Lesson 5.7: Proving Quadrilateral Properties

In this lesson you will:

- learn about "thinking backward" strategy for writing proofs
- prove many of the quadrilateral conjectures from this chapter

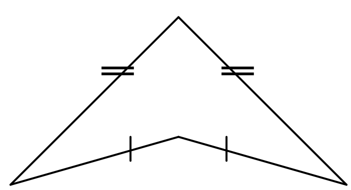
Most of the flowchart proofs you have done so far have been set up for you to complete. Creating your own proofs requires good reasoning strategies and planning. One excellent reasoning strategy is "thinking backward." If you know where you are headed but are unsure where to start, start at the end of the problem and work your way back to the beginning one step at a time.

The firefighter below asks another firefighter to turn on one of the water hydrants. But which one? A mistake could mean disaster—a nozzle flying around loose under all that pressure. Which hydrant should the firefighter turn on?

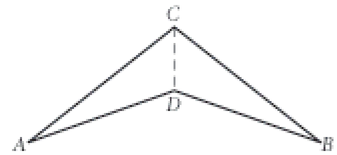
Did you "think backward" to solve the puzzle? Thinking backward is a useful reasoning strategy to use when you write proofs.

To help plan a proof and visualize the flow of reasoning, you can make a flowchart. As you think backward through the proof, you draw a flowchart backward to show the steps in your thinking. Start with the conclusion and reason back to the given. Let's look at an example (on the next page).

For the example, you need to know that a concave kite is sometimes called a dart.

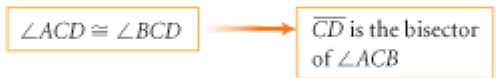


• Example 1: Write a flowchart proof for the information below by reasoning backward. I have started it for you.



Given: Dart ADBC with $\overline{AC} \cong \overline{BC}$, $\overline{AD} \cong \overline{BD}$
Show: $\overline{CD}$ bisects $\angle ACB$

You can start by thinking, “I can show $\overline{CD}$ bisector of $\angle ACB$ if I can show $\angle ACD \cong \angle BCD$.”



Then you can think, “I can show $\angle ACD \cong \angle BCD$ if they are….

Investigation 5.7: "Finding the Square Route"

Here is a puzzle for you to solve that has nothing to do with square roots. (Whew!) In the puzzle grid at right, the goal is to find a route—a path—that starts at 1 in the upper left and ends at 100 in the lower right.

You can move to an adjacent square horizontally, vertically, or diagonally. In order to move, you must be able to add, subtract, multiply, or divide the number in the square you occupy by 2 or 5 to get the number in the new square. For example, if you happen to be in square 11, you could move to square 9 by subtracting 2, or to square 55 by multiplying by 5.

A.) Using this puzzle's rule for moving, explain why there are 3 possible first moves.

B.) Solve the puzzle—which route will take you from 1 to 100? Show it with arrows.

C.) Think about any problem-solving strategies that were particularly helpful for solving this puzzle. How can these strategies help you in developing proofs?

⇒**ASSIGNMENT**: ____