Logical Method:

Induction and Deduction

This Tutorial includes two files:

- **Lesson (31a_Logical_Method_Lesson)**

  In order to learn the material presented in this tutorial more effectively, we have created a "notes" section in the exercises file. Take notes for this tutorial by answering the questions listed in the exercises file.

- **Exercises (31b_Logical_Method_Exercises** – located in the same area as the lesson)
  - It has highlighted areas for you to take notes and answer the exercises using an application such as Adobe Acrobat Reader.
  - Download and save this file as your own; you will share it with an instructor after you complete the lesson and exercises.

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Logical Method: Induction & Deduction

Imagine yourself as a primitive human, wandering around the plains of Africa millions of years ago. You come across a new tree with rich, red fruit. You pick a piece of fruit; you eat it. An hour later, you become violently sick. You make a mental note that this tree's fruit is poisonous.

A month later, you come across a tree of the same species. This time, you know to avoid the fruit. "It's poisonous," you explain to the rest of your group.

This is an example of how **inductive** and **deductive** reasoning combine to help us learn about the world. We all use both methods of drawing conclusions from the evidence around us, and from what we've already learned. Induction and deduction represent the natural turn of human intellect.

Reasoning consists of drawing a conclusion from previously established premises. We can outline rational arguments in a formula called "standard form," a logical outline consisting of a main idea (conclusion, bolded) and its supporting ideas (premises, listed above):

The walls are unpainted.
The roof needs replacing.
The carpet is worn.
Therefore, the building is in bad shape.

The building is in bad shape.
Buildings that are in bad shape are not worth buying.
Therefore, this building is not worth buying.

Of course, we can't join just any old statements together; the statements must combine to support the conclusion--they can't be irrelevant, they can't be repetitive, and every necessary logical step must be stated aloud. Standard form reveals incoherent or incomplete arguments:

Marie has red hair.
Therefore, she has a hot temper.
[What is implied about red-heads? Is it a reasonable statement?]

Marie has a hot temper.
Marie tends to get angry over small things.
Therefore, we should be careful not to annoy her.
[Are these two premises really different?]

Marie has a hot temper.
Marie has no respect for human life.
Marie enjoys hiking.
Therefore, we should be careful not to annoy her.
[Do these premises all relate to the conclusion?]

So: What are the different ways that we can combine premises to make conclusions?

The answer lies in the way our minds work. Human reason puts ideas together in two ways:

- By inferring general statements or principles from observation. We put evidence together, usually based on our observations, and see if we can make any general conclusions.

  This raven is black.
  This other raven is black too.
  All ravens I've ever seen or heard about have been black.
  Therefore, ravens are black.

- By applying these principles to new information. Now we have inferred a pattern or general statement about ravens, we apply this information to any new ravens we see.

  All ravens are black.
  This bird is a raven.
  Therefore, this bird must be black.

Look again at the opening example, in which you were a prehistoric human eating bad fruit.

- First, you ate some fruit and got sick. From this concrete and specific experience, you drew a conclusion not just about the fruit you ate, but about all fruit of that kind. That was one kind of reasoning: "This piece of fruit made me sick, therefore fruit of this kind will always make me sick."
- Next, you applied this information to other fruit. Even though you didn't even taste the fruit from the second tree, you already felt you knew something about it based on your past experience.

These two methods of drawing conclusions are called **induction** and **deduction**. You may not be aware of doing these mental operations, any more than you are aware of all the nerve endings relaying electric messages from your brain when you walk. But you do both mental operations all the time; together, they form the essence of human learning.

Please open your Logical Method exercises file and complete notes 1 and 2.

Induction

True story: A mother explained to her little girl that Daddy had a mild heart attack, and was going to be in the hospital for a few days. After absorbing the news, the girl replied, "Mum, when are you *going to have your heart attack then?"*

Everyone knows dozens of these "kids-say-the-darndest-things" stories. In truth, children are simply exercising the first natural mode of thinking**: induction**. This little girl had learned to see her parents as a group; what is true for one is true for the other. So when Dad has a heart attack, it follows that Mom will have one too.

Thus do we generate conclusions from our experience of the world? For instance, we see that every day of our lives the sun has risen. Experience suggests that the sun will rise tomorrow too. That is how we arrive at predictions or generalizations, such as: "the sun rises every day." **Induction** is the name we give to this kind of thinking: the tentative formulation of statements from what we have experienced.

The key word is "tentative." As we can see from the girl's example, even the most reasonable inductive inferences can never be 100% certain, because we don't know what we don't know. There may be information around the corner which will change everything.

Inductive reasoning is characterized by the following:

- **It is usually based on observation.** The premises of inductive arguments are usually bits of evidence that we've gathered by observation, direct or indirect.

- **Its conclusions are tentative generalizations about groups or relationships, or predictions.** Eating one bad fruit yields the conclusion that what is true for one fruit must be true for the whole group of fruit. If one little green apple gives you stomachaches, you will conclude that little green apples always give stomachaches. Often, these conclusions seem to be proven facts. But because we're drawing conclusions based on what we do observe, we don't necessarily know that we're getting the whole picture. You will see a good example of this below (the turkey before Thanksgiving!) So inductive conclusions, however solid they seem, do not necessarily follow the premises. Other conclusions are always possible (maybe not reasonable, but possible).

Here are some inductive arguments. As you read them over, note:

- The conclusion is usually a prediction, guess or generalization.
- There are always other *possible* inferences (not reasonable ones, perhaps, but possible ones).

> The lights in my friend's house are out.
> The curtains are drawn.
> No one is answering the phone.
> **Therefore, my friend must be away.**
> *[This is an example of an inductive argument that is reasonable, but not necessarily correct. The friend may indeed be away, but other inferences are possible: he may be sick, or just hiding.]*

> I went to North Beach this week and parking was terrible.
> I went to North Beach last year and parking was terrible.
> **Therefore, I will have trouble parking at North Beach.**

> House prices are very high here.
> Gas prices are very high here.
> Food prices are very high here.
> **Therefore, it is very expensive to live here.**

> Sean, an Irishman, drinks a lot.
> Kevin, another Irishman, drinks a lot.
> Frankie, yet another Irishman, drinks a lot.
> **Therefore, all Irishmen must drink a lot.**

> Fewer adult Americans smoke today than 30 years ago.

More laws restrict smoking in public than ever before.
Therefore, smoking is on the wane in the U.S.

[In the mind of a turkey, two days before Thanksgiving:]
The farmer fed me today.
The farmer fed me yesterday.
The farmer fed me the day before.
Therefore, the farmer will feed me forever!
[Here is an example of an argument that is quite reasonable, but unfortunately, quite wrong, because the turkey doesn't know what he doesn't know. The turkey has made a reasonable inference from the information at his disposal. But he doesn't see the big picture.]

Please open your Logical Method exercises file and complete notes 3 through 5.

Where Induction Goes Wrong

We can't prove that an inductive conclusion is 100% right or wrong. But we can tell if it is sound or unsound.

Here are some classic mis-steps one can make when putting together inductive arguments that can lead to an unsound conclusion.

1. **Inferring an unreasonable generalization.**

A reasonable inference covers the available information, and doesn't require us to invent a lot of new hypothetical information to make it stick. An unreasonable conclusion may fit the existing evidence, but it also requires us to accept a lot of other ideas!

The lights in my friend's house are out.
The curtains are drawn.
No one is answering the phone.
Therefore, my friend has joined a cult that worships darkness.

I went to North Beach this week and parking was terrible.
I went to North Beach last year and parking was terrible.
Therefore, North Beach drivers enjoy tormenting me.

House prices are very high here.
Gas prices are very high here.
Food prices are very high here.
Therefore, all Bay Area residents must rob banks to survive.

<u>So: good induction relies on reasonable inferences.</u>

2. **Generalizing from insufficient evidence.**

All of the following generalizations are drawn from one or two examples. You would be surprised to find out how many of your opinions are based on one observation. Indeed, many of our opinions are not even based on observation at all--we merely say what everyone else around us is saying, or repeat what we heard on television last night. Sad, but true.

> I spent five minutes looking for a restaurant in San Mateo that was open at 2 p.m. but didn't find one.
> **Therefore, there are NO restaurants open past 2 p.m. in San Mateo, ever.**
>
> I tasted an Entenmann's cake and it was dry.
> **Therefore, all Entenmann's cakes are rubbish.**
>
> An Irishman got drunk at my house.
> **Therefore, Irishmen are all drunks.**

<u>So: good induction relies on wide observation, including several examples, and preferably examples from other people's experience as well as your own.</u>

3. **Generalizing from a biased sample.**

Look at the following arguments:

> Last Thanksgiving Thursday, Safeway was shut.
> The Thanksgiving before that, it was shut.
> The Thanksgiving before that, it was shut.
> The Thanksgiving before that, it was shut. [etc.]
> **Therefore, Safeway is always shut on a Thursday.**
>
> I have twenty-five Irish friends from my local Alcoholics Anonymous group, and all are recovering drunks.
> **Therefore, all Irishmen are recovering drunks.**
>
> 100% of students in the ENGL 165 online class use their computers to study.
> **Therefore, all CSM students use computers to study.**
>
> When I lived in San Francisco, no one I met through work was in trouble with the law.
> Since I moved to Eureka, everyone I've met through work has been in trouble with the law.
> **Therefore, there is a lot more lawbreaking in Eureka than in San Francisco.**

You can see the problem. In each case, the speaker has generalized from a sample--for instance, made a generalization about all Irishmen based on a sample of Irishmen. But even though the observation may be quite wide, the speaker has not taken into account the fact that the sample itself is biased.

- *Everyone* in an AA meeting is going to be a recovering alcoholic.
- Students in an *online class* are much more likely to use computers than the general school population.
- *Thanksgiving Thursday* is not a typical Thursday!

- The San Francisco/Eureka statements sounds impressive--until you find out that the speaker used to be a *Web designer*, and moved to Eureka to become a *cop*. It's not surprising, then, that he should encounter different kinds of people through his work.

So: a good generalization should be based on varied examples, to avoid getting a biased picture.

Please open your Logical Method exercises file and complete notes 6 and 7.

Deduction

True story: A mother explained to her little girl that Daddy had a mild heart attack, and was going to be in the hospital for a few days. After absorbing the news, the girl replied, "Mum, when are you going to have your heart attack then?"

Look again at this story. We see **induction** at work in the child's unspoken generalization that everything that happens to Dad must happen to Mom as well. But note that she immediately uses this generalization to infer a piece of information about her mother: that her mother, too, will have a heart attack. This is **deduction**--the application of a general principle (my parents share all experiences) to a specific (my mom will have this experience too).

Induction gives us general statements, principles and predictions based on what we know so far. With **deduction**, we apply these principles to any new experiences. It helps us to make sense of them, and gives us some information about them.

For example: I eat some grilled liver; it tastes like boots. Later, I eat it again; it still tastes like boots. I conclude, through **induction**, that grilled liver *always* tastes like boots. The following week I am at a friend's house, and she serves me a plate of liver. I groan inside: "This is going to taste like boots," I think sadly.

Now, how can I know something about a meal that I haven't yet touched? Through **deduction**. I have drawn conclusions about liver in general, and now whenever I see liver on the menu, I assume that it must have all the qualities that I have discovered in liver.

The key word is "must." Inductive reasoning, you remember, is always tentative. The premises to an inductive argument may all be true, but your conclusion--however reasonable--may be wrong. However, deductive reasoning produces conclusions that are true *of necessity, IF the premises are true*. If it is indeed true that liver always tastes like boots, and if this quivering red mass before me is indeed liver, then it absolutely *must* be true that it, too, will taste like boots. If it does not, then the general statement that I got through induction must be false--or this isn't liver after all.

Deductive reasoning is characterized by the following:

- **It generates necessary conclusions**. If the premises of the arguments are true--and remember, they may not be--then the conclusion absolutely must be true. There is no room for other inferences.
- **It puts together a general statement about a group and a statement establishing a member of that group, and draws a conclusion about that member**. The premises to the liver

argument are thus: Grilled liver always tastes like boots, and this is grilled liver. My conclusion: This, too, will taste like boots.

- **It puts together a general prediction and a statement about a given situation, and draws a conclusion from this**. The premises establish what we know about a particular cause-effect, and use these to draw conclusions about a situation. For example: If you drink milk, it will make you throw up. You are not throwing up. Therefore, you haven't drunk milk.

There are two patterns of deductive argument:

1. **Syllogisms:** This involves putting together a general statement about a group and a statement establishing something as a member of that group, and draws a conclusion about that member. See how this is reflected in the logical outline:

a. the premises consist of a generalization about a group (the kind of statement that you would get through induction), and a statement that something belongs to that group;
b. the conclusion connects the quality of the group to the thing or person that is part of that group;
c. the conclusion *must* be true if the premises are true.

Here are some examples.

- All men are mortal.
  Socrates is a man.
  Therefore, Socrates is mortal.
  [See how the conclusion MUST follow here. If it's true that all men are mortal, and if it's true that Socrates is a man, then we know something for certain about Socrates.]

- Parking at North Beach is always terrible
  Green Street is in North Beach.
  Therefore, parking in Green Street is terrible.

- It is very expensive to live in the Bay Area
  San Francisco is part of the Bay Area.
  Therefore, it is very expensive to live in San Francisco.

- All Irishmen drink a lot.
  Ardal is an Irishman.
  Therefore, Ardal drinks a lot.
  [This is an example of how a deductive argument can be wrong. Remember, the conclusion follows ONLY if the premises are true. If it turns out that Ardal never drinks, then one of the argument's premises MUST be wrong. Either not all Irishmen drink after all, or Ardal isn't really Irish!]

- Smokers have yellow fingers.
  Janine is a smoker.
  Therefore, Janine has yellow fingers.

- It is fine to perform natural bodily functions in public.
  Nursing babies is a natural bodily function.
  Therefore, it is fine to nurse babies in public.

[Remember this? Here is the standard form of the argument.]

2. **Hypothetical chains:** This involves putting together a cause-effect statement (predictions arrived at through induction) and a statement about a specific event, to draw a conclusion about that event.

a. the premises consist of a statement about a cause-effect relationship, another kind of generalization that you would get through induction, and a statement describing a specific situation;
b. the conclusion is usually a statement about that specific situation;
c. the conclusion must be true if the premises are true.

Here are some examples:

- If the window is open, the room will be cold.
  The room is warm.
  Therefore, the window is not open.
  [See how the conclusion MUST follow here. If it's true that an open window cools the room down, and if it's true that the room is warm, then there is no way the window can be open--unless one of these premises is wrong.]

- If the team played well, we would certainly win.
  We played well.
  Therefore, we must have won.

- If Chevron and Exxon merge, the price of gas will go up.
  Chevron and Exxon have merged.
  Therefore, the price of gas will go up.

- If the ink contains nigrosine, a chemical introduced in 1940, it cannot be Victorian.
  The ink contains nigrosine.
  Therefore, the ink cannot be Victorian.
  [This is an example of how a hypothetical chain can be wrong. Remember, the conclusion follows ONLY if the premises are true. In this case, as you remember, another expert determined that nigrosine WAS used in the 19th century, and thus challenged the first premise.]

- If Grace Foods caused the pollution that made the families in Woburn sick, they are responsible for that sickness.
  Grace Foods did cause the pollution that made the families sick.
  Therefore, Grace Foods is responsible for the sickness.

- If the families started to get sick before the earliest date that Grace Foods could have contaminated the water, then Grace Foods is NOT responsible for their sickness.
  The families did start to get sick before this date.
  Therefore, Grace Foods is not responsible for their sickness.
  [These last two arguments reflect the arguments put forward by opposing sides in a famous court case, described in A Civil Action.]

Please open your Logical Method exercises file and complete notes 8 through 10.

Where Deduction Goes Wrong

While the standard for an inductive statement is whether or not it is *sound*, the standard for a deductive statement can be more rigorous. Deductive arguments give us conclusions that follow *of necessity* if the premises are true. Sometimes, however, we make mistakes about what is or is not necessarily true! We draw conclusions that may (coincidentally) be right, but which are not warranted by the premises. This kind of mistaken reasoning is called invalid. This is the standard for deductive arguments: they are valid or invalid.

Sometimes we think we are using good deductive reasoning, but we have mixed up our formulae. Looking again at both syllogisms and hypothetical chains, here are the two errors we can fall into.

a. "All" is not the same as "Only": How Syllogisms Can Go Wrong

Here is a perfectly good bit of deduction:

- All cats eat meat.
  Mister is a cat.
  Therefore, Mister eats meat.

If it's true that all cats eat meat, and if it's true that Mister is a cat, we know one thing about Mister for sure: we know he must eat meat. This argument makes sense.

But what about this?

- All cats eat meat.
  Mister eats meat.
  Therefore, Mister is a cat.

Not so good!

This sounds very similar. But the line of logic is quite different. It may be true that all cats eat meat, and it may be true that Mister also eats meat. But nowhere have we said that *only* cats eat meat. In fact, lots of creatures eat meat--cats, dogs, pigs, accountants, rock stars and certain kinds of plant. The logical mistake here is thinking that because two things share the same quality, they must belong to the same group. Unless this is the *only* group that has the quality you're talking about, this conclusion isn't warranted.

Here are some more of this kind of mistake. In each case, the speaker slips by thinking that because two things share the same quality, they must belong to the same group:

- Lions eat a huge meal at one sitting.
  My brother John eats a huge meal at one sitting.
  Therefore, my brother John is a lion.
  [Are lions the only creatures that eat huge meals at once?]

- People with shaved heads and swastika tattoos are racists.
  Ron does not have a shaved head or a swastika tattoo.
  Therefore, Ron is not a racist.
  [Is there only one kind of racist?]

- Hard workers do well in their studies.
  Frank does well in his studies.
  Therefore, Frank is a hard worker.
  [How do we know Frank isn't just lucky?]

- All the cool people will be at the Castro Halloween festival.
  Marco will be at the Castro Halloween festival.
  Therefore, Marco is one of the cool people.
  [Are the cool people the only ones who are going?]

- Teens who go on to commit violent acts often dye their hair, wear black clothes, play video games, argue with their parents and listen to depressing music.
  Joey dyes his hair, wears black clothes, plays video games, argues with his parents and listens to depressing rock music.
  Therefore, Joey is going to commit violent acts.
  [Paraphrased from the FBI guidelines, published in the wake of the Columbine massacre, on how to spot troubled teens. The problem is, it describes half the population of a normal high school!]

So keep your premises clear in your mind:

- If a group has a quality and something belongs to that group, it is valid to assume that it, too, shares the quality.
- BUT if a group has a quality and something else has that quality, it is not valid to assume that it too must belong to the group--unless we know that this group is the only one that possesses the quality. "All" does not equal "only."

b. "Always" is not the Same as "Only": How Hypothetical Chains Go Wrong

Consider the following reasonable inference:

- If you drink milk, you get sick.
  You aren't sick.
  Therefore, you didn't drink milk.

If both of these premises are true, then this argument makes perfect sense. If drinking milk must result in sickness, then the fact that the person is not sick must mean that she hasn't drunk any milk. If a cause must have a certain effect, then the absence of that effect must imply the absence of that cause. So far, so good.

You can generalize this pattern using A and B to stand for "cause" and "effect":

- If you drink milk [A,] then you will get sick [B] If *A, then B.*
  You aren't sick. *[Not B.]*

Therefore, you didn't drink milk. *Therefore, not A.*

But what of this?

- If you drink milk [A], you will get sick [B]. *If A, then B.*
  You aren't drinking milk. *[Not A.]*
  Therefore, you won't get sick. *Therefore, not B.*

Here, you've switched around; you've inferred that because Cause A has the certain effect of Effect B, then the absence of Cause A must mean that Effect B can't happen either. This *isn't* logical.

What makes it illogical is clearer with a more concrete example:

- If I shoot my cat, he'll die.
  I didn't shoot my cat.
  Therefore, he must be alive.

You see the problem? The cat could have died for any number of reasons: he could have leaped from the window, fallen ill, or accidentally eaten a pound of tainted meat.

It's logical to infer that where the effect of a cause is certain, then the absence of the effect means the absence of the cause. If I shoot my cat, he'll certainly die; so if he's alive, I can't possibly have shot him.

However, it isn't logical to infer that where a cause-effect link is certain, it must also be exclusive. That is to say, just because Cause A must result in Effect B, it may be that many other causes would produce Effect B equally well--just as there are many ways to kill a cat! If I shoot my cat, he'll die. But just because I didn't shoot him doesn't mean he's alive; this cause may have a sure effect, but it's not the only cause. It's certain, but not exclusive.

Here are some examples of illogical inferences that make this mistake.

- If you do no work, you'll fail this course.
  You failed the course!
  Therefore, you didn't work hard.
  [We've frequently been the victim of this piece of illogic! Everyone knows there are many reasons for not getting a passing grade in a course.]

- If you eat 900 calories a day, you'll be slim.
  Mark is slim.
  Therefore, Mark eats 900 calories a day.
  [And we all know someone who shows up this piece of illogic! While it's (arguably) true that rigorous dieting can help you get slim, it's also true that other causes contribute--a speedy metabolism, lots of exercise, etc.]

- If the burglar got in through the window, it would be broken.
  It is broken.
  Therefore, the burglar got in through the window.

[Couldn't something else have broken the window?]

- If the Giants play well, they will win the Series.
  The Giants did play well.
  Therefore, they must have won the Series.
  [But it's possible that their opponent played a little better!]

- If you smoke, you greatly increase your risks of cancer.
  Frank doesn't smoke.
  Therefore, Frank does not risk cancer.
  [Unless he supervised nuclear testing in the 1950s.]

- If you get a 4.0 GPA, you will be eligible for a scholarship.
  You didn't get a 4.0 GPA.
  Therefore, you won't get a scholarship.
  [But scholarships are granted for many reasons.]

Did you note the pattern of these illogical arguments?

If A, then B.
B, therefore A.
OR
If A, then B
Not A, therefore not B.

Both patterns make the same mistake: both assume that because Cause A certainly leads to Effect B, it is also the *only* thing that leads to Effect B. Thus when Effect B does or doesn't happens, the speaker infers that Cause A must or must not have happened.

So keep your premises clear in your mind:

- If a cause always leads to an effect, we can reasonably conclude that if the cause is there, the effect must be there. If shooting my cat will kill him and I have shot him, it is valid to conclude that he will die.
- But one effect may have many causes. If shooting my cat will kill him and he is dead, it is not valid to conclude that I must have shot him. Many things might kill my poor cat. "Always" does not mean "only."

Please open your Logical Method exercises file and complete notes 12 through 14.

The Scientific Method

So: which generates better conclusions? Which is better--inductive or deductive reasoning?
By now, you probably realize that this is a meaningless question. Neither method excludes the other. Indeed, it's clear from looking at arguments that neither method can exist in isolation.

Induction gives us general statements. It is the natural turn of human thought, the essence of learning, to make patterns and draw abstract principles. "All the grilled liver I've ever eaten has tasted like boots, so I guess that grilled liver generally tastes like boots."

Deduction lets us use those statements to make sense of the world. "Grilled liver? No thanks--it tastes like boots."

Without **induction**:

- there is no learning--every plate of liver is like the first.
- there is no deduction. You cannot make deductions about specifics unless you have some general principle to apply.

Without **deduction**:

- inductive generalizations are useless. What is the point of knowing that grilled liver tastes like boots, unless you apply this information to the next menu you read?
- inductive generalizations are never put to the test. Whenever reality contradicts our generalizations--when we meet a teetotal Irishman, or a red-head with a sunny temper, or a purple raven--we know we have to go back and review our premises. Why? Because if our premises about Irishmen and drinking were both true, then every Irishman must be a drunk--the conclusion follows of necessity. So if we meet a sober Irishmen, one of our premises *must* be wrong--and it's probably the generalization!

Good critical thinking requires both inductive and deductive reasoning. Induction permits us to learn; deduction puts our learning to use, and also keeps it honest, by forcing us always to test what we think we've learned against reality. Neither method contradicts or is better than the other: as philosopher Alfred Whitehead wrote, "it would be just as sensible for the two ends of a work to quarrel."

This is the essence of the **scientific method**. Scientists observe facts and make a speculative inference (induction). Armed with this hypothesis, they get to work creating specific experiments that will help determine whether the hypothesis is true or not. They try to identify grounds, which can **disprove**, rather than **prove**, their ideas.

We do this all the time in our own lives. For instance, let's say you develop a rash and start sneezing, and your doctor tells you it's an allergic reaction. How do you know what you are reacting to?

- **Induction**. Is there something you've been eating a lot of recently? Something that commonly provokes allergies? You realize that you have: only last week you ate an entire crate of strawberries. This leads you to your tentative generalization:
  I ate lots of strawberries.
  Strawberries often provoke allergies.
  THEREFORE, I have developed an allergy to strawberries.

- **Deduction**. Now, you need to see if this is true. So you stop eating strawberries. But your rash and your sneezing don't go away. Deduction has now helped you test your inductive generalization, and indeed, reject it. It was reasonable; but deduction now shows that it was wrong.

The only thing that gives me a rash is eating strawberries.
I didn't eat strawberries.
THEREFORE, I won't get a rash.
[But you did. So since this is a valid deduction, this means that one of your premises must be untrue.]

If you only remember 3 things from your logic work a year from now, you should remember these:

- A lot of the things we think we "know," we don't really know at all--we have only guessed at.
- We must keep testing and re-testing our guesses, opinions and ideas against reality.
- If we are not able or ready to do this, our opinions are trivial.

Please open your Logical Method exercises file and complete note 15.

Please open your Logical Method exercises file and complete exercises 1 through 3.

Final Activity

Instructions:

1. Now that you have completed the lesson, notes and exercises for this tutorial, please share your tutorial notes and exercise answers with the Writing Center, either by emailing them to csmtwc@smccd.edu or by stopping by room 18- 104.

2. The Instructional Aide will review your notes and exercises and give you the Exit Quiz. If you pass the quiz, the Instructional Aide will give you credit for this tutorial. If you do not pass the quiz, you will need to make an appointment to meet with a Writing Center Instructor. To make this appointment, sign up using the same method you use to make essay conference appointments. Be sure to include a comment or note that you are meeting about a tutorial.

3. During this appointment, the instructor will make sure you understand the concepts covered in this tutorial, answer any questions that you might have, review your notes, answers to the exercises, and quiz. The instructor will then give you credit for completing this tutorial.