

## Applied I

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## Reasoning and Inference

Reason is how we form inferences about the world; there are different types of reasoning, which have different advantages.

### LEARNING OBJECTIVES

Distinguish among abductive, inductive, and deductive reasoning

### KEY TAKEAWAYS

#### Key Points

- Reason is the capacity for consciously making sense of things, applying logic, establishing and verifying facts, and changing or justifying practices, institutions, and beliefs based on new or existing information.
- We use reason to form inferences—conclusions drawn from propositions or assumptions that are supposed to

be true.

- Deduction is a general-to-specific form of reasoning that goes from known truths to specific instances.
- Inductive reasoning is a specific-to-general form of reasoning that tries to make generalizations based on specific instances.
- Abductive reasoning is a specific-to-general form of reasoning that specifically looks at cause and effect.

#### Key Terms

- **logic:** Step-by-step thinking about how a problem can be solved or a conclusion can be reached.
- **inference:** A conclusion drawn from true or assumed-true facts.
- **sylogism:** A type of deductive reasoning, often in the form “All A are B; C is A; therefore, C is B.”
- **reason:** The capacity for consciously making sense of the world based on logic and evidence.

Reason is the capacity for consciously making sense of things, applying logic, establishing and verifying facts, and changing or justifying practices, institutions, and beliefs based on new or existing information. It is considered to be a definitive characteristic of human nature, and it is associated with a wide range of fields, from science to philosophy.

Reason and reasoning (i.e., the ability to apply reason) are associated with thinking, cognition, and intelligence. Like habit or intuition, reason is one of the ways that an idea progresses to a related idea, helping people understand concepts like cause and effect, or truth and falsehood. We use reason to form inferences—conclusions drawn from propositions or assumptions that are supposed to be true.

### Types of Reasoning

There is more than one way to start with information and arrive at an in-

ference; thus, there is more than one way to reason. Each has its own strengths, weaknesses, and applicability to the real world.

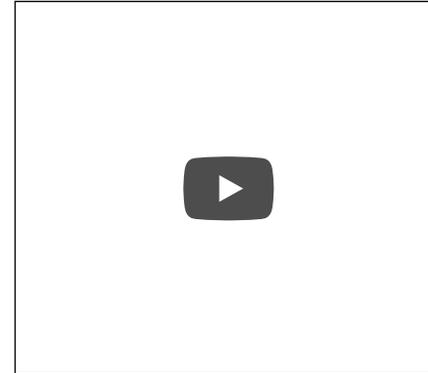
## Deduction

In this form of reasoning a person starts with a known claim or general belief, and from there determines what follows. Essentially, deduction starts with a hypothesis and examines the possibilities within that hypothesis to reach a conclusion. Deductive reasoning has the advantage that, if your original premises are true in all situations and your reasoning is correct, your conclusion is guaranteed to be true. However, deductive reasoning has limited applicability in the real world because there are very few premises which are guaranteed to be true all of the time.

A syllogism is a form of deductive reasoning in which two statements reach a logical conclusion. An example of a syllogism is, “All dogs are mammals; Kirra is a dog; therefore, Kirra is a mammal.”

## Induction

Inductive reasoning makes broad inferences from specific cases or observations. In this process of reasoning, general assertions are made based on specific pieces of evidence. Scientists use inductive reasoning to create theories and hypotheses. An example of inductive reasoning is, “The sun has risen every morning so far; therefore, the sun rises every morning.” Inductive reasoning is more practical to the real world because it does not rely on a known claim; however, for this same reason, inductive reasoning can lead to faulty conclusions. A faulty example of inductive reasoning is, “I saw two brown cats; therefore, the cats in this neighborhood are brown.”



**Sherlock Holmes, master of reasoning:** In this video, we see the famous literary character Sherlock Holmes use both inductive and deductive reasoning to form inferences about his friends. As you can see, inductive reasoning can lead to erroneous conclusions. Can you distinguish between his deductive (general to specific) and inductive (specific to general) reasoning?

## Abduction

Abductive reasoning is based on creating and testing hypotheses using the best information available. Abductive reasoning is used in a person’s daily decision making because it works with whatever information is present—even if it is incomplete information. Essentially, this type of reasoning involves making educated guesses about the unknowable from observed phenomena. Examples of abductive reasoning include a doctor making a diagnosis based on test results and a jury using evidence to pass judgment on a case: in both scenarios, there is not a 100% guarantee of correctness—just the best guess based on the available evidence.

The difference between abductive reasoning and inductive reasoning is a subtle one; both use evidence to form guesses that are likely, but not guaranteed, to be true. However, abductive reasoning looks for cause-and-effect relationships, while induction seeks to determine general rules.