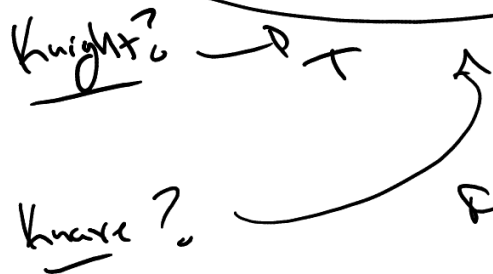


Q's

A	B
Knight	Knight
Knight	Knave
Knave	Knight
Knave	Knave

A: (At least one of us is a knave)



1.6 Rules of Inference (useful tautologies)

$$\left(\underbrace{[(P \rightarrow Q) \wedge P]}_{\text{premise}} \rightarrow \underbrace{Q}_{\text{conclusion}} \right) \equiv T$$

$$\frac{P \rightarrow Q}{P} \\ \therefore Q$$

$$\begin{aligned} [(P \rightarrow \neg Q) \wedge P] \rightarrow \neg Q &\equiv \neg [(\neg P \vee \neg Q) \wedge P] \vee \neg Q \\ &\equiv [\neg (\neg P \vee \neg Q) \vee \neg P] \vee \neg Q \\ &\equiv \neg (\neg P \vee \neg Q) \vee (\neg P \vee \neg Q) \equiv T \end{aligned}$$

Argument is of the form

Ver 1 (Premise 1 Premise 1 ... 1premise) \rightarrow conclusion

Ver 2

Premise
Premise

Premise

\therefore conclusion

Valid?

when it is a
tautology

not a tautology?

Invalid

Argument form uses propositional variables

Ex

$$\begin{array}{l} p \rightarrow q \\ p \\ \hline \therefore q \\ \hline \hline \end{array}$$

Affirm the hypothesis
 \rightarrow Modus ponens

Ex

$$\begin{array}{l} p \rightarrow q \\ \neg q \\ \hline \therefore \neg p \end{array}$$

Deny the conclusion
 \rightarrow Modus tollens

a non-tautology used as if it is (\leftrightarrow lot)
gets its own name

$$\frac{p \rightarrow q}{q} \therefore p$$

fallacy of affirming the conclusion

$$\frac{p \rightarrow q}{\neg p} \therefore \neg q$$

fallacy of denying the hyp.

$$\frac{p \rightarrow q}{q \rightarrow r} \therefore p \rightarrow r$$

hypothetical syllogism

$$\frac{p \vee q}{\neg p} \therefore q$$

disjunctive syllogism

$$\frac{p}{\therefore p \vee q}$$

addition

$$\frac{p \wedge q}{\therefore p}$$

simplification

$$\frac{p}{q} \therefore p \wedge q$$

conjunction

$P \times Q$
 $\neg P \vee R$
 $\therefore (Q \vee R)$

Resolution

Quantification

$\forall x P(x)$
 $\therefore P(c)$ for any c

Universal
Instantiation

$\exists x P(x)$
 $\therefore P(c)$ for some c

Existential
Instantiation

$P(c)$ for any c
 $\therefore \forall x P(x)$

Universal
Generalization

$P(c)$ for some c
 $\therefore \exists x P(x)$

Note:

Premise
 Premise
 \vdots
 Premise
 \therefore Conclusion

Must know

Premises are
true

Ex

P. 74

100

All insects have 6 legs
 dragonflies are insects
 spiders do not have 6 legs
 Spiders eat dragonflies

Allowed

find as many
 valid conclusions
 as you can.