A Step-By-Step Guide to Conditional Logic

By Scott Miller
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This guide will help you understand conditional logic as it is used on the LSAT. If you find conditional logic confusing, this should make it all much clearer. If you already have a good grasp of conditional logic, this guide can solidify your understanding and clarify concepts that might still be fuzzy, or it can just help you review.

This guide explains conditional logic in a very step-by-step way. As you read each explanation or example, pause for a moment and let it sink in. If you don't totally understand something, read it again. And don't feel bad about taking breaks while reading this guide, or reading it a few times to really wrap your head around the concepts.

Some of these concepts will intuitively make sense to you. Others might not. If something doesn't intuitively make sense, just treat it as a rule or definition that you should memorize and remember. Some people find that easier than trying to reason their way through some of these concepts.

Let's get started!

1. Conditional statements sound like phrases that we use all the time, but their meaning on the LSAT is very different.

This is important to understand right from the start.

We often call conditional statements "if-then" statements. We use these types of statements all the time in everyday conversation, but we use them in a very loose, informal way.

When talking with a coworker, you might say, "if you have any questions, let me know." This doesn't mean that the coworker *must* let you know any time they have a question. It's fine if they ask someone else, or figure things out for themselves. But that's not how if-then statements work on the LSAT!

Here's another example. Suppose there's a conference in Iowa next month, and your coworker doesn't want to go. If the boss doesn't tell them to go, they aren't going. The coworker might say, "I'll go to the conference next month if the boss says that I have to." However, if this was an LSAT question, the coworker would need to say, "I'll go to the conference next month <u>only if</u> the boss says that I have to." That difference between "if" and "only if" might not seem significant, but on the LSAT it can be huge. We'll explain why below.

2. Conditional statements are about things that must be true. They tell us what *must be true* under certain conditions.

Consider this statement:

> "If a town is in North Carolina then it is in the USA."

The word "then" in this statement indicates that whatever follows *must be true*. If a town is in North Carolina, it must be true that the town is in the USA.

This happens to be factually true, but it also demonstrates how if-then statements work on the LSAT.

This is easy to understand when a conditional statement describes something that is true in real life, like the example above. It's important to remember that all conditional statements on the LSAT work this way. They all indicate that something must be true. Suppose a rule in a logic game states,

> "If Smith works on Wednesday then Rivera works on Thursday."

This rule means that, if Smith works on Wednesday, it *must be true* that Rivera works on Thursday.

Here's another example:

> "If Marat wears a hat then Sonya wears a hoodie."

If we see this statement on the LSAT, we take it as something that must be true. If we find out that Marat is wearing a hat, Sonya *must be* wearing a hoodie. Even if Sonya isn't in the room, and we haven't seen her in a year, we know that she's wearing a hoodie. This would seem weird in real life, but it's exactly how conditional statements work and how we need to think about them on the LSAT.

If it helps, you can think of all conditional statements as rules that must be followed—even when they show up in Logical Reasoning questions.

3. Conditional statements include a sufficient condition and a necessary condition.

The statement immediately after “if” is called the “sufficient condition.” Looking at our example above, if you know that a town is in North Carolina, that fact by itself is *sufficient* to tell you that the town must be in the USA. You don’t need any other information to know that the town is in the USA.

The second part of a conditional statement, the part which follows the word “then,” is called the “necessary condition.” Any time the sufficient condition is met, the necessary condition is guaranteed to be true. If a town is in North Carolina, it is guaranteed to be in the USA.

We can diagram conditional statements using a small arrow between the sufficient condition and the necessary condition. The small arrow means “then.”

North Carolina → USA

When reading this, we would say, “if North Carolina then USA,” or “if a town is in North Carolina then it is in the USA.”

We can diagram the other examples above in the same way:

Smith Wednesday → Rivera Thursday

Marat hat → Sonya hoodie

The statement that appears on the left side of the arrow is always the sufficient condition. The statement on the right side of the arrow is always the necessary condition. The only time this changes is when we have a biconditional statement. We’ll look at biconditional statements below.

Helpful notes:

The terms “sufficient condition” and “necessary condition” are standard terms in logic, and you’ll occasionally see these terms on the LSAT. Unfortunately, we also use the terms “sufficient assumption” and “necessary assumption.” While there is a connection, it can be helpful to keep these terms completely separate in your mind. Treat a sufficient condition as something that is completely different from a sufficient assumption, and a necessary condition as completely different from a necessary assumption.

Also, people sometimes read a statement like “North Carolina → USA” as “North Carolina *therefore* USA.” The universe won’t explode if you do this, but “then” and “therefore” have very different meanings on the LSAT. It’s helpful to keep them separate in your mind, so be sure to read the arrow as “then,” not “therefore.”

4. Conditional statements do not necessarily indicate anything about time or the order of events.

Some people develop the idea that conditional statements are based on the order that things happen. You might think that the statement on the left side of the arrow happens first, followed by the statement on the right side:

> This thing happens first → this thing happens second

This is a common misunderstanding. The arrow doesn't indicate the order of events.

Consider these examples:

> "If Smith works on Wednesday then Rivera works on Thursday."
>
> Smith Wednesday → Rivera Thursday

In this case, the direction of the arrow just happens to align with the order of events. But that's just a coincidence. We should think of a conditional statement as giving us a rule to follow, rather than telling us about the order of events. Consider these next examples:

> "If Smith works on Wednesday then Rivera also works on Wednesday."
>
> Smith Wednesday → Rivera Wednesday
>
> "If Smith works on Wednesday then Rivera works on Tuesday."
>
> Smith Wednesday → Rivera Tuesday

These are perfectly reasonable conditional statements. Again, a conditional statement establishes that one thing is required to be true any time another thing is true. It doesn't necessarily indicate the order in which events must happen.

5. Conditional statements only matter when the sufficient condition is triggered.

If the sufficient condition doesn't happen, a conditional statement does not provide any information about the necessary condition. We can almost treat the necessary condition as if it doesn't exist.

For example, imagine that you're renting an apartment and this is a clause in your lease:

> "if rent is paid after the fifth day of the month then payment must be made with a certified check."

What if you pay your rent on the first day of the month? Do you have to pay with a certified check? No, you don't. The sufficient condition has not been triggered, so the necessary condition does not apply to you. You aren't affected at all by this rule.

If you pay your rent on the first day of the month, can you choose to pay with a certified check anyway? Sure! When the sufficient condition is not triggered, the rule doesn't restrict you in any way.

Let's say that again: when the sufficient condition is not triggered, the rule does not restrict you in any way.

Here's another example. Imagine that a logic game involves five people who work at a store. It's an Ordering game. Each person works on exactly one day of the week, Monday through Friday. A rule in the logic game states:

> "if Smith works on Wednesday then Rivera works on Thursday."

We can diagram this as:

> Smith Wednesday → Rivera Thursday

This rule only triggers a result when Smith works on Wednesday. If Smith is working on Monday instead of Wednesday, the rule does not tell us anything at all about Rivera.

S	__	__	__	__
M	Tu	W	Th	F

In this case, Rivera could work on Wednesday, or Friday, or any other available day. What's important to remember is that Rivera *can* still work on Thursday. She doesn't have to, but she could.

In this case It's very easy to think that, since Smith is not working on Wednesday, Rivera cannot work on Thursday. However, that's not correct. We would call this an "illegal negation."

> Smith NOT Wednesday → Rivera NOT Thursday

That is an illegal negation.

Remember our original statement:

> Smith Wednesday → Rivera Thursday

If the sufficient condition is not met, stop right there. We cannot draw any conclusions about the information in the necessary condition.

6. We're not allowed to reverse a conditional statement.

We know that a town in North Carolina must be in the USA. But the reverse is not necessarily true.

It's *not* correct to say,

> "If a town is in the USA then it is in North Carolina."
>
> USA → North Carolina

This would be called an "illegal reversal."

This is why we normally use an arrow (→) instead of an equal sign (=) when diagramming conditional statements. An equal sign represents a relationship that works in both directions. For example, "2 + 2 = 4" and "4 = 2 + 2" are both correct.

Conditional statements do not work in both directions. "North Carolina → USA" is correct, but "USA → North Carolina" is not correct.

The world won't come to an end if you use an equal sign when diagramming conditional statements for the LSAT. However, the arrow is a very useful reminder about the direction of the logic in conditional statements.

7. We can reverse a conditional statement as long as we also negate both conditions. This will create a different statement that also must be true.

Here's a conditional statement:

> "If a town is in British Columbia then it is in Canada." (BC → Canada)

Reversing and negating both sides gives us another statement which must also be true:

> "If a town is <u>not</u> in Canada then it is <u>not</u> in British Columbia." (~ Canada → ~ BC)

This is called the **contrapositive**.

We can do the same with any conditional statement. Suppose a rule states,

> "If Smith works on Wednesday then Rivera works on Tuesday"
>
> Smith Wednesday → Rivera Tuesday

This must also be true:

> "If Rivera does <u>not</u> work on Tuesday then Smith does <u>not</u> work on Wednesday"

> ~ Rivera Tuesday → ~ Smith Wednesday

You might have noticed that, when diagramming a conditional statement, we often use a tilde (~) to indicate "not" or a negative condition, one that is not occurring. People also use a minus sign (–). Some people prefer to cross out statements to indicate a negative:

> ~~Rivera Tuesday~~ → ~~Smith Wednesday~~

8. The word "if" by itself indicates the beginning of the sufficient condition.

These two sentences mean exactly the same thing:

> "<u>If</u> a town is in British Columbia then it is in Canada."

> "A town is in Canada <u>if</u> it is in British Columbia."

Both statements have the same sufficient condition (being in British Columbia) and the same necessary condition (being in Canada). We would diagram both as:

> British Columbia → Canada

9. You'll see conditional statements written a few different ways.

Here are some other examples:

> "If a town is in North Carolina, it is in the USA." (The word "then" can be replaced by a comma.)

> "Every town in North Carolina is in the USA."

> "Any town in North Carolina is in the USA."

> "All towns in North Carolina are in the USA."

> "When a town is in North Carolina, it is in the USA."

We would diagram all of these statements as:

> North Carolina → USA

10. The phrase “only if” means something different from the word “if.”

The phrase “only if” indicates the beginning of the necessary condition. “Only if” means “then.”

> “A town is in North Carolina only if it is in the USA.”

This means:

> North Carolina → USA

Here’s another example:

> “I can sign in to the website only if I have the correct password.”

This means

> sign in → correct password

Similar phrases like “only when” and “only on” mean the same thing as “only if.”

> “I can sign in to a website <u>only when</u> I have the correct password.”
>
> sign in → correct password
>
> “I can visit the zoo <u>only on</u> days when it is open.”
>
> visit zoo → day when open

11. The phrase “if and only if” indicates a biconditional statement, which is a conditional statement that works in both directions.

Here’s an example of a biconditional statement:

> “Lauren eats soup if and only if she is at her favorite restaurant.”

The best way to understand this is to read it as two separate conditional statements, one containing “if” and the other containing “only if.”

In our example above, the first statement would be

> “Lauren eats soup <u>if</u> she is at her favorite restaurant.”
>
> at favorite restaurant → eats soup

The second statement would be

> "Lauren eats soup only if she is at her favorite restaurant."

> eats soup → at favorite restaurant

When diagramming a biconditional statement, we can always write out both statements separately like we just did above. Alternatively, we can use a two-headed arrow to show that the statement works in both directions. Either is correct.

> at favorite restaurant → eats soup *and* eats soup → at favorite restaurant

OR

> at favorite restaurant ↔ eats soup

12. The word "unless" is also a common conditional logic indicator on the LSAT.

There are two ways to deal with the word "unless." It's okay to pick the method that works best for you and forget the other one entirely.

Method A:

> Step 1: Replace the word "unless" with "if not."

> Step 2: Make that the start of the sufficient condition.

Example:

> "I cannot sign in to the website unless I have the correct password."

This becomes

> "I cannot sign in to the website if not I have the correct password."

Or, to be more grammatically correct,

> "I cannot sign in to the website if I do not have the correct password."

We would diagram this as

> ~ correct password → ~ sign in

Method B:

Step 1: Replace “unless” with “then.” As noted earlier, the word “then” indicates the beginning of the necessary condition.

Step 2: Negate the other statement in the sentence and add “if” to the beginning. This becomes the sufficient condition.

Example:

“I cannot sign in to the website unless I have the correct password.”

When we apply Step 1, this becomes

“I cannot sign in to the website <u>then</u> I have the correct password.”

When we apply Step 2, this becomes

“<u>If</u> I <u>can</u> sign in to the website then I have the correct password.”

We would diagram this as

sign in → correct password

Notice that the result of Method A and the result of Method B are contrapositives:

~ correct password → ~ sign in

sign in → correct password

That’s why you can use either method. If a conditional statement is true, the contrapositive must also be true. We can always switch from one to the other.

“Until,” “except if,” and “except when” can be treated the same way as “unless.”

13. Words like “no” and “none” are also conditional logic indicators.

Both of these sentences are conditional statements:

“No employee of Acme, Inc. works on Saturday.”

“None of the birds at the zoo are from South America.”

To change statements like these into simple if-then statements, look for the subject of the sentence—the first person, place or thing mentioned in the sentence. In the first example above, the subject is “employee of Acme, Inc.”

Once you’ve identified the subject, make that the sufficient condition.

employee of Acme, Inc. → ________________

Be sure to leave out the “no.” Our sufficient condition is “employee of Acme, Inc.” It’s not, “no employee of Acme, Inc.”

Now read the original sentence again. What does it tell us about the employee?

“No employee of Acme, Inc. works on Saturday.”

The employees do not work on Saturday. This is our necessary condition:

employee of Acme, Inc. → ~ work on Saturday

14. We can connect conditional statements.

If the *sufficient condition* of one statement matches the *necessary condition* of another, we can connect the statements.

British Columbia → Canada

Canada → Earth

We can combine these statements, then cut out the middle man:

British Columbia → Canada → Earth

British Columbia → Earth

You’ve made it through the guide! Congratulations!

Here’s one more tip. A few concepts show up occasionally on the LSAT which aren’t covered in this guide. And future exams will almost certainly include conditional-type situations that haven’t been seen on previous tests. The folks at LSAC are a creative bunch, and love to throw curveballs at us on the test.

If you run into something unfamiliar on the LSAT, to quote another excellent guide, “don’t panic!”

You can often figure out something you haven’t seen before by noticing what’s familiar about it. How is it similar to something you understand?

You might be able to combine some of the concepts in this guide to handle scenarios that we didn’t explicitly discuss here.

When dealing with conditional logic, one thing that can be very helpful is to ask yourself, “what is required here? What must happen under certain conditions?” That’s the necessary condition or “then” part of the statement. Sometimes it’s helpful to ask the opposite: “what’s the trigger?” That can help you spot the sufficient condition or “if” part of the statement.

Do you have questions, comments, or feedback? Did you find a mistake in the guide? Did you find it helpful? I’d love to hear from you. Email LSAT@ScottMillerCoaching.com.

You’re welcome to share this document with other people as long as you share the entire document in its original form. Even better, if someone wants a copy, send them to my website at https://scottmillercoaching.com/lsat. If they sign up for my free LSAT emails containing tips and words of encouragement, they’ll get a copy of my free LSAT Conditional Logic Guide. They can unsubscribe from the emails at any time, like after they ace the LSAT and are on their way to law school.

All the best,

Scott Miller

But wait… there’s more…

We already covered most of what you need to know about conditional logic on the LSAT, but you'll find a couple of bonus topics below. They're slightly more advanced, and show up less frequently, but they're based on the foundations we already discussed.

If your brain is hurting right now, take a break. It's fine to spend some time practicing and using what you've already learned, then come back to the topics below later. But if you're feeling froggy, keep going!

15. Compound conditional statements are a thing.

Compound conditional statements have more than one sufficient condition or necessary condition, connected by "and" or "or." Here are common forms seen on the LSAT:

A → B or C   A → B and C

X or Y → Z   X and Y → Z

Here's a real-world example:

> "To make my Aunt Marie's lasagna, I need fresh homemade meatballs and lots of garlic."
>
> AM's lasagna → meatballs AND garlic

This tells us that there are two necessary conditions: I need both homemade meatballs AND lots of garlic.

If we don't have one of those ingredients OR the other, we can't make the lasagna.

Go back and read that last sentence again. You just saw how to create the contrapositive of a compound conditional statement:

> ~ meatballs OR ~ garlic → ~ AM's lasagna
>
> "If I don't have homemade meatballs OR I don't have lots of garlic then I can't make Aunt Marie's lasagna."

When we talk about the word "or" on the LSAT, it's important to remember that it can mean "both." Suppose I say, "Lauren will go to the gym on Wednesday or Thursday." In everyday conversation, this might mean that Lauren is going on one day or the other, but not both. If we see this statement on the LSAT, it's totally possible for Lauren to go on both days.

If the LSAT means one or the other, but not both, it will explicitly state that. An example of this would be, "Lauren will go to the gym on Wednesday or Thursday, but not both." In this case, she will go to the gym on Wednesday OR she will go on Thursday, but she cannot go on both days.

When creating the contrapositive of a compound conditional statement,

- we reverse the conditions;
- we negate the conditions;
- "AND" becomes "OR;" and "OR" becomes "AND."

Original Statement	Contrapositive
A → B or C	~ B and ~ C → ~ A
A → B and C	~ B or ~ C → ~ A
X or Y → Z	~ Z → ~ X and ~Y
X and Y → Z	~ Z → ~ X or ~Y

16. Assumptions in LSAT arguments can often be expressed as a conditional statement.

Answer choices in Sufficient Assumption questions and Principle-Strengthen questions are often written as conditional statements. A correct answer can be translated into a conditional statement that follows this pattern:

> "if *premise* then *conclusion*."
>
> premise → conclusion

Here's an example:

> "Defense attorney: My client was in Miami when the jewels were stolen. Therefore, my client did not steal the jewels."

What is an assumption that completely fills the gap in the argument?

> "If a person was in Miami when the jewels were stolen then that person did not steal the jewels."
>
> in Miami → did not steal jewels

Notice how this completely fills the gap in the argument.

My client was in Miami when the jewels were stolen.

(If a person was in Miami when the jewels were stolen then that person did not steal the jewels.)

Therefore, my client did not steal the jewels.

Let's see how this might play out in a Principle-Strengthen question.

Defense attorney: My client was in Miami when the jewels were stolen. Therefore, my client did not steal the jewels.

Which of the following principles, if valid, provides the most support for the defense attorney's argument?

A) If a person did not steal the jewels then that person was in Miami when the jewels were stolen.

This is incorrect. It's an illegal reversal of the statement that we want: "did not steal jewels → in Miami" is incorrect.

B) If a person was not in Miami when the jewels were stolen then that person stole the jewels.

This is incorrect. It's an illegal negation: "not in Miami → stole jewels" is incorrect.

C) If a person was not in Miami when the jewels were stolen then that person did not steal the jewels.

This answer has the correct necessary condition but an incorrect sufficient condition: "not in Miami → did not steal jewels" is incorrect.

Notice that both (C) and (D) have an incorrect sufficient condition, "not in Miami." In questions like this, we can sometimes eliminate incorrect answers just by noticing that one half of the conditional statement is clearly incorrect.

Sometimes we might need to diagram an answer in order to evaluate it.

D) The attorney's client was in Miami unless they stole the jewels.

Using one of the methods that we discussed earlier, this becomes either

did not steal jewels → in Miami

or

not in Miami → stole jewels

Either way we look at this, it's incorrect. It's not what we want.

How about this answer?

> *E) The attorney's client was in Miami only if they did not steal the jewels*

This might sound strange when you first read it, but it translates to

in Miami → did not steal jewels

which is exactly what we want. Choice (E) is correct!

Nice job!

you just worked through this entire guide → you deserve a break!

- Scott