HOW DO I CHECK FOR VALIDITY WITH TRUTH TABLES?

WEEK 2. TOPIC INTRODUCTION

LAST TIME...

we constructed truth tables for well-formed formulas.

TODAY...

we construct truth tables for argument forms.

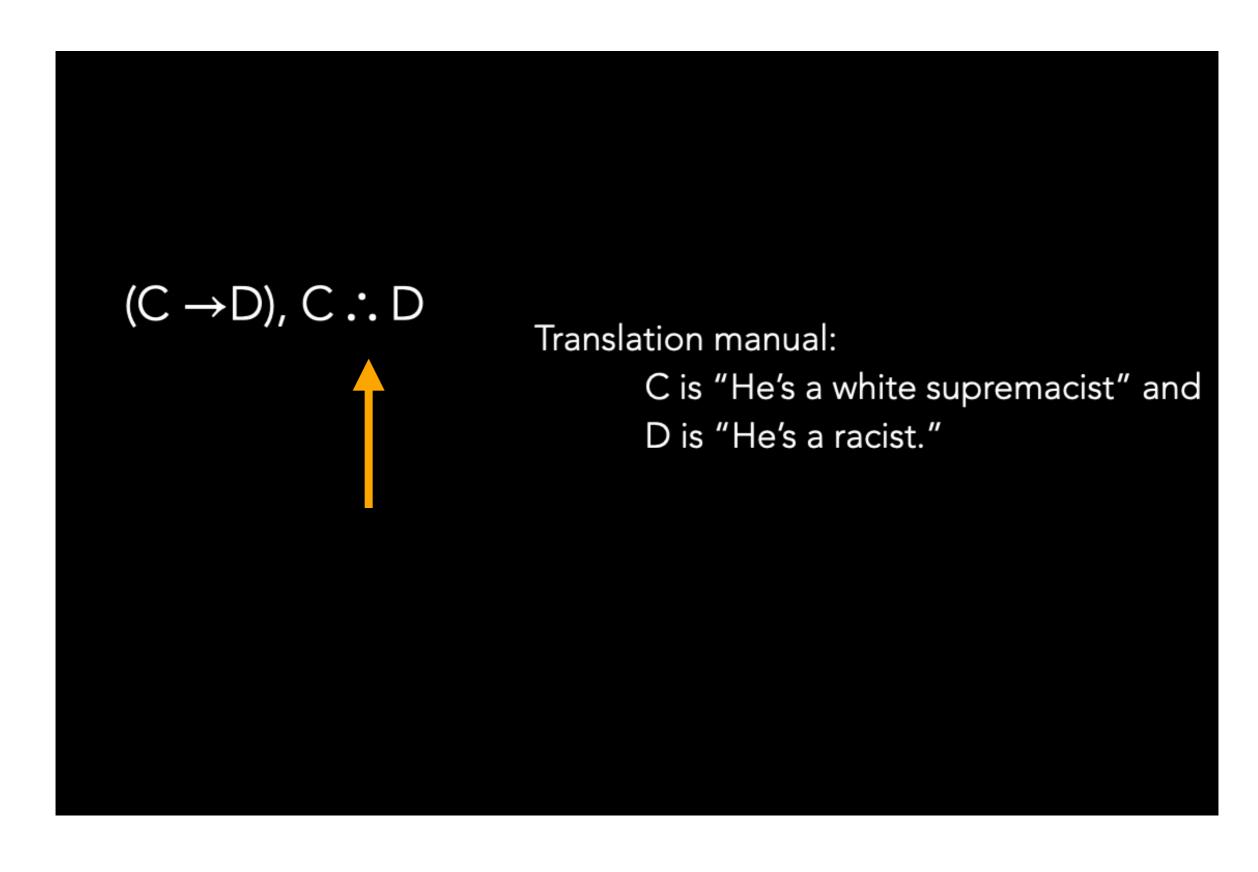
RECALL



Translation manual:

C is "He's a white supremacist" and D is "He's a racist."

RECALL



We will say that an argument is *valid* if for all possible combinations of truth-values of the basic propositional letters in the formulas, if all the premises are true on a combination, then the conclusion is true on that combination

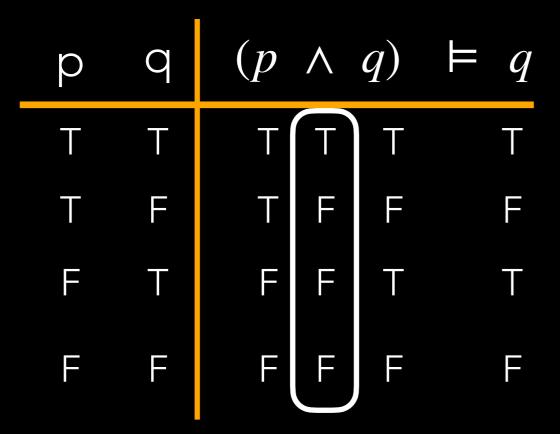
We symbolize validity with \models as in: $(p \land q) \models q$

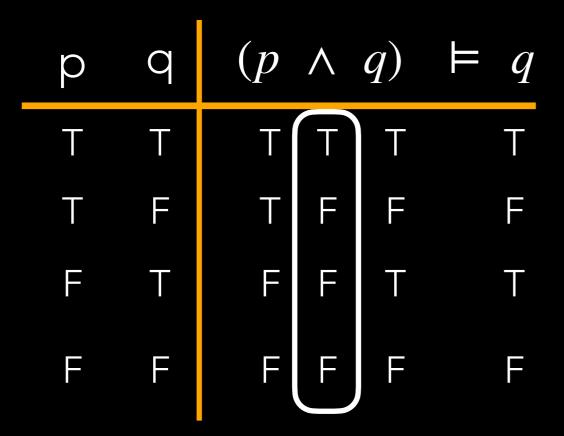
We write $\phi_1, ..., \phi_n \vDash \psi$ to indicate that the argument with premises $\phi_1, ..., \phi_n$ and conclusion ψ is valid.

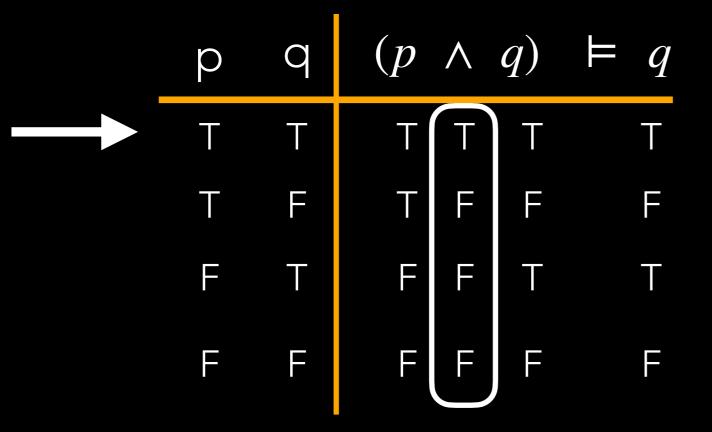
As you can see, when we have multiple premises, we separate them with commas.

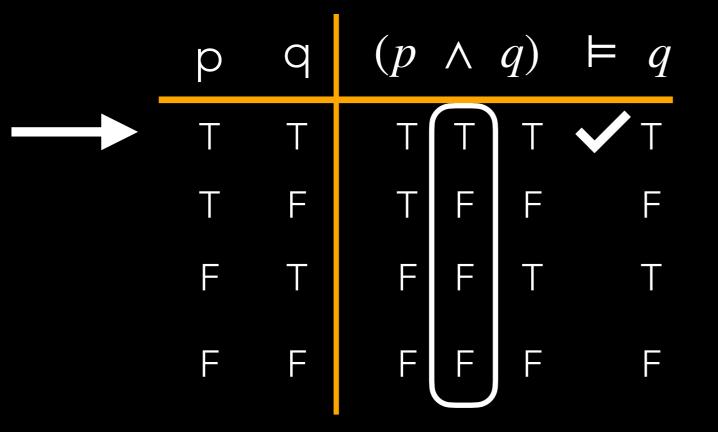
We read $(p \land q) \vDash q$ as:

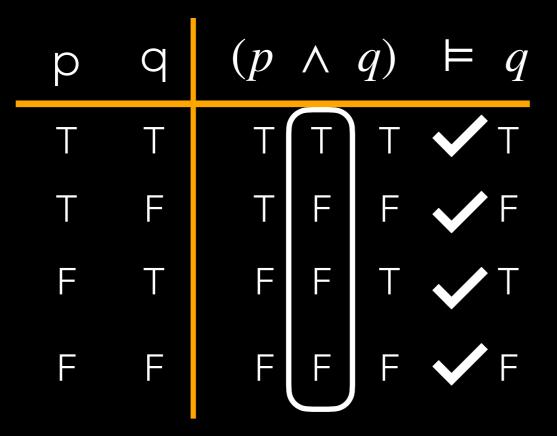
- $(p \land q)$ has q as a consequence
- $(p \land q)$ models q
- q follows from the premise $(p \land q)$
- The argument with premise $(p \land q)$ and conclusion q is valid.

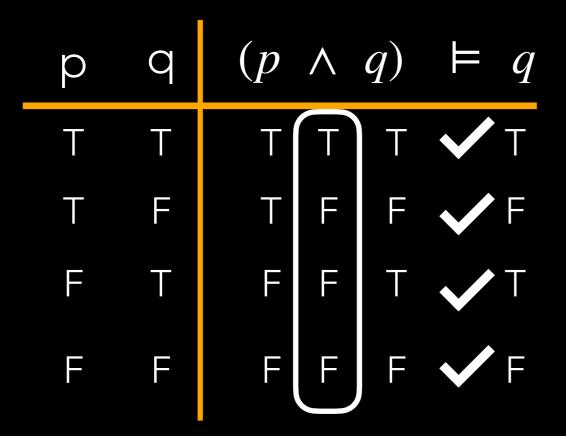












What about the rest of the rows?

The premises aren't true in the other rows. So it doesn't matter what the conclusion is, the argument will be valid.

Α	В	$A \rightarrow B$
Т	Т	Т
Т	F	F
F	Т	Т
F	F	Т

Α	В	$A \rightarrow B$
Т	Τ	Т
Т	F	F
F	Т	Т
F	F	Т

AN ARGUMENT IS VALID IF WHENEVER ALL THE PREMISES ARE TRUE, THE CONCLUSION IS TRUE.

Α	В	$A \rightarrow B$
Т	Т	Т
Т	F	F
F	Т	Т
F	F	Т

AN ARGUMENT IS VALID IF WHENEVER ALL THE PREMISES ARE TRUE, THE CONCLUSION IS TRUE.

THIS IS LIKE THE CONDITIONAL TRUTH TABLE.

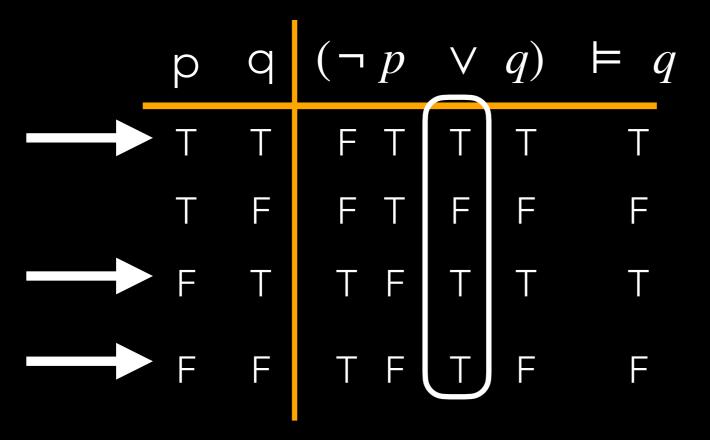
Α	В	$A \rightarrow B$
Т	Т	Т
Т	F	F
F	Т	Т
F	F	Т

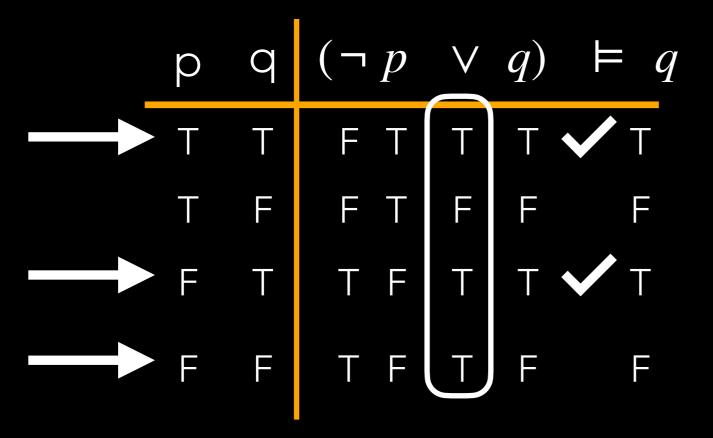
AN ARGUMENT IS VALID IF WHENEVER ALL THE PREMISES ARE TRUE, THE CONCLUSION IS TRUE.

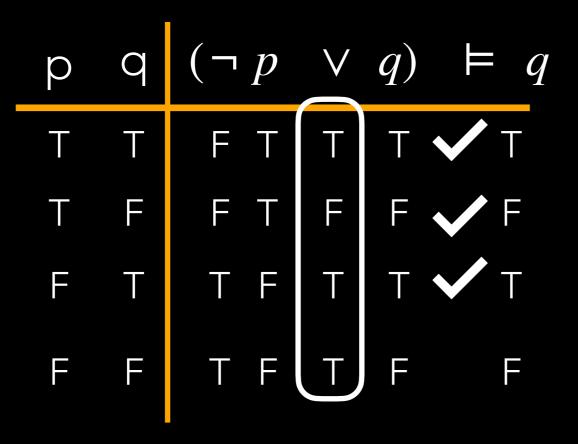
THIS IS LIKE THE CONDITIONAL TRUTH TABLE.

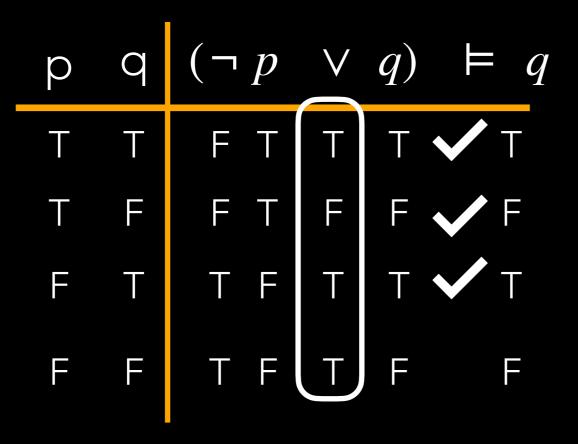
Conditional is only false if the premise is true and the conclusion doesn't follow. An argument is only invalid if there's a case when the premises are all true but the conclusion isn't.

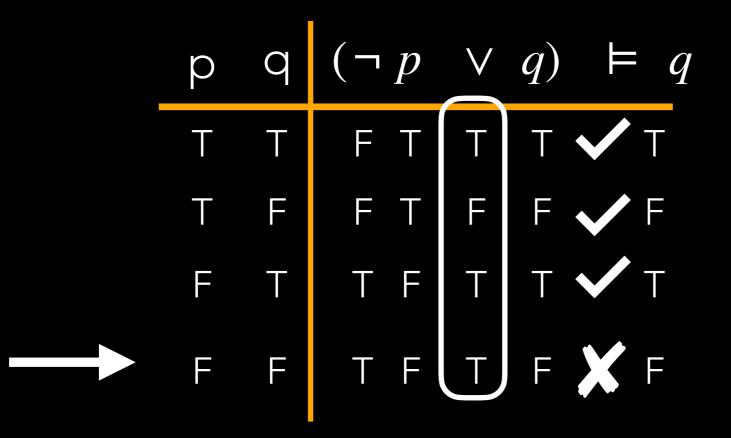
р	q	$(\neg p$	∨ <i>q</i>)	$\models q$
Т	Т	FΤ	ТТ	Т
Т	F	FΤ	F F	F
F	Т	ΤF	т т	Т
F	F	ΤF	T F	F











Here we have the premises as true, but the conclusion is false. Just one row like this is sufficient to make the argument invalid!

p
q
$$(\neg p) \lor q) \models q$$

T
T
T
T
T
T

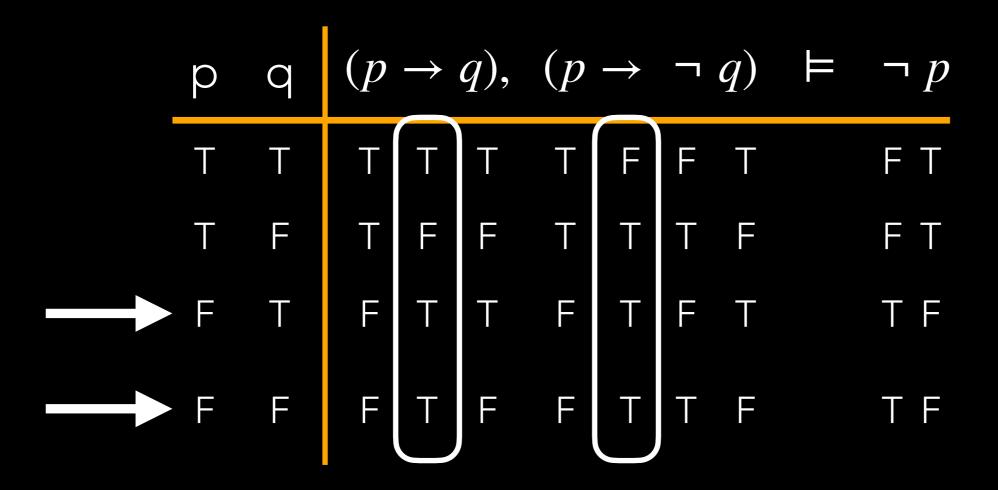
T
F
T
F
F
F

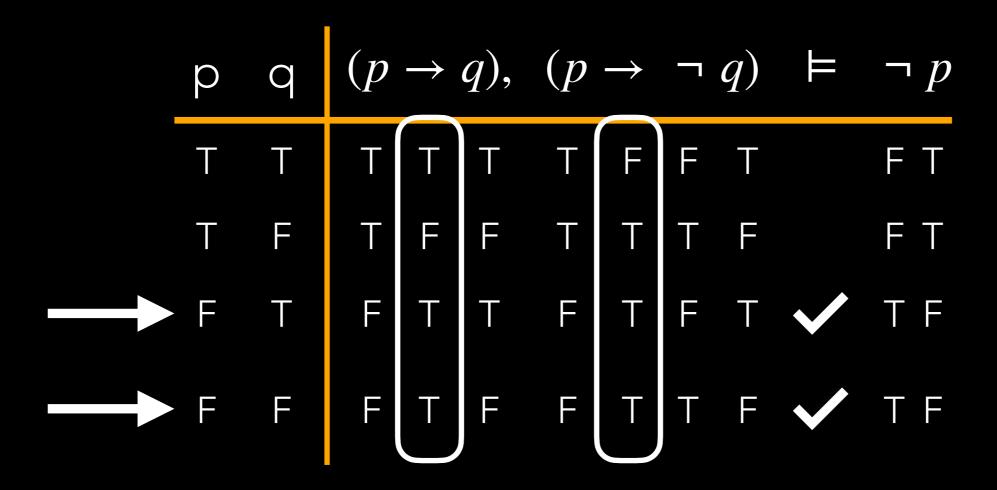
F
T
T
F
F
F

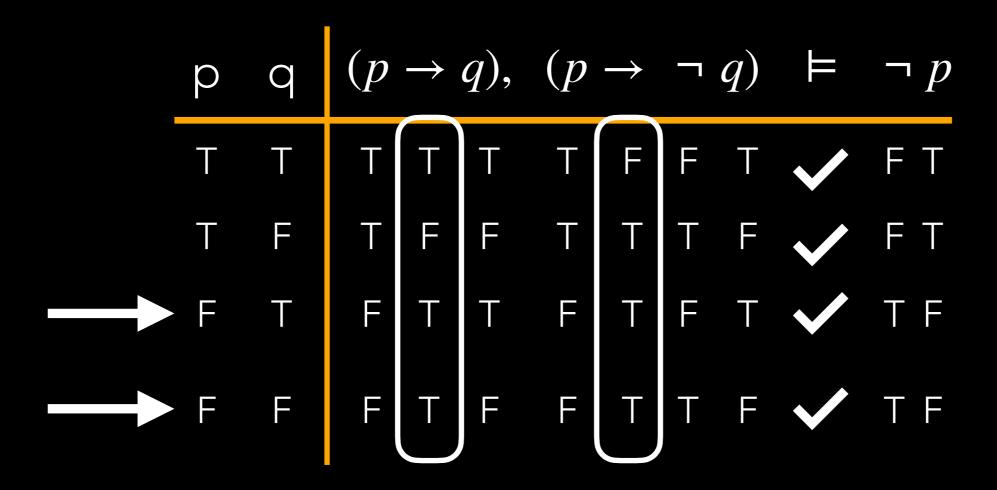
F
F
T
T
F
F

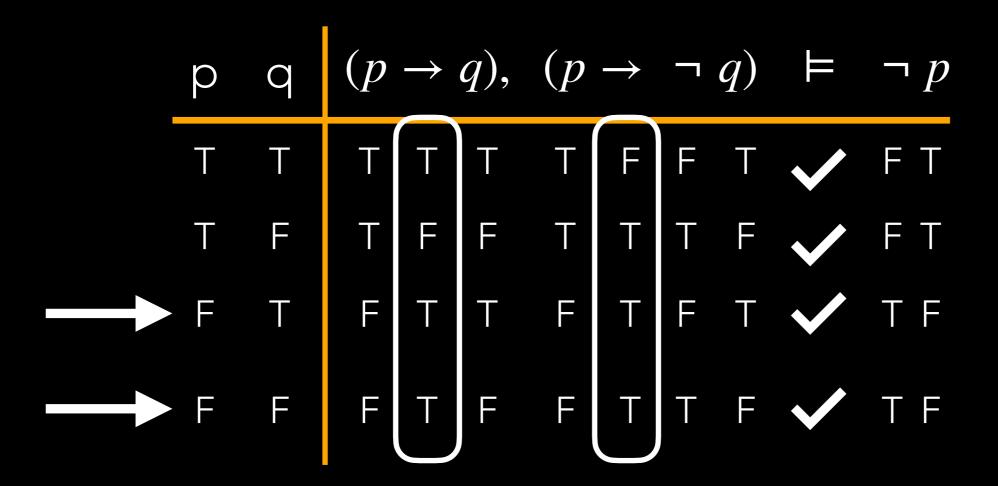
- $(\neg p \lor q)$ does not have q as a consequence
- $(\neg p \lor q)$ does not model q
- q does not follow from the premise $(\neg p \lor q)$
- The argument with premise $(\neg p \lor q)$ and conclusion q is invalid.

р	q	(<i>p</i>	\rightarrow	q),	<i>(p</i>	\rightarrow	7	q)	Þ	$\neg p$
Т	Т	Т	Т	Т	Τ	F	F	Т		FΤ
Т	F	Т	F	F	Τ	Т	Т	F		FΤ
F	Т	F	Т	Т	F	Т	F	Т		ΤF
F	F	F	Т	F	F	Т	Т	F		ΤF









The argument with premises $(p \rightarrow q), (p \rightarrow \neg q)$ and conclusion $\neg p$ is valid.