Lesson 2.4: Deductive Reasoning

In this lesson you will:

- learn about deductive reasoning
- use deductive reasoning to justify the steps in the solution of an equation
- use a deductive argument to explain why a geometric conjecture is true

In lessons 2.1-2.3, you used inductive reasoning to make conjectures based on observed patterns. To explain *why* a conjecture is true, you need to use *deductive* reasoning. **Deductive reasoning** is the process of showing that certain statements _____ logically from agreed-upon assumptions and proven _____. When you use deductive reasoning, you try to reason in an orderly way to convince yourself or someone else that your conclusion is valid. If your initial statements are true and you give a logical argument, then you have shown your conclusion is true. For example, in a trial, lawyers use deductive arguments to show how the evidence that they present proves their case. A lawyer might make a very good argument. But first, the court must believe the evidence and accept it as true.

*Add "deductive reasoning" to your dictionary.

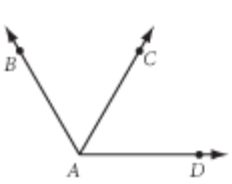
You use deductive reasoning in algebra. When you provide a reason for each step in the process of solving an equation, you are using deductive reasoning. Here is an example.

•Example 1: Solve the equation for *x*. Give a reason for each step in the process. I've started it for you.

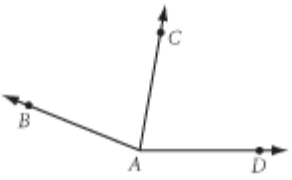
$3(2x+1)+2(2x+1)+7=42-5x$	The original equation
$6x+3+4x+2+7=42-5x$	Distribute

The next example shows how to use both kinds of reasoning: inductive reasoning to discover the property and deductive reasoning to explain why it works.

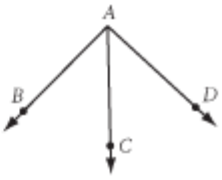
•Example 2: In each diagram, $\overrightarrow{AC}$ bisects obtuse angle *BAD*. Classify $\angle BAD$, $\angle DAC$, and $\angle CAB$ as acute, right, or obtuse. Then complete the conjecture.



$m\angle BAD = 120°$



$m\angle BAD = 158°$



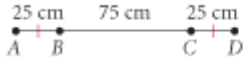
$m\angle BAD = 92°$

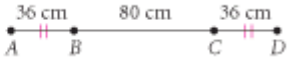
Conjecture: If an obtuse angle is bisected, then the two newly formed congruent angles are _____.

Justify your conjecture with a deductive argument.

Investigation 2.4: "Overlapping Segments"

In each segment, $\overline{AB} \cong \overline{CD}$.





A.) From the markings on each diagram, determine the lengths of $\overline{AC}$ and $\overline{BD}$. What do you notice about these segments?

B.) Draw a new segment. Label it $\overline{AD}$. Place your own points *B* and *C* on $\overline{AD}$ so that $\overline{AB} \cong \overline{CD}$.

C.) Measure $\overline{AC}$ and $\overline{BD}$ on your segment. How do these lengths compare?

D.) Complete the conclusion of this conjecture: (Overlapping Segments Conjecture)
If $\overline{AD}$ has points *A, B, C,* and *D* in that order with $\overline{AB} \cong \overline{CD}$, then _____

_____

E.) Use logical reasoning to show that your conjecture from part D will always be true.

⇒**ASSIGNMENT**: _____