

### Phi 270 F05 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Restate 1 using an unrestricted quantifier.*

1. **Everyone knew the tune.** [Remember to restate your answer to this using an unrestricted quantifier.]

answer

2. **Sam heard only tunes that he knew.**

[Remember to restate your answer in 2 using an unrestricted quantifier.]

answer

3. **No one liked everything on the menu.**

answer

Synthesize an English sentence with the following logical form; that is, produce a sentence that would have the following analysis:

4.  $(\forall x: Px) \rightarrow \neg Fsx$

P: [ is a person ]; F: [ fit ]; s: the shoe

answer

Use derivations to show that the following arguments are valid. You may use any rules.

5.  $\forall x (Fx \wedge Gx)$

$\forall x (Gx \wedge Fx)$

answer

6.  $\forall x \forall y (Gy \rightarrow Rxy)$

$\forall x (Fx \rightarrow Gx)$

$\forall x (Fx \rightarrow \forall y Ryx)$

answer

Use a derivation to show that the following argument is not valid and present a counterexample by describing a structure that divides an open gap. (You may describe the structure either by depicting it in a diagram, as answers in the text usually do, or by giving tables.)

7.  $\forall x (Fx \rightarrow Rax)$

Fa

$\forall x Rxa$

answer

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## Phi 270 FO5 test 4 answers

1. Everyone knew the tune

Everyone is such that (he or she knew the tune)

$(\forall x: \underline{x} \text{ is a person}) \underline{x} \text{ knew the tune}$

$(\forall x: Px) Kxt$

$\forall x (P \rightarrow Kxt)$

K: [ \_ knew \_ ]; P: [ \_ is a person ]; t: the tune

2. Sam heard only tunes that he knew

only tunes that Sam knew are such that (Sam heard them)

$(\forall x: \neg x \text{ is a tune that Sam knew}) \neg \underline{\text{Sam heard } x}$

$(\forall x: \neg (x \text{ is a tune} \wedge \underline{\text{Sam knew } x})) \neg Hsx$

$(\forall x: \neg (Tx \wedge Ksx)) \neg Hsx$

[ \_ heard \_ ]; K: [ \_ knew \_ ]; T: [ \_ is a tune ]; s: Sam

A different but equally plausible interpretation would be to treat tunes as a bounds indicator; this interpretation would be analyzed as  $(\forall x: Tx \wedge \neg Ksx) \neg Hsx$ . This is also the analysis of *Sam heard no tunes he didn't know*.

3. No one liked everything on the menu

No one is such that (he or she liked everything on the menu)

$(\forall x: \underline{x} \text{ is a person}) \neg x \text{ liked everything on the menu}$

$(\forall x: Px) \neg \text{everything on the menu is such that } (x \text{ liked it})$

$(\forall x: Px) \neg (\forall y: \underline{y} \text{ is on the menu}) \underline{x} \text{ liked } \underline{y}$

$(\forall x: Px) \neg (\forall y: Oym) Lxy$

L: [ \_ liked \_ ]; O: [ \_ is on \_ ]; P: [ \_ is a person ]; m: the menu

4.  $(\forall x: x \text{ is a person}) \neg \text{the shoe fit } x$

No one is such that (the shoe fit him or her)

The shoe fit no one

**or**

$(\forall x: x \text{ is a person}) \neg \text{the shoe fit } x$

$(\forall x: x \text{ is a person}) \text{the shoe didn't fit } x$

Everyone is such that (the shoe didn't fit him or her)

The shoe didn't fit anyone

The sentence *The shoe didn't fit everyone* is not the best synthesis since it is likely to be understood as the denial of *The shoe fit everyone*—i.e., as  $\neg (\forall x: Px) Fsx$ .

5.

	$\forall x (Fx \wedge Gx)$ a:2	
	ⓐ	
2 UI	Fa $\wedge$ Ga	3
3 Ext	Fa	(6)
3 Ext	Ga	(5)
	•	
	┌	
5 QED	Ga	4
	•	
	┌	
6 QED	Fa	4
	└	
4 Cnj	Ga $\wedge$ Fa	1
1 UG	$\forall x (Gx \wedge Fx)$	

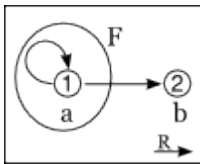
6.

	$\forall x \forall y (Gy \rightarrow Rxy)$ b:6	
	$\forall x (Fx \rightarrow Gx)$ a:4	
	ⓐ	
	Fa	(5)
	└	
	ⓑ	
4 UI	Fa $\rightarrow$ Ga	5
5 MPP	Ga	(8)
6 UI	$\forall y (Gy \rightarrow Rby)$	a: 7
7 UI	Ga $\rightarrow$ Rba	8
8 MPP	Rba	(9)
	•	
	└	
9 QED	Rba	3
	└	
3 UG	$\forall y Rya$	2
	└	
2 CP	Fa $\rightarrow \forall y Rya$	1
1 UG	$\forall x (Fx \rightarrow \forall y Ryx)$	

7.

	$\forall x (Fx \rightarrow Rax)$		$a:1, b:4$
	$Fa$		$(2)$
1 UI	$Fa \rightarrow Raa$		2
2 MPP	$Raa$		
	ⓑ		
4 UI	$Fb \rightarrow Rab$		6
	$\neg Rba$		
	$\neg Fb$		
	$\circ$		$Fa, Raa, \neg Rba, \neg Fb \not\Rightarrow \perp$
	$\perp$		7
7 IP	$Fb$		6
	$Rab$		
	$\circ$		$Fa, Raa, \neg Rba, Rab \not\Rightarrow \perp$
	$\perp$		6
6 RC	$\perp$		5
5 IP	$Rba$		3
3 UG	$\forall x Rxa$		

Counterexample presented by a diagram



Counterexample presented by tables

range: 1, 2	$a$	$b$	$\tau$	$F\tau$	$R$	1	2
	1	2	1	T	1	T	T
			2	F	2	F	F

This counterexample divides both gaps; but the specific value for  $F_2$  is needed only for the first gap and the specific value for  $R_{12}$  is needed only for the second.