Phi 270 F02 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Notice the special instructions for 2.*

1. Only bears performed.

answer

2. If everyone cheered, the elephant bowed. [In this case, restate your answer using an unrestricted quantifier.]

answer

3. No one laughed at any performers except clowns.

answer

Synthesize an English sentence with the following logical form:

4. (∀x: Px ∧ Cxt) Ctx

C: [_ called _]; P: [_ is a person]; t: Tom

answer

Use derivations to establish the validity of the following arguments. You may use attachment rules.

5.
$$\frac{\forall x\, Fx \qquad \forall x \neg (Fx \wedge Gx)}{\forall x \neg Gx}$$

answer

6.
$$\frac{\forall x \forall y\, (Fy \rightarrow Rxy)}{\forall x\, (Fx \rightarrow \forall y\, Ryx)}$$

answer

Use a derivation to show that the following argument is not valid and describe a structure (by using either a diagram or tables) that divides one of the derivation's open gaps.

7.
$$\frac{\forall x\, Rax \qquad \forall x\, (Rbx \rightarrow \neg\, Rxa)}{\forall x \neg\, Rbx}$$

answer

Phi 270 F02 test 4 answers

1. Only bears performed

(∀x: ¬ x is a bear) ¬ x performed

(∀x: ¬ Bx) ¬ Px

B: [_ is a bear]; P: [_ performed]

2. If everyone cheered, the elephant bowed
everyone cheered → the elephant bowed
(∀x: x is a person) x cheered → the elephant bowed

$$(\forall x\text{: } Px)\ Cx \rightarrow Be$$

$$\forall x\ (Px \rightarrow Cx) \rightarrow Be$$

B: x bowed; C: x cheered; P: x is a person; e: the elephant
Incorrect:
(∀x: Px) (Cx → Be) *or:* ∀x (Px → (Cx → Be))
these say: If anyone cheered, the elephant bowed

3. No one laughed at any performers except clowns
all performers except clowns are such that (no one laughed at them)
(∀x: x is a performer ∧ ¬ x is a clown) no one laughed at x
(∀x: x is a performer ∧ ¬ x is a clown) (∀y: y is a person) ¬ y laughed at x

$$(\forall x\text{: } Fx \wedge \neg\, Cx)\ (\forall y\text{: } Py)\ \neg\, Lyx$$

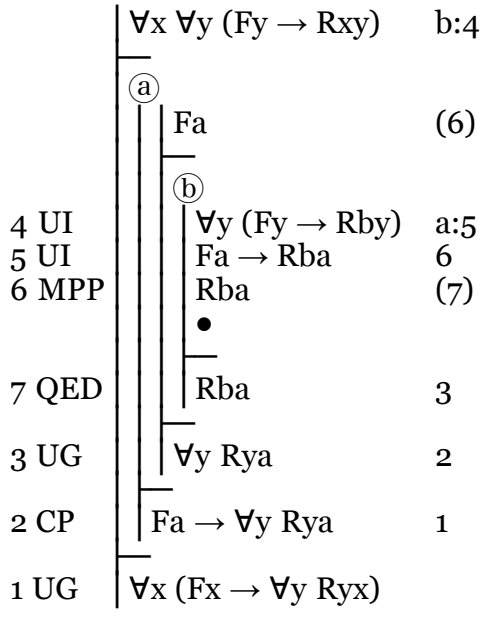
C: [_ is a clown]; F: [_ is a peformer]; P: [_ is a person]; L: [_ laughed at _]
Incorrect:
(∀y: Py) ¬ (∀x: Fx ∧ ¬ Cx) Lyx
says: No one laughed at all performers who weren't clowns

4. (∀x: x is a person ∧ x called Tom) Tom called x
(∀x: x is a person who called Tom) Tom called x
everyone who called Tom is such that (Tom called him or her)
Tom called everyone who called him

5.

	∀x Fx	a:2
	∀x ¬ (Fx ∧ Gx)	a:3
	ⓐ	
2 UI	Fa	(4)
3 UI	¬ (Fa ∧ Ga)	4
4 MPT	¬ Ga	(5)
	●	
5 QED	¬ Ga	1
1 UG	∀x ¬ Gx	

6.


∀x ∀y (Fy → Rxy) b:4
ⓐ
Fa (6)
ⓑ
4 UI ∀y (Fy → Rby) a:5
5 UI Fa → Rba 6
6 MPP Rba (7)
•
7 QED Rba 3
3 UG ∀y Rya 2
2 CP Fa → ∀y Rya 1
1 UG ∀x (Fx → ∀y Ryx)

7.

	∀x Rax	a:3,b:4,c:5
	∀x (Rbx → ¬ Rxa)	c:6,a:8,b:10
	ⓒ	
	Rbc	(7)
3 UI	Raa	(9)
4 UI	Rab	
5 UI	Rac	
6 UI	Rbc → ¬ Rca	7
7 MPP	¬ Rca	
8 UI	Rba → ¬ Raa	9
9 MTT	¬ Rba	
10 UI	Rbb → ¬ Rba	11
	¬ Rbb	
	○	Rbc,Raa,Rab,Rac,¬Rca,¬Rba,¬Rbb ⇏ ⊥
	⊥	12
12 IP	Rbb	11
	¬ Rba	
	○	Rbc,Raa,Rab,Rac,¬Rca,¬Rba ⇏ ⊥
	⊥	11
11 RC	⊥	2
2 RAA	¬ Rbc	1
1 UG	∀x ¬ Rbx	

Counterexample presented by tables

range: 1, 2, 3

a	b	c
1	2	3

R	1	2	3
1	T	T	T
2	F	F	T
3	F	F	F

Grayed values are not required to divide either gap;
the value for R22 is not required to divide the 2nd gap

Counterexample presented by a diagram