Propostions, Arguments, Premises, Conclusions, Deduction, Induction, etc.

ForAllx (the open source linked pdf)

- This PowerPoint is meant to go along with the linked reading in Unit 2, ForAllx Chapter 1
- http://www.fecundity.com/codex/forallx.pdf

Contents

Remember the parts of arguments

- Statements, **propositions** that can be found to be true or false
- Propositions have to be declarative descriptive statements, not questions or commands
- Premises (evidence for a claim)
- Conclusion (the major claim itself)

premise indicators: since, because, given that

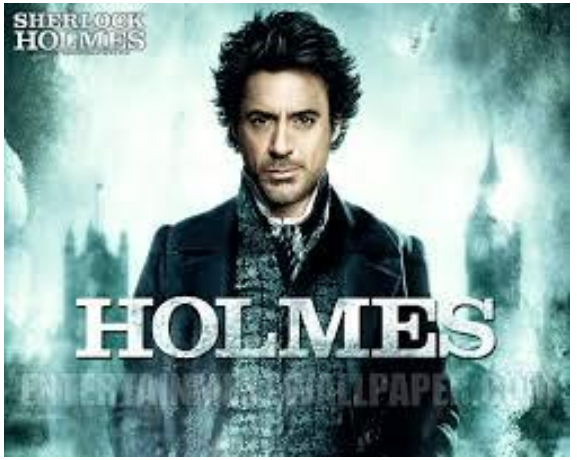
conclusion indicators: therefore, hence, thus, then, so

To be perfectly general, we can define an ARGUMENT as a series of sentences. The sentences at the beginning of the series are premises. The final sentence in the series is the conclusion. If the premises are true and the argument is a good one, then you have a reason to accept the conclusion.

Notice that this definition is quite general. Consider this example:

There is coffee in the coffee pot.
There is a dragon playing bassoon on the armoire.
∴ Salvador Dali was a poker player.

It may seem odd to call this an argument, but that is because it would be a terrible argument. The two premises have nothing at all to do with the conclusion. Nevertheless, given our definition, it still counts as an argument—albeit a bad one.



Elementary deduction, my dear Watson… (Sherlock Holmes)

Just be careful, because sometimes when Holmes mentions deduction, he's actually been doing an inductive causal inference. That's how college makes you think!

Deduction:
the type of argument in which the premises are meant to be providing such solid support that the conclusion should be inescapable, necessary, no other choice.

The rare earths appear in a particular row near the bottom of the periodic table, and Cerium appears in that particular row near the bottom of the periodic table. Cerium is a rare earth.

Induction:
the type of argument in which the conclusion is supposed to follow from the premise(s) with probability or likelihood.

John is a Republican, and many Republicans voted for Romney, so he probably voted for Romney.

Evaluating Arguments

- A key goal of logic is to provide standards for measuring the degree to which the premises support the conclusion.
- Assessing the degrees of support of the premises for the conclusion involves a variety of techniques that we shall be encountering.

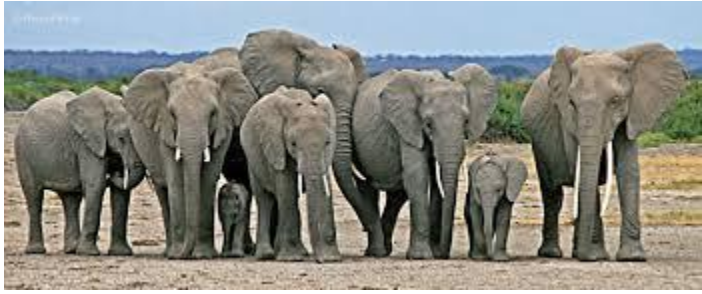
Evaluating Arguments (cont.)

- To have a good argument, the premises must sufficiently support the conclusion, and the premises must actually be true.
- Determining whether the premises are actually true, we must appeal either to facts that we know directly through our experiences and observations, or to facts we know through credible sources and expert opinion.

Induction and Deduction

- Assessing the support for the conclusion depends upon whether we have an inductive or a deductive argument.
- Good *deductive arguments* have conclusions that follow necessarily or that must follow.
- *Inductive arguments* have conclusions that are probable or likely to some degree.

Inductive arguments



- Here's an example of an inductive argument:
  - *The elephants in the zoo are gray.*
  - *The elephants in the pictures in National Geographic magazine are gray.*
  - *The elephants in the movie "African Queen" are gray.*
  - *Therefore, all elephants are gray.*

- The conclusion "All elephants are gray" is likely to some degree based on the premises, but the premises do not guarantee that every elephant is gray, which is to say that the argument is inductive.

- Notice that in an inductive argument more supporting evidence can strengthen the conclusion—for instance if we have the additional premises that "All the elephants in Barnum's Circus are gray".

Deductive Arguments

- Deductive arguments can be assessed as either valid or invalid.

- The basis of validity is the ***form*** of the argument.

1.4 Deductive validity

An argument is deductively VALID if and only if it is impossible for the premises to be true and the conclusion false.

The crucial thing about a valid argument is that it is impossible for the premises to be true *at the same time* that the conclusion is false. Consider this example:

Oranges are either fruits or musical instruments.
Oranges are not fruits.
$\therefore$ Oranges are musical instruments.

The conclusion of this argument is ridiculous. Nevertheless, it follows validly from the premises. This is a valid argument. *If* both premises were true, *then* the conclusion would necessarily be true.

A Question for You:

- What conclusion would you draw from these premises?

- *All ducks are birds, and*
- *all mallards are ducks;*
- *therefore, _____.*

Some possibilities----

- All birds are ducks?
- All ducks are mallards?
- All mallards are mallards?
- All birds are mallards?
- All mallards are birds?
- All birds have feathers?

The best answer----

- *All ducks are birds, and*
- *All mallards are ducks,*
- *Therefore, all mallards are birds.*

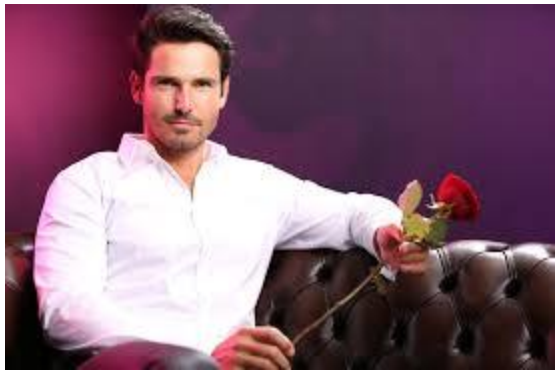
- ***Why does this work better than the other choices? Discuss.***

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.
- A toothpaste is a dentifrice. Crest is a toothpaste, therefore Crest is a dentifrice.



Arguments based on Math

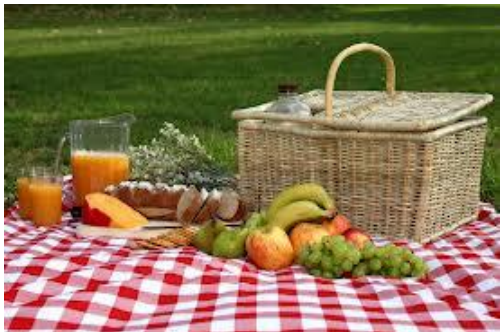
- Mark has twice as many cats as Susan. Susan has 3 cats; therefore, Mark has 6 cats.
- The area of a circle is $\pi \times r^2$. This circle has a r (radius) of 3. Therefore the area of the circle is $\pi \times 3^2$.
  - Remember that these arguments should come from facts in math knowledge, not percentages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

Categorical Syllogism

- All students are rich, and 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 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:

Spiders are reptiles, and All reptiles are democrats, so some 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 exam on Unit 1, 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.
- 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 was assassinated, then he's dead. So he must have been assassinated, since he's dead.*
- *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.*