CRITICAL THINKING Lecture #11

Validity & Truth Tables



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Arguments

truth of all the premises entails the truth of the conclusion.

is that *if* the premises are true, *then* the conclusion must be true as well.

- Recall that an argument is a collection of statements about which the claim is made that the
- So an argument asserts that the conclusion can be inferred from the premises. That is, the claim



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Valid & Invalid Arguments

Also recall the distinction between deductively valid and deductively invalid arguments:

An argument is valid if and only if the truth of its premises logically entails the truth of its conclusion. It is logically impossible for the conclusion to be false while the premises are all true.

An argument is invalid if and only if it is logically possible to have true premises but a false conclusion.



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not. For instance, let's assess the validity of the following argument:

dead.

- Given an argument, we can construct a truth table to determine whether it is logically valid or
 - If science can prove that God is dead, then God is dead. But science cannot prove that God is dead. Therefore, God is not



Assessing Validity with a Truth Table: Illustration

Step I: Put the argument into argumentative form:

- If science can prove that God is dead, then God is dead. |. 2. Science cannot prove that God is dead.
- . God is not dead.



Step 2: Label each simple positive statement in the argument.

In this example, there are two simple positive statements:

S: Science can prove that God is dead. G: God is dead.



Step 3: Translate the argument into the language of symbolic logic.

In this example, the entire argument is symbolized as follows:



Step 4: Construct a truth table representing the argument.

The premises and conclusion must each have its own column.



each of these (as premise or conclusion) for later reference:

Put negative and compound statements (i.e., more than one letter/symbol, as in $\sim S$, $\sim G$, and $S \rightarrow G$) to the right. Put simple positive statements (i.e., only one letter, though none so far in this example) to the far left.

Begin by putting each premise and the conclusion at the top of a column in the table, marking





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Add any additional columns, following the procedure for truth table construction:

For this example, we have a ~G, so we need a G column. The ~S column requires an S column. With those two new G and S columns added, the $S \rightarrow G$ column is already broken down as well.







Fill in the rows, following the procedure for truth table construction:



Since there are only 2 simple positive statements in the table, it has $2^2 = 4$ rows.

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Step 5: Circle any rows in which *all the premises* are true:



In this example, the premises are both true in lines 3 and 4, so those are the rows that are circled. Line 1 is not circled because premise 2 is false in it; line 2 is not circled because both premises are false in it.





Step 6: Now circle the conclusion in these rows:



Premise 1	Premise 2	Conclusion
→ G	~S	~G
Т	F	F
F	F	Т
Τ	Т	F
Τ	Τ	Τ

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In this example, however, the conclusion is false in line 3. So this argument is *invalid*: line 3 has true premises but a false conclusion. So it *is possible* for the premises to be true with a false conclusion.





dead.

In sum, this is an invalid argument. Even if the premises are true, it is still logically possible that the conclusion is false.

If science can prove that God is dead, then God is dead. But science cannot prove that God is dead. Therefore, God is not





Assessing the validity of an argument with a truth table is done according to the followings steps:

- Put the argument into argumentative form,
- Label each simple positive statement in the argument, 2.
- Translate the argument into the language of symbolic logic, 3.
- Construct a truth table representing the argument,
- Circle any rows in which all the premises are true,
- Circle the conclusion in these rows, and
- false in *at least one* of those rows, then the argument is *invalid*.

Check validity. If the conclusion is true is *all* those rows, then it is a *valid* argument. If the conclusion is





Argument #1

Consider the following argument:

God being dead is a necessary condition for science proving that God is dead. But God is not dead. Therefore, science cannot prove that God is dead.

Use the truth table method to determine whether this is a valid or invalid argument. Be sure to briefly explain how the truth table supports your answer.



Argument #1: Step 1

- God is dead.
- 2. God is not dead.
- . Science cannot prove that God is dead.

1. God being dead is a necessary condition for science proving that

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Argument #1: Step 2

S: Science can prove that God is dead.G: God is dead.



Argument #1: Step 3



















A *valid* argument. There is *no* line where the premises are all true but the conclusion is false. That is, whenever the premises are all true (which only happens in line 4), the conclusion is also true. So it is *absolutely impossible* for the premises to be true with a false conclusion.





cannot prove that God is dead.

In sum, this is valid argument. Whenever the premises are true, it is logically impossible for the conclusion to be false.

God being dead is a necessary condition for science proving that God is dead. But God is not dead. Therefore, science





Next Class...

We will practice using truth tables to assess some common valid and invalid patterns that deductive arguments often take.



References

iPresentee. (2017, January 9). Countdown Timers for Keynote. [Software package]. Retrieved February 27, 2017 from http://www.ipresentee.com/keynote-countdown-timers/.