# Handout 2 – Argument Terminology

1. Arguing, Arguments, & Statements

Open Question: What happens when two people are in an argument?

An argument is an abstraction from what goes on when people arguing. An **argument** is a set of propositions arranged in such a way that one proposition (the conclusion) is supposed to follow from another set of propositions (the premises).

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Premise (Proposition)
Premise (Proposition)

↓

Conclusion
(Proposition)

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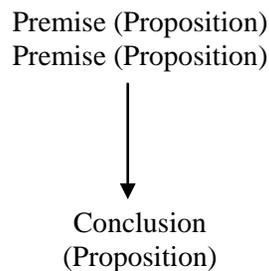
Arguments are differentiated from other kinds of linguistic behavior—e.g. prayers, yelling at people, asking questions, reading a book aloud—by the fact the premises of an argument purportedly *support* the conclusion.

Philosophers of language and logic disagree about the definition of a proposition, but we will define it a **proposition** as the content expressed by a sentence that is capable of being true or false.
- *Sentence ≠ Proposition:* While all propositions are expressed by sentences, not all sentences express propositions, e.g. commands, questions, exclamations do not express propositions.
- *Many Sentences Can Express One Proposition*: A single proposition can be expressed in a variety of different ways
  - Example 1: 'John loves Liz' vs. 'Liz is loved by John.'
  - Example 2: A single proposition expressed in two different languages
- *One Sentence Can Express Many Propositions:* A single sentence does not always express the same proposition, e.g. 'I ate breakfast'
- *Being T or F vs. Knowing T of F:* While a proposition must express content that is true or false (or can be true or false), it is not necessary that you *know* the truth value of a sentence (or know how to confirm the truth value) in order for the sentence to be a proposition, e.g. 'there are 50,304 trees in State College.'

2. Premises, Conclusions, and Identifying Arguments

An argument has two parts: the premises and the conclusion. The **conclusion** of an argument is the proposition that is *said / claimed / represented as* to follow from (or be supported by) a set of
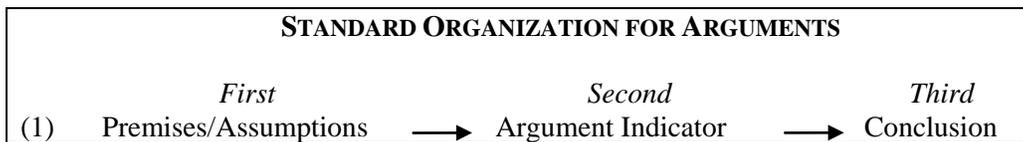
propositions, while the **premises** of an argument are the propositions (or reasons) that are said to support (or entail) the conclusion.

One key critical-thinking capacity is the ability to *identify* arguments from non-arguments. In some cases, it is easy to identify what is and is not an argument and easy to identify the premises/conclusion of an argument, but sometimes it is not so easy. Here are some tips to keep in mind:

Tip #1: Arguments tend to have a**rguments indicators** like 'therefore', 'since', 'due to the fact that', 'it follows that', 'consequently' which indicate the presence of an argument. Often, these argument indicators mark the conclusion or premises.

> EXAMPLE: If the stock market crashes, I will be broke. Yesterday, I received an insider's tip that the stock market will crash. Therefore, I will be broke.

Tip #2: While arguments do not have a single order of presentation, a standard way of presenting arguments is as follows:

STANDARD ORGANIZATION FOR ARGUMENTS		
First	*Second*	*Third*
(1) Premises/Assumptions $\longrightarrow$	Argument Indicator $\longrightarrow$	Conclusion

This sometimes shows up in how people present their arguments (but not always).

> EXAMPLE: John told me that David is a bad teacher. Frank also told me that David is a bad teacher. John and Frank are *never* wrong about who is a good or bad teacher because they have failing grades. Therefore, David must be a bad teacher.

Tip #3: It is helpful to think about what is **not** an argument. This will help you to identify what **is** an argument. Grocery lists, lists in general, narratives, a description of a sequence of events, a series of questions, and many other uses of language are not arguments.

> EXAMPLE: Yesterday, I saw a little bunny. He was so white and fuzzy and cute. I tried to walk up to him and pet him, but he cowered in fear. Yes, I had just eaten a delicious piece of rabbit meat not too long ago, but how would that little bunny know that?

3. Two Kinds of Arguments

There are two different ways to characterize how the premises of an argument *relate* to the conclusion. An argument can be said to

> (i) simply explicate or draw out the information contained in the premises, and
> (ii) go beyond the information contained in the premises by making the conclusion more probable.

The two different ways that the premises of the argument relate to a conclusion correspond to two different types of arguments. A **deductive argument** is one that is intended by the arguer to draw out the information contained in the premises, i.e. it draws out the premises' implications or what is entailed by the premises. An **inductive argument** is one that is intended by the arguer to make the conclusion more probable.

> Example #1: All criminals are evil. John is a criminal. Therefore, John is evil.
> Example #2: Sally told me that John once kicked a puppy. John is a criminal. Therefore, John is evil.

Notice that both arguments have the same conclusion but (1) is deductive as it appears that the conclusion is simply drawn from the information contained in the premises, while (2) is inductive as it appears that the premises are used to render the conclusion probable.

The distinction between deductive and inductive argument is problematic since it relies upon the arguer's *intent*. Sometimes, it is hard to determine whether an individual is putting forward a bad deductive argument or an inductive argument. Because this distinction is so problematic, we will focus on another way of classifying how the premises relate to the conclusion.

3.2. Deductively Arguments: Valid or Invalid

Arguments are **deductively valid** or **deductively invalid**.

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

In other words, *assuming* the premises of an argument are true, the conclusion must be true.

> An argument is **deductively invalid** if and only if it is possible for the premises to be true and the conclusion false.

Two important points:

> (1) You are **not** considering whether the premises are *in fact* true.
> (2) You are considering a certain *relation* between the premises and the conclusion, namely you are considering whether it is <u>*impossible* for all of the premises to be true and the conclusion to be false</u>. If it is impossible for all of the premises to be true and the conclusion false, then the argument is valid.

There are several ways to test whether an argument is valid or invalid (some better than others). We will consider a test called *The Imagination Test for Validity*.

> Step #1: Start by assuming that all of the premises are true.
> - If you cannot, then the argument is **valid** because it will be impossible for **the premises to be true** and the conclusion false.
> - If you can, then move to Step #2.

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Step #2: Given this assumption in Step #1, consider whether you can (while imaging the premises to be true) also imagine the conclusion as false.

- If this is not possible, then the argument is *valid* because **it will be impossible for the premises to be true and the conclusion false**.
- If you can imagine this, then the argument is *invalid* because it is possible for the premises to be true and the conclusion false.

THE IMAGINATION TEST FOR VALIDITY / INVALIDITY		
		Yes, then invalid
	If yes, then (step #2): is it possible given that all of the premises are true for the conclusion to be false	
Step #1: Is it possible for all of the premises to be true		No, then valid
	If no, then valid	

Let's look at some examples.

	Example	Analysis
1	Either John is president of the U.S.A. or Liz is the president. Liz is not the president. Therefore, John is the president.	Both of the premises of the argument are *false* (and the conclusion is false) but the argument is deductive valid. Why?
2	Barack Obama is the president of the U.S.A. Barack Obama supports Obamacare. Therefore, Obamacare was declared constitutional.	Both of the premises of the argument are *true* (and the conclusion is true) but the argument is *deductively invalid*. Why?

Why should you care about deductive validity? Well, the nice thing about a deductively valid argument is that they are *truth preserving*: provided the premises are true, the conclusion will be true as well. That is, if an argument is deductively valid, then you won't (no, *can't!*) go from true premises to a false conclusion. This is great in any area where you think you have true premises, e.g. physics, math, your personal opinions about x, y, or z.

Deductively Valid Argument using Newton's First Law of Motion
1. T = Newton's First Law of Motion (an object travels at a constant velocity unless it is otherwise acted upon by an external force)
2. ic_1 = there exists an object planet u that is in motion and not being acted upon by an external force.
3. p = planet u should remain in motion.
P1. For every object n, if n is in motion and there is no external force, then n will remain in motion.
P2. u is an object n that is in motion and is not being acted upon by an external force.
C. Therefore, u should remain in motion.

3.3. Deductive Arguments: Sound or Unsound

But, whether the premises of an argument are true, however, is a different question. An argument is **sound** if and only if the argument is both deductively valid and all of its premises are true. An argument is **unsound** if and only if the argument is either *deductively invalid* or *deductively valid yet has at least one false premise*.

Soundness	Deductively Valid + All True Premises

3.4. Inductive Arguments: Strong or Weak

Earlier, we noted that an **inductive argument** is an argument that is intended by the arguer merely to render the conclusion probable. This characterization of an argument is problematic because it relies upon the arguer's *intent*. However, there is another way of thinking about arguments distinct from the validity/invalidity and sound/unsound distinctions.

> An argument is **inductively strong** if and only if the premises provide significant support for the conclusion. That is, *if* the premises were true, then it is *very likely* that the conclusion is true.

Another way of putting this is that the truth of the premises makes the conclusion *very probable*.

> An argument is **weak** if and only if the premises provide little (or no support) for the conclusion. That is, the truth of the premises does *not* make it *very likely* that the conclusion is true.

Another way of putting this is that the truth of the premises does **not** make the conclusion *very probable*.

To **test** whether an argument is strong or weak, start by assuming that the premises are true (if it is possible to do so), then, given this assumption, consider whether the conclusion is very likely. If it is, then the argument is *strong*. If not, then the argument is *weak*.

> *Weak Inductive Argument*
> 1. There is a bag on the table filled with 50 beans.
> 2. I randomly drew 5 beans from a bag and they were black.
> 3. Therefore, all of the beans in the bag are black.

> *Strong Inductive Argument*
> 1. There is a bag on the table filled with 50 beans.
> 2. I randomly drew 40 beans from the bag and they were all black.
> 3. Therefore, all of the beans in the bag are black.

Whereas an argument is either valid or invalid (all or nothing), the strength of an argument admits of *degrees*. That is, if the premise were "I randomly drew 49 beans from the bag and they were all black", then we would have a *stronger argument* than either of those one above. In

contrast, if the premise were "I randomly drew 2 beans from the bag and they were all black," we would have a *weaker argument* than either of those above.

Calling an argument strong or weak concerns the *relation* between the premises and the conclusion and is unrelated to whether the premises or the conclusion are *in fact* true. An argument can be extremely strong but have false premises and a false conclusion.

> ### Strong Inductive Argument
> 1. There is a bag on the table filled with 50 beans.   *False*, there are actually 100
> 2. I randomly drew 40 beans from the bag and   *False*, a couple of these were blue.
>   they were all black.
> 3. Therefore, all of the beans in the bag are black.   *False*, some beans were orange.

In short, saying that an argument is *strong* just means that *if* the premises were true, then the conclusion *would be very likely*, it does not mean that the premises are actually true.

3.5. Inductive Arguments: Cogent or Uncogent

Inductive arguments are **cogent** or **uncogent**. An inductive argument is **cogent** if and only if the argument is *strong* and its *premises are true*. An inductive argument is **uncogent** provided the argument is either weak or strong but its premises are not true.

Cogent	Strong Inductive Argument + All True Premises

Argument

Deductive   Inductive

Valid   Invalid   Strong   Weak

Sound   Unsound   Cogent   Uncogent
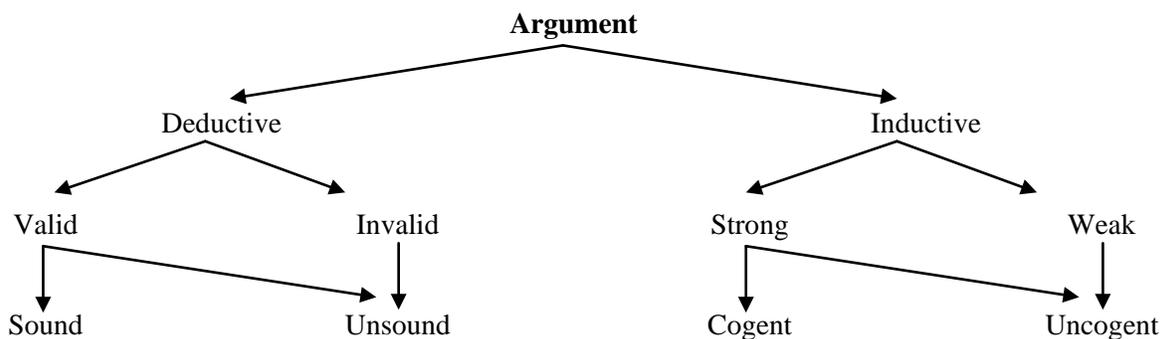
A. Identify Propositions: For the following sentences, state which express propositions and which do not express *not* propositions.

1. Let the dog out.
2. In a fixed rate par bond, the issuer issues the bond at par value.
3. Brandon has Finance 301 at 11:15PM on Thursdays.
4. Recycling bins are blue.
5. Let's Go Pens!
6. Mike goes to the University of Miami.
7. Billboards are a great way to advertise for your company.

8. Can you pass me the pepper?
9. Finance is awesome.
10. Isaac Newton discovered gravity when he dropped a piano on his brother's head.

B. Identify Arguments: For the following sets of sentences, state which express arguments and which do not express *not* arguments.

1. If Jimmy goes to school, he will get a good grade. His mom would be really happy if Jimmy gets a good grade. Therefore, Jimmy should go to school.

2. I really like elephants. They have super big ears and a really long nose. What a cool animal!

3. Going to the doctor is hard enough but the cost of health care is making it even harder. People got by before all these medical advances. I wish health insurance was more affordable.

4. You should read the review of the new restaurant that was in the paper this morning. It had great information on the types of food available. From the way it sounds, it could be a pretty neat place. It also describes the environment pretty well. Definitely check out the paper when you get a chance.

5. If T is the case, where T = Newton's Law of Universal Gravitation and Newton's Three Laws of Motions. AND IF all of the following are the case: ic_1 = there exists a planet u, and ic_2 = planet u is at position p_1, and ic_3 = there exists only n number of bodies that are close enough and massive enough to exert non-negligible gravitational force on u; these are x, y, and z, and ic_4 = Body x is at position p_1, at time t_1, and has a mass of m_1, THE planet u should be at position p_7 at time t_7.BUT, p = Planet u and it was **not** at position p_7 at time t_7.Therefore, it is not the case that T.

C. Identify Deductively Valid or Invalid

Arguments: For the following arguments, state which are deductively valid and which are deductively invalid.

1. All men are mortal. Socrates is a man. Therefore, Socrates is mortal.

2. All unicorns are pink. Frankie is a unicorn. Therefore, Frankie is pink.

3. Someone loves Liz. Liz loves someone. Therefore, everyone loves Liz.

4. Liz gave Jon five dollars yesterday. Jon is a good guy. Therefore, Jon will return Liz's five dollars tomorrow.

5. Some bicyclists smoke. Some bicyclists give to charity. Therefore, there are some bicyclists that both smoke and give to charity.

D. Identify Inductively Strong or Weak

Arguments: For the following arguments, state which are inductively strong and which are inductively weak.

1. I once was robbed by a white male in his 40s. Therefore, everyone who is a white male in his 40s is a robber.

2. The earth rotated around the sun yesterday. Therefore, the earth will rotate around the sun for the next week.

3. The earth rotated around the sun yesterday, the day before that, and for the last couple million years. Therefore, the earth will rotate around the sun for the next week.

4. Men should always ask women to school dances and not the other way around. It has always been a tradition for the men to ask the women and it is the gentlemanly thing to do. More and more men are moving away from this grand and glorious tradition. This is not good. Guys should also keep in mind that girls are not going to readily ask them to dances.

5. My doctor told me, upon inspection, that I have a skin disease. But I didn't believe him and so I asked for them to test to make sure. The lab results confirmed this. But, I'm still skeptical. So, I got a second and third opinion. The second and third doctors (and lab tests) told me I had the same skin disease. But, Uncle Jon told me not to believe them and Uncle Jon once won the lottery (he is a lucky guy). Therefore, I do not have the skin condition that the doctors claim that I have.

E. Key Terms:
In your own words, define each term and give an example that represents its meaning.

1. Proposition
2. Argument
3. Deductive Argument
4. Inductive Argument
5. Deductively Valid Argument
6. Deductively Invalid Argument
7. Sound Argument
8. Unsound Argument
9. Inductively Strong Argument
10. Inductively Weak Argument
11. Cogent Argument
12. Uncogent Argument