angle or a right angle. Composing three 90 degree angles gives a 270 degree 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 45-45- angles. Composing three copies of a 45-45- angle makes a 135 degree angle, and so on.

Students also learn that 90 degree angles are formed by perpendicular lines.

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

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.

Section C:

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 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.

Differentiated Instruction

Technology Integration

21st Century Skills

Positive Behavior

CASEL

Collaborative for Academic, Social, and Emotional Learning

Resources

Teacher Notes and Reflections
