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A Brief Review of Some Basics of Critical Thinking/Logic

"Logic is the art of making truth prevail."

--Le Bruyere, from *Characters*

Most of the reasoning we do is non-reflective—that is, we don't think about the fact that we are doing it. Thus, whether you realize it or not, you engage in a considerable amount of reasoning each day of your life. For answering basic questions and meeting many of our needs and desires in life, this situation is acceptable, especially since much of this reasoning is fairly simple. However, as questions deepen and our needs and desires become more complex, our need to become better at reasoning also increases.

One can become better at reasoning—that is, become a critical thinker—through engagement with many different academic disciplines, or areas of study. Improving your reasoning in most disciplines is accomplished simply by practicing the way reason is applied in that particular field. In other words, reasoning is taught as you perform it in the study of something else. One significant feature of this approach is that one remains largely unaware of and thereby inarticulate about the nature of the reasoning one performs. Philosophy (in particular, that area of it now known as 'logic') stands out in history for the way it has devoted itself to the reflective study of reasoning itself. It is committed to the idea that reasoning skills can be further enhanced if one becomes aware of what it is that one is doing when one reasons. This involves becoming more articulate about when reasoning works well and when it fails. In devoting itself to this task, philosophy has generated powerful and lasting insights into the rules that govern the way we think.

This is not a course in logic or critical thinking, but your comprehension of the material will improve if you are familiar with some basic critical thinking vocabulary and tools. The aim of this brief handout is to provide you with an overview of some of these, most of which you have likely encountered in an earlier philosophy course.

I. **What is an argument?**

Being a better critical thinker involves being able to identify and evaluate arguments. The word, "argument" has a number of meanings. (There were nine the last time I checked the dictionary.) Sometimes we use the word to refer to an angry dispute between people, but here that is not the meaning intended. In this setting, an **argument** is an instance, or occurrence, of reasoning. For example, we might say to a public figure or political candidate, "What's your argument for why we should stay the course in Iraq?"

As an instance of reasoning, an argument is made up of a collection of two or more statements. One of those statements is the **conclusion**—the claim, or thesis, that the author of the argument is seeking to establish as true. The remaining statement or statements are the **premises**—those claims, or reasons, providing support for the conclusion.

Since arguments are composed of statements, the first step in identifying them is to recognize the difference between a statement and something that is not a statement. A **statement** is a

sentence that can be true or false (*It is raining now.*). Some types of sentences that are not statements include commands (*Close the window!*), questions (*What is your name?*), and exhortations (*Let's all play a good game today.)*.

Here then is a simple argument offered by Abraham Lincoln in correspondence with a friend:

> I have now come to the conclusion never again to think of marrying, and for this reason; I can never be satisfied with anyone who would be blockhead enough to have me.[1]

In order to better understand how the statements of an argument are intended to work together to support the conclusion, it is often useful to extract its statements from the passage and present them in a more schematic form. **Schematizing** reasoning in this way involves listing the premises (labeled `P1,' `P2,' etc.) with a line underneath them and the conclusion stated below it (labeled 'C'). Abe's argument could be schematized the following way:

> P1: I can never be satisfied with anyone who would be blockhead enough to have me.
> ---
> C: I will never again think of marrying.
>
> **Note that one lists the statements here according to their function, not according to the order in which they appear in the passage.*

In this case, we've followed Abe's wording very closely in paraphrasing his reasoning. However, it's usually best to try to restate the argument in one's own terms to make the reasoning clearer. Remember to state premises in complete sentences that are capable of being true or false.

> P1: Anyone who would be willing to marry me is stupid.
>
> P2: I will never marry a person that is stupid.
> _____
> C: Therefore, I will never marry.

II. **Identifying and Articulating Arguments**

An argument is not just any collection of statements but is defined by the way the premises are associated with the conclusion—namely, that they support the conclusion by providing reasons for thinking that the conclusion is true. This is what sets arguments apart from other collections of statements (e.g., descriptions, explanations, elaborations, illustrations, narratives, etc.). Identifying arguments in a passage requires that one be able to spot when this relationship between statements exists.

Sometimes, one will be confident that a passage contains an argument but it won't be entirely clear which statement is the conclusion and which are serving as premises. First, begin by trying to identify the conclusion. Ask yourself: What claim does the author wish for me to adopt? Once you've answered this question, ask: "What reasons does s/he give me for thinking that this conclusion is true?"

[1] "Mr. Lincoln and Cupid," by Richard J. Behn from: http://www.lehrmaninstitute.org/history/essays9.html

If the situation is still not clear, look for **reasoning flags**—that is, words often indicating that what follows or immediately precedes them is either a conclusion or a premise.

> "Since Andrew has a son, it must be that he is a father."

Here, the word, 'since,' indicates that the statement that follows is a premise. The phrase, 'it must be that,' indicates the conclusion.

> P1: Andrew Eshleman has a son.
> ---
> C: Andrew Eshleman is a father.

Note here that some obvious claims are not stated explicitly, even though they are working in the background as part of the reasoning. Unstated claims of this sort—known as **suppressed** premises--are often claims or assumptions the author of the argument believes are so obvious that they need not be explicitly expressed. When schematizing an argument on a more significant topic, we will often want to make explicit any suppressed claims, because these will not always be claims (as they are in the present case) that everyone would agree about as the author or speaker may have assumed. If we wanted to spell-out the argument of our very simple example in more detail than we normally would in everyday contexts, it might look something like this:

> P1: Andrew Eshleman has a son.
>
> P2: A son is male offspring of a male human (suppressed)
>
> P3: All male humans with sons are fathers. (suppressed)
>
> P4: Andrew Eshleman is a male human. (suppressed)
>
> ---
> C: Andrew Eshleman is a father.

Reasoning won't always be marked by the words "since" and "must." Below is a list of some additional common reasoning flags you may encounter and note that often reasoning flags are not explicitly stated.

Conclusion Flags	**Premise Flags**
therefore	because
thus	as
hence	for
so	since
consequently	given that
it follows that	for the reason that
as a result	as shown by
it must be that	seeing that
this entails that	being that
we may infer that	
suggests strongly that	

***Many of these words (especially 'for,' 'because,' and 'since') perform other functions as well, so their mere presence does not guarantee that reasoning is present.*

Finally, note that arguments sometimes proceed in stages. That is, a conclusion earlier in a process of reasoning may serve as a premise as the reasoning continues in support of one or more additional conclusions. These are *compound* arguments. Here is a familiar type of compound argument:

> P1: When Chemical X was administered to mice in multiple well-designed studies, the rate of heart failure multiplied threefold.
> ---
> C1/P2: Chemical X likely caused an increased risk of heart failure in mice.
>
> P3: Physiologically, mouse hearts work much like human hearts.
> ---
> C2/P4: Chemical X likely causes an increased risk of heart failure in humans
>
> P5: Chemical X is a main ingredient in the most delicious of all snacks, Yum Yum Bars.
> ---
> C3: Yum Yum Bars are not safe to eat

III. Evaluating Arguments

We are presented with reasoning of many different kinds and on many different topics. Much of this is pretty straightforward and easily understandable, but sometimes the issues are more complicated and we feel the need to carefully weigh the reasoning. It is in these cases that it pays to improve the skills involved in identifying and articulating reasoning, for in coming to understand an argument better we are better positioned to evaluate it—that is, entertain whether we should be convinced or not by the reasoning. In order to properly evaluate an argument, we need to know what we're looking for in a good argument.

A good, or compelling, argument possesses two main properties. Thus, in evaluating an argument, one is checking for the presence of these two characteristics.

> **The Two Properties of a Good Argument**
>
> - The premises of a good argument are true (or at least we have good reason to think that they are true).
>
> - In a good argument, if the premises are accepted as true, then the truth of the conclusion follows from them.

Premises can only serve their function of providing support for the conclusion if they are true (or at the very least, when we are justified in believing that they are true). However, the second characteristic points to the fact that there also must be a powerful link between the premises of an argument and its conclusion so that the conclusion would follow from the premises in cases where the premises are true. The importance of this can be highlighted by examining an argument that has true premises but which lacks this further property.

P1: If someone is Paula's father, then that someone is a male.

P2: Henry is a male.

C: Therefore, Henry is Paula's father.

When examining whether an argument's conclusion follows from its premises, we do not need to know if the premises are, in fact, true. In this case, we know that the first premise of this argument is true simply in virtue of the definition of "father." However, we do not know to whom "Henry" refers, so the actual truth of the second premise is unclear. *In this sort of case, we can simply assume for the sake of argument that the premise is true—that "Henry," in fact, refers to a male—in order to see whether the conclusion follows.*[2] If we do so, we see that the two premises, even if both true, do not provide sufficient reason for thinking that Henry is Paula's father. Knowing the definition of "father" and that someone named "Henry" is a male does not provide us with good reasons for thinking that Henry is Paula's father (or anyone else's father for that matter—Henry may be 2 yrs. old!). Thus, in evaluating this argument, we would be correct to say, "That conclusion doesn't follow." So, in this case, we can tell it's a bad argument, even though we don't know for sure whether the second premise is true.

Note further that this would be a bad argument even if it turned out to be factually true that Henry was Paula's father, because it would still be the case that the premises offered failed to provide us with good reasons for thinking that the conclusion was true. That is, we might say in that case that we stumbled by accident upon the truth rather than that we were led by good reasons to the truth. (As an analogy, think about how a botched criminal trial might nevertheless yield the correct verdict wholly by accident).

Given that there are two properties of a good piece of reasoning, it follows that there are two sorts of objections one can raise against an argument if one suspects it to be a case of faulty, or bad, reasoning:

- Objection Type 1: one can argue that there is reason to think that one or more of the premises are false.

- Objection Type 2: one can argue that even if the premises were true that the conclusion would not follow properly from them—that is, the conclusion is not adequately supported by the premises.

The objection we raised against the argument above is of the second variety insofar as we noted that the conclusion does not follow—i.e., we cannot know that Henry is Paula's father based on the premises provided.

IV. Deductive Arguments

For the sake of keeping things simplified in the discussion above, we have not distinguished between two different kinds of arguments. Drawing this distinction allows one to be a little more articulate in describing the problem with some arguments by enabling one to spell-out more clearly the way in which the supporting premises must be linked to the conclusion of a good

[2] Notice the way this illustrates that the 2nd property of a good argument—whether the conclusion follows from the premises—is distinct from the question of whether the premises are, in fact, true.

argument. We will focus first on *deductive* arguments. Later, we will examine *inductive* arguments.

In a deductive argument, the person presenting the argument intends to assert that the conclusion "follows from" the premises is an especially strong sense—namely, that if the premises are accepted as true, then the conclusion *must* necessarily be true. Or, to state this the other way around, in offering such an argument, one is claiming that it is *impossible* that the premises be true and the conclusion false. Here is an example of such an argument:

P1: All college students are human beings.

P2: James is a college student.

C: James is a human being.

If all college students are human beings (true, right?) and James is a college student, then James must be a human being. When an argument is constructed in such a way that the conclusion does follow from the premises in this way it is **valid**.[3] If it fails to meet this standard, it is **invalid**. A good deductive argument—one that is valid and has true premises—is **sound**.

Note that the definition of a deductive argument refers to what the author of the argument intended. Did he or she intend the premises to establish the conclusion with certainty? This is significant, for one may offer an argument, thinking that the conclusion follows from the premises in this way, but be mistaken (for example, the invalid argument presented above about Paula's father).

Note also that validity is a matter of the structure, or form, of the argument. As we noted in our earlier discussion of the way a conclusion needs to "follow from" the premise: *it is not concerned with the actual truth or falsity of the premises and conclusion*. So, in assessing the validity of an argument, we set aside the question (temporarily) about whether the premises are, in fact, true. Instead, we hypothetically entertain the possibility that they are true, and ask ourselves whether the conclusion would then follow deductively. To illustrate how the issue of validity is distinct from the issue of the actual truth of the premises, consider these deductively valid arguments that are nevertheless unsound:

P1: Andrew Eshleman is a philosophy professor.

P2: All philosophy professors are infallible.

C: Andrew Eshleman is infallible.

P1: One cannot succeed in business unless one possesses an M.B.A. degree.

P2: Bill Gates does not have an M.B.A. degree.

C: Bill Gates cannot succeed in business.

[3] Note here how the use of the word "valid" is different in this context than in everyday usage where it is often used simply to mean "true."

These are valid arguments because if their premises were true, we would be logically compelled to accept the conclusion as true as well. However, one of the premises in each case is false, so these are unsound arguments. They do not give us good reasons to accept the conclusion.

In a deductively valid argument, the conclusion follows from the premises as a matter of sheer logic. One is forced by logical necessity to accept the conclusion if the supporting premises are true.

V. Deductive Forms

As noted above, an argument's validity is strictly a matter of its form, or structure, rather than its content. To further highlight this distinction between an argument's form and its content, consider the following two arguments:

P1: If Wells Fargo is a bank, then it is a financial institution.

P2: Wells Fargo is a bank.

C: Wells Fargo is a financial institution.

P1: If an animal has fins, then it is a fish.

P2: Dolphins have fins.

C: Dolphins are fish.

The content of these arguments—that is, what they are about—is very different. Yet you no doubt have noticed that they nevertheless have something important in common. They share the same form, or structure, of reasoning, and in virtue of that shared structure, they are both valid arguments (though only one of them is also sound). This form, or structure, can be represented symbolically, freed of the particular content of the examples. For instance, we can represent the shared form of these two arguments as such:

P1: If A, then B.

P2: A.

C: Therefore, B.

That arguments can share a common structure is a powerful observation, because it allows one to more readily recognize when valid reasoning occurs. If the valid form, or pattern, is present, then we know we have a valid argument. Some invalid patterns are quite common as well, so if you learn to spot some of those, you can more quickly recognize invalid reasoning when it occurs.

For this course, you won't need to identify and name valid and invalid forms of deductive arguments. It will be more important to be able to think more generally about what it means for an argument to be valid and to be able to think your way through the question of whether the conclusion of a particular argument would follow with certainty if the premises were imagined to be true.

If you'd like to survey some of the most common valid and invalid patterns of deductive reasoning, see Appendix A. For a more in-depth foray into the study of argument forms and their symbolic representation, you might consider our department's course in symbolic logic.

VI. The Philosophical Use of Thought Experiments

Before turning to examine inductive arguments, it will prove helpful to say something about the way philosophers sometimes use examples to engage in some deductive reasoning. Examples are often used by a writer to simply illustrate or amplify a point. However, examples can also be used as part of an argument. Philosophers sometimes construct elaborate examples for this purpose--many of which involve fanciful scenarios that seem far removed from our everyday experience. Consider the following example given by Judith Jarvis Thompson:

> But now let me ask you to imagine this. You wake up in the morning and find yourself back to back in bed with an unconscious violinist. A famous unconscious violinist [sic]. He has been found to have a fatal kidney ailment, and the Society of Music Lovers has canvassed all the available medical records and found that you alone have the right blood type to help. They have therefore kidnapped you, and last night the violinist's circulatory system was plugged into yours, so that your kidneys can be used to extract poisons from his blood as well as your own. The director of the hospital now tells you, "Look, we're sorry the Society of Music Lovers did this to you--we would never have permitted it if we had known. But still, they did it, and the violinist now is plugged into you. To unplug you would be to kill him. But never mind, it's only for nine months. By then he will have recovered from his ailment, and can safely be unplugged from you." (From 'A Defense of Abortion,' *Philosophy and Public Affairs*, 1:1[1971], p. 48)

A common student reaction to such examples is that they are irrelevant to the issue at hand--here the permissibility of abortion--since it's not about abortion and no such thing could ever happen. In assessing the strength of such an example—utilized as part of the author's argument--it's important to understand how such cases are meant to function. The cases are aimed at undermining a particular claim or premise in an argument. In this case, Thompson intends to put critical pressure on one of the premises in an argument some give to support the impermissibility of abortion. See if you can identify the premise Thompson is calling into question by means of her example. A common argument for the wrongness of all abortion goes something like this:

> P1: Every person has a right to life.
>
> P2: A fetus is a person.
> ---
> C1/P3: A fetus has a right to life.
>
> P4: Women carrying fetuses have a right to decide what happens to their bodies.
>
> P5: The right to life is always more stringent than the right one has to control what happens to one's body.
> ---
> C2/P6: The fetus' right to life outweighs the mother's right to control what happens to her body.

P7: If one is innocent and has a right to life, then it is wrong to kill him/her.

P8: The fetus is innocent.

P9: Abortion involves killing the fetus.

C3: Abortion is wrongful killing.

The idea here is that if P5 were true, then we should say that you have a moral obligation not to unhook yourself from the violinist. But this seems incorrect to most people. Granted, it would be a sad thing for the violinist to die, and it would be a very nice thing for you to agree to remain hooked up to him. Nevertheless, many agree with Thompson that it is difficult to believe that you have an *obligation* to do so under the circumstances. So, the example suggests that it may not be true that another person's right to life *always* trumps one's right to control what happens to one's body.[4] This then illustrates the way examples of this kind may be used by an author to test a claim or premise. The reasoning behind Thompson's example is:

P1: If the right to life was always more stringent than the right to control one's body, then it would be wrong to unhook oneself from the violinist.

P2: It would not be wrong to unhook oneself from the violinist.

C: The right to life is not always more stringent than the right to control one's body.

But what about the fact that the example is so weird? Why should we concede that a lesson drawn from such a case is relevant to our real life situation? There is currently an interesting discussion about the use of such cases in philosophy, but here's one way of explaining their possible relevance. The examples may be thought of as experiments parallel to those done in science, though here the experiment takes place in your head. In the case of science, there is some hypothesis, or claim, that is to be tested in the experiment. Now, in order to isolate the particular thing being tested and control for variables, it's sometimes the case that scientists must conduct the experiment under artificial laboratory conditions. That is, the worry is that if the experiment were conducted in a natural environment, there are too many other variables that might come into play, making it difficult to know how best to explain the results. The fact that the experiment is not performed under real life conditions does not by itself undermine the conclusions drawn from the experiment (though sometimes good questions can be raised about whether the results in the laboratory carry over to 'real life').

In similar fashion, when philosophers construct a fanciful example to test a claim, they are doing so in order to clearly isolate the thing being tested and to control for other variables that might

[4] The issue of the moral permissibility of abortion is complex and so cannot be settled by a single argument of this sort. For example, note that even if the argument goes through, its conclusion would only be relevant in those cases where a woman became pregnant through rape. In the remainder of her essay, Thompson discusses cases she thinks would generate conclusions about the permissibility of abortion in other instances of pregnancy. Also, some have raised the important question of whether this sort of argument misrepresents the status of the fetus as a stand-alone individual insofar as it overlooks the very unique way that the fetus' body is intertwined with that of the mother (and thus not like the violinist case, such authors would argue). See, for example, Catriona Mackenzi, "Abortion and Embodiment," *Australasian Journal of Philosophy* 70:2 (1992): 136-155.

be influencing how we think about the issue in question. They are in this way, *thought experiments*. And just as in science, it's not enough to simply say that the experiment is irrelevant because it's not a real life scenario. To make the case that the example is not directly relevant, one must try to explain why one can't carry over the results of the thought experiment to more everyday contexts. For example, one might try to show that in trying to control for variables, one has left out an important factor in real life contexts that must be taken into consideration or that the lesson of the experiment only applies to very limited real-life contexts. (See if you can think of a way one might critically respond to Thompson's argument.)

To this point, we've been focusing on deductive reasoning—reasoning which aims to establish a particularly strong connection between the premises and the conclusion such that if the premises are true, the conclusion must, by necessity, also be true. However, not all arguments having a strong link between the premises and conclusion are of this kind.

VII. Inductive Arguments

In an inductive argument, the conclusion is intended to follow from the premises in such a way that if the premises are true, then the conclusion is *probably*, or most likely to be, true. Or to state it the other way around, in a good inductive argument, it is very *improbable* that the premises are true and that the conclusion is false. Here's an everyday case of inductive reasoning:

P1: The clouds are getting darker overhead.

P2: The wind is getting stronger.

P3: The barometer is falling.

C: A storm is on the way.

In this argument, it is unlikely that the conclusion is false if all the premises are true, but it is possible. In other words, even if P1-P3 are true, there may be no storm. Thus, these arguments are not deductively valid. This need not, however, mean that they are bad arguments, for it could be that the premises offer good supporting evidence for the conclusion, even though it is not logically airtight. Consider another familiar type of this kind of reasoning:

P1: Jack has always hated Peter and has been heard in the past to have threatened him.

P2: Peter was shot to death at 11pm in his apartment on Monday night.

P3: Jack was seen leaving Peter's apartment building in a hurry at 11:10pm on Monday night with blood stains on his shirt.

P4: The gun used to kill Peter was found in Jack's home.

C: Jack shot Peter to death.

Think about how many TV and movie plots revolve around the idea that while evidence of this sort strongly supports a judgment of guilt, it could turn out that the individual is not guilty after all. (Can you imagine a possible scenario in which all of this argument's premises are true, yet the conclusion is false?) Nevertheless, at this point, absent strong contrary evidence supporting Jack's innocence, this is a pretty good argument because the supporting premises suggest that it is probable that the conclusion is true. Jack will need a good lawyer.

Like the case of deductive arguments, the definition of an inductive argument makes reference to what the author of the argument intended. So, again, this leaves open the possibility that despite the author's intention, the argument may not possess the sort of desired link between the premises and the conclusion. If an inductive argument has the desired link between its premises and conclusion so that its conclusion is very probably true if its premises are true, then we say that it is **inductively strong** (or reliable). If it lacks this property, we say it is **inductively weak** (or unreliable). If the inductive argument is strong and its premises are true, then it is a **cogent** argument.

Note here that strength of an inductive argument is a matter of degree. A good inductive argument will be one in which conclusion is established by the sheer weight of the evidence. How strong the argument needs to be to establish its conclusion will depend upon the context. The difference between deductive validity and inductive strength is analogous to the difference between a traditional light switch and a dimmer switch. Deductive validity is 'on' or 'off' matter, inductive strength is a matter of more or less.

As noted, distinguishing deductive from inductive arguments requires that we interpret the intentions of the argument's author. Did s/he intend to assert that the conclusion follows necessarily from the premises or only with a high degree of probability? Sometimes, the intent will be very straightforward, given the way the argument is presented (including which reasoning flags are employed). However, in other cases it may not be entirely clear. When the intent is not made clear by the manner of presentation, one should interpret the argument based on a judgment about which way of casting the argument—as deductive or inductive—makes it a better argument. In doing so, we are applying "*The Principle of Charity*," a principle which encourages us to put the best interpretive face on a claim or argument before engaging in its evaluation. Adopting this charitable attitude in interpretation not only helps express respect for one's conversation partners but also helps make the pursuit of understanding and truth more productive.

Philosophy textbooks have a tendency to overemphasize the centrality of deductive reasoning, regarding it as the "gold standard" of reasoning. This suggests that inductive arguments—though accepted as sometimes necessary—are second-best. It's important to resist this tendency, since an inductive argument is sometimes more appropriate in a given context and a certain kind of inductive argument plays a very central role in philosophical exploration. This form of reasoning is known as "inference to the best explanation" and involves weighing the explanatory power of competing theses. We'll talk more about this later, but think about how this is the case in the example above involving Jack. The question is, "Who killed Peter?" and in their attempt to answer this question, investigators might need to weigh the likelihood that one suspect vs. another killed Peter. That is, they will be weighing the explanatory power of competing theses about who killed Peter. Similarly, in philosophy one is often seeking to answer a particular question and competing philosophical views will need to weighed to ascertain which one possesses the most explanatory power in answering the question.

Finally, since it is so widespread (and easy to encounter on the internet), it is worth pausing to comment on a very common way others sometimes draw the distinction between deductive and inductive arguments. It is often said that the distinction rests on whether one is reasoning from a general claim to a particular claim (or claims) vs. reasoning from a particular claims(or claims) to a general claim. If reasoning in the former manner, some say it is a deductive argument and if in the latter way, then it is inductive.

General to Particular	Particular to General
P1: All humans are mortal. (general claim)	P1: The seven crows I've seen are black. (particular)
P2: Socrates is human.	P2: The two crows you've seen are black. (particular)
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C: Socrates is mortal. (particular claim)	C: All crows are black. (general)

As in the cases above, it is true that many deductive arguments begin with a more general claim and work toward a more particular claim and that many inductive arguments begin from more particular claims and work toward a more general claim. *However, this is not always the case, so it's not the most accurate way to characterize the distinction between the two types of arguments.*

For example, deductive arguments may also sometime begin with the particular and conclude with a general claim:

P1: The Decembrists and the Fleet Foxes are the best bands of the day. (particular)

P2: The Decembrists and the Fleet Foxes are from the Pacific Northwest. (particular)

C: All the best bands of today are from the Pacific Northwest (general)

Or they may proceed from particular to particular:

P1: Bandit is a cat. (particular)

P2: Bandit has a tail. (particular)

C: Bandit's tail is the tail of a cat. (particular)

Also, inductive arguments can proceed from general claims and conclude with particular claims.

P1: All skeletons of early homo-sapiens indicate that they walked upright. (general)

C: The next skeleton of an early human we discover will also indicate that s/he walked upright. (particular)

So, again, it's best to distinguish whether an argument is deductive or inductive based on the intended strength of the link between the premises and conclusion. Did the author of the argument intend the conclusion to follow with certainty if one were to assume that the premises

are true? If so, then the argument is deductive. Or, did the author of the argument intend the conclusion to follow with increased probability if one were to assume that the premises are true? If so, then the argument is inductive.

For those who'd like to keep reading, see the appendices below. There, I discuss some of the most common valid and invalid deductive forms and some of the most common informal fallacies. This detail that can come in handy, but it won't be necessary to be in command of that further detail for this course.

Appendix A: Common Valid and Invalid Forms

Here are the most common deductively valid forms of argument:

Valid Form	**Example**
Modus Ponens ("the way that affirms")	
P1: If A, then B.	P1: If Wells Fargo is a bank, then it is a financial institution.
P2: A.	P2: Wells Fargo is a bank.
---	---
C: Therefore, B.	C: Therefore, Wells Fargo is a financial institution.
Modus Tollens ("the way that denies by denying")	
P1: If A, then B.	P1: If Wells Fargo is a bank, then it is a financial institution.
P2: Not B.	P2: Wells Fargo is not a financial institution.
---	---
C: Therefore, not A.	C: Therefore, Wells Fargo is not a bank.
Disjunctive Syllogism	
P1: A or B	P1: Oliver North is either a traitor or a hero.
P2: Not A	P2: Oliver North is no traitor.
---	---
C: Therefore, B.	C: Therefore Oliver North is a hero.

Hypothetical Syllogism

P1: If A, then B.	P1: If you buy our product, you will be more attractive.
P2: If B, then C.	P2: If you are more attractive, you will be more successful.
---	---
C: Therefore, if A, then C.	C: Therefore, if you buy our product, you will be more successful.

We not only can recognize the validity of an argument by recognizing that it embodies a valid form, we also can recognize the invalidity of some arguments by recognizing that they embody a form that cannot generate a valid inference from the premises to the conclusion. When faulty reasoning occurs and the fault is not simply that one or more of the premises are false, we may say that a *fallacy* has been committed, or that the reasoning is fallacious. When a fallacy is due to the argument's form alone, it is known as a "*formal fallacy*." Below are some of the most common formal fallacies, made common most likely by the fact that they may be mistaken for one of the valid forms listed above.

Invalid Form	**Example**
Denying the Antecedent	
P1: If A, then B.	P1: If J.P. Morgan is a bank, then it is a financial institution.
P2: Not A.	P2: J. P. Morgan is not a bank.
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C: Therefore, not B.	C: Therefore, J. P. Morgan is not a financial institution.
Affirming the Consequent	
P1: If A, then B.	P1: If it rained, then the sidewalk is wet.
P2: B.	P2: The sidewalk is wet.
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C: Therefore, A.	C: Therefore it rained.

Affirming the Disjunct

P1: A or B	P1: A or B	P1: Either Jim Taylor is a student, or he is an athlete.
P2: A.	P2: B	P2: Jim Taylor is a student.
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C: Therefore, not B.	C: Therefore, not A.	C: Therefore, Jim is not an athlete.

*Note: In English, we sometimes use the conjunction "or" in the **exclusive** sense to denote that the one possibility excludes the other: "Susan is in Georgia, or Susan is in Oregon." At other times we use "or" in an **inclusive** sense to mean that both possibilities might be true: "Susan is busy, or Susan is tired." The fallacy of Affirming the Disjunct applies in cases where the inclusive sense of "or" makes the most sense in context but someone is mistakenly treating it in the exclusive sense in his/her reasoning. That is, if both A and B can be true at the same time, then you commit a fallacy if you try to deduce that B can't be true based on the fact that you know A to be true. It involves overlooking the possibility that both disjuncts can be true at the same time.*

*If it is clearly a case where the disjunction is **exclusive** ("Susan is in Georgia, or Susan is in Oregon."), then it would not be a fallacy to conclude that B can't be true based on the fact that you know A to be true. (From the fact that Susan is in Georgia, you can validly conclude that she's not in Oregon.)*

Appendix B: Informal Fallacies

A fallacy is committed whenever the premises provide reasons of the wrong kind to support an argument's conclusion (whether the premises are true or not). Earlier, we looked at some common formal fallacies—that is, cases where an argument is made invalid by the form or structure or the reasoning quite independent of the argument's content. However, not all fallacies are due strictly to the form of the argument. Some derive from the argument's content—that is, what the argument is about. These are known as "informal fallacies." Some informal fallacies may occur in both deductive and inductive reasoning; others are strictly problems in cases of inductive reasoning.

Many of the most common informal fallacies may be classified as *fallacies of relevance*. In this category of informal fallacies, the premises offered are logically irrelevant to establishing the truth of the conclusion. However, these ways of arguing are common because they are often psychologically influential on the reader/hearer.

Some Informal Fallacies of Irrelevance	**Example**
Emotional Appeals—For example:	
Appeal to Force or Fear: Here one is urged to accept some conclusion out of fear of some harm rather than on the basis of weighing the support for the truth of the conclusion.	Pitch to Board of Directors of a charitable organization: "I'm sure you will agree that Pete Thornby is the most qualified person to be elected to take the open seat on the Board. Remember what a great contributor his father has been to our organization and how much he would like continue giving."
Appeal to Pity: As the name suggests, here one seeks to evoke the emotion of pity, in support of one's conclusion.	Driver to police officer: "Surely I don't deserve a speeding ticket. I've been working double shifts for weeks and so have barely seen my wife. I was only trying to get home quickly to see her before she left for work."

Appeal to the People: Here the author of the argument appeals to one's desire to belong or be respected by some group (and/or to not be associated with some other group).	Politician: "Vote for X, the only policy for America's middle-class working men and women." (Absent any further support for the claim.)
Against the Person (Ad Hominem): Here attention is diverted away from the merits of the argument and focused on something allegedly negative about the person making the argument.	"Those arguing for the legalization of marijuana are either ivory tower academics and/or loser potheads, so there's no point in revisiting the current drug laws."
Straw Man: This fallacy involves a violation of the Principle of Charity described above. The original view or argument is distorted or characterized so unfairly so that it can be (too) easily refuted, like knocking over a straw man.	"Students have asked for a venue on campus where alcohol could be served. So, now they want us to use tuition dollars to run an open bar for them?"

This next group of informal fallacies involves illegitimately presuming a key something in the premises.

Some Informal Fallacies of Presumption and Ambiguity	**Example**
Begging the Question: In these cases, the problem is that one reasons in a circle or leaves unstated a key assumption, which happens to be the very thing the argument seeks to establish.	"Capital punishment is a justified form of punishment for murder because it's clearly appropriate for someone to be put to death for such a horrible crime."
False Dichotomy: Here a disjunctive (A or B) is proposed as presenting the only available possibilities when there is reason to think that this is not the case.	"Either I keep drinking a lot, or I cut back as you ask and become miserable company—someone you wouldn't want to be around."
Fallacy of Equivocation: in these cases, the meaning of a word or phrase fails to remain constant, or changes, in the course of the argument.	"Some newspapers censor speech by refusing to publish controversial authors. Censorship violates the First Amendment. Therefore, some newspapers violate the First Amendment." (The meaning of "censorship" as prohibited by the 1st Amendment concerns the use of governmental powers to suppress speech, whereas the author here is using "censor" in the first premise to refer more broadly to any decision made to control content, which is not addressed by the Constitution.)

Finally, another class of informal fallacies involves inductive reasoning which fails to generate strong support for a conclusion.

Informal Fallacies of Weak Induction	**Example**
Appeal to Unqualified Authority: Many good inductive arguments make appeal to qualified authorities. (Think of the expertise behind a weather forecast.) However, sometimes one can choose the wrong kind of authority and thereby generate a poor argument.	"According to Max Tabor, lead actor of a popular TV crime series, and a group of well-known musicians, there is no good forensic evidence to convict Mark Johnson of murder."
Hasty Generalization: in a good inductive generalization one reasons from a characteristic of a representative sample to some characteristic of a larger population. A fallacy can occur when one's sample is a single case or in some other way, not representative of the larger population.	"My aunt's HP laptop crashed after just two weeks. HP computers are worthless."
Problematic Causal Inferences—For example:	
Slippery Slope: assume a chain of causes that is unlikely to unfold as imagined. Note: not all causal chain arguments are fallacious—the strength of the argument hinges on the evidence for the likely causal connections.	"If we continue to allow the increase of taxes on tobacco products because of their ill health effects, then soon there will be a similar tax on doughnuts and potato chips."
False Cause: this involves either mistakenly assuming that since two things are correlated, the one causes the other (*post hoc ergo propter hoc*);	"More and more young people are attending high schools and colleges today than ever before. Yet there is more juvenile delinquency and more alienation among the young. This makes it clear that these young people are being corrupted by their education."
or mistakenly oversimplifying the causal story behind a phenomenon.	"Every time Damian Lillard shoots at least 20 times per game, the Trailblazers win. So, all they need to do to keep winning is make sure that he shoots at least 20 times per game."