Types of Deductions and Inductions with Examples

Types of Deductive Arguments

- Arguments based on Definitions
- Arguments based on Math
- Syllogisms
  - Categorical Syllogism
  - Hypothetical Syllogism
  - Disjunctive Syllogism

Arguments based on Definitions

- A bachelor is an unmarried man. Bob is a man, and Bob is unmarried, so Bob is a bachelor.
- By definition, any toothpaste is also a dentifrice. Crest is an example of a toothpaste, therefore Crest is also a dentifrice.

Arguments based on Math

- Mark has twice as many cats as Susan. Susan has 3 cats; therefore, Mark has 6 cats.
- The area of a circle is $\pi \times r^2$. This circle has a r (radius) of 3. Therefore the area of the circle is $\pi \times 3^2$.
  - Remember that these arguments should come from facts in math knowledge, not percentages or odds or likelihood of some event.

Categorical Syllogism

- All students are rich people, and some students do volunteer work. Therefore, some rich people do volunteer work.
- Some philosophers were from Athens, and all people from Athens enjoy olives. Therefore, some philosophers enjoy olives.

Hypothetical Syllogism (if..then..)

- If I do not wake up, then I cannot go to work. If I cannot go to work, then I will not get paid. Therefore, if I do not wake up, then I will not get paid.
- If it rains, we will not have a picnic. If we don't have a picnic, we won't need a picnic basket. Therefore, if it rains, we won't need a picnic basket.

Disjunctive Syllogism (either…or)

- Either Logic is the most important course you will take in college or I am the queen of England. I am not the queen of England; therefore, Logic is the most important course you will take in college.
- The cake has either chocolate or vanilla frosting. The cake does not have vanilla frosting. Therefore, the cake has chocolate frosting.

Inductive Arguments

- Words like “necessary” or “it must be the case that” usually indicate a deductive argument.
- Words like “probably” or “likely” most often indicate that the argument is inductive.

Types of Inductive Arguments

- Prediction
- Arguments from Analogy
- Generalization
- Arguments from Authority
- Arguments based on Signs
- Causal Inference (inferring what caused an effect)

Prediction

- In the past when we have had unusually warm winters we have had problems with fire ants in the summer. Since we are having an unusually warm winter this year, next summer we will have problems with fire ants.
- The summer in Death Valley always includes at least ten days above 100 degrees. This summer in Death Valley there will be at least ten days above 100 degrees.

Argument from Analogy

Katie and Elizabeth are both from California, taking Sociology and wearing flip-flops. I know Katie is a vegetarian, so Elizabeth is probably a vegetarian too.

Coleridge is a poet from England, and Blake is a poet from England. Their poems are surely very similar.

Generalization

- Every class I have taken in the English department has been a piece of cake, so all English classes are probably easy.
- All the people I know who are members of the Democratic party are in favor of campaign finance reform. All members of the Democratic party are likely to be in favor of campaign finance reform.

Argument from Authority

- Bush says that the war in Iraq was justified, so it is justified.
- The Pope says that the best flavor of ice cream is vanilla, so I believe that vanilla is the best flavor of ice cream.

Argument based on Signs

(Literally, a sign or a plaque that says something.)

This sign says this is room 104. This must be room 104.

This historical marker says a famous civil war battle happened here. It must have happened here.

This sign says George Washington slept here. George Washington must have slept here!

Causal Inference

- It is raining, so the shoes I left in the yard are probably wet.
- There is honey in the beehive, so the bees likely made the honey.
- There is police “crime scene” tape across the entrance to that building. Perhaps there was a police investigation happening here today.

Deductive and Inductive

- Argument based on Mathematics
- Argument from Definition
- Categorical Syllogism
- Hypothetical Syllogism
- Disjunctive Syllogism

- Prediction
- Argument from Analogy
- Generalization
- Argument from Authority
- Argument based on signs
- Causal Inference

Evaluating Deductions

Question 1: If you hypothetically accept the premises, do you then have to accept the conclusion?

(Pretend you are living in the imaginary world the premises create, just for a minute.)

If yes, the argument is **VALID**.

If no, the argument is **INVALID**.

This is separate from

Question 2: Are the premises each really true?

If all premises are true as statements on their own, **SOUND**.

If there is even one false premise, **UNSOUND**.

Example:

All spiders are reptiles, and All reptiles are democrats, so All spiders are democrats.

- **Categorical Syllogism, Deductive**
- If we accept the premises (Spiders are reptiles, and reptiles are democrats in this world) then we do have to accept the conclusion: **VALID**.
- But, the premises are not all true (spiders are not reptiles, and reptiles don't appear to have a political party affiliation) so **UNSOUND**.

Officially:

- Once you see that an a deductive argument is unsound, it has to also be considered invalid.
- However for the sake of our quiz on Unit 2, please do note the argument had a valid structure in which the premises would have made the conclusion true if the premises had been true.
- In online quizzes, I will be sure to try and limit the choices so it is clear which is the best answer.
- In written exams, you can write VALID and then strike through it as in ~~VALID.~~

More examples for you to do:

- *Jones is a citizen because she can vote, and only citizens can vote.*
- *If Ronald Reagan is dead, then he's been assassinated. He really is dead now. So he must have been assassinated.*
- *All tooth fillings are made of metal amalgam, and Mary has tooth fillings. Therefore Mary has metal amalgam tooth fillings.*

Evaluating Inductions

Question 1: If you hypothetically accept the premises, do you then find the conclusion has a strong likelihood of being true?

(Pretend you are living in the imaginary world the premises create, just for a minute.)

If yes, the argument is **STRONG**.

If no, or low likelihood, the argument is **WEAK**.

This is separate from

Question 2: Are the premises each really true?

If all premises are true as statements on their own, **COGENT**.

If there is even one false premise, **UNCOGENT**.

Example:

The next President is probably going to be male, since all Presidents so far have been male.

- **Inductive, Prediction**
- If we accept the premise, that all Presidents so far have been male, then it does seem to be quite **strong** that the next one will be male.
- The premise is actually true, all Presidents so far have been male, so it is **cogent** as well.

Another Example:

Turner is an orthodontist, so he's probably homeless.

Inductive: Generalization

Weak (being an orthodontist does not give strong evidence for being homeless also)

Cogent (we can say it is cogent, we can assume the premise is true that there actually is some orthodontist named Turner)

Remember:

- The two questions are separate:
- 1. Do the premises give sufficient reason for the conclusion, if you pretend the premises are accurate for the sake of argument?
- 2. Are the premises actually true on their own?

Types

Deduction

- Arguments based on Math
  - Literally facts from math
- Arguments based on Definitions
  - Terms defined in the argument
- Categorical Syllogism
  - 3 categories, 3 statements
- Hypothetical Syllogism
  - If—then conditions being met, usually 3 conditional if—then statements
- Disjunctive Syllogism
  - Either- or choice being made, usually 3 statements as well

Induction

- Prediction
  - Claims about future events
- Arguments from Analogy
  - Two things are compared and said to be alike in a new way too
- Generalization
  - Moving from group-individual claims or individual-group
- Arguments from Authority
  - Usually one individual is named who is well known, a claim about agreeing with them is made
- Arguments based on Signs
  - Literally a sign or a plaque is claimed to tell the truth
- Causal Inference (inferring what caused an effect)
  - Seeing some effect or evidence, and then inferring who did it or what did it as in Sherlock Holmes mysteries

What do you think?

1. Joe must own at least ten DVD's, because he's been buying one a week since he got that DVD player in June.

2. All cats are mammals, and no mammals are fish, so no cats are fish.

3. Either we'll get Chinese or Thai. But Thai Café is closed today, so we'll have to get Chinese.

4. The Bobcats will probably come in last place this year because they are a terrible team.

5. Smith must have been smoking in the company front yard again, he's the only person here who smokes Camels and these are all Camel cigarette butts in the yard.

6. The world is like a huge machine made up of smaller machines, and since machines have intelligent creators, the world must have one too.

7. Philosophers always write both fiction and non-fiction. After all, Sartre and Rousseau both wrote fiction and non-fiction.