What You Will Learn

▶ Use inductive reasoning.

▶ Use deductive reasoning.

Inductive Reasoning

A **conjecture** is an unproven statement that is based on observations. You use **inductive reasoning** when you find a pattern in specific cases and then write a conjecture for the general case.

Conjecture is an educated guess.

Describe how to sketch the fifth figure in the pattern. Then sketch the fifth figure.
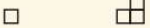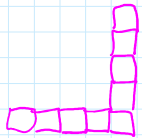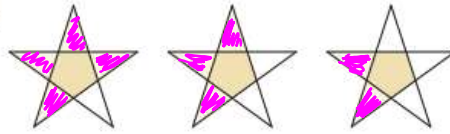
Figure 1   Figure 2

□   ⊞

Figure 3   Figure 4

add 1 block to each "leg"

must have at least 3 examples to be accurate in inductive reasoning

2,4

Sketch the next figure in the pattern.

2.

remove the shading from one of the points.

2, 4, 6, 8, 10, 12, *counting by 2's*

2, 4, 8, 16, 32   *multiplied by 2*

2, 4, 16,

Counterexample

To show that a conjecture is true, you must show that it is true for all cases. You can show that a conjecture is false, however, by finding just one *counterexample*. A **counterexample** is a specific case for which the conjecture is false.

A student makes a conjecture about absolute values. Find a counterexample to disprove the student's conjecture.

Conjecture: The absolute value of the sum of two numbers is equal to the sum of the two numbers.

$$|a+b| = a+b$$

$a=2$ $b=4$

$|2+4| = 2+4$
$|6| = 6$
$6 = 6$

$a=5$ $b=15$

$|5+15| = 5+15$
$|20| = 20$
$20 = 20$

$a=-5$ $b=6$

$|-5+6| = -5+6$
$|1| = 1$
$1 = 1$

$a=-6$
$b=5$

$|-6+5| = -6+5$
$|-1| = -1$
$1 \neq -1$

Counterexample

Deductive Reasoning

Deductive reasoning uses facts, definitions, accepted properties, and the laws of logic to form a logical argument. This is different from *inductive reasoning*, which uses specific examples and patterns to form a conjecture.

Laws of Logic

Law of Detachment

If the hypothesis of a true conditional statement is true, then the conclusion is also true.

If you are in MSHS, then you are in the USA. You are in MSHS.
you are in USA.

Law of Syllogism

A: You are in the USA.
A: Not possible.

If hypothesis p, then conclusion q.
If hypothesis q, then conclusion r. ⟩ If these statements are true,
If hypothesis p, then conclusion r. ← then this statement is true.

$p \rightarrow q$
$q \rightarrow r$
$p \rightarrow r$

If a figure is a square, then it is a rectangle. You know that quadrilateral ABCD is a square. Using the law of Detachment, what statement can you

make?

quad. ABCD is a rectangle

∠R = 155°

8. If $90° < m\angle R < 180°$, then $\angle R$ is obtuse. The measure of $\angle R$ is 155°. Using the Law of Detachment, what statement can you make?

∠R is obtuse

Not possible

$p \rightarrow q$
$q \rightarrow r$
$p \rightarrow r$

If possible, use the law of syllogism to write a new conditional statement that follows from the pair of true statements.
~~If soccer practice is cancelled~~, then you can go to the mall after school. If it is raining today, ~~then soccer practice is cancelled~~. *if it is raining, then you can go to the mall.*

If it is raining, ~~then you can go inside~~.
~~If you go inside~~, then you can play video games.

if it is raining, then you can play video games.

The table shows the sum of measures of the interior angles in various polygons. What conclusion can you make about the sum of interior angles in an n-sided polygon?

Polygon	Number of sides	Sum of interior angles
Triangle	3	180°
Quadrilateral	4	360°
Pentagon	5	540°
Hexagon	6	720°

Decide whether inductive reasoning or deductive reasoning is used to reach the conclusion. Explain your reasoning.

a. If the sum of the digits of a number is divisible by 3, then the number is divisible by 3. The sum of the digits of the number 147 is 12. So the number 147 is divisible by 3.

Deductive (Detatchment)

b. Each time you forget to do your math homework, your parents take away your phone privileges for a day. So, the next time you forget to do your math homework, you will lose your phone privileges.

Inductive Reasoning

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*Practice sec 2.2 **pg.***

80: 1-3A,
5-25EO, 29-33EO

80: 1-3A,
5-25EO, 29-33EO