Name _____ Date _____ Period 1

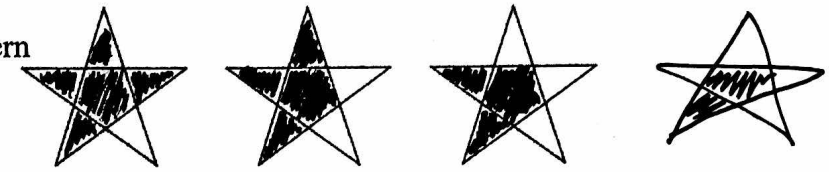
Inductive Reasoning // Counterexamples

Lesson Objective IWBAT use inductive reasoning to draw conclusions; find counterexamples to prove statements false.

Conjecture: A conjecture is an unproven statement based on observations.

Inductive Reasoning: when you find a pattern in specific cases and then write a conjecture for the general case.

Example:

1. Sketch the next figure in the pattern 

2. Sketch the next figure in the pattern 

Making and Testing a Conjecture

Example:

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

4. Make and test a conjecture about the product of two odd integers.

$(5)(7) = 35$

$(3)(9) = 27$

$(1)(11) = 11$

conjecture: the product is also odd.

Counterexamples

To show a conjecture is true, you must show that it is true for ALL cases.

You can show it is false, however, by finding just one counterexample.

A counterexample is a specific case for which the conjecture is false.

Example:

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

"The sum of two numbers is always greater than their difference."

$5 + (-1) = 4$

$5 - (-1) = 6$

4 is not > 6

6. Find a counterexample to show that the conjecture is false.

"The value of x^2 is always greater than the value of x."

$0 \leq x \leq 1$

$x = 1$

$1^2 = 1$ 1 is not >1

$x = \frac{1}{2}$

$(\frac{1}{2})^2 = \frac{1}{4}$ $\frac{1}{4}$ is not $> \frac{1}{2}$

7. Find a counterexample to show that the conjecture is false.

"If $1 - y > 0$, then $0 < y < 1$."

$y \leq 0$

$y = -1$

$1 - (-1) > 0$ but $0 < -1 < 1$

$2 > 0$

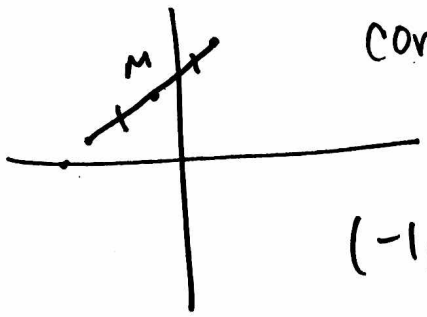
$y = 0$

$1 - 0 > 0$ $0 < 0 < 1$

$1 > 0$

8. Determine if each biconditional is true. If false, provide a counterexample.

"A segment has endpoints at (1, 5) and (-3, 1) if and only if its midpoint is at (-1, 3)."



cond. is true but conv. is false!

(-1, 3) is mdpt of segment w/ endpoints (-4, 0) and (2, 6)