1.1 - Inductive Reasoning
Vocabulary

- Natural or Counting Numbers
- Ellipsis
- Scientific Method
- Hypothesis or Conjecture
- Counterexample
Vocabulary

Natural or Counting Numbers
1, 2, 3, 4, 5... positive whole numbers

Ellipsis

Scientific Method

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Counterexample
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Ellipsis
three dots indicating a continuation of the pattern

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Scientific Method
the process for proving (or disproving) a hypothesis
after observations of specific cases

Hypothesis or Conjecture

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a specific example that proves that the conjecture is false
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Rules about counterexamples:
It takes only one to disprove a conjecture
Not finding one neither proves or disproves a conjecture
Inductive vs. Deductive Reasoning
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Inductive Reasoning is the process of reasoning to a general conclusion through observations of specific cases.
Inductive vs. Deductive Reasoning

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Deductive Reasoning is the process of reasoning to a specific conclusion from a general statement.
Inductive vs. Deductive Reasoning

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Deductive Reasoning is the process of reasoning to a specific conclusion from a general statement

The Process:
  - Observe a trend
  - Make a general conclusion based on the trend (IR)
  - Make a hypothesis to prove
  - Look for a counterexample
  - If you can't find a counterexample make a proof (DR)
  - If your proof holds up, then you have proven your hypothesis
When will you use inductive reasoning?

When will you use deductive reasoning?
General Notation for Proofs:

Odd numbers: \((2n - 1)\)

Even numbers: \((2n)\)

**Use \(n\) for the first odd or even number, then \(m\), then \(p\), etc.
**Always try to get your final number in the form of an odd or even number
Example 1: The product of two odd numbers
Will the product of two odd numbers always be odd?

\[\text{Odd } \neq 1 : 2n - 1\]
\[\text{Odd } \neq 2 : 2m - 1\]

\[(2n-1)(2m-1)\]

\[4nm - 2an - 2am + 1\]

\[2(something) \neq 1\]
\[2(2nm - n - m) + 1\]
Example 2: The sum of an odd and an even number
If an odd number and an even number are added, will the sum be an odd or an even number?

\[ 2n + 2m + 1 \]

\[ = 2(n + m) + 1 \]
Example 3: Divisibility

If the last two digits of a number are divisible by seven will the number then be divisible by seven?

\[
\begin{array}{c}
714 \\
\hline
549
\end{array}
\]
Example 4: Prove or Disprove

a) The difference of any two counting numbers will be a counting number.

\[ 10 - 20 = -10 \]

b) The product of any two counting numbers will be a counting number.

Yes
Example 5: Pick a number $n$.
Pick any number, multiply the number by 4, add 6 to the product, divide the sum by 2, and subtract 3 from the quotient. What can we conclude?

$n = 127$

\[
\frac{127 \times 4}{508} + \frac{6}{514} \div a = \frac{257}{254} - \frac{3}{254}
\]
Example 6: Pick a number \( n \).
Prove the conjecture from Example 5.

Pick any number, multiply the number by 4, add 6 to the product, divide the sum by 2, and subtract 3 from the quotient.

\[
\frac{4n + 6}{2} = 2n + 3 - 3 = 2n \checkmark
\]
IN YOUR HOMEWORK -

Pay close attention to #39 - 42!!!