Introduction to Logical Reasoning

Validity and Table Tables

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Arguments

Recall that an **argument** is a collection of statements about which the claim is made that the truth of all the premises entails the truth of the conclusion.

So an argument asserts that the conclusion can be inferred from the premises. That is, the claim is that *if* the premises, then the conclusion *must* be true as well.

Valid and Invalid Arguments

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

> A **valid** argument is an argument where the truth of all its premises logically entails the truth of its conclusion.
>
> An **invalid** argument is an argument where it *is* logically possible for the conclusion to be false while the premises are all true.

Argument 1

Consider the following argument:

> If the U.S. is winning the war on terror, then there will be no major terrorist attacks on U.S. soil. There have been no such attacks, so the U.S. is winning the war on terror.

Assessing Validity

Step 1: Put the argument into argumentative form:

1. If the U.S. is winning the war on terror, then there will be no major terrorist attacks on U.S. soil.

2. There have been no major terrorist attacks on U.S. soil.

∴ The U.S. is winning the war on terror.

Assessing Validity

Step 2: Label each simple positive statement that the argument involves.

There are two simple positive statements to label:

1. There have been major terrorist **attacks** on U.S. soil (A), and

2. The U.S. is **winning** the war on terror (W).

Assessing Validity

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

Here we have:

1. $W \rightarrow \sim A$.

2. $\sim A$.

$\therefore$ W.

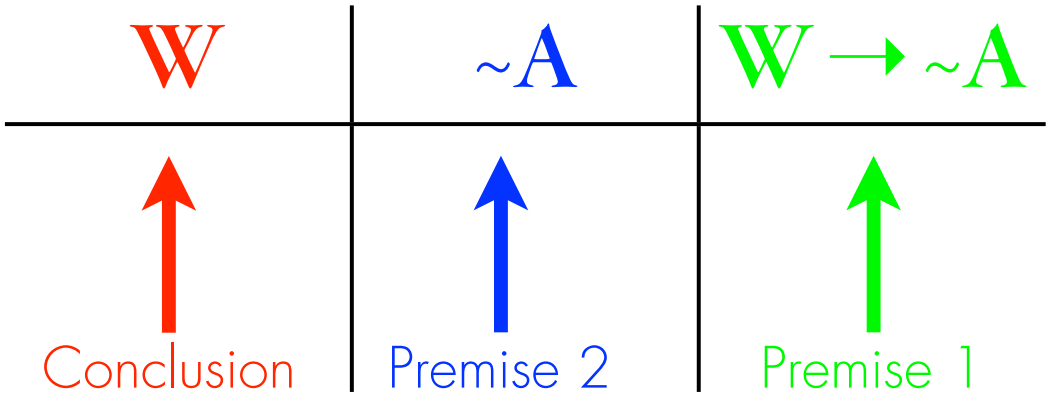
Assessing Validity

Step 4: Construct a truth table.

Each premise and the conclusion must have its own column in the truth table.

Assessing Validity

Begin by putting each premise and the conclusion at the top of a column.



Put negative and compound statements (i.e., more than one letter/symbol) to the right. Put simple positive statements (only one letter) to the far left.

Assessing Validity

Then add any additional columns, following the procedure for truth table construction.

A	W	~A	W → ~A

Conclusion Premise 2 Premise 1

Assessing Validity

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

A	W	~A	W → ~A
T	T	F	F
T	F	F	T
F	T	T	T
F	F	T	T
	Conclusion	Premise 2	Premise 1

Assessing Validity

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

A	W	~A	W → ~A
T	T	F	F
T	F	F	T
F	T	T	T
F	F	T	T

Conclusion Premise 2 Premise 1

Assessing Validity

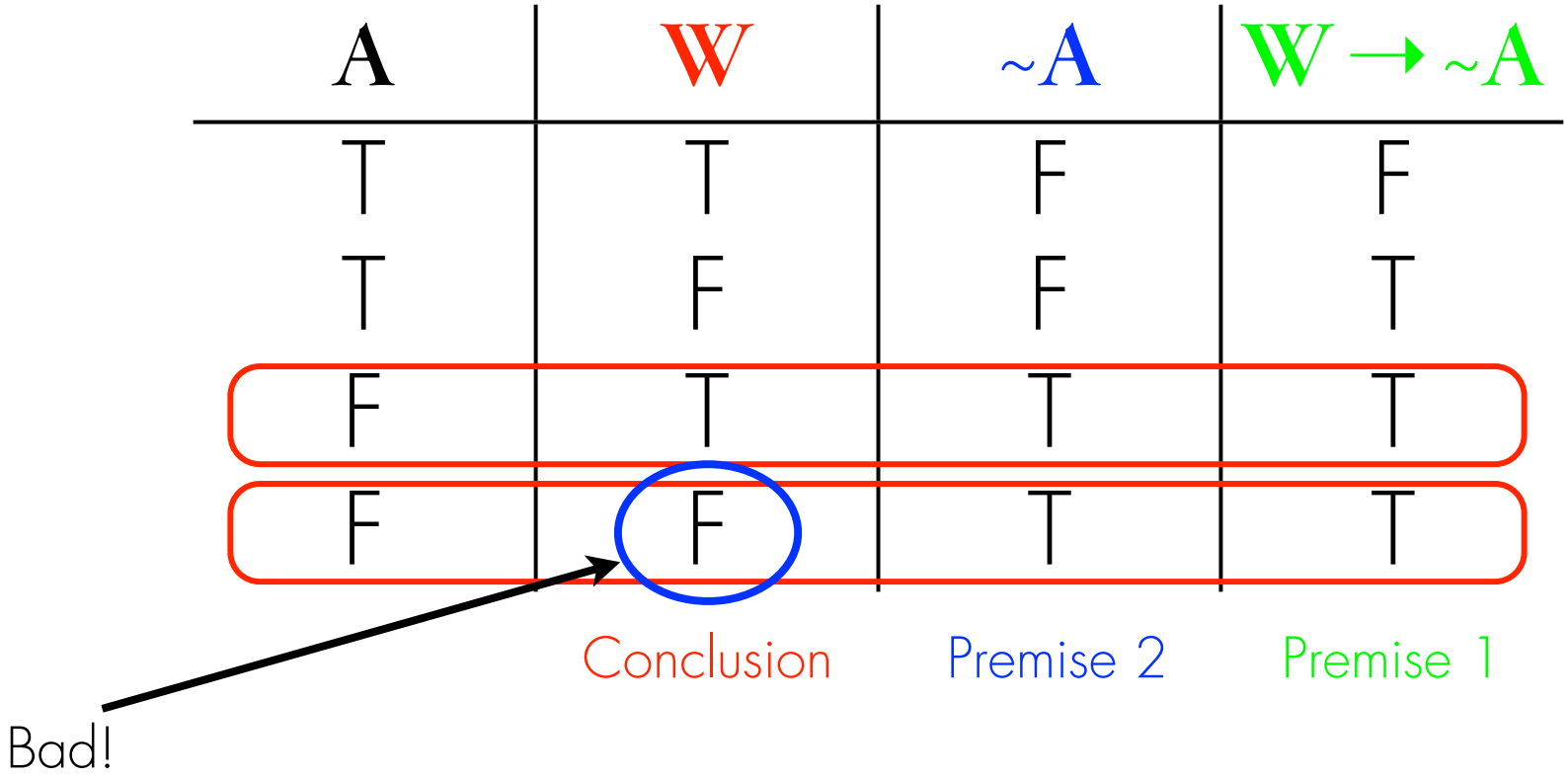
Step 6: The argument is valid just when the conclusion is true in *all* the circled rows.

A	W	~A	W → ~A
T	T	F	F
T	F	F	T
F	T	T	T
F	F	T	T

Conclusion Premise 2 Premise 1

Assessing Validity

In this case, the conclusion is false in one row, so this argument is *invalid*.



Argument 1

Is this a valid argument?

> If the U.S. is winning the war on terror, then there will be no major terrorist attacks on U.S. soil. There have been no such attacks, so the U.S. is winning the war on terror.

No, this is an *invalid* argument. Even if the premises are true, it is possible that the conclusion is false.

Argument 2

Consider the following argument:

> If I have the bird flu, then I am really sick. I have the bird flu. Therefore, I am really sick.

Assessing Validity

Step 1: Put the argument into argumentative form:

1. If I have the bird flu, then I am really sick.
2. I have the bird flu.

∴ I am really sick.

Assessing Validity

Step 2: Label each simple positive statement that the argument involves.

Here there are two of such statements to label:

1. I have the bird **flu**. (F)
2. I am really **sick**. (S)

Assessing Validity

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

Here we have:

1. $F \rightarrow S$.

2. F.

$\therefore$ S.

Assessing Validity

Step 4: Construct a truth table.

F	S	F → S
T	T	T
T	F	F
F	T	T
F	F	T
Premise 2	Conclusion	Premise 1

Assessing Validity

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

F	S	F → S
T	T	T
T	F	F
F	T	T
F	F	T

Premise 2 Conclusion Premise 1

Assessing Validity

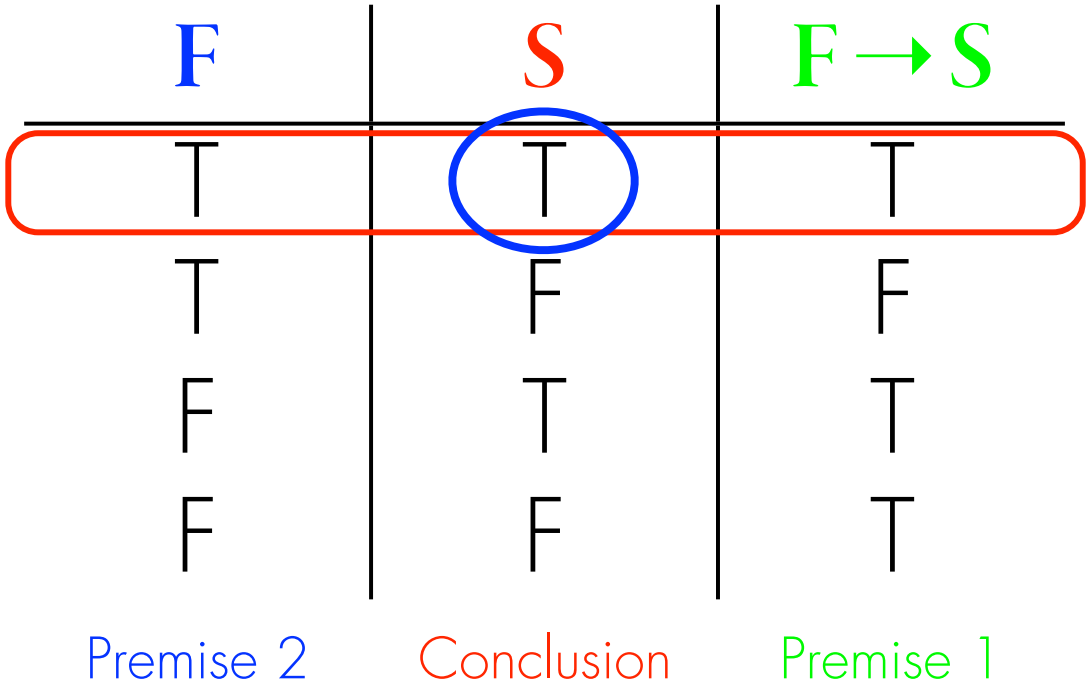
Step 6: The argument is valid just when the conclusion is true in *all* the circled rows.

F	S	F → S
T	T	T
T	F	F
F	T	T
F	F	T

Premise 2 Conclusion Premise 1

Assessing Validity

In this case the argument is *valid* because whenever the premises are all true, the conclusion is true as well.



Argument 2

Is this a valid argument?

> If I have the bird flu, then I am really sick. I have the bird flu. Therefore, I am really sick.

Yes, it is a *valid* argument. Whenever the premises are all true, the conclusion is always true.

Next Class…

We will look at some common valid and invalid forms that deductive arguments often take.