**Lesson 3 Notes: Inductive and Deductive Reasoning**

*Reasoning is* the foundation of mathematical competence and proficiency!

**Inductive Reasoning**

The process of forming conclusions on the basis of patterns, observations, examples, or experiments is called inductive reasoning. It takes specific premises and draws a broader general conclusion.

\_\_\_\_\_\_\_is a set of facts or assumptions.

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a mathematical statement that has not been thoroughly proven.

**Example 1**

Premise 1: The last president was honest. *(specific)*

Premise 2: The current president is honest.

Hypothesis: All presidents are honest. *(broad generalization)*

**Deductive Reasoning**

The process of reasoning that takes general premises and makes a specific conclusion. It is logically valid and is the fundamental method in which mathematical facts are shown to be true.

 

# **Example 2**

Premise 1: All dogs are animals. *(general)*

Premise 2: Patches is a dog.

Hypothesis: Patches is an animal. *(specific conclusion)*

***For each example below, decide if it is inductive or deductive reasoning?***

**Example 3**

Premise 1: Kitty is a calico cat and purrs loudly.

Premise 2: Every calico cat I’ve met purrs loudly.

Hypothesis: All calico cats purr loudly.

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**Example 4**

Premise 1: All dogs have ears.

Premise 2: Poodles are dogs.

Hypothesis: Poodles have ears.

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**Counter Example**

A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is one example that disproves the hypothesis.

Can you find a counter example for the following conjectures?

“All prime numbers are odd.”

“The sum of any two whole numbers is divisible by 2.”

“The sum of any two odd numbers is divisible by 2.”

**Let’s Practice!**

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| **Situation** | **Conjecture** | **Did you use Inductive or Deductive Reasoning? Why?** |
| **Jack took 4 shots and scored a goal.** |  |  |
| **My three friends got their driver’s license when they turned 16. I turn 16 tomorrow.** |  |  |
| **Christmas is always December 25th. Today is December 25th.** |  |  |
| **All baseball players become coaches. Kyle is a baseball player.** |  |  |
| **All racecars can go over 100 mph. A Camaro can go over 100 mph.** |  |  |
| **The World Cup is held every 4 years. The World Cup was held in 2022.** |  |  |
| **Snoop Dogg is cool. Jake the Dog is cool. Dog the Bounty Hunter is cool.** |  |  |

**Which conclusion below shows evidence of deductive reasoning?**

1. A science teacher assigns the following homework at 9 p.m. every night for two months, see which constellations are visible in the eastern sky. Report your findings to the class.
2. The firewood seems to have burned well this year. I also remember it burned well last year. Since we got it from the same man both years, we should buy from him again next year.
3. Alan is allergic to all foods containing wheat. When I read the ingredients on this spaghetti packaging it says “contains semolina, a wheat product.” Therefore, Alan is allergic to this pasta.
4. Bradley smiled when he saw Heidi Klum. He also smiled when he saw Beyonce. Just now, he smiled when he saw me. Since Heidi Klum and Beyonce are beautiful, he must think I am beautiful too.

**Which conclusion below shows evidence of logical inductive reasoning?**

1. Before the jury goes out to deliberate, the attorney summarizes the evidence presented in court against a person accused of robbing McDonalds. He concludes his argument by saying the evidence makes it clear that the person is guilty of the crime.
2. The cut-off date for swim camp registration is June 15. After that date, kids go on a wait list - no exceptions allowed. You have missed the cut-off date to register your child by two days, so your child won’t be registered and her name will go on the wait list.
3. All doctors must complete a residency in medical school. Anna wants to be a doctor, and she is in medical school right now. I bet she will have to complete a residency real soon.
4. The National Heart Institute researchers state that if you fry food, you will add more fat than if you had baked the food. The choices in the cafeteria today are fried chicken and baked chicken. The fried chicken has more fat in it than the baked chicken. Make and test a conjecture.

**DEDUCTIVE REASONING**

THEORY HYPOTHESIS OBSERVATIONCONFIRMATION

**INDUCTIVE REASONING**

THEORY HYPOTHESIS PATTERN OBSERVATION

***Developing skills in mathematical reasoning can contribute****significantly to students' overall critical thinking skills!*