Objective

Use inductive reasoning to make conjectures.
1.1 Patterns and Inductive Reasoning

Check Skills You’ll Need

Here is a list of the counting numbers: 1, 2, 3, 4, 5, …

Some are even and some are odd.

1. Make a list of the positive even numbers. $2, 4, 6, …$

2. Make a list of the positive odd numbers. $1, 3, 5, …$

3. Copy and extend this list to show the first 10 perfect squares.

$1^2 = 1, 2^2 = 4, 3^2 = 9, 4^2 = 16, …$

4. Which do you think describes the square of any odd number?

- It is odd
- It is even

$1^2 = 1$ $6^2 = 36$

$2^2 = 4$ $7^2 = 49$

$3^2 = 9$ $8^2 = 64$

$4^2 = 16$ $9^2 = 81$

$5^2 = 25$ $10^2 = 100$
Which do you think describes the square of any odd number?

It is odd.

Correct  Incorrect

*HOW DO YOU KNOW?*
Reasoning based on patterns that you observe is called **INDUCTIVE REASONING**.

Find a pattern for this sequence.
Find the next two terms in the sequence.

3   6   12   24...

48   96
A conclusion you reach using inductive reasoning is called a **CONJECTURE**.

Make a conjecture about the sum of the first 30 odd numbers.

**Step 1:** Find the first few sums.

\[
\begin{align*}
1 & = 1 \\
1 + 3 & = 4 \\
1 + 3 + 5 & = 9 \\
1 + 3 + 5 + 7 & = 16
\end{align*}
\]

**Step 2:** Find a pattern.

\[
\begin{align*}
1 & = 1 = 1^2 \\
1 + 3 & = 4 = 2^2 \\
1 + 3 + 5 & = 9 = 3^2 \\
1 + 3 + 5 + 7 & = 16 = 4^2
\end{align*}
\]

**Step 3:** Make a conclusion.

The sum of the first 30 odd numbers is \(30^2\) or 900.
Not all conjectures turn out to be true!

You can prove that a conjecture is false by finding one COUNTEREXAMPLE.
Find a counterexample that makes these conjectures false:

The square of any number is greater than the original number.

**Counterexample:** \( 1^2 = 1 \), but \( 1 \nless 1 \)

Any number and its absolute value are opposites.

\( |-3| = 3 \), but \( |-3| \) is not the opposite of \( 3 \) because distance from zero on a number line is not the same as being opposite. 

\( |12| = 2 \) is not opposites because they are not on opposite sides of zero.
HOMEWORK

p. 6 # 1-6, 17-18, 19-22, 25-26, 51, 52
CHALLENGE #54