Lesson 2

Classifying Angles

NCTM Standards 3, 4, 6, 7, 8, 9, 10
Common Core State Standards 4.G 1

Lesson Planner

STUDENT OBJECTIVES

- To recognize angles as the union of two rays with a common endpoint
- To understand concepts of angle and measure angles
- To find unknown angles on a diagram
- To draw and identify acute, obtuse, and right angles

2 Teach and Practice

MATERIALS

Ⓐ **Investigating Right Angles** (TG p. 250)

Ⓑ **Classifying Angles** (TG p. 251)

Ⓒ **Classifying Angles as Acute, Obtuse, and Right** (TG p. 252)

Added Activity

Ⓓ **Drawing, Investigating, and Measuring Angles** (CCRG pp. CC 19–CC 20)

- TR: Activity Master, AM22
- demonstration protractor
- protractors
- rulers or straightedges
- CCRG: Explore Master: How to Use a Protractor

Lesson Notes

Activity D has been added to **Lesson 4.2**. Introduce Activity D after students complete Activity C. You may wish to allow two days to complete this lesson.

About the Activity

Activity D introduces students to the more formal definition of an angle as the figure formed by two rays with a common endpoint. Students draw angles and identify acute, obtuse, and right angles in two-dimensional figures. They learn that angles are measured in degrees and practice measuring angles using protractors. Students are also asked to recognize that angle measure is additive as they write equations and find measures of angles in figures composed of two non-overlapping adjacent angles.

2 Teach and Practice

D Drawing, Investigating, and Measuring Angles

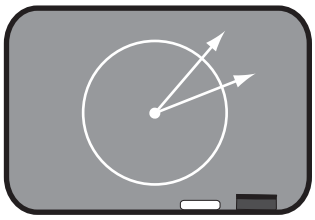
individuals | 30 MIN

Materials
- For the teacher: demonstration protractor
- For each student: AM 22 from Activity A, ruler or straightedge, protractor, Explore: How to Use a Protractor

NCTM Standards 3, 4, 6, 7, 8, 9, 10
CCSS 4.MD 5, 4.G 1, 6, 7

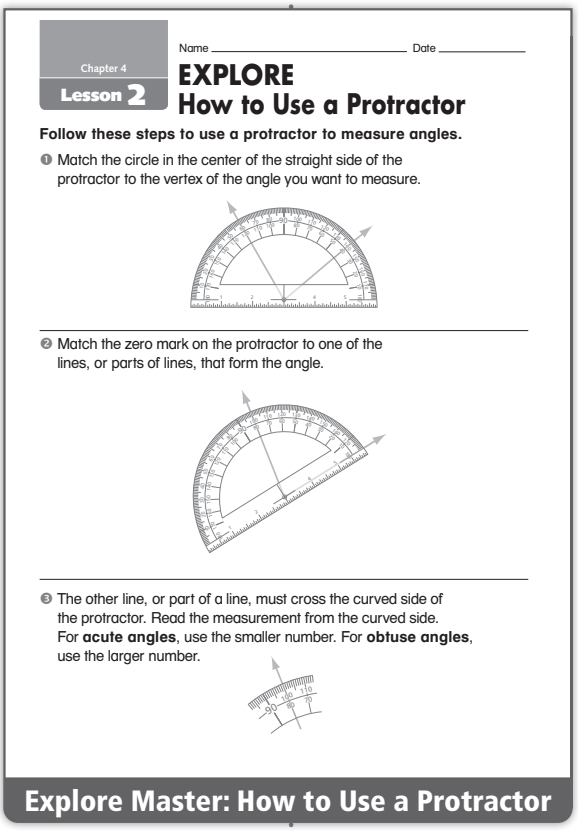
Purpose To understand angle concepts and measure

Introduce Tell students that they are going to learn how to measure angles. Explain that mathematicians define an angle as a figure that is formed by two rays with a common endpoint. Display a transparency of Activity Master 22 or draw a blank spinner on the board like one from Activity Master 22. Then draw an angle whose sides are two rays with a common endpoint at the center of the spinner.



Distribute a copy of AM22 to each student. Ask students to draw an acute angle in one of the spinners and an obtuse angle in the other.

Guide students to see an angle as a turn around a point. The measure of an angle is how far one side of the angle is turned from the other side. A turn all the way around the circle is 360°. If you divided the circle into 360 parts, an angle whose sides formed one of those parts would measure 1°.



Chapter 4 Lesson 2

Name _____ Date _____

EXPLORE
How to Use a Protractor

Follow these steps to use a protractor to measure angles.

❶ Match the circle in the center of the straight side of the protractor to the vertex of the angle you want to measure.

❷ Match the zero mark on the protractor to one of the lines, or parts of lines, that form the angle.

❸ The other line, or part of a line, must cross the curved side of the protractor. Read the measurement from the curved side. For **acute angles**, use the smaller number. For **obtuse angles**, use the larger number.

Explore Master: How to Use a Protractor

Task **Distribute and have students read the directions on Explore Master: How to Use a Protractor.** On the board, or on the transparency, use a demonstration protractor to show students how to measure the angle that you drew at the beginning of the activity.

Once you are sure that students understand how to use a protractor, have them measure the angles that they drew on AM22. Observe students as they work, helping them place their protractors correctly and deciding which number to choose for the angle measure. You might distribute another copy of AM22 to each student to provide more practice drawing and measuring angles.

Talk Math Discuss with students how they can tell if their measurements make sense.

- If you are measuring an acute angle, could your answer be 120°? Explain. No. Possible explanation: An acute angle is smaller than a right angle so its measure has to be less than 90°.
- What do you know about the measure of the obtuse angle you drew? Possible answer: Its measure will be more than 90°.
- How do you know whether to use the smaller or the larger number on the protractor to read the measurement of the angle? Possible answer: For acute angles, you use the smaller number. For obtuse angles, you use the larger number.

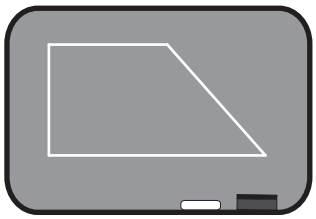
Ongoing Assessment
- Can the student visually determine if the angle is greater than or less than a right angle?
- Does the student use a right angle as a benchmark to identify acute and obtuse angles?

Concept Alert

These are some common errors students may make when using a protractor to measure angles.

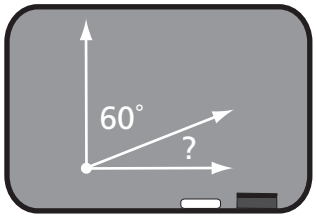
- Students may not place the "center" of the protractor at the angle's vertex.
- Students may read the angle measurement from the wrong scale on the protractor.

Extend On the board, draw a trapezoid with two right angles like the one below.

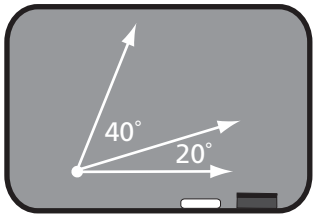


Point to each angle of the trapezoid and ask students to describe the angle as either acute, obtuse, or right. If time allows, you might have students come to the board to measure each of the angles.

Finally, draw an angle on the board and tell students that it is a right angle. Ask students to tell you what its measure would be. 90° Draw another ray in the interior of the angle and label the figure as shown.



Guide students to provide a number sentence that would help them find the missing measure. $60° + ? = 90°$ Ask them to find that measure. 30° Draw additional examples on the board, such as the one below. Have students write an equation that they could use to find the measure of the larger angle, and then have them find that measure. $40° + 20° = ?$; 60°



Chapter 4

Lesson 2

Name _____ Date _____

EXPLORE
How to Use a Protractor

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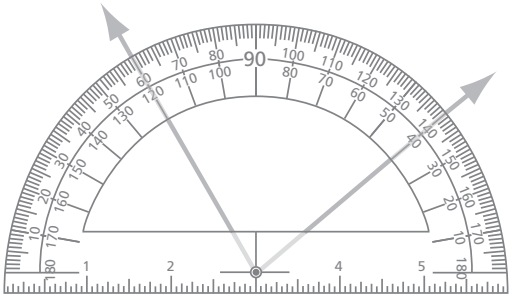
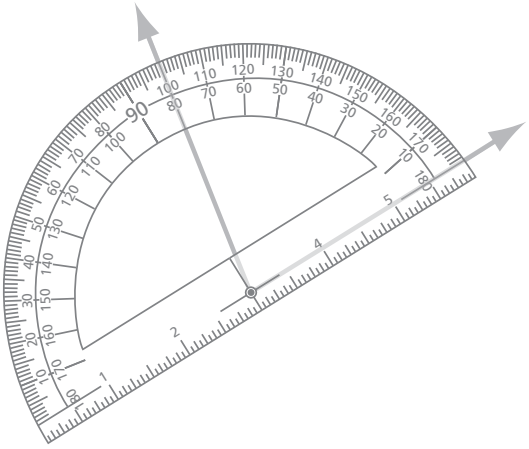


❷ Match the zero mark on the protractor to one of the lines, or parts of lines, that form the angle.



❸ The other line, or part of a line, must cross the curved side of the protractor. Read the measurement from the curved side. For **acute angles**, use the smaller number. For **obtuse angles**, use the larger number.