# SHOW WHAT YOU KNOW

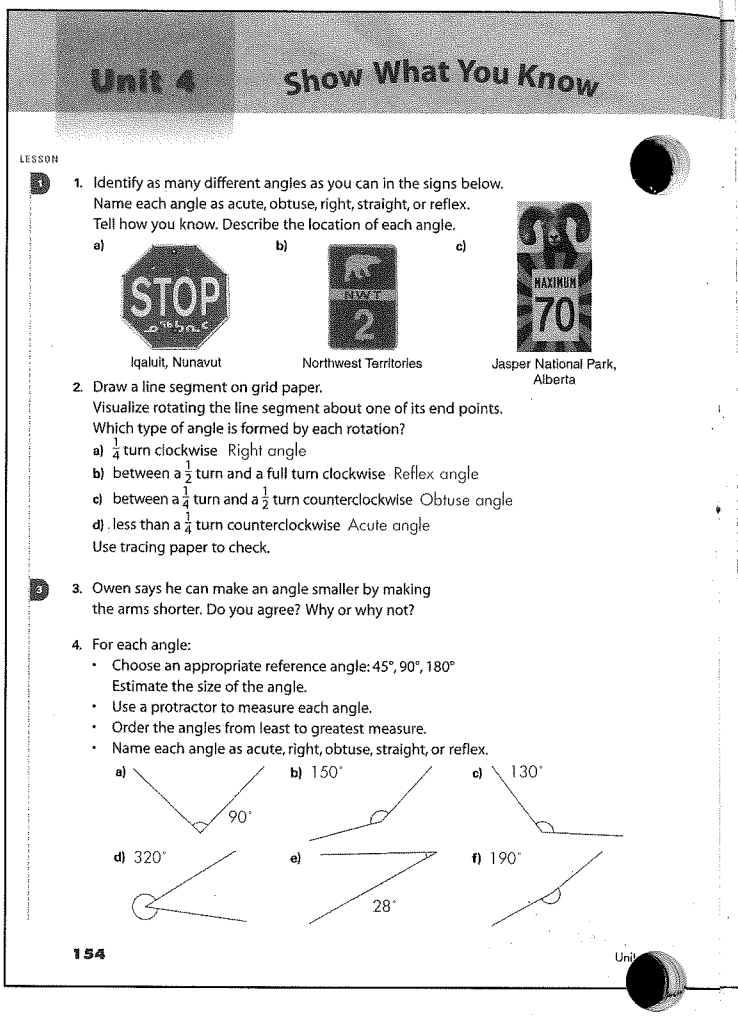
## LESSON ORGANIZER

80–100 min

**Student Materials**

- protractors
- 1-cm grid paper (PM 23)
- tracing paper

**Assessment:** Master 4.1 Unit Rubric: Angles and Polygons; Master 4.4 Unit Summary: Angles and Polygons



Unit 4 Show What You Know

LESSON

1. Identify as many different angles as you can in the signs below. Name each angle as acute, obtuse, right, straight, or reflex. Tell how you know. Describe the location of each angle.

a) b) c)

STOP

Iqaluit, Nunavut

NWT 2

Northwest Territories

MAXIMUM 70

Jasper National Park, Alberta

2. Draw a line segment on grid paper. Visualize rotating the line segment about one of its end points. Which type of angle is formed by each rotation?
   a) $\frac{1}{4}$ turn clockwise Right angle
   b) between a $\frac{1}{2}$ turn and a full turn clockwise Reflex angle
   c) between a $\frac{1}{4}$ turn and a $\frac{1}{2}$ turn counterclockwise Obtuse angle
   d) less than a $\frac{1}{4}$ turn counterclockwise Acute angle
   Use tracing paper to check.

3. Owen says he can make an angle smaller by making the arms shorter. Do you agree? Why or why not?

4. For each angle:
   - Choose an appropriate reference angle: 45°, 90°, 180° Estimate the size of the angle.
   - Use a protractor to measure each angle.
   - Order the angles from least to greatest measure.
   - Name each angle as acute, right, obtuse, straight, or reflex.

a) 90° b) 150° c) 130°

d) 320° e) 28° f) 190°

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Unit

## Sample Solutions

1. a) All the interior angles of the stop sign are obtuse angles because they are greater than right angles. The "T" has 2 right angles. I can use the corner of a piece of paper to check. The top of the "T" is a straight angle. I can use the edge of a piece of paper to check. There are reflex angles outside all the angles except the straight angle.

   b) The 4 corners of the road sign could be right angles, although they appear to be a little curved. There are also right angles where the green part meets the white band in the middle of the sign. I can use a square corner to check. The "N" contains 2 acute angles and the "W" contains 3 acute angles. I can compare the angles to a square corner. The "T" has 2 right angles and a straight angle. I can compare the angles to a square corner and to the edge of my ruler. There are reflex angles outside all the angles except the straight angle.

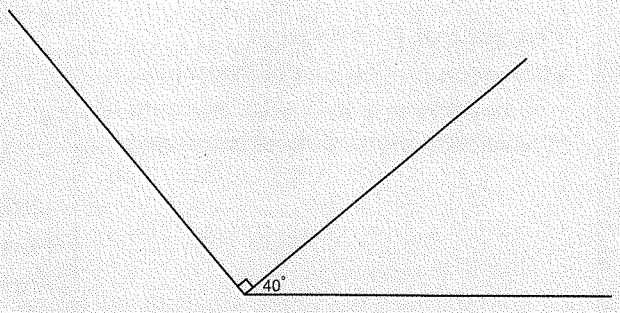
   c) The 4 corners of the road sign are right angles as they match a square corner exactly. There are 4 right angles in the corners of the speed limit part of the sign, and where the top section of the sign meets the bottom section. There are straight angles along the sides of each rectangle. There are many acute and obtuse angles in the yellow and black design on the outside of the white rectangle that shows the speed limit. I can compare these angles to a square corner. Each "M" contains 3 acute angles. The "A" and the "X" have acute and obtuse angles. There are reflex angles outside all the angles except the straight angle.

3. No; the measure of an angle stays the same if I make the arms shorter. The arm length is independent of the angle measure.

4. a) Reference angle: 90°; estimate: about 90°
   The angle measures 90°, so it is a right angle.
   b) Reference angle: 180°; estimate: about 160°
   The angle measures 150°, so it is an obtuse angle.
   c) Reference angle: 90°; estimate: about 120°
   The angle measures 130°, so it is an obtuse angle.
   d) Reference angle: 180°; estimate: about 300°
   The angle measures 320°, so it is a reflex angle.
   e) Reference angle: 45°; estimate: about 35°
   The angle measures 28°, so it is an acute angle.
   f) Reference angle: 180°; estimate: about 190°
   The angle measures 190°, so it is a reflex angle.
   The angles from least to greatest measure are:
   e, a, c, b, f, d

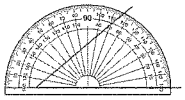
5. No; the student did not place the centre of the protractor on the vertex of the angle.

6. a), b)




   b) I used a protractor to draw a 40° angle. I used the corner of my ruler to draw a 90° angle on the second arm. The new angle is: 40° + 90° = 130°
   c) The angle measures 130° with a protractor.

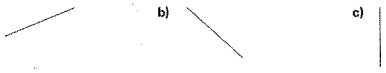
A student used a protractor to measure this angle.
The student says the angle measures 65°.
Is the student correct?
If your answer is yes, explain how you know.
If your answer is no, describe the student's mistake.



6. a) Use a protractor to draw a 40° angle.
   b) Do not use a protractor.
   Draw an angle that is 90° greater. Describe the strategy you used.
   c) Use a protractor to check the angle in part b.

7. Copy these line segments. Use a ruler and a protractor.
   Using each line as one arm, draw a 125° angle.

   a) b) c)

   Does the position of an angle on the page affect its measure?
   Explain how you know.

8. Use a ruler and a protractor.
   a) Draw, then label each angle below with its measure:
   - a right angle
   - an acute angle
   - an obtuse angle

   b) For each angle in part a:
   - Join the arms together to make a triangle.
   - Measure and label one of the other angles.
   - Without using a protractor, label the third angle with its measure.

   c) Explain the strategy you used to find the measure of the third angle each time.

9. Two angles of a triangle are given.
   Find the measure of the third angle.
   a) 70°, 25° 85° b) 62°, 71° 47° c) 58°, 74° 48° d) 115°, 43° 22°

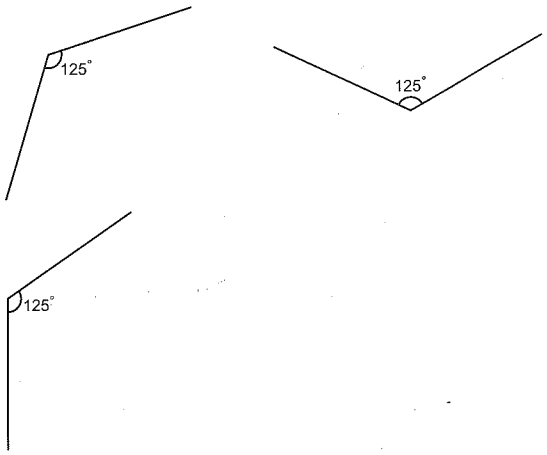
10. A quadrilateral has angles measuring 60°, 50°, and 120°.
    What is the measure of the 4th angle? How do you know?
    130°

UNIT 4 Learning Goals

- ☑ name, describe, and classify angles
- ☑ estimate and determine angle measures
- ☑ draw and label angles
- ☑ provide examples of angles in the environment
- ☑ investigate the sum of angles in triangles and quadrilaterals

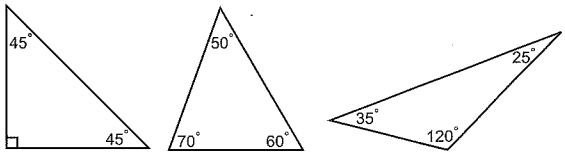


7.




The position of an angle on the page does not affect its measure. It isn't the position of the arms that matters, but the angle between them.

8. a), b)




c) The sum of the angles in a triangle is 180°. I subtracted the measures of the 2 angles I knew from 180° to find the measure of the third angle.

10. The sum of the angles in a quadrilateral is 360°.
So, to find the measure of the fourth angle, I subtract:
$360° - 60° - 50° - 120° = 130°$

## ASSESSMENT FOR LEARNING

### What to Look For

***Conceptual Understanding***

✔ **Question 2:** Students can relate an angle to a turn.

✔ **Question 4:** Students can choose an appropriate reference angle to estimate the measure of an angle.

***Procedural Knowledge***

✔ **Questions 1 and 4:** Students can classify an angle as an acute, right, obtuse, straight, or reflex angle.

✔ **Question 4:** Students can accurately measure angles in degrees using a protractor.

✔ **Question 7:** Students can construct angles in different orientations.

✔ **Questions 8, 9, and 10:** Students can use the sum of the angles in a triangle and in a quadrilateral to find the measures of unknown angles without measuring.

***Communication***

✔ **Question 3:** Students can explain why an angle measure is not dependent upon the length of its arms.