(2.1) **Inductive Reasoning and Conjecture**

Objective: To **make conjectures based on inductive reasoning** and **find counterexamples**.

Why: Finding patterns in data help make predictions.
Obj: To make conjectures based on inductive reasoning and find counterexamples.

Inductive Reasoning: making a conjecture/conclusion based on patterns or previous examples

Steps: 1. Look for a pattern
        2. Make a conjecture (unproven statement based on observations)
        3. Verify the conjecture is true for all cases
Find the next item in the pattern.

1. January, March, May, ...

2. 7, 14, 21, 28, ...

3. 

4. 2, 4, 12, 48, 240, ... \(1440\)

5. 1, 2, 4, ... \(8\)
Make a conjecture about each value or geometric relationship. List or draw some examples that support your conjecture.

a. the sum of an odd number and an even number

Conjecture: The sum of an odd # and an even# is ODD

\[ \begin{align*}
1 + 2 &= 3 \\
245 + 342 &= 587 \\
10 + 11 &= 21
\end{align*} \]

b. For points L, M, and N, LM=20, MN=6, and LN=14. Make a conjecture and draw a figure to illustrate your conjecture.

1. \[ MN + LN = LM \]
2. \[ 20 \]
3. \[ 14 \]
4. \[ 6 \]

4. The pts L, M, and N are collinear.
SALES: The table shows the total sales for the first three months a store is open. The owner wants to predict the sales for the fourth month.

<table>
<thead>
<tr>
<th>Month</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$500</td>
</tr>
<tr>
<td>2</td>
<td>$1500</td>
</tr>
<tr>
<td>3</td>
<td>$4500</td>
</tr>
</tbody>
</table>

a. Make a statistical graph that best displays the data.

b. Make a conjecture about the sales in the fourth month and justify your claim or prediction.
Goldbach's Conjecture:
Every even number greater than 2 can be written as the sum of 2 primes. (i.e. 44 = 13 + 31)

Think of some even numbers greater than 2 and how they can be written as the sum of 2 primes.

\[
\begin{align*}
56 &= 13 + 43 \\
36 &= 17 + 19 \\
4  &= 2 + 2 \\
12 &= 5 + 7 \\
42 &= 23 + 19 \\
40 &= 37 + 3
\end{align*}
\]
To prove a conjecture is true, you must prove it true for all cases. It only takes ONE false example to show that a conjecture is NOT true. This false example is a COUNTEREXAMPLE.

Find a counterexample to show that each conjecture is false.

1. If \( n \) is a real number, then \( n^2 > n \).

\[
\begin{array}{c|c}
F. & \text{Counterex: } 1 \text{ false example: } 1/2 \\
\end{array}
\]

2. If \( \angle ABC \cong \angle DBE \), then \( \angle ABC \) and \( \angle DBE \) are vertical angles.

3. The unemployment rate is the highest in the cities with the most people.

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong</td>
<td>2,163</td>
<td>3.7%</td>
</tr>
<tr>
<td>Cameron</td>
<td>371,825</td>
<td>7.2%</td>
</tr>
<tr>
<td>El Paso</td>
<td>713,126</td>
<td>7.0%</td>
</tr>
<tr>
<td>Hopkins</td>
<td>33,201</td>
<td>4.3%</td>
</tr>
<tr>
<td>Maverick</td>
<td>50,436</td>
<td>11.3%</td>
</tr>
<tr>
<td>Mitchell</td>
<td>9,402</td>
<td>6.1%</td>
</tr>
</tbody>
</table>
Obj: To make conjectures based on inductive reasoning and find counterexamples.

HW:

HR: (2.1) Pg.95: 15–27odd, 31–45odd, 57