Warm Up
Classify each angle.

(1.)
(2.)
(3.)
(4.)
(5.)
(6.)
(7.)
(8.)
Objectives

EQ: How do you use inductive reasoning to identify patterns and make conjectures?

How do you find counterexamples to disprove conjectures?

Unit 2A Day 4
Vocabulary

inductive reasoning
conjecture
counterexample
Example 1A: Identifying a Pattern

Find the next item in the pattern.

January, March, May, ...

*Alternating months of the year make up the pattern.*

The next month is July.
Example 1B: Identifying a Pattern

Find the next item in the pattern.

7, 14, 21, 28, ...

*Multiples of 7 make up the pattern.*

The next multiple is 35.
Example 1C: Identifying a Pattern

Find the next item in the pattern.

In this pattern, the figure rotates 90° counterclockwise each time.

The next figure is △.
When several examples form a pattern and you assume the pattern will continue, you are applying *inductive reasoning*. **Inductive reasoning** is the process of reasoning that a rule or statement is true because specific cases are true. You may use inductive reasoning to draw a conclusion from a pattern. A statement you believe to be true based on inductive reasoning is called a **conjecture**.
Complete the conjecture.

The sum of two positive numbers is \( \_\_\_ \).

List some examples and look for a pattern.

\[
1 + 1 = 2 \quad 3.14 + 0.01 = 3.15 \\
3,900 + 1,000,017 = 1,003,917
\]

The sum of two positive numbers is positive.
Complete the conjecture.

The product of two odd numbers is \(?\).

*List some examples and look for a pattern.*

\[
\begin{align*}
1 \times 1 &= 1 \\
3 \times 3 &= 9 \\
5 \times 7 &= 35
\end{align*}
\]

The product of two odd numbers is odd.
Example 3A: Biology Application

The cloud of water leaving a whale’s blowhole when it exhales is called its *spray*. A biologist observed blue-whale sprays. Another biologist recorded humpback-whale sprays. Make a conjecture based on the data.

<table>
<thead>
<tr>
<th>Heights of Whale Sprays</th>
<th>25</th>
<th>29</th>
<th>27</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of Blue-whale sprays (ft.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of Humpback-whale sprays (ft.)</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

The height of a blue-whale’s spray is greater than a humpback whale’s spray.
Check It Out! Example 3B

Make a conjecture about the lengths of male and female whales based on the data.

<table>
<thead>
<tr>
<th>Average Whale Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Female (ft)</td>
</tr>
<tr>
<td>Length of Male (ft)</td>
</tr>
</tbody>
</table>

*In 5 of the 6 pairs of numbers above the female is longer.*

Female whales are longer than male whales.
To show that a conjecture is always true, you must prove it.

To show that a conjecture is false, you have to find only one example in which the conjecture is not true. This case is called a **counterexample**.

A counterexample can be a drawing, a statement, or a number.
<table>
<thead>
<tr>
<th><strong>Inductive Reasoning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Look for a pattern.</td>
</tr>
<tr>
<td><strong>2.</strong> Make a conjecture.</td>
</tr>
<tr>
<td><strong>3.</strong> Prove the conjecture or find a counterexample.</td>
</tr>
</tbody>
</table>
Show that the conjecture is false by finding a counterexample.

Any two complementary angles (angles that sum to 90 degrees) are not congruent.

\[ 45° + 45° = 90° \]

*If the two congruent angles both measure 45°, the conjecture is false.*
Show that the conjecture is false by finding a counterexample.
For any real number $x$, $x^2 \geq x$.

Let $x = \frac{1}{2}$.

Since $\left(\frac{1}{2}\right)^2 = \frac{1}{4}$, $\frac{1}{4} \neq \frac{1}{2}$.

The conjecture is false.
Show that the conjecture is false by finding a counterexample.

Supplementary (angles that add to 180 degrees) angles are adjacent.

The supplementary angles are not adjacent, so the conjecture is false.
Assignment:

AG# class: pg 25 #8-13, 20-22

AG class: pg 25 #11-13, 17-22
Lesson Quiz

Find the next item in each pattern.

1. 0.7, 0.07, 0.007, ...  
   0.0007

2. 0.0007

Determine if each conjecture is true. If false, give a counterexample.

3. The quotient of two negative numbers is a positive number.  true

4. Every prime number is odd.  false; 2

5. Two supplementary angles are not congruent.  false; 90° and 90°

6. The square of an odd integer is odd.  true