Introduction to Logic

PHIL 170

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Announcements

- Buy the book! (Logic & Proofs, accessible via the ELMS course website)
- Read Chapters 1 & 2 before next Wednesday. Answer all the "Did I get it" questions.
- First quiz due today at 10am. Let me know if you had any problems submitting the quiz.
- Problem Sets Due Friday 11:59pm
- Bring you laptops to section. You will work through some of the problem sets together.

Recap: Logic

"Logic is many things: a science, an art, a toy, a joy, and sometimes a tool."

- Dorothy Grover and Nuel Belnap

Recap: Arguments

Logicians study **arguments**. An argument is a set of **statements**, one of which is singled out as the **conclusion**, the other statements are called **premises**.

A **good argument** gives you a reason to accept the conclusion — the premises **support** the conclusion.

Recap: Statments

- Statements can be either true or false (but not both)
- Statements are what is associated with **declarative sentences**
- The same sentence can be used to express many different statements (e.g., "I have eaten here before.")
- The same statement can be expressed by different sentences.
- Many sentences are ambiguous. (e.g., "She hit the man with the purse.")
- Sentence types: Interrogatives, Imperatives, Declaratives, Exclamations.

Arguments

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Lily needs to be at the bus-stop by 9am.

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Argument Diagramming

1. Identify premises and conclusion
2. Do the premises jointly or independently support the conclusion?

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

Premise Indicators

since may be inferred from as

in that for the reason that given that

seeing that because inasmuch as

as indicated by for owing to

Arguments without indicators

The space program deserves increased expenditures in the years ahead. Not only does the national defense depend on it, but the program will more than pay for itself in terms of technological spinoffs. Furthermore, at current funding levels the program cannot fulfill its potential.

Which one is an argument?

Since Edison invented the phonograph, there have been many technological developments.

Since Edison invented the phonograph, he deserves credit for a major technological development.

- At least one statement must claim to present evidence (or reasons).
- There must be a claim that the alleged evidence supports — i.e., something must follow from the alleged evidence.
- The premises are the *alleged* bearers of support, and the conclusion is that which is claimed to be supported by the premises.
- It is not necessary that (i) the premises actually do support the conclusion nor that (ii) the premises are actually true or correct.

Valid Arguments

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Logical Impossibility

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- That spaceship travels faster than the speed of light. (physical impossibility)
- Eric held his breath for 15 minutes. (physical impossibility)
- $2 + 2 = 5$. (arithmetic impossibility)
- Eric is from Ohio and Eric is not from Ohio. (logical impossibility)

An argument is...

valid: it is impossible for all the premises to be true and the conclusion to the false.

sound: the argument is valid and all the premises are true.

inductively strong: the truth of the premises make the conclusion more probable.

cogent: the argument is inductively strong and the premises are true

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Therefore, Zinfandel is a beverage.

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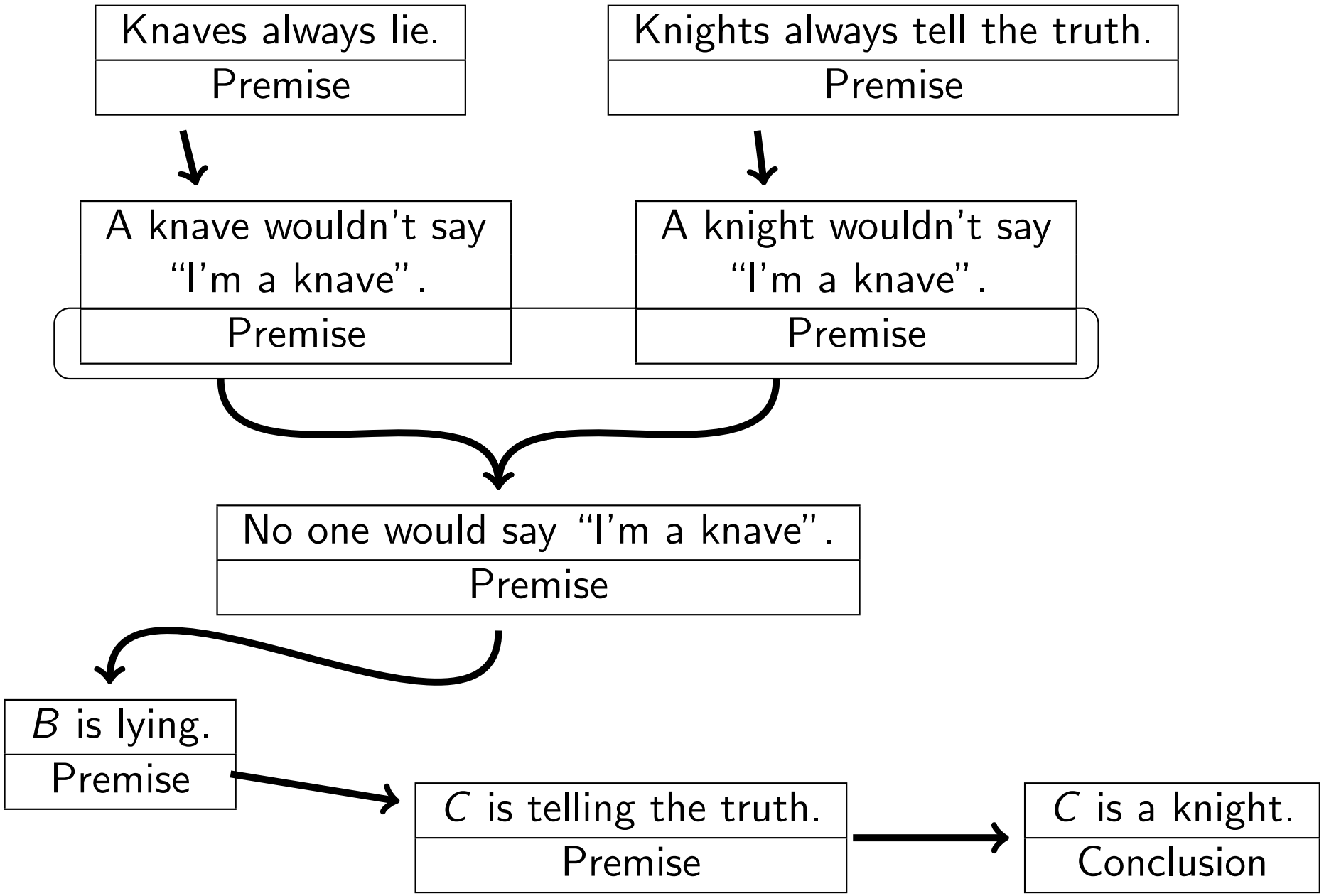
Was C a knight or a knave?

The Argument

A knave wouldn't say "I'm a knave" because knaves always lie. A knight wouldn't say "I'm a knave" because knights always tell the truth. So, no one would say "I'm a knave". Therefore, B is lying. Thus, C is telling the truth. Hence, C is a knight.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Conclusion

Smullyan's Knights and Knaves

Suppose that Abercrombie didn't ask A whether he was a knight or a knave (because he would have known in advance what answer he would get), but instead asked A how many of the three were knaves. Again A answered indistinctly, so Abercrombie asked B what A had said. B then said that A had said that exactly two of them were knaves. Then, as before, C claimed that B was lying.

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Is it now possible to determine whether C is a knight or a knave?