

Module 1: Logic and Reasoning

Topic 3 Content: Law of Detachment Transcript

Hi, guys. Welcome to Geometry. This topic's going to focus on the law of detachment. You're again going to continue to use your logic and reasoning skills to learn how to use this law to draw valid conclusions. You ready to get started? Let's go.

Before we dive into the law of detachment, I want to discuss inductive reasoning a little bit. Inductive reasoning is the use of patterns to draw a valid conclusion. So you make observations, you see if you can find a pattern in whatever particular set that you're dealing with, and then you use that pattern to draw a conclusion. For example, we're going to use inductive reasoning here to determine the next two terms in the sequence.

From these terms, it appears that we're counting by fives. To get those next two terms, they should probably be 20 and 25. That would be continuing the pattern that I'm noticing of counting by fives. To draw that conclusion, you actually use inductive reasoning.

Now there's another type of reasoning known as deductive reasoning, or the use of laws, facts, and definitions in order to draw a valid conclusion. One of those laws that we're going to discuss is the law of detachment. I'm going to show you symbolically what this law is.

"If p , then q ," you're going to be given a conditional statement. "If p is true," the conclusion is, "therefore q must also be true."

If p then q (you're given some type of condition), if p is true, therefore you can conclude that q is also true.

Now let's use this law to do a few examples. Here's our first one. I put the symbols for the law of detachment, the symbolic form here on the left just to help you keep in mind what we're looking for in these verbal statements, or these verbal arguments. Let me switch back to my pen here.

"If two lines are parallel, then the lines do not intersect." We were given the hypothesis and a conclusion here. And it is a true statement: "If two lines are parallel, then the lines do not intersect." The second argument here is, Line AB is parallel to Line CD.

Now notice I threw in some symbols. The double headed arrow over two capital letters represents a line, and then two vertical segments together like that represents "parallel." Here we see Line AB is parallel to Line CD. That's true, right? From what it's telling us here. That actually refers back to what they told us that p meant, right? In a sense here, this statement is telling us that p is true; we take that to be a true statement. The conclusion that we can draw from that—let me get this out of our way—"Therefore, Line AB and Line CD do not intersect." We can make that conclusion: that the lines do not intersect must be true for Line AB and Line CD.

That was the law of detachment in action. You're given a statement: "If two lines are parallel then they do not intersect." Then you're given a condition, in this case: p (Line AB is parallel to Line CD). You can conclude: "Therefore, Line AB and Line CD do not intersect." Law of detachment in action.

Now look at this one. Here we're going to go through these arguments, and then we're going to determine if this conclusion behind here is actually valid. Let's take a look.

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"If the figure is a square, then it has four sides," let me switch to my pen. There they're giving us "if p then q ," and that is true: If a figure is a square, then it has four sides. That's a true statement, and it did follow the pattern of giving us "if p then q ," or it did follow the definition for the law of detachment.

Now here, figure PLMN has four sides. Hmm, what do they actually give us here? It wasn't actually p . If you look back at that conditional statement, they actually referred back to q here. If you're using the law of detachment to draw a conclusion, then your second sentence must be p . So here—"figure PLMN has four sides"—that didn't follow the law of detachment so that means that this conclusion here is not going to be valid. They did not follow what the law of detachment has set up for us.

Let's take a look at that conclusion, "therefore, PLMN is a square."

You see like we saw, this is actually p . We actually can't draw this conclusion from using the law of detachment. Again, if we just read through it here—because I know we were looking for if it applied to the law of detachment—let's really take this apart and see if we can think about a counterexample.

"If a figure is a square then it has four sides." We said everything was fine there. "Figure PLMN has four sides. Therefore, figure PLMN is a square." Well, just because a figure has four sides doesn't mean that it's necessarily a square. It could be a rectangle, a parallelogram, a rhombus, a trapezoid. . . It could be a lot of other four-sided figures. So you see here, we came up with some counterexamples as to why that wasn't actually true, and we saw how this verbal argument did not follow the law of detachment.

All right, now take a look at this one, which I do believe—yep—is the directions for you to try one on your own. I'm going to give you a verbal argument, and I want you to see: Can you use the law of detachment to draw a valid conclusion? If you can, go ahead and write that conclusion. If you can't, tell me why. Alright, so press pause and I'm going to go ahead and show this to you.

Alright, let's see how you took this one apart. I think I'm going to switch to black ink here, just so it stands apart. "If today is Friday, then Chris will have pizza for dinner." Alright, so just translating this here: This is my p arrow q , because it's an if-then statement. And my hypothesis is "today is Friday," conclusion is "Chris will have pizza for dinner."

Now we follow it with: "today is Friday, August 12." Well, that's a reference back to p , our hypothesis. So far it is following the law of detachment, so I can use these statements to draw a valid conclusion. If you remember the law of detachment, I should follow this with: "therefore, Chris will have pizza for dinner." You see here how we used that law of detachment, given those verbal arguments, in order to draw a valid conclusion.

Alright, you've reached the conclusion of this topic on using the law of detachment to draw a valid conclusion. I hope you saw the difference between inductive reasoning using patterns and deductive reasoning using laws to draw valid conclusions. Bye.