Geometry
Chapter Two

Section 1
Use Inductive reasoning
Vocabulary

**Pattern**- when numbers or objects have the same observable characteristics.

**Conjecture**- an unproven statement that is based on observations.

**Inductive reasoning**- when you find a pattern in specific cases and then write a conjecture for the general case.

**Counterexample**- a specific case that proves the conjecture false.
<table>
<thead>
<tr>
<th>Number of points</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture</td>
<td><img src="image1" alt="Image of single dot" /></td>
<td><img src="image2" alt="Image of two dots connected" /></td>
<td><img src="image3" alt="Image of three dots connected" /></td>
<td><img src="image4" alt="Image of four dots connected" /></td>
<td><img src="image5" alt="Image of five dots connected" /></td>
</tr>
<tr>
<td>Number of connections</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>?</td>
</tr>
</tbody>
</table>

+ 1 \rightarrow + 2 \rightarrow + 3 \rightarrow + ?

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EXAMPLE 1  Describe a visual pattern

Describe how to sketch the fourth figure in the pattern. Then sketch the fourth figure.
**EXAMPLE 2** Describe a number pattern

Describe the pattern in the numbers $-7, -21, -63, -189, \ldots$ and write the next three numbers in the pattern.

$$-7, -21, -63, -189, \boxed{567}, \boxed{1701}, \boxed{5103}$$

$x \times 3$ $x \times 3$ $x \times 3$

Notice that each number in the pattern is three times the previous number.
2. *Describe* the pattern in the numbers 5.01, 5.03, 5.05, 5.07,... *Write* the next three numbers in the pattern.

Notice that each number in the pattern is increasing by 0.02.
Find the pattern in the following group of numbers:

\[0, 2, 8, 3, 5, 11, 6, 8, 14, 9 \ldots\]

\[\underline{+2 \ +6 \ -5 \ +2 \ +6 \ -5} \quad 11, 17, 12, 14\]
<table>
<thead>
<tr>
<th>x</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Find the rule that matches the table above.

\[ y = x + 1 \]
EXAMPLE 4  Make and test a conjecture

Numbers such as 3, 4, and 5 are called **consecutive numbers**. Make and test a conjecture about the sum of any three consecutive numbers.

\[3 + 4 + 5 = 12 = 4 \times 3\]
\[7 + 8 + 9 = 24 = 8 \times 3\]
\[10 + 11 + 12 = 33 = 11 \times 3\]
\[16 + 17 + 18 = 51 = 17 \times 3\]

Middle number and multiply by 3 and you will get the sum of the numbers.

-5, 6, 7  \(\text{YES}\)
-1, 0, 1  \(\text{YES}\)
**Example 5** Find a counterexample

A student makes the following conjecture about the sum of two numbers. Find a counterexample to disprove the student’s conjecture.

**Conjecture** The sum of two numbers is always greater than the larger number.

\[-12 + (-6) = -18\]

\[0 + 7 = 7\]
Which conjecture could a high school athletic director make based on the graph at the right?

A) More boys play soccer than girls.
B) More girls are playing soccer today than in 1995.
C) More people are playing soccer today than in the past because the 1994 World Cup games were held in the United States.
D) The number of girls playing soccer was more in 1995 than in 2001.

The correct answer is B.) More girls are playing soccer today than in 1995.
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