1.1 - Inductive Reasoning

Vocabulary

Natural or Counting Numbers

Ellipsis

Scientific Method

Hypothesis or Conjecture

Counterexample

Vocabulary

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1, 2, 3, 4, 5... positive whole numbers

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three dots indicating a continuation of the pattern
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    the process for proving (or disproving) a hypothesis after observations of specific cases
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a prediction based on specific observations

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

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Counterexample
  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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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

1 2 3 4 5 6 7 8

2(1) 2(2) 2(3) 2(4)

Example 1: The product of two odd numbers

Will the product of two odd numbers always be odd?

Odd #1: $2n - 1$

Odd #2: $2m - 1$

$(2n-1)(2m-1)$

$4nm - 2n - 2m + 1$

$2(\text{something}) \pm 1$

$2(2nm - n - m) + 1$

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 thenbe divisible by seven?

714

849

$\frac{849}{7}$

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?

$n = 127$

$$\begin{array}{r} 127 \\ \times\ 4 \\ \hline 508 \\ +\ 6 \\ \hline 514 \end{array}$$

$514 \div 2 = 257$

$$\begin{array}{r} 257 \\ -\ 3 \\ \hline 254 \end{array}$$

#39-42

a, b, c

#39-42
2

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.

$$\frac{4x+6}{2} = 2x+3-3$$

$$= 2x \checkmark$$

IN YOUR HOMEWORK -

Pay close attention to #39 - 42!!!