Philosophy 231 More Paraphrase; Schematization; Interpretations; Truth-Tables

Sanford Shieh

Wesleyan University

Fall 2014

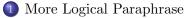
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2 Schematization

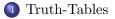
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NEVER, NEVER, NEVER

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NEVER, NEVER, NEVER, NEVER, read (\supset) as 'implies'

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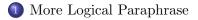
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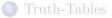
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2 Schematization

3 Interpretation of Schemata



The Biconditional

The biconditional sign, \equiv is just an abbreviation.

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The Biconditional

The biconditional sign, \equiv is just an abbreviation.

That is to say,

 $p \equiv q$

means exactly the same thing as

 $(p\supset q).(q\supset p)$

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Paraphrasing Conditionals

Paraphrasing into the symbol (\supset) poses more difficulties than the other logical symbols. So I want to go over three expressions that can be paraphrased using (\supset) .

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▶ Consider the following statement

▶ Consider the following statement

A car will start only if there's gas in the tank.

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Consider the following statement

A car will start only if there's gas in the tank.

▶ The way to think about paraphrasing this is to consider whether we will take the statement to be \top or \bot , under various conditions.

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For example, suppose some car starts, but there's no gas in the tank (because it's a combination gas electricity car) is the statement ⊤ or ⊥?

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- For example, suppose some car starts, but there's no gas in the tank (because it's a combination gas electricity car) is the statement ⊤ or ⊥?
- ▶ Now, suppose a car doesn't start, but there is gas in the tank, is the statement \top or \perp ?

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- For example, suppose some car starts, but there's no gas in the tank (because it's a combination gas electricity car) is the statement ⊤ or ⊥?
- ▶ Now, suppose a car doesn't start, but there is gas in the tank, is the statement \top or \perp ?

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▶ So, our paraphrase is:

- For example, suppose some car starts, but there's no gas in the tank (because it's a combination gas electricity car) is the statement ⊤ or ⊥?
- ▶ Now, suppose a car doesn't start, but there is gas in the tank, is the statement \top or \perp ?

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▶ So, our paraphrase is:

(That car will start) \supset (there's gas in its tank)

Necessary and Sufficient Conditions

If a conditional statement is \top , then

▶ Its antecedent is a sufficient condition for the consequent

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Necessary and Sufficient Conditions

If a conditional statement is \top , then

- ▶ Its antecedent is a sufficient condition for the consequent
- ▶ Its consequent is a necessary condition for the antecedent

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'provided that'

▶ Let's try to paraphrase the statement

▶ Let's try to paraphrase the statement

You will pass the course provided that you attend all the lectures.

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▶ Let's try to paraphrase the statement

You will pass the course provided that you attend all the lectures.

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Suppose you attend all the lectures, but I didn't pass you, would you say that I'm a liar?

▶ Let's try to paraphrase the statement

You will pass the course provided that you attend all the lectures.

- Suppose you attend all the lectures, but I didn't pass you, would you say that I'm a liar?
- ▶ What about if you passed the course, despite not having attended all the lectures?

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Suppose you had an enemy, who comes around and reminds me of what I said, and says that I ought to flunk you; would I be right to reply that what I did is consistent with my previous statement?

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▶ So, here's the paraphrase:

- Suppose you had an enemy, who comes around and reminds me of what I said, and says that I ought to flunk you; would I be right to reply that what I did is consistent with my previous statement?
- ▶ So, here's the paraphrase:

(You attend all the lectures) \supset (you will pass the course)

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'unless'

▶ Consider the following sentence:

- ▶ Consider the following sentence:
 - I won't go to the party unless I finish the logic problem set.

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▶ Consider the following sentence:

I won't go to the party unless I finish the logic problem set.

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Suppose you go to the party without finishing the problem set. Would you have kept your word?

▶ Consider the following sentence:

I won't go to the party unless I finish the logic problem set.

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- Suppose you go to the party without finishing the problem set. Would you have kept your word?
- \blacktriangleright So the statement seems to be \bot in the same condition as

▶ Consider the following sentence:

I won't go to the party unless I finish the logic problem set.

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▶ Consider the following sentence:

I won't go to the party unless I finish the logic problem set.

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(I will go to the party) \supset (I finish the logic problem set).

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▶ Is this the right paraphrase?



 You might say no, when you think about possible situations in which you do finish the problem set.

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 You might say no, when you think about possible situations in which you do finish the problem set.

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 You might say no, when you think about possible situations in which you do finish the problem set.

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• Given our reading of \supset ,

 You might say no, when you think about possible situations in which you do finish the problem set.

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• Given our reading of \supset ,

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is \top no matter whether its antecedent is \top or \perp .

- You might say no, when you think about possible situations in which you do finish the problem set.
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is \top no matter whether its antecedent is \top or \bot .

But, if you in fact finish the problem set, then surely you will go to the party, right?



► Really?

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- ► Really?
- Even if you do finish the problem set, something else might happen to prevent you from going to the party.

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- ► Really?
- Even if you do finish the problem set, something else might happen to prevent you from going to the party.
- Maybe you get a call from a friend who is depressed and you miss the party because you were cheering her up.

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- ► Really?
- Even if you do finish the problem set, something else might happen to prevent you from going to the party.
- ▶ Maybe you get a call from a friend who is depressed and you miss the party because you were cheering her up.
- ► So the possibility in which you finish the problem set is compatible with your not going to the party.

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'unless' is the same as ' \lor '

▶ If we paraphrase

▶ If we paraphrase

I won't go to the party unless I finish the logic problem set.

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▶ If we paraphrase

I won't go to the party unless I finish the logic problem set.

as

(I will go to the party) \supset (I finish the logic problem set),

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▶ If we paraphrase

I won't go to the party unless I finish the logic problem set.

as

(I will go to the party) \supset (I finish the logic problem set), then we must take the word

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'unless' to be the same as ' \lor '.

► Can you see why?

► If

not p unless q

is paraphrased as

 $p\supset q$

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► If

not p unless q

is paraphrased as

 $p\supset q$

► Then

p unless q

is paraphrased as

 $-p \supset q$

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► Now,

 $-p \supset q$

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is \perp only when -p is \top and q is \perp ,

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► Now,

$$-p\supset q$$

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- is \perp only when -p is \top and q is \perp ,
- I.e., only when p is \perp and q is \perp .

► Now,

 $-p\supset q$

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- is \perp only when -p is \top and q is \perp ,
- I.e., only when p is \perp and q is \perp .
- But these are the truth-conditions of $p \lor q$

▶ 'just in case'

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- ▶ 'just in case'
 - ▶ This is frequently paraphrased into the biconditional.

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- ▶ 'just in case'
 - ▶ This is frequently paraphrased into the biconditional.
 - ▶ Why? It may help to think of 'just in case' as 'exactly in the case that'

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- ▶ 'just in case'
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▶ 'even though'.

- ▶ 'just in case'
 - ▶ This is frequently paraphrased into the biconditional.
 - ▶ Why? It may help to think of 'just in case' as 'exactly in the case that'

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- ▶ 'even though'.
- ▶ How would you paraphrase

- ▶ 'just in case'
 - ▶ This is frequently paraphrased into the biconditional.
 - ▶ Why? It may help to think of 'just in case' as 'exactly in the case that'

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- 'even though'.
- ▶ How would you paraphrase

The Wesleyan faculty is productive even though the Wesleyan administration overburdens it?

 The meanings of ordinary English words obviously don't always match exactly the meanings of our logical symbols.

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▶ The meanings of ordinary English words obviously don't always match exactly the meanings of our logical symbols.

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► In order to avoid the problems of paraphrase, I give a list of Standard Paraphrases in the handout for this class.

▶ The meanings of ordinary English words obviously don't always match exactly the meanings of our logical symbols.

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- ► In order to avoid the problems of paraphrase, I give a list of Standard Paraphrases in the handout for this class.
- ▶ You will never go wrong if you follow them

 $\begin{array}{lll} & `p \ {\rm only} \ {\rm if} \ q' & `p \ \supset q' \\ & `p \ {\rm provided} \ {\rm that} \ q' & `q \ \supset p' \\ & `{\rm not} \ p \ {\rm unless} \ q' & `p \ \supset q' \\ & `p \ {\rm unless} \ q' & `-p \ \supset q' \ {\rm or} \ `p \ \lor q' \\ & `p \ {\rm if} \ {\rm and} \ {\rm only} \ {\rm if} \ q' & `p \ \equiv q' \\ & `p \ {\rm just} \ {\rm in} \ {\rm case} \ q' & `p \ \equiv q' \\ & `p \ {\rm even} \ {\rm though} \ q' & `p.q' \end{array}$

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As Goldfarb puts it on p. 18, there are generally speaking, three steps involved in logical paraphrase

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As Goldfarb puts it on p. 18, there are generally speaking, three steps involved in logical paraphrase

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▶ Identify the English expressions that are used like our truth functional connectives.

As Goldfarb puts it on p. 18, there are generally speaking, three steps involved in logical paraphrase

- ► Identify the English expressions that are used like our truth functional connectives.
- ▶ Demarcate the constituent sentences of the sentence, and make the appropriate changes to turn these sentences into statements.

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As Goldfarb puts it on p. 18, there are generally speaking, three steps involved in logical paraphrase

- ► Identify the English expressions that are used like our truth functional connectives.
- ▶ Demarcate the constituent sentences of the sentence, and make the appropriate changes to turn these sentences into statements.

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▶ Determine the grouping of the constituent statements.

Example of Paraphrase: Truth-functional Connective Phrases

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

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Example of Paraphrase: Truth-functional Connective Phrases

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation.

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Example of Paraphrase: Truth-functional Connective Phrases

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What are the truth-functional connectives?

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

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What are the truth-functional connectives?

 \blacktriangleright If ... then

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

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What are the truth-functional connectives?

- If \ldots then
- \blacktriangleright and

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation.

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What are the truth-functional connectives?

- If \ldots then
- \blacktriangleright and
- ▶ unless

Let's try our hand at paraphrasing a fairly complicated sentence, the first Homework problem on today's Handout:

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What are the truth-functional connectives?

- If \ldots then
- ▶ and
- unless
- ► or

What are the constituent statements?

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation

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What are the constituent statements?

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation

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▶ the tree rings have been correctly identified

What are the constituent statements?

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation

- ▶ the tree rings have been correctly identified
- ▶ the mace is indigenous

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- ▶ the tree rings have been correctly identified
- ▶ the mace is indigenous
- ▶ the Ajo culture antedated the Tula culture

What are the constituent statements?

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation

- ▶ the tree rings have been correctly identified
- ▶ the mace is indigenous
- ▶ the Ajo culture antedated the Tula culture
- ▶ the Tula culture was contemporary with the culture of the present excavation

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What are the constituent statements?

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation

- ▶ the tree rings have been correctly identified
- ▶ the mace is indigenous
- ▶ the Ajo culture antedated the Tula culture
- ▶ the Tula culture was contemporary with the culture of the present excavation

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▶ the Tula culture was derivative from the culture of the present excavation

If the tree rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula unless the latter was contemporary with or derivative from that of the present excavation.

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▶ So, what is the logical structure at the highest level?

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• What about the consequent?

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▶ It's a disjunction with *three* disjuncts

▶ It's a disjunction with *three* disjuncts

(the Ajo culture antedated the Tula culture) \lor ((the Tula culture was contemporary with the culture of the present excavation) \lor (the Tula culture was derivative from the culture of the present excavation))

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▶ So, here's the full paraphrase:

▶ It's a disjunction with *three* disjuncts

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2 Schematization

3 Interpretation of Schemata

4 Truth-Tables

Sanford Shieh (Wesleyan University)

 Schematization is the process of displaying the logical form of English statements by

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 Schematization is the process of displaying the logical form of English statements by

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1. Translating them into logical English, and then

- Schematization is the process of displaying the logical form of English statements by
 - 1. Translating them into logical English, and then
 - 2. Replacing the sub-statements of the result with sentence letters: p, q, r, s, etc.

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- ▶ We have actually been doing this all along, so there is nothing mysterious about it.
- ► For example, the logical form of the arguments from last class are schematizations:

 $p \supset r$ $q \supset r$ $p \lor q$ Therefore r

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▶ So now, let's schematize what we just paraphrased:

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▶ So now, let's schematize what we just paraphrased:

((the tree rings have been correctly identified).(the mace is indigenous)) \supset (the Ajo culture antedated the Tula culture) \lor ((the Tula culture was contemporary with the culture of the present excavation) \lor (the Tula culture was derivative from the culture of the present excavation))

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- ▶ What is the schema?

$$(p.q)\supset \ (r\lor \ (s\lor \ t))$$

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Convention for Bracketing

We're going to make life a little easier for ourselves: we adopt a convention so as to write fewer brackets. The following tells you how big of a break a connective marks, in increasing order

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We're going to make life a little easier for ourselves: we adopt a convention so as to write fewer brackets. The following tells you how big of a break a connective marks, in increasing order

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Example of Convention for Bracketing

This isn't that difficult to understand. All it amounts to is that if we write

 $-p \cdot q$

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Example of Convention for Bracketing

This isn't that difficult to understand. All it amounts to is that if we write

 $-p \cdot q$

We mean

 $(-p) \cdot q$

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Sanford Shieh (Wesleyan University)

Example of Convention for Bracketing

This isn't that difficult to understand. All it amounts to is that if we write

$$-p.q$$

We mean

$$(-p) \cdot q$$

Not

 $-(p \cdot q)$

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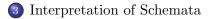
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Fall 2014

1 More Logical Paraphrase

2 Schematization



4 Truth-Tables

Sanford Shieh (Wesleyan University)

There are two notions of interpretation of schemata

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There are two notions of interpretation of schemata

Replacing each letter appearing in a schema with a statement.
 This is called interpretation by replacement.

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There are two notions of interpretation of schemata

- Replacing each letter appearing in a schema with a statement.
 This is called interpretation by replacement.
- ▶ The result is to convert a schema back to a statement of logical English.

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There are two notions of interpretation of schemata

- ▶ Replacing each letter appearing in a schema with a statement. This is called interpretation by replacement.
- ▶ The result is to convert a schema back to a statement of logical English.
- ▶ Assigning a truth value to each distinct letter of a schema. This is called interpretation by assignment.

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There are two notions of interpretation of schemata

- Replacing each letter appearing in a schema with a statement.
 This is called interpretation by replacement.
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- Assigning a truth value to each distinct letter of a schema. This is called interpretation by assignment.
- ▶ Notation: ' $p := \bot$ ' means that the sentence letter p is assigned the value \bot .

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There are two notions of interpretation of schemata

- Replacing each letter appearing in a schema with a statement.
 This is called interpretation by replacement.
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▶ The result of such an assignment is that the entire schema is determined as \top or \perp .

▶ Let's consider the schema:

 $p \vee q \supset r$

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▶ Let's consider the schema:

 $p \vee q \supset r$

▶ An interpretation by assignment is:

 $p:=\top,q:=\bot,r:=\top$

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▶ Let's consider the schema:

 $p \lor q \supset r$

▶ An interpretation by assignment is:

$$p:=\top,q:=\bot,r:=\top$$

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► The truth value of this schema under this interpretation is computed by using the rules for the truth functional connectives. Can you tell me what it is?

▶ Let's consider the schema:

 $p \vee q \supset r$

▶ An interpretation by assignment is:

$$p:=\top,q:=\bot,r:=\top$$

- ► The truth value of this schema under this interpretation is computed by using the rules for the truth functional connectives. Can you tell me what it is?
- ▶ It's \top , because the schema is a conditional, and its consequent is assigned \top . The assignments to p and to q, in this case, don't matter, because a conditional is \top if it has a \top consequent, no matter what the truth-value of its antecedent.

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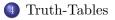
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2 Schematization

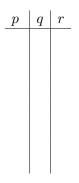
3 Interpretation of Schemata



There is a standard procedure for constructing truth tables: the rows of the table are written down in a fixed order. Let's look at how it's done with 3 sentence letters, p, q, and r. For 3 letters there are $2^3 = 8$ possible combinations of truth-values. Each letter is \top in half of those and \perp in half; i.e., \top in 4 interpretations and \perp in the other 4.

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We begin with p, and first fill the first 4 rows with \top .



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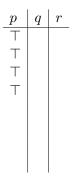
We begin with p, and first fill the first 4 rows with \top .



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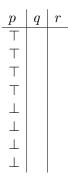
We begin with p, and first fill the first 4 rows with \top . Then we fill the remaining 4 with \perp



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Fall 2014

We begin with p, and first fill the first 4 rows with \top . Then we fill the remaining 4 with \perp



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Next we work on q, in the 4 rows in which p is \top .

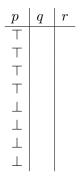
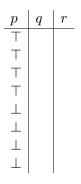


Image: A matrix

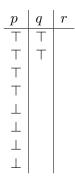
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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top



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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top



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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top Then the rest with \bot



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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top Then the rest with \bot



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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top

Then the rest with \perp

Then we do the same for the 4 rows in which p is \perp



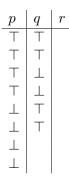
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Fall 2014

Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top

Then the rest with \perp

Then we do the same for the 4 rows in which p is \perp



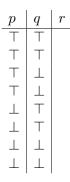
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Next we work on q, in the 4 rows in which p is \top . We fill half of those with \top

Then the rest with \perp

Then we do the same for the 4 rows in which p is \perp



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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	
Т	Т	
Т	\perp	
Т	\perp	
\perp	Т	
\perp	Т	
\perp	\perp	
\perp	$ \perp $	

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	
Т	\perp	
Т	\perp	
\perp	Т	
\bot	Т	
\bot	\perp	
\perp	\perp	

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	\perp
Т	\perp	
Т	\perp	
\perp	Т	
\bot	Т	
\bot	\perp	
\perp	\perp	

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	
Т	\perp	T
Т		
\perp	T	
\perp	T	
\perp		
\perp		

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	
Т	\perp	Т
Т	\perp	
\perp	Т	
\perp	Т	
\perp	\perp	
\perp	\perp	

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	
Т	\perp	Т
Т	\perp	
\perp	Т	T
\perp	Т	
\perp	\perp	
\perp	\perp	

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	\perp
Т	\perp	Т
Т	\perp	
\perp	Т	Τ
\perp	Т	
\perp	\perp	
\perp		

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Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Τ	Т	Т
Т	Т	\perp
Т	\perp	Т
Т	\perp	\perp
\bot	Т	Т
\perp	Т	\perp
\perp	\perp	Т
\perp		

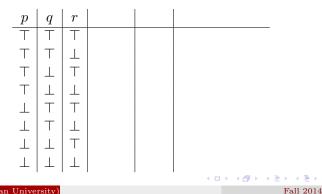
Now we work on r. It's just alternating \top and \perp down the third column:

p	q	r
Т	Т	Т
Т	Т	
Т	\perp	Т
Т		
\perp	Т	T
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\perp	\perp	Т
\perp		⊥

Let's now calculate the truth-table for a fairly simple schema:

$$(p\supset q)\equiv -r$$

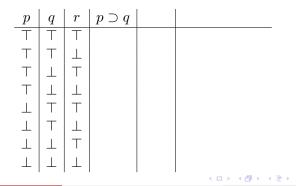
First we write across the top the parts of the schemata, from less complex to more complex.



Let's now calculate the truth-table for a fairly simple schema:

$$(p\supset q)\equiv -r$$

First we write across the top the parts of the schemata, from less complex to more complex.

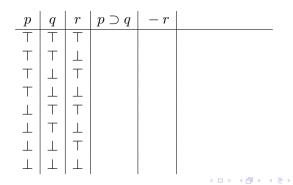


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Let's now calculate the truth-table for a fairly simple schema:

$$(p\supset q)\equiv -r$$

First we write across the top the parts of the schemata, from less complex to more complex.

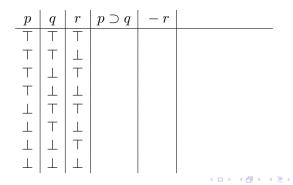


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Let's now calculate the truth-table for a fairly simple schema:

$$(p\supset q)\equiv -r$$

First we write across the top the parts of the schemata, from less complex to more complex. Then the whole schema.

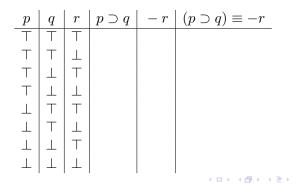


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Let's now calculate the truth-table for a fairly simple schema:

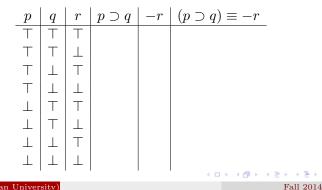
$$(p\supset q)\equiv -r$$

First we write across the top the parts of the schemata, from less complex to more complex. Then the whole schema.

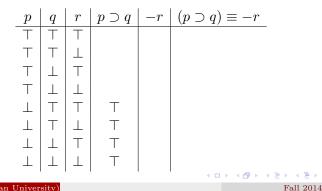


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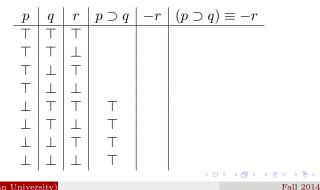
Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .



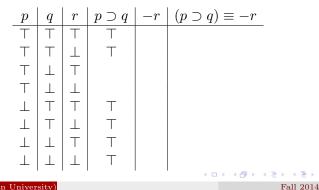
Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .



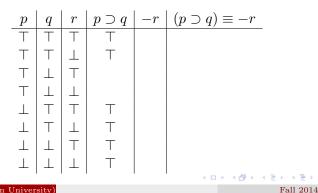
- Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .
- ▶ A conditional is also \top if its consequent is \top so we can write \top in the rows in which q is \top .



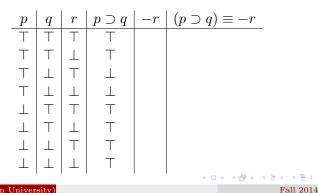
- Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .
- ▶ A conditional is also \top if its consequent is \top so we can write \top in the rows in which q is \top .



- Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .
- ▶ A conditional is also \top if its consequent is \top so we can write \top in the rows in which q is \top .
- In the remaining rows $p \supset q$ is \perp .



- Since a conditional is \top if its antecedent is \bot , we can immediately write a \top in all the rows in which p is \bot .
- ▶ A conditional is also \top if its consequent is \top so we can write \top in the rows in which q is \top .
- In the remaining rows $p \supset q$ is \perp .



The Truth-Values of -r

This is easy, we just reverse the truth-values of the third column

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
\vdash	Т	Т	Т		
Т	Т	\perp	Т		
Т	\perp	Т			
Т	\perp				
\perp	Т	T	Т		
\perp	Т	\perp	Т		
\perp	\bot	Т	Т		
\perp	\perp	\perp	T		

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The Truth-Values of -r

This is easy, we just reverse the truth-values of the third column

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т		
Т	Т	\perp	Т	Т	
Т	\perp	Т			
Т	\perp			T	
\perp	Т	T	Т		
\perp	Т	\perp	Т	Т	
\perp	\bot	Т	Т		
\perp	\perp		Т	Т	

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Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	$\mid r$	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т		
Т	Т	\perp	Т	Т	
Т	\perp	Т		\perp	
Т	\bot	\perp		Т	
\perp	Т	Т	Т	\perp	
\perp	Т		Τ	T	
\perp	\bot	T	Τ		
\perp	\perp	$ \perp$	T	T	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т		\perp
Т	Т	\perp	Т	Т	
Т	\perp	Т		\perp	
Т	\perp	\perp		Т	
\perp	Т	Т	Т	\perp	
\perp	Т		Т	Т	
\perp	\perp	Т	Т	\perp	
\perp	\perp		T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	$\mid r$	$p\supset q$	-r	$(p\supset q)\equiv -r$
\vdash	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\bot	Т	\perp	\perp	
Т	\perp		\perp	Т	
\perp	Т	Т	Т	\perp	
\perp	Т	\perp	Т	Т	
\perp	\bot	T	Т	\perp	
\perp	\perp	⊥	T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т		\perp	Т
Т	\perp	\perp		Т	
\perp	Т	T	Τ		
\perp	Т		Т	Т	
\perp	\perp	T	Т		
\perp	\perp	⊥	T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
\top	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т	\perp	\perp	Т
Т	\perp	\perp	\perp	Т	\perp
\perp	Т	Т	Т	\perp	
\perp	Т		Т	Т	
\perp	\perp	T	Т		
\perp	\perp	⊥	T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
\top	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т		\perp	Т
Т	\perp	\perp		Т	\perp
\perp	Т	T	Τ		\perp
\perp	Т		Т	Т	
\perp	\perp	Т	Т		
\perp	\perp	⊥	T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	$\mid r$	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т	\perp	\perp	Т
Т	\perp	\perp		Т	\perp
\perp	Т	Т	Т	\perp	\perp
\perp	Т		Τ	Т	Т
\perp	\perp	T	Т		
\perp	\perp	⊥	T	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	r	$p \supset q$	-r	$(p\supset q)\equiv -r$
\top	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т	\perp	\perp	Т
Т	\perp	\perp	\perp	Т	1
\perp	Т	T	Т		1
\perp	Т		Т	Т	Т
\perp	\perp	T	Т		\perp
\perp	\perp	\perp	Т	Т	

Finally, we calculate the final column from the truth-values of the 4^{th} and 5^{th} columns:

p	q	$\mid r$	$p \supset q$	-r	$(p\supset q)\equiv -r$
Т	Т	Т	Т	\perp	\perp
Т	Т	\perp	Т	Т	Т
Т	\perp	Т		\perp	Т
Т	\perp	\perp		Т	\perp
\perp	Т	T	Τ		\perp
\perp	Т		Т	Т	Т
\perp	\perp	Т	Т		\perp
\perp	\perp	⊥	T	Т	Т

Now it's Homework Time

DL p. 254, Problem 4 (a)-(c); paraphrase and schematize:

(a) The curse will be effective and neither Fasolt nor Fafner will retain the Ring.

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Now it's Homework Time

DL p. 254, Problem 4 (a)-(c); paraphrase and schematize:

- (a) The curse will be effective and neither Fasolt nor Fafner will retain the Ring.
- (b) Either Wotan will triumph and Valhalla be saved or else he won't and Alberic will have the final word.

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Fall 2014

Now it's Homework Time

DL p. 254, Problem 4 (a)-(c); paraphrase and schematize:

- (a) The curse will be effective and neither Fasolt nor Fafner will retain the Ring.
- (b) Either Wotan will triumph and Valhalla be saved or else he won't and Alberic will have the final word.

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(c) Wotan and Alberic will not both be satisfied.