Reasoning for Humans: Clear Thinking in an Uncertain World

PHIL 171

Eric Pacuit

Department of Philosophy
University of Maryland
pacuit.org

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Arguments

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Conclusion Indicators

therefore hence for this reason

thus implies that entails that so

it must be that we may infer wherefore

it follows that we may conclude that

consequently as a result accordingly

Declarative Sentences

A sentence is **declarative** if it makes a statement: that is, if it asserts something.

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Examples

Amsterdam is in The Netherlands.

Helsinki is in Norway.

Textbooks are free in all of my courses.

The Terps beat the Buckeyes in football.

Declarative Sentences, Commands, Questions

Attendance is mandatory. (declarative)

Show up to the lectures! (imperative)

Are you coming to class today? (interrogative)

Indexical Sentences

I have been in the Skinner building.

My computer was stolen.

The dog ate the steak yesterday.

Terminology: Proposition

The premises and conclusion of an argument are not the declarative sentences we use to express the argument, but rather the *meanings* of those declarative sentences.

A **proposition** is something that can be true or false.

Some logic/philosophy texts use "statement" or "claim" instead of "proposition".

Many sentences can express the same proposition

1. I have taken logic before.
2. I took logic.
3. This is not the first time I have taken logic.

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1. I have taken logic before.
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1. There is a cat in the teapot.
2. Hay un gato en la tetera.
3. Il y a un chat dans la théière.
4. Eine Katze ist in der Teekanne.
5. Er is een kat in de theepot

A sentence may express different propositions

1. Ann bumped into the main with an umbrella.
2. No student solved exactly two problems.

Summary

A sentence is **declarative** if it makes a statement: that is, if it asserts something.

A **proposition** is something that can be true or false. It is the statement expressed by a declarative sentence.

The premises and conclusion of an **argument** are not the declarative sentences we use to express the argument, but rather the *propositions* expressed by those declarative sentences.

Some logic/philosophy texts use "statement" or "claim" instead of "proposition".

Representing Arguments

The lecture will either be in the Skinner building or on Zoom. Since classroom space is limited on campus, the lecture will not be in the Skinner building. So, the lecture will be on Zoom.

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$S1$ The lecture will either be in the Skinner building or on Zoom.
(Premise)

$S2$ Since classroom space is limited on campus,
the lecture will not be in the Skinner building.
(Premise)

$S3$ The lecture will be on Zoom.
(Conclusion)

$S1$	The lecture will either be in the Skinner building or on Zoom. (Premise)
$S2$	Since classroom space is limited on campus, the lecture will not be in the Skinner building. (Premise)
$S3$	The lecture will be on Zoom. (Conclusion)

$S1$ The lecture will either be in the Skinner building or on Zoom.
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$S2$ Since classroom space is limited on campus,
the lecture will not be in the Skinner building.
(Premise)

$S3$ $\therefore$ The lecture will be on Zoom.
(Conclusion)

$$\frac{S1 \quad S2}{\therefore S3}$$

$$S1, S2 \Rightarrow S3$$

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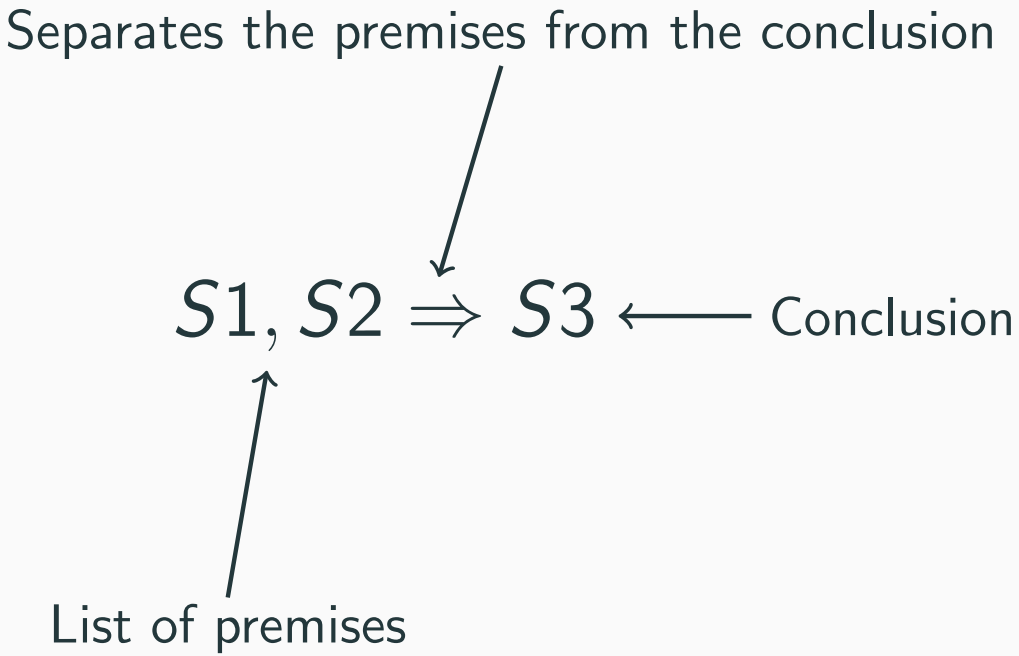
$$S1, S2 \Rightarrow S3$$


Separates the premises from the conclusion
$S1, S2 \Rightarrow S3$
Conclusion
List of premises

Arguments and Inference

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

Is this an argument?

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

Is this an argument? Yes.

What is the premise?

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

Is this an argument? Yes.

What is the premise? "The philosophy department is in Tawes Hall".

What is the conclusion?

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

Is this an argument? Yes.

What is the premise? "The philosophy department is in Tawes Hall".

What is the conclusion? "The math department is in the Skinner Building".

Is this a *good* argument?

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

Is this an argument? Yes.

What is the premise? "The philosophy department is in Tawes Hall".

What is the conclusion? "The math department is in the Skinner Building".

Is this a *good* argument? No!

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

What's wrong with this argument?

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

What's wrong with this argument?

1. The premise is not true.
2. The conclusion does not *follow from* the premise.

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

$S1 \Rightarrow S2$

The philosophy department is in Tawes Hall. So, the math department is in the Skinner Building.

$S1 \Rightarrow S2$

Eric had steak or fish for dinner. Eric did not have fish. So, Eric had steak for dinner.

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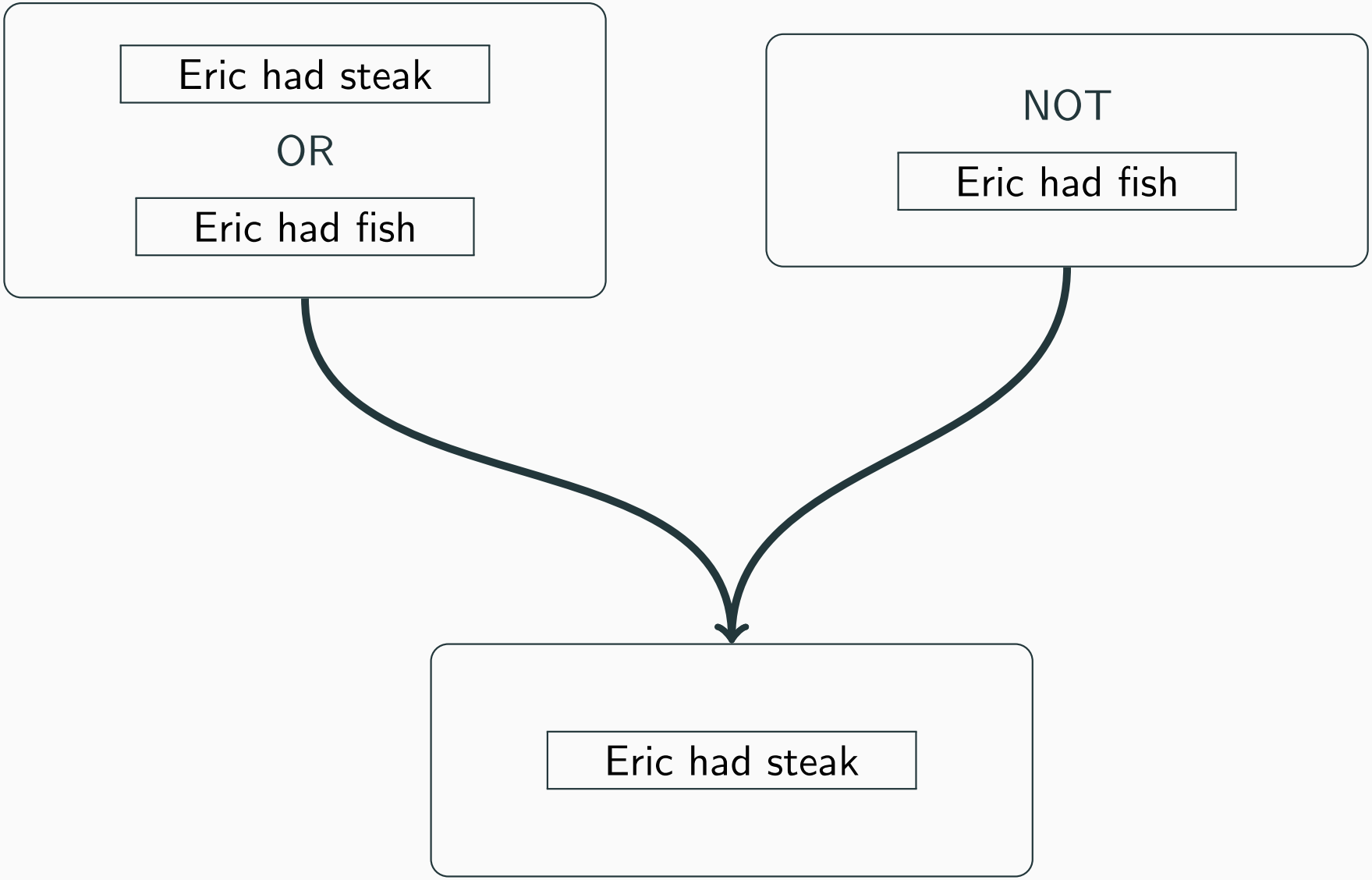
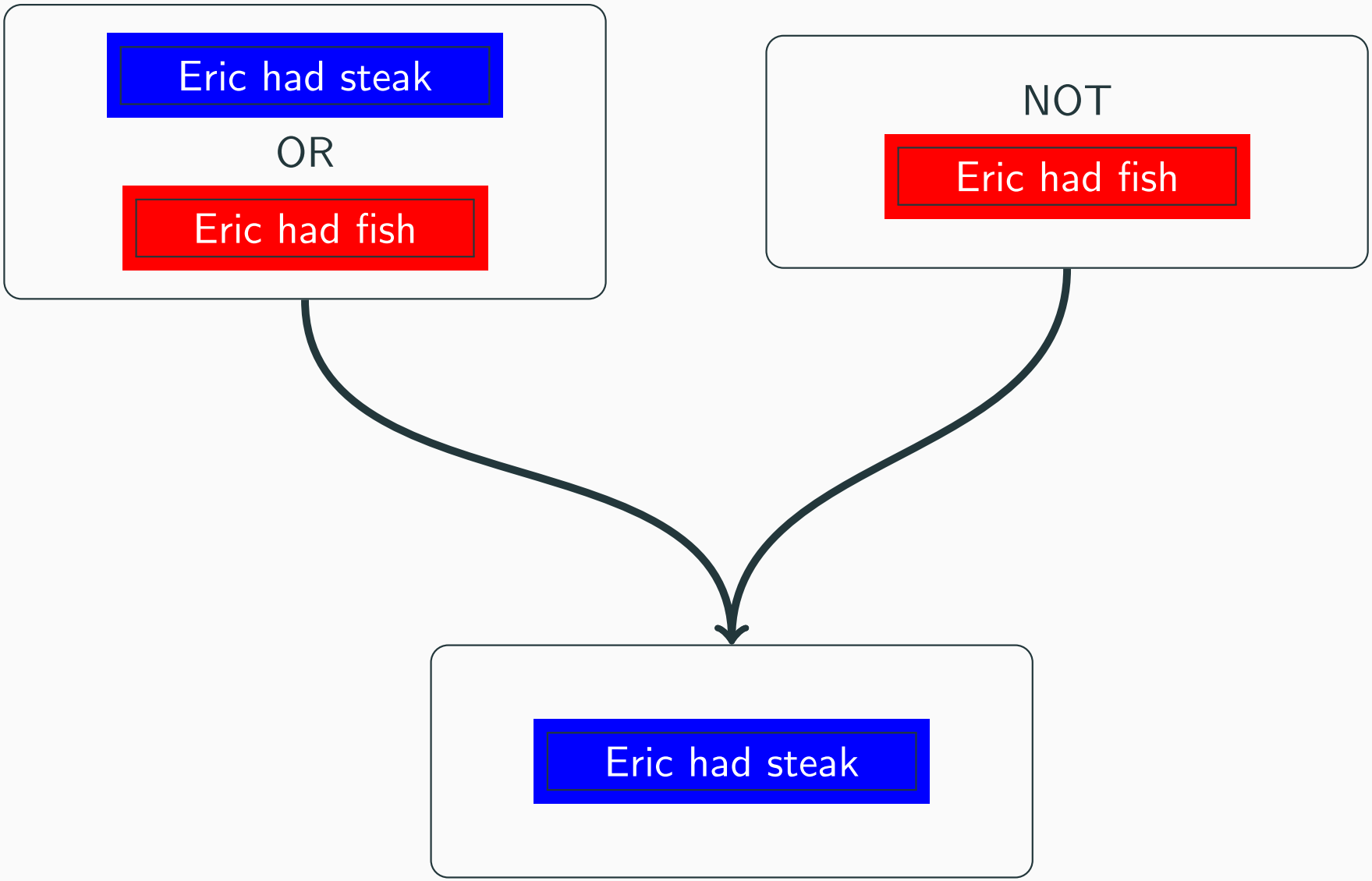

Eric had steak
OR
Eric had fish
NOT
Eric had fish
Eric had steak


Eric had steak
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Restaurant Example

In a restaurant, Ann ordered Fish, Bob ordered Pasta and Charles ordered Meat. Out of the kitchen comes some new person carrying the three plates. What will happen?

The waiter asks a first question, say "Who ordered the meat?", and puts that plate in front of Charles. Then he asks a second question "Who ordered the fish?", and puts that plate in front of Ann.

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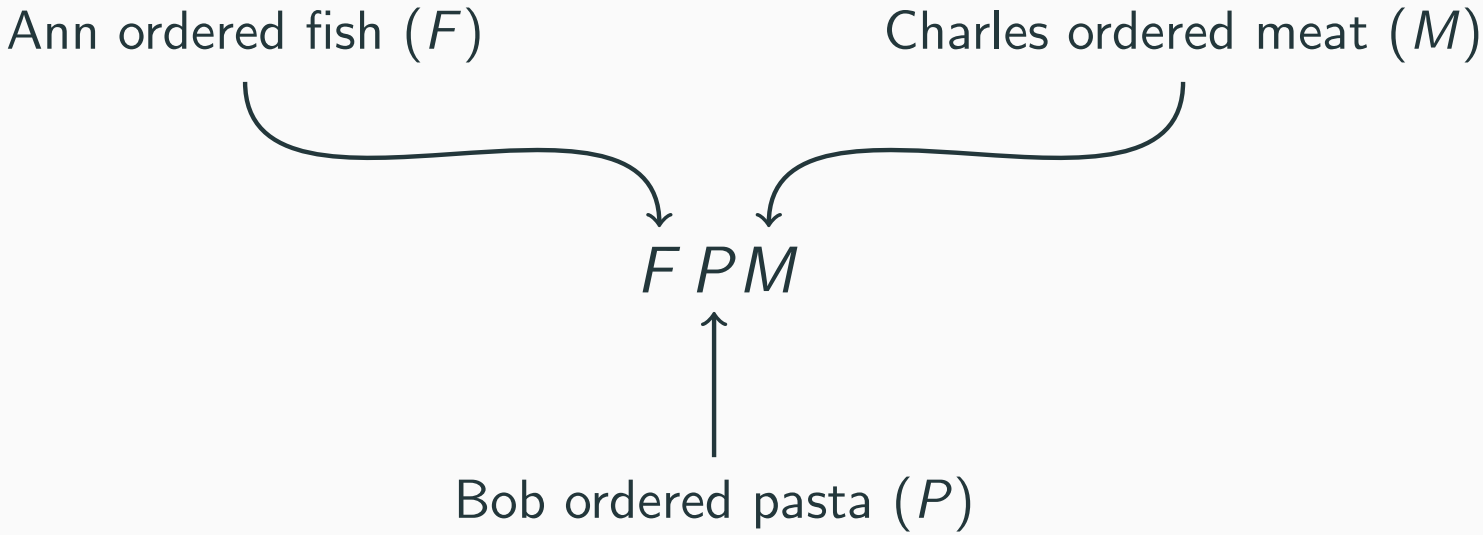
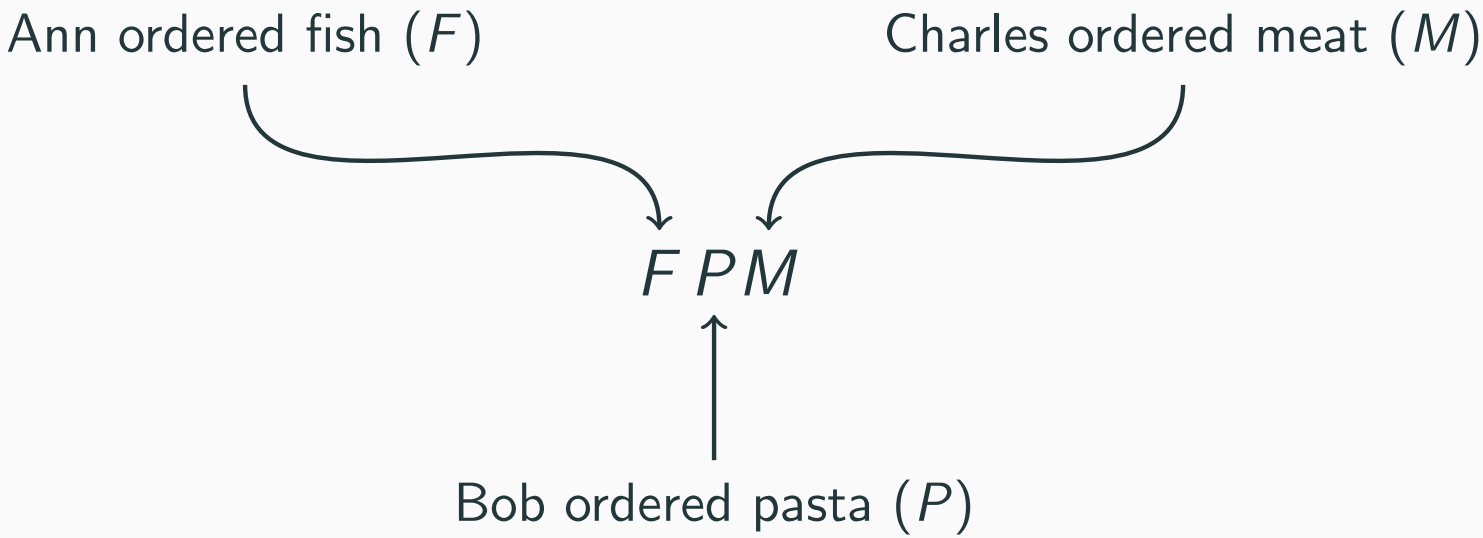
Meat or Pasta or Fish, not Fish, not Meat $\Longrightarrow$ Pasta



How many ways could the waiter/waitress distribute the meals?



How many ways could the waiter/waitress distribute the meals?

Does the waiter/waitress *know* how to distribute the meals?

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What happens after learning that Charles ordered meat (M)?

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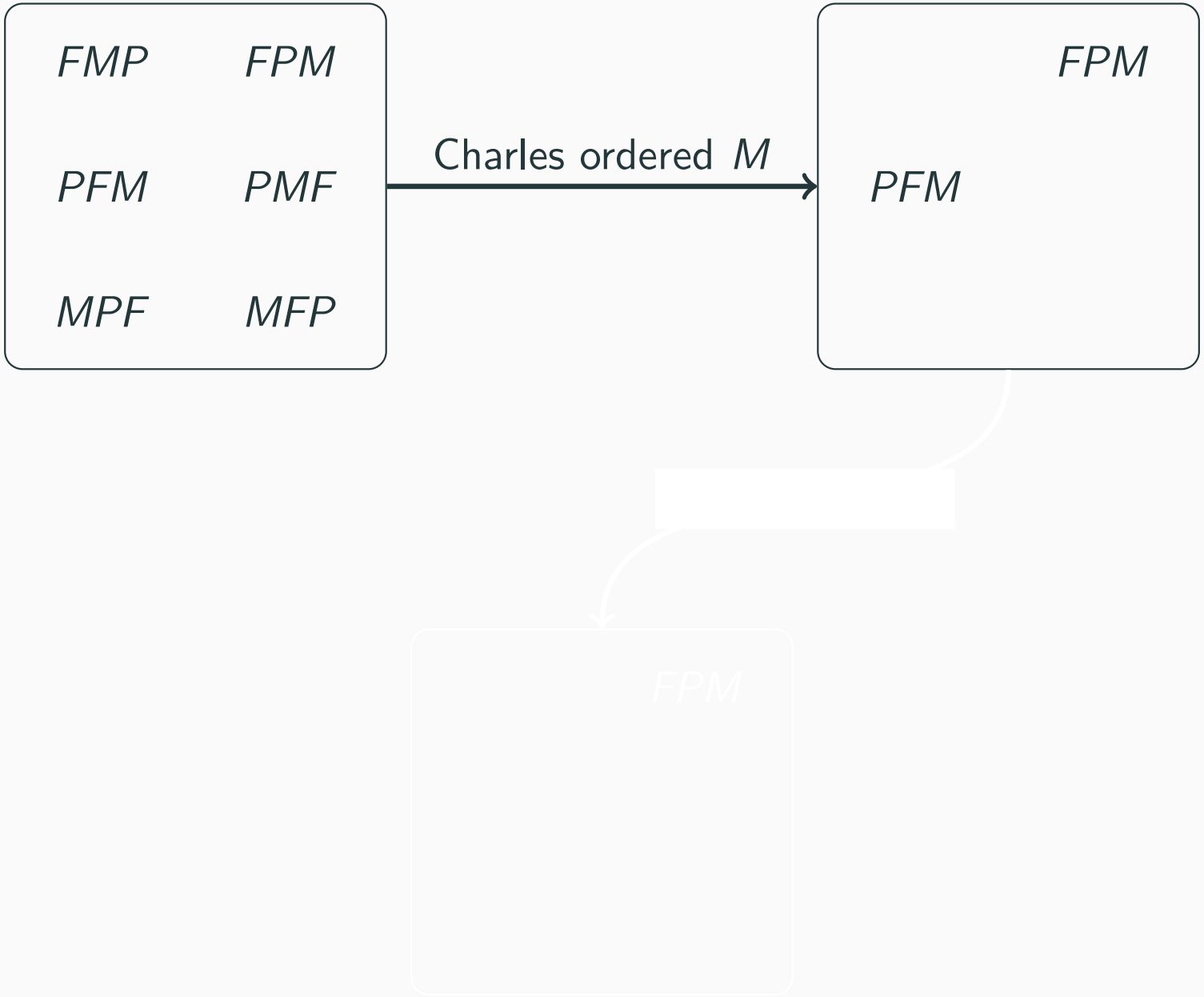
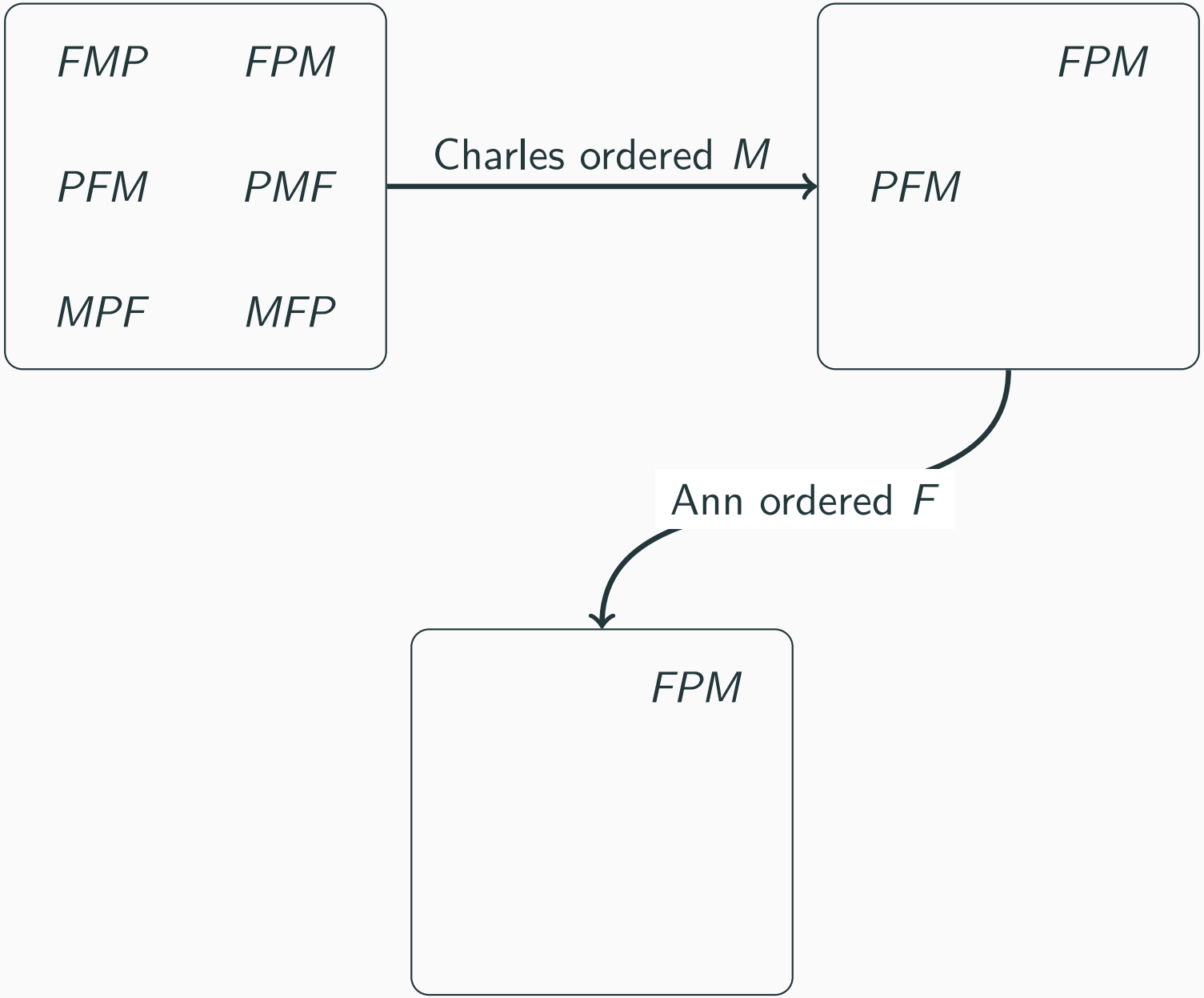

FMP
FPM
PFM
PMF
MPF
MFP
Charles ordered M
FPM
PFM
FPM


FMP
FPM
PFM
PMF
MPF
MFP
Charles ordered M
FPM
PFM
Ann ordered F
FPM

After *observing/learning* that Charles ordered meat and Ann ordered fish, the waiter/waitress **concludes/infers** that Bob ordered pasta (P). That is, the only possibility is FPM.

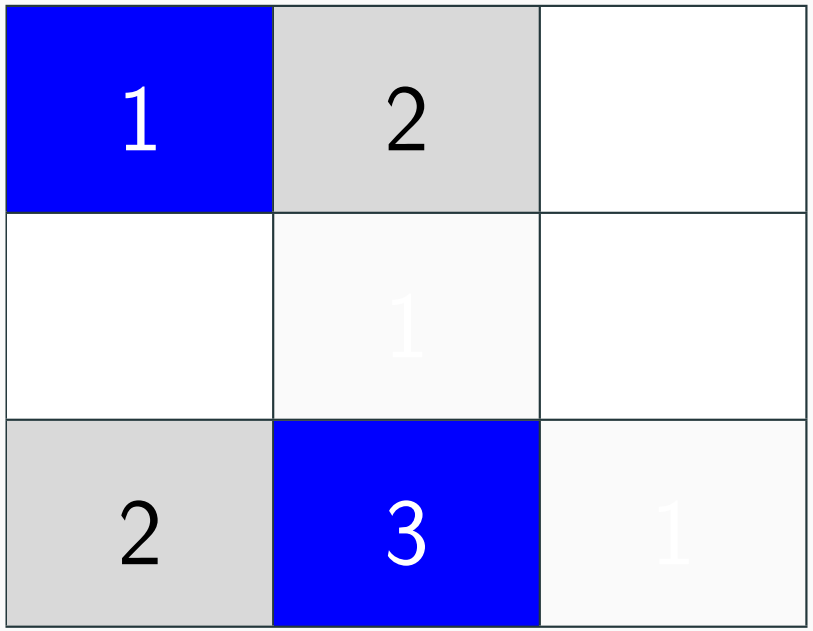
F or P or M, not M, not $F \Longrightarrow P$

Sudoku

1		
	1	
2	3	1

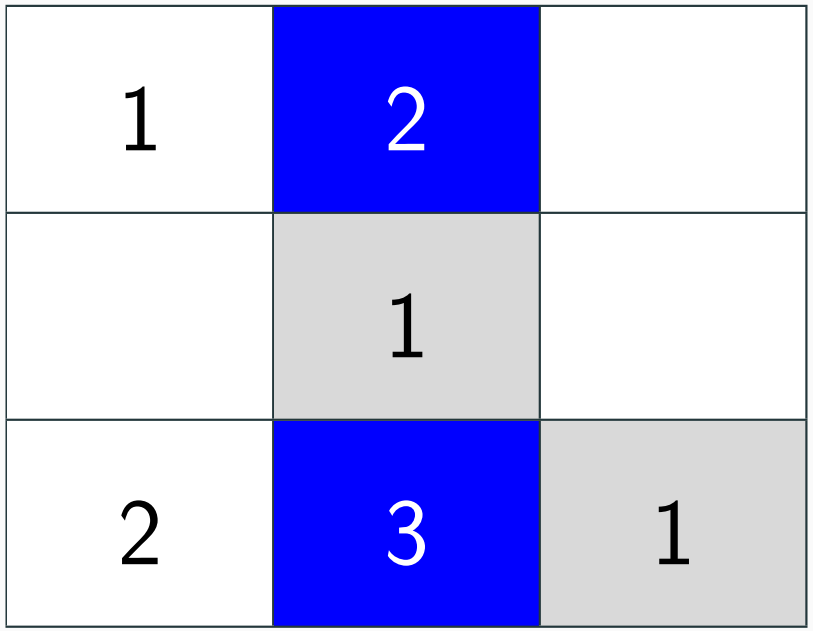
1 or 2 or 3, not 1, not 2 $\Longrightarrow$ 3

Sudoku



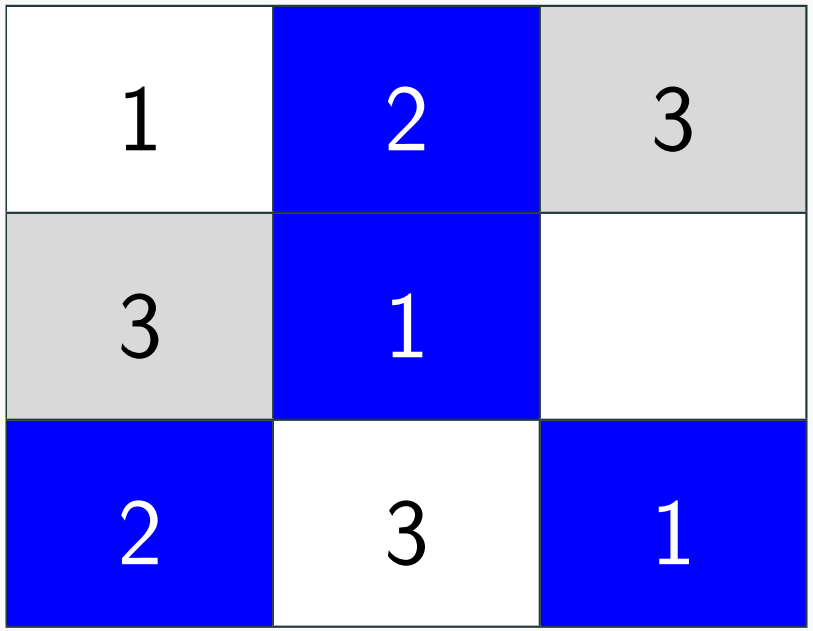
1 or 2 or 3, not 1, not 3 $\Longrightarrow$ 2

Sudoku



1 or 2 or 3, not 2, not 3 $\Longrightarrow$ 1

Sudoku



1 or 2 or 3, not 2, not 1 $\Longrightarrow$ 3

Sudoku

1	2	3
3	1	2
2	3	1

1 or 2 or 3, not 2, not 1 $\Longrightarrow$ 3

Argument form/inference pattern

From fish or meat or pasta, not fish, not meat **infer** pasta

From 1 or 2 or 3, not 1, not 2 **infer** 3

The lecture is in Skinner or in Tydings or on Zoom. The lecture is not in Skinner. The lecture is not in LeFrak. **So**, the lecture is on Zoom.

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From fish or meat or pasta, not fish, not meat **infer** pasta

From 1 or 2 or 3, not 1, not 2 **infer** 3

The lecture is in Skinner or in Tydings or on Zoom. The lecture is not in Skinner. The lecture is not in LeFrak. **So**, the lecture is on Zoom.

$$\varphi \text{ or } \psi \text{ or } \chi, \text{ not } \varphi, \text{ not } \psi \Rightarrow \chi$$

Important point

"follows from" should be distinguished from "inferring".

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Inferring is an activity that a person or computer performs, but "follows from" is a relationship between sentences.