

Student: Dong Liang

Homework: 2b

1. Based on the truth table for conjunction, can we know that " $P \wedge Q$ " will always be true exactly whenever " $Q \wedge P$ " is true? Why or why not? (Briefly explain your answer; a couple-three sentences at most should be needed.)

Yes, it will always be true. The reason could be explained by a truth table:

P	Q	$Q \wedge P$	$P \wedge Q$
T	T	T	T
T	F	F	F
F	T	F	F
F	F	F	F

So, the table shows that one conjunction would be true only if both conjuncts are true. In this case, since we know $P \wedge Q$ will always be true, the P and Q will always be true also.

Thus, $Q \wedge P$ is true.

2. How would you say the following things in FOL? Use the following symbolizations:

r = Robert, l = Laura, $\text{Human}(x)$ = x is a human, $\text{Az}(x)$ = x is an Arizonan.

Also, use only the truth-function connectives " \sim " and " \wedge ".

A. Robert is a human, and Laura is a human.

$\text{Human}(r) \wedge \text{Human}(l)$

B. Laura is a human, and Robert isn't.

$\sim \text{Human}(r) \wedge \text{Human}(l)$

C. Laura is a human and Arizonan.

$$\text{Human}(l) \wedge \text{AZ}(l)$$

D. Laura and Robert are both humans, but Laura is an Arizonan and Robert isn't.

$$\text{Human}(l) \wedge \text{AZ}(l) \wedge \text{Human}(r) \wedge \sim \text{AZ}(r)$$

E. Neither Laura nor Robert are humans.

$$\sim \text{Human}(r) \wedge \sim \text{Human}(l)$$

Or

$$\sim (\text{Human}(r) \vee \text{Human}(l))$$