NAME _____ DATE _____ PERIOD _____

Study Guide and Intervention

7MR1.2, 7NS1.3

Problem-Solving Investigation: Use Logical Reasoning

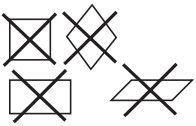
You may need to use logical reasoning to solve some problems.

Explore	• Determine what information is given in the problem and what you need to find.
Plan	• Select a strategy including a possible estimate.
Solve	• Solve the problem by carrying out your plan.
Check	• Examine your answer to see if it seems reasonable.

Example **A plane figure has four sides. The figure has only two congruent sides and two pairs of congruent angles. Is the figure a square, rectangle, parallelogram, rhombus, or trapezoid? Did you use *deductive* or *inductive* reasoning?**

Explore We know that a plane figure has four sides and the figure has only two congruent sides and two pairs of congruent angles. We need to see if the figure is a square, rectangle, parallelogram, rhombus, or trapezoid.

Plan Let's look at the characteristics of these different figures.
A square or rhombus has *four* congruent sides.
The figure is not a square or a rhombus.
A rectangle or parallelogram has *two* pairs of congruent sides. The figure is not a rectangle or a parallelogram.



Solve An isosceles trapezoid can have two congruent sides and two pairs of congruent angles. The figure could be a trapezoid.

Check Since all choices but the trapezoid were eliminated, the figure is a trapezoid. Because you used existing rules about four-sided figures to make a decision, you used deductive reasoning.

Exercises

For Exercises 1–3, solve each problem using logical reasoning.

1. **GEOMETRY** Jennifer draws a square on a piece of paper and uses a ruler to draw one line through the square to create two shapes. What is the maximum number of sides that either of these shapes can have, and how would the line have to be drawn to create it? **5 sides. The line would have to be drawn through adjacent sides of the square, which creates a triangle and an irregular pentagon.**
2. **MODELS** You have 30 toothpicks. You can create two adjacent squares using 7 toothpicks if the adjacent square shares a toothpick for the side between them. How many total squares could be created this way with 30 toothpicks, if the squares are formed in a row? **9 squares. The first square takes 4 toothpicks. Each addition square uses 3 toothpicks and shares a side with the previous squares (4 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 = 28 squares).**
3. **AGES** You and your grandfather have a combined age of 84 years. If your grandfather is 6 times as old as you are, how old are you? Explain. **12 years old. If your grandfather is 6 times your age, and you are 1 times your age, then your combined ages are 7 times your age. 84 ÷ 7 = 12. Check: 12 × 6 = 72; 72 + 12 = 84.**