Philosophy 270, Fall 2008

Topics for test 4

The following are the topics to be covered. The proportion of the test covering each will approximate the proportion of the classes so far that have been devoted to that topic. Your homework and the collection of old tests will provide specific examples of the kinds of questions I might ask.

Analysis. Be ready to handle any of the key issues discussed in class—for example, the proper analysis of every, no, and only (see §7.2.2), how to incorporate bounds on complementary generalizations (see §7.2.3), ways of handling compound quantifier phrases (such as only cats and dogs, see §7.3.2), the distinction between every and any (see §§7.3.3 and 7.4.2), how to represent multiple quantifier phrases with overlapping scope (see §7.4.1). You should be able restate your analysis using unrestricted quantifiers (see §7.2.1), but you will not need to present it in English notation.

Synthesis. You may be given a symbolic form and an interpretation of its non-logical vocabulary and asked to express the sentence in English. Remember that the distinction between every and any can be important here, too.

Derivations. Be able to construct derivations to show that entailments hold and to show that they fail. I may tell you in advance whether an entailment holds or leave it to you to check that using derivations. If a derivation fails, you *may* be asked to present a counterexample, which will involve describing a structure. You will *not* be responsible for the rules introduced in §7.8.1.

Phi 270 F06 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *State your analysis also in a form that expresses any generalizations using unrestricted quantifiers.*

1. Every door was locked.

answer

2. Only people who had witnessed the event were able to follow the description of it.

[It is possible for the scope of only to change with emphasis; although varying interpretations are less likely with this sentence than with others, you may choose whichever scope seems most plausible to you.]

answer

3. No key opened every door.

[You should understand this sentence to leave open the possibility that some key opened some door.]

answer

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

4. $(\forall x\colon Px \wedge Nxa)\ (Dxm \vee Axm)$

A: [_ was acted on at _]; D: [_ was discussed at _]; N: [_ was on _]; P: [_ was a proposal]; a: the agenda; m: the meeting

answer

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

5.
$$\frac{\forall x\,(Fx \rightarrow (Gx \rightarrow Hx)) \quad \forall x\,Gx}{\forall x\,(Fx \rightarrow Hx)}$$

answer

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

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.

$\forall x\ Rax$
$\forall x\ Rxb$

$\forall x\ Rxx$

answer

Phi 270 F06 test 4 answers

1. Every door was locked
Every door is such that (it was locked)
(∀x: x is a door) x was locked
(∀x: Dx) Lx
∀x (Dx→ Lx)

D: [_ is a door]; L: [_ was locked]

2. only people who had witnessed the event were able to follow the description of it
only people who had witnessed the event are such that (they were able to follow the description of it)
(∀x: ¬ x is a person who had witnessed the event) ¬ x was able to follow the description of the event
(∀x: ¬ (x is a person ∧ x had witnessed the event)) ¬ Fx(the description of the event)
(∀x: ¬ (Px ∧ Wxe)) ¬ Fx(de)
∀x (¬ (Px ∧ Wxe) → ¬ Fx(de))

F: [_ was able to follow _]; P: [_ is a person]; W: [_ had witnessed _]; e: the event; d: [the description of _]

Other possible (though less likely) interpretations:

(∀x: Px ∧ ¬ Wxe)) ¬ Fx(de) [only people *who had witnessed…*]

(∀x: ¬ Px ∧ Wxe) ¬ Fx(de) [only *people* who had witnessed …]

Not a possibility:

(∀x: ¬ Px ∧ ¬ Wxe)) ¬ Fx(de)

3. No key opened every door
No key is such that (it opened every door)
(∀x: x is a key) ¬ x opened every door
(∀x: Kx) ¬ every door is such that (x opened it)
(∀x: Kx) ¬ (∀y: y is a door) x opened y
(∀x: Kx) ¬ (∀y: Dy) Oxy
∀x (Kx → ¬ ∀y (Dy → Oxy))

D: [_ is a door]; K: [_ is a key]; O: [_ opened _]

Although there are equivalent analyses, one that differs only in the location of ¬ is likely to be wrong. In particular, (∀x: Kx) (∀y: Dy) ¬ Oxy rules out the possibility that some key opened some door.

4. (∀x: Px ∧ Nxa) (Dxm ∨ Axm)
(∀x: x was a proposal ∧ x was on the agenda) (x was discussed at the meeting ∨ x was acted on at the meeting)
(∀x: x was a proposal on the agenda) (x was discussed or acted on at the meeting)
Every proposal on the agenda is such that (it was discussed or acted on at the meeting)
Every proposal on the agenda was discussed or acted on at the meeting

5.

	∀x (Fx → (Gx → Hx))	a: 3
	∀x Gx	a: 5
	ⓐ	
	Fa	(4)
3 UI	Fa → (Ga → Ha)	4
4 MPP	Ga → Ha	6
5 UI	Ga	(6)
6 MPP	Ha	(7)
	●	
7 QED	Ha	2
2 CP	Fa → Ha	1
1 UG	∀x (Fx → Hx)	

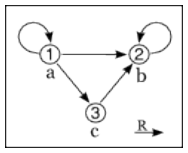
6.

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

7.

	∀x Rax	a: 2, b: 3, c: 4
	∀x Rxb	a: 5, b: 6, c: 7
	ⓒ	
2 UI	Raa	
3 UI	Rab	
4 UI	Rac	
5 UI	Rab	
6 UI	Rbb	
7 UI	Rcb	
	¬ Rcc	
	○	Raa,Rab,Rac,Rbb,Rcb,¬Rcc ⇏ ⊥
	⊥	8
8 IP	Rcc	1
1 UG	∀x Rxx	

Counterexample presented by a diagram



Counterexample presented by tables

range: 1, 2, 3

a	b	c
1	2	3

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

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. (∀x: Px) ¬ 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.
$$\frac{\forall x\,(Fx \wedge Gx)}{\forall x\,(Gx \wedge Fx)}$$

answer

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

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.
$$\frac{\forall x\,(Fx \rightarrow Rax)\qquad Fa}{\forall x\,Rxa}$$

answer

Phi 270 F05 test 4 answers

1. Everyone knew the tune

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

(∀x: x is a person) x knew the tune

(∀x: Px) Kxt

∀x (P → 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)

(∀x: ¬ x is a tune that Sam knew) ¬ Sam heard x

(∀x: ¬ (x is a tune ∧ Sam knew x)) ¬ Hsx

(∀x: ¬ (Tx ∧ Ksx)) ¬ 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 (∀x: Tx ∧ ¬ Ksx) ¬ 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)

(∀x: x is a person) ¬ x liked everything on the menu

(∀x: Px) ¬ everything on the menu is such that (x liked it)

(∀x: Px) ¬ (∀y: y is on the menu) x liked y

(∀x: Px) ¬ (∀y: Oym) Lxy

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

4. (∀x: x is a person) ¬ the shoe fit x

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

The shoe fit no one

or

(∀x: x is a person) ¬ the shoe fit x

(∀x: x is a person) 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 ¬ (∀x: Px) Fsx.

5.

	∀x (Fx ∧ Gx)	a:2
	ⓐ	
2 UI	Fa ∧ Ga	3
3 Ext	Fa	(6)
3 Ext	Ga	(5)
	●	
5 QED	Ga	4
	●	
6 QED	Fa	4
4 Cnj	Ga ∧ Fa	1
1 UG	∀x (Gx ∧ Fx)	

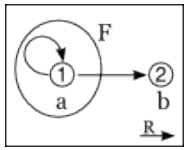
6.

	∀x ∀y (Gy → Rxy)	b:6
	∀x (Fx → Gx)	a:4
	ⓐ	
	Fa	(5)
	ⓑ	
4 UI	Fa → Ga	5
5 MPP	Ga	(8)
6 UI	∀y (Gy → Rby)	a: 7
7 UI	Ga → Rba	8
8 MPP	Rba	(9)
	●	
9 QED	Rba	3
3 UG	∀y Rya	2
2 CP	Fa → ∀y Rya	1
1 UG	∀x (Fx → ∀y Ryx)	

7.

	∀x (Fx → Rax) Fa	a:1, b:4 (2)
1 UI 2 MPP	Fa → Raa Raa	2
	ⓑ	
4 UI	Fb → Rab	6
	¬ Rba	
	¬ Fb	
	○	Fa,Raa,¬Rba,¬Fb⇏⊥
	⊥	7
7 IP	Fb	6
	Rab	
	○	Fa,Raa,¬Rba,Rab⇏⊥
	⊥	6
6 RC	⊥	5
5 IP	Rba	3
3 UG	∀x Rxa	

Counterexample presented by a diagram



Counterexample presented by tables

range: 1, 2

a	b
1	2

τ	Fτ
1	T
2	F

R	1	2
1	T	T
2	F	F

This counterexample divides both gaps; but the specific value for F2 is needed only for the first gap and the specific value for R12 is needed only for the second.

Phi 270 F04 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Restate* **2** *using an unrestricted quantifier.*

1. Sam checked every lock

answer

2. No one who was in the office answered the call

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

answer

3. Ralph got the joke if anyone did

answer

4. Only bestsellers were on every list

answer

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

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

answer

6.
$$\frac{\forall x\,(Rxa \rightarrow \forall y\, Txy)}{\forall x\, \forall y\,(Rya \rightarrow Tyx)}$$

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.
$$\frac{\forall x\, Rax}{\forall x\,(Rxa \rightarrow Rxx)}$$

answer

Phi 270 F04 test 4 answers

1. Sam checked every lock

Every lock is such that (Sam checked it)

(∀x: x is a lock) Sam checked x

(∀x: Lx) Csx

C: [_ checked _]; L: [_ is a lock]; s: Sam

2. No one who was in the office answered the call

No one who was in the office is such that (he or she answered the call)

(∀x: x is a person who was in the office) ¬ x answered the call

(∀x: x is a person ∧ x was in the office) ¬ Axc

(∀x: Px ∧ Nxo) ¬ Axc

∀x ((Px ∧ Nxo) → ¬ Axc)

A: [_ answered _]; P: [_ is a person]; N: [_ was in _]; c: the call; o: the office

3. Ralph got the joke if anyone did

Everyone is such that (Ralph got the joke if he or she did)

(∀x: x is a person) Ralph got the joke if x did

(∀x: Px) (Ralph got the joke ← x got the joke)

(∀x: Px) (Grj ← Gxj)

(∀x: Px) (Gxj → Grj)

P: [_ is a person]; G: [_ got _]; j: the joke

4. Only bestsellers were on every list

Only bestsellers are such that (they were on every list)

(∀x: ¬ x is a bestseller) ¬ x was on every list

(∀x: ¬ Bx) ¬ every list is such that (x was on it)

(∀x: ¬ Bx) ¬ (∀y: y is a list) x was on y

(∀x: ¬ Bx) ¬ (∀y: Ly) Nxy

B: [_ is a bestseller]; L: [_ is a list]; N: [_ was on _]

5.

	∀x Fx	a: 3
	∀x ¬ Gx	a: 5
	ⓐ	
3 UI	Fa	(4)
	●	
4 QED	Fa	2
5 UI	¬ Ga	(6)
	●	
6 QED	¬ Ga	2
2 Cnj	Fa ∧ ¬ Ga	1
1 UG	∀x (Fx ∧ ¬ Gx)	

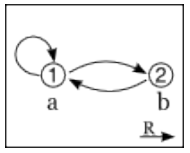
6.

	∀x (Rxa → ∀y Txy)	c:4
	ⓑ	
	ⓒ	
	Rca	(5)
4 UI	Rca → ∀y Tcy	5
5 MPP	∀y Tcy	b: 6
6 UI	Tcb	(7)
	●	
7 QED	Tcb	3
3 CP	Rca → Tcb	2
2 UG	∀y (Rya → Tyb)	1
1 UG	∀x ∀y (Rya → Tyx)	

7.

	∀x Rax	a:4, b:5
	ⓑ	
	Rba	
	¬ Rbb	
4 UI	Raa	
5 UI	Rab	
	○	Rba, ¬Rbb, Raa, Rab ⇏⊥
	⊥	3
3 IP	Rbb	2
2 CP	Rba → Rbb	1
1 UG	∀x (Rxa → Rxx)	

Counterexample presented by a diagram



Counterexample presented by tables

range: 1, 2

a	b
1	2

R	1	2
1	T	T
2	T	F

Phi 270 F03 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Restate 2 using an unrestricted quantifier*.

1. No one called the new number

answer

2. Sam asked everyone he could think of [Remember to restate this one using an unrestricted quantifier.]

answer

3. If any door was opened, the alarm sounded

answer

4. Only people who'd read everything the author had written were asked to review the book

answer

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

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

answer

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

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 an open gap.

7.
$$\frac{\forall x\,(Fx \rightarrow Rxa)}{Fa \rightarrow \forall x\,Rxx}$$

answer

Phi 270 F03 test 4 answers

1. No one called the new number

No one is such that (he or she called the new number)

(∀x: x is a person) ¬ x called the new number)

(∀x: Px) ¬ Cxn

C: [_ called _]; P: [_ is a person]; n: the new number

2. Sam asked everyone he could think of

everyone Sam could think of is such that (Sam asked him or her)

(∀x: x is a person Sam could think of) Sam asked x

(∀x: x is a person ∧ Sam could think of x) Asx

(∀x: Px ∧ Tsx) Asx

∀x ((Px ∧ Tsx) → Asx)

A: [_ asked _]; P: [_ is a person]; T: [_ could think of _]; s: Sam

3. If any door was opened, the alarm sounded

every door is such that (if it was opened, the alarm sounded)

(∀x: x is a door) if x was opened, the alarm sounded

(∀x: Dx) (x was opened → the alarm sounded)

(∀x: Dx) (Ox → Sa)

D: [_ is a door]; O: [_ was opened]; S: [_ sounded]; a: the alarm

4. Only people who'd read everything the author had written were asked to review the book

Only people who'd read everything the author had written are such that (they were asked to review the book)

(∀x: ¬ x is a person who'd read everything the author had written) ¬ x was asked to review the book

(∀x: ¬ (x is a person ∧ x had read everything the author had written)) ¬ Axb

(∀x: ¬ (x is a person ∧ everything the author had written is such that (x had read it))) ¬ Axb

(∀x: ¬ (Px ∧ (∀y: y is a thing the author had written) x had read y)) ¬ Axb

(∀x: ¬ (Px ∧ (∀y: the author had written y) Rxy)) ¬ Axb

(∀x: ¬ (Px ∧ (∀y: Way) Rxy)) ¬ Axb

A: [_ was asked to review _]; P: [_ is a person]; R: [_ had read _]; R: [_ had written _]; a: the author; b: the book

5.

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

6.

	∀x (Fx → Gx)	b:4
	∀x ∀y (Gy → Rxy)	a:6
	ⓐ	
	ⓑ	
	Fb	(5)
4 UI	Fb → Gb	5
5 MPP	Gb	(8)
6 UI	∀y (Gy → Ray)	b:7
7 UI	Gb → Rab	8
8 MPP	Rab	(9)
	●	
9 QED	Rab	3
3 CP	Fb → Rab	2
2 UG	∀y (Fy → Ray)	1
1 UG	∀x ∀y (Fy → Rxy)	

7.

	∀x (Fx → Rxa)	a:2, b:5
	Fa	(3)
2 UI	Fa → Raa	3
3 MPP	Raa	
	ⓑ	
5 UI	Fb → Rba	7
	¬ Rbb	
	¬ Fb	
	○	Fa,Raa,¬Rbb,¬Fb ⇏ ⊥
	⊥	8
8 IP	Fb	7
	Rba	
	○	Fa,Raa,¬Rbb,Rba ⇏ ⊥
	⊥	7
7 RC	⊥	6
6 IP	Rbb	4
4 UG	∀x Rxx	1
1 CP	Fa → ∀x Rxx	

Counterexample presented by tables

range: 1, 2

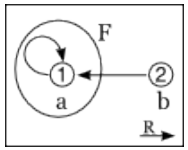
a	b
1	2

τ	Fτ
1	T
2	F

R	1	2
1	T	F
2	T	F

(This interpretation divides both gaps; the value of F2 is needed only for the 1st and the value of R21 only for the 2nd.)

Counterexample presented by a diagram



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

(∀x: Px) Cx → Be

∀x (Px → Cx) → 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

(∀x: Fx ∧ ¬ Cx) (∀y: Py) ¬ 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

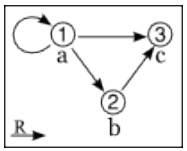
range: 1, 2, 3

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



Phi 270 F00 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 necessary projects were funded. [Different interpretations of the scope of *only* are possible here; any of them will do.]

answer

2. Tom can solve the puzzle if anyone can. [In this case, restate your answer using an unrestricted quantifier.]

answer

3. No one received every vote

answer

Use derivations to establish the validity of the following arguments. You may use attachment rules. English interpretations are suggested but remember that they play no role in derivations, and don't hesitate to ignore them if they don't help you think about the derivations.

4.

∀x (Dx → Mx)
∀x (¬ Ax → ¬ Mx)

∀x (Dx → Ax)

answer

A: [_ is an animal]; D: [_ is dog]; M: [_ is a mammal]

5.

∀x ∀y ((Py ∧ Byx) → Dyx)

∀x (Px → ∀y (Bxy → Dxy))

answer

Everyone who has built anything is proud of it / Everyone is proud of everything he or she has built

6. 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.

∀x (Rxx → ¬ Fx)
∀x Rxc

∀x ∀y (Fy → ¬ Rxy)

answer

Phi 270 F00 test 4 answers

1. Only necessary projects were funded

(∀x: ¬ x was a necessary project) ¬ x was funded

(∀x: ¬ (x was a project ∧ x was necessary)) ¬ x was funded

(∀x: ¬ (Px ∧ Nx)) ¬ Fx

or: (∀x: Px ∧ ¬ Nx) ¬ Fx—i.e., No unnecessary projects were funded;

or: (∀x: Nx ∧ ¬ Px) ¬ Fx—i.e., Among the necessities only projects were funded

F: [_ was funded]; N: [_ was necessary]; P: [_ was a project]

2. Tom can solve the puzzle if anyone can

(∀x: x is a person) Tom can solve the puzzle if x can

(∀x: Px) (Tom can solve the puzzle ← x can solve the puzzle)

(∀x: Px) (S Tom the puzzle ← S x the puzzle)

(∀x: Px) (Stp ← Sxp) [*or:* (∀x: Px) (Sxp → Stp)]

∀x (Px → (Stp ← Sxp)) [*or:* ∀x (Px → (Sxp → Stp))]

P: [_ is a person]; S: [_ can solve _]; p: the puzzle; t: Tom

3. No one received every vote

(∀x: x is a person) ¬ x received every vote

(∀x: Px) ¬ x received every vote

(∀x: Px) ¬ (∀y: y is a vote) x received y

(∀x: Px) ¬ (∀y: Vy) Rxy

P: [_ is a person]; R: [_ received _]; V: [_ is a vote]

Incorrect answers:

(∀x: Px) (∀y: Vy) ¬ Rxy *says* No one received any vote

¬ (∀x: Px) (∀y: Vy) Rxy *says* Not everyone received every vote

(∀y: Vy) ¬ (∀x: Px) Rxy *says* No vote is such that everyone received it

4.

	∀x (Dx → Mx)	a:3
	∀x (¬ Ax → ¬ Mx)	a:5
	ⓐ	
	Da	(4)
3 UI	Da → Ma	4
4 MPP	Ma	(6)
5 UI	¬ Aa → ¬ Ma	6
6 MTT	Aa	(7)
	●	
7 QED	Aa	2
2 CP	Da → Aa	1
1 UG	∀x (Dx → Ax)	

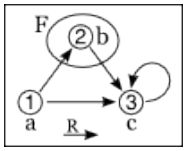
5.

	∀x ∀y ((Py ∧ Byx) → Dyx)	b:5
	ⓐ	
	Pa	(9)
	ⓑ	
	Bab	(10)
5 UI	∀y ((Py ∧ Byb) → Dyb)	a:6
6 UI	(Pa ∧ Bab) → Dab	8
	¬ Dab	(8)
8 MTT	¬ (Pa ∧ Bab)	9
9 MPT	¬ Bab	(10)
10 Nc	⊥	7
7 IP	Dab	4
4 CP	Bab → Dab	3
3 UG	∀y (Bay → Day)	2
2 CP	Pa → ∀y (Bay → Day)	1
1 UG	∀x (Px → ∀y (Bxy → Dxy))	

[This can be done without the *reductio* argument begun at stage 7 by using Adj to derive Pa ∧ Bab in order to exploit (Pa ∧ Bab) → Dab for a]

6.

	∀x (Rxx → ¬ Fx)	b:4, c:9, a:11
	∀x Rxc	a:6, b:7, c:8
	ⓐ	
	ⓑ	
	Fb	(5)
4 UI	Rbb → ¬ Fb	5
5 MTT	¬ Rbb	
6 UI	Rac	
7 UI	Rbc	
8 UI	Rcc	(10)
9 UI	Rcc → ¬ Fc	10
10 MPP	¬ Fc	
11 UI	Raa → ¬ Fa	13
	Rab	
	¬ Raa	
	○	Fb,¬Rbb,Rac,Rbc,Rcc,¬Fc,Rab,¬Raa ⇏ ⊥
	⊥	14
14 IP	Raa	13
	¬ Fa	
	○	Fb,¬Rbb,Rac,Rbc,Rcc,¬Fc,Rab,¬Fa ⇏ ⊥
	⊥	13
13 RC	⊥	12
12 RAA	¬ Rab	3
3 CP	Fb → ¬ Rab	2
2 UG	∀y (Fy → ¬ Ray)	1
1 UG	∀x ∀y (Fy → ¬ Rxy)	



divides both open gaps

Phi 270 F99 test 4

Analyze the following sentences in as much detail as possible, providing a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer.

1. Sam invited every vertebrate to the party, but only people accepted his invitation

answer

2. Tom didn't send anything to the printer

answer

3. No game that every child liked was complete

answer

Synthesize an English sentence whose analysis would yield the following form.

4. (∀x: Px) (∀y: Ry ∧ Txy) Sy

P: [_ is a person]; R: [_ is a room]; S: [_ was reserved]; T: [_ thought of _]

answer

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

5.
$$\frac{\forall x\,(Fx \rightarrow Gx)}{\forall x\,Fx \rightarrow \forall x\,Gx}$$

answer

6.
$$\frac{\forall x\,\forall y\,(Fyx \rightarrow \neg\, Py)}{\forall x\,(Px \rightarrow \forall y\,\neg\, Fxy)}$$

answer

7. 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.

$$\frac{\begin{array}{c}\forall x\,\forall y\,(Fy \rightarrow \neg\, Rxy)\\ \forall x\,Rxx\end{array}}{\forall x\,\forall y\,\neg\, Rxy}$$

answer

Phi 270 F99 test 4 answers

1. Sam invited every vertebrate to the party, but only people accepted his invitation

Sam invited every vertebrate to the party ∧ only people accepted Sam's invitation

every vertebrate is such that (Sam invited it to the party) ∧ only people are such that (they accepted Sam's invitation)

(∀x: x is a vertebrate) Sam invited x to the party ∧ (∀x:¬ x is a person) ¬ x accepted Sam's invitation

(∀x: Vx) Isxp ∧ (∀x:¬ Px) ¬ Ax(Sam's invitation)

(∀x: Vx) Isxp ∧ (∀x: ¬ Px) ¬ Ax(is)

A: [_ accepted _]; I: [_ invited _ to _]; P: [_ is a person]; V: [_ is a vertebrate]; i: [_ 's invitation]; p: the party; s: Sam

2. Tom didn't send anything to the printer

everything is such that (Tom didn't send it to the printer)

∀x Tom didn't send x to the printer

∀x ¬ Tom sent x to the printer

∀x ¬ Stxp

S: [_ sent _ to _]; p: the printer; t: Tom

3. No game that every child liked was complete

No game that every child liked is such that (it was complete)

(∀x: x was a game that every child liked) ¬ x was complete

(∀x: x was a game ∧ every child liked x) ¬ Cx

(∀x: x was a game ∧ every child is such that (he or she liked x)) ¬ Cx

(∀x: Gx ∧ (∀y: y was a child) y liked x) ¬ Cx

(∀x: Gx ∧ (∀y: Dy) Lyx) ¬ Cx

C: [_ was complete]; D: [_ was a child]; G: [_ was a game]; L: [_ liked _]

4. (∀x: x is a person) (∀y: y is a room ∧ x thought of y) y was reserved

(∀x: x is a person) (∀y: y is a room x thought of) y was reserved

(∀x: x is a person) every room x thought of was such that (it was reserved)

(∀x: x is a person) every room x thought of was reserved

everyone is such that (every room he or she thought of was reserved)

every room anyone thought of was reserved

5.

	∀x (Fx → Gx)	a:3
	∀x Fx	a:4
	ⓐ	
3 UI	Fa → Ga	5
4 UI	Fa	(5)
5 MPP	Ga	(6)
	●	
6 QED	Ga	2
2 UG	∀x Gx	1
1 CP	∀x Fx → ∀x Gx	

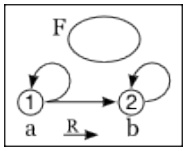
6.

	∀x ∀y (Fyx → ¬ Py)	b:5
	ⓐ	
	Pa	(8)
	ⓑ	
	Fab	(7)
5 UI	∀y (Fyb → ¬ Py)	a:6
6 UI	Fab → ¬ Pa	7
7 MPP	¬ Pa	(8)
	●	
8 Nc	⊥	4
4 RAA	¬ Fab	3
3 UG	∀y ¬ Fay	2
2 CP	Pa → ∀y ¬ Fay	1
1 UG	∀x (Px → ∀y ¬ Fxy)	

7.

	∀x ∀y (Fy → ¬ Rxy)	a:4,b:5
	∀x Rxx	a:6,b:7
	ⓐ	
	ⓑ	
	Rab	(11)
4 UI	∀y (Fy → ¬ Ray)	a:8, b:9
5 UI	∀y (Fy → ¬ Rby)	a:12, b:13
6 UI	Raa	(10)
7 UI	Rbb	(14)
8 UI	Fa → ¬ Raa	10
9 UI	Fb → ¬ Rab	11
10 MTT	¬ Fa	
11 MTT	¬ Fb	
12 UI	Fa → ¬ Rba	15
13 UI	Fb → ¬ Rbb	14
14 MTT	¬ Fb	
	¬ Fa	
	○	¬Fa,¬Fb,Rab,Raa,Rbb ⇏ ⊥
	⊥	16
16 IP	Fa	15
	¬ Rba	
	○	¬Fa,¬Fb,Rab,Raa,Rbb,¬Rba ⇏ ⊥
	⊥	15
15 RC	⊥	3
3 RAA	¬ Rab	2
2 UI	∀y ¬ Ray	1
1 UI	∀x ∀y ¬ Rxy	

The structure below divides both gaps



Phi 270 F98 test 4

(questions 1-2 are from quiz 4 and 3-8 are from quiz 5 out of 6 quizzes—these two quizzes addressed the part of the course your test is designed to cover)

1. Identify individual terms and quantifier phrases in the following sentence and indicate links between pronouns and their antecedents. (You can do this by marking up an English sentence; you are *not* being asked to provide a symbolic analysis.)

Sam ordered a book, but instead of it he received a book he didn't want.

answer

2. Analyze the following generalization in as much detail as possible. Provide a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer.

No one saw the book that was lying on the table.

answer

Analyze the following sentences in as much detail as possible, providing a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer.

3. No one except numismatists understood the joke

answer

4. The movie delighted all boys and girls

answer

5. If anyone relayed the message to everyone, then no one understood every part of it

answer

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

6.

$$\frac{\forall x\ (Fx \vee Gx) \qquad \forall x\ \neg\ Gx}{\forall x\ Fx}$$

answer

7.

$$\frac{\forall x\ (Fx \rightarrow \forall y\ (Pxy \rightarrow Rxy))}{\forall y\ \forall x\ ((Fx \wedge Pxy) \rightarrow Rxy)}$$

answer

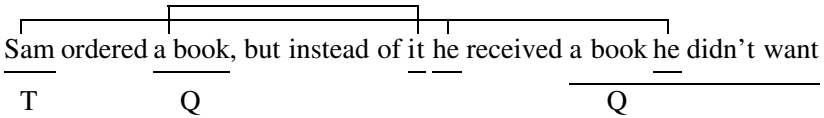
8. Use a derivation to show that the following argument is not valid and describe a structure dividing one of the derivation's open gaps.

$$\frac{\forall x\,(Fx \rightarrow \neg\, Rxx)}{\forall x\,\forall y\,(Fy \rightarrow \neg\, Rxy)}$$

answer

Phi 270 F98 test 4 answers

1.



2. No one saw the book that was lying on the table.

No one is such that (he or she saw the book that was lying on the table)

(∀x: x is a person) ¬ x saw the book that was lying on the table

(∀x: Px) ¬ Sx(the book that was lying on the table)

(∀x: Px) ¬ Sx(bt)

P: [_ is a person]; S: [_ saw _]; b: [the book that was lying on _]; t: the table

3. No one except numismatists understood the joke

(∀x: x is a person ∧ ¬ x is a numismatist) ¬ x understood the joke

(∀x: Px ∧ ¬ Nx) ¬ Uxj

N: [_ is a person]; P: [_ is a numismatist]; U: [_ understood _]; j: the joke

4. The movie delighted all boys and girls

all boys and girls are such that (the movie delighted them)

(∀x: x is a boy or girl) the movie delighted x

(∀x: x is a boy ∨ x is a girl) the movie delighted x

(∀x: Bx ∨ Gx) Dmx

B: [_ is a boy]; D: [_ delighted _]; G: [_ is a girl]; m: the movie

5. If anyone relayed the message to everyone, then no one understood every part of it

(∀x: x is a person) if x relayed the message to everyone, then no one understood every part of it

(∀x: Px) (x relayed the message to everyone → no one understood every part of the message)

(∀x: Px) ((∀y: y is a person) x relayed the message to y → (∀z: z is a person) ¬ z understood every part of the message)

(∀x: Px) ((∀y: Py) x relayed the message to y → (∀z: Pz) ¬ (∀w: w is a part of the message) z understood w)

(∀x: Px) ((∀y: Py) Rxmy → (∀z: Pz) ¬ (∀w: Twm) Uzw)

P: [_ is a person]; R: [_ relayed _ to _]; T: [_ is a part of _]; U: [_ understood _]; m: the message

6.

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

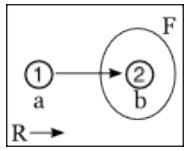
7.

	∀x (Fx → ∀y (Pxy → Rxy))	b:5
	ⓐ	
	ⓑ	
	Fb ∧ Pba	4
4 Ext	Fb	(6)
4 Ext	Pba	(8)
5 UI	Fb → ∀y (Pby → Rby)	6
6 MPP	∀y (Pby → Rby)	a:7
7 UI	Pba → Rba	8
8 MPP	Rba	(9)
	●	
9 QED	Rba	3
3 CP	(Fb ∧ Pba) → Rba	2
2 UG	∀x ((Fx ∧ Pxa) → Rxa)	1
1 UG	∀y ∀x ((Fx ∧ Pxy) → Rxy)	

8.

	∀x (Fx → ¬ Rxx)	b:5, a:7
	ⓐ	
	ⓑ	
	Fb	(6)
	Rab	
5 UI	Fb → ¬ Rbb	6
6 MPP	¬ Rbb	
7 UI	Fa → ¬ Raa	8
	¬ Fa	
	○	Fb,Rab,¬Rbb,¬Fa ⇏ ⊥
	⊥	9
9 IP	Fa	8
	¬ Raa	
	○	Fb,Rab,¬Rbb,¬Raa ⇏ ⊥
	⊥	8
8 RC	⊥	4
4 RAA	¬ Rab	3
3 CP	Fb → ¬ Rab	2
2 UG	∀y (Fy → ¬ Ray)	1
1 UG	∀x ∀y (Fy → ¬ Rxy)	

This structure divides both gaps:



Phi 270 F97 test 4

(questions 1-3 are from quiz 4 and 4-9 are from quiz 5 out of 6 quizzes—these two quizzes addressed the part of the course your test is designed to cover)

1. Identify individual terms and quantifier phrases in the following sentence and indicate links between pronouns and their antecedents. (You can do this by marking up an English sentence; you are *not* being asked to provide a symbolic analysis.)

Everyone who Carol lent the book to spoke to her at length about it.

answer

Analyze the following generalizations in as much detail as possible. Provide a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer *and restate the result using an unrestricted quantifier*.

2. Bob called no one.

answer

3. Among contestants, only professionals were finalists.

answer

Analyze the following sentences in as much detail as possible, providing a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer.

4. Bob doesn't own any map showing Dafter.

answer

5. Nothing anyone said bothered Dave.

answer

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

6.
$$\frac{\forall x\,(Fx \wedge Gx)}{\forall x\,Fx}$$

answer

7.
$$\frac{\forall x\,(Rxa \rightarrow \forall y\,Rxy)}{\forall x\,(\forall y\,Rxy \rightarrow Rxb)}$$

answer

8. Use a derivation to show that the following argument is not valid and describe a structure dividing one of the derivation's open gaps. (You will *not* need the rules UG+ and ST of 7.8 that were designed to avoid unending derivations.)

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

$\forall x\ (Fx \rightarrow Rxa)$

answer

You will receive credit for *one* of the following (but you may attempt both):

9a. Synthesize an English sentence whose analysis would yield the following form.

$(\forall x\text{: } Dx)\ (Okx \rightarrow (\forall y\text{: } Dy)\ Oky)$

D: [_ is a door]; O: [_ opens _]; k: the key

answer

9b. Use derivations to establish the validity of the following argument. You may use attachment rules.

$\forall x\ \forall y\ (Rxy \rightarrow \neg\ Fy)$

$\forall x\ (Fx \rightarrow Rxx)$

$\forall x \neg\ Fx$

answer

Phi 270 F97 test 4 answers

1.

Everyone who Carol lent the book to spoke to her at length about it

Q T T

2. Bob called no one

no one is such that (Bob called him or her)

$(\forall x\text{: } x \text{ is an person}) \neg$ Bob called x

$(\forall x\text{: } Px) \neg\ Cbx$

$\forall x\ (Px \rightarrow \neg\ Cbx)$

C: [_ called _]; P: [_ is person]; b: Bob

3. Among contestants, only professionals were finalists

Among contestants, only professionals are such that (they were finalists)

$(\forall x\text{: } x$ was a contestant $\wedge \neg\ x$ was a professional$) \neg\ x$ was a finalist

$(\forall x\text{: } Cx \wedge \neg\ Px) \neg\ Fx$

$\forall x\ ((Cx \wedge \neg\ Px) \rightarrow \neg\ Fx)$

C: [_ was a contestant]; F: [_ was a finalist]; P: [_ was a professional]

4. Bob doesn't own any map showing Dafter

every map showing Dafter is such that (Bob doesn't own it)

$(\forall x\text{: } x$ is a map showing Dafter$) \neg$ Bob owns x

$(\forall x\text{: } x$ is a map $\wedge\ x$ shows Dafter$) \neg\ Obx$

$(\forall x\text{: } Mx \wedge Sxd) \neg\ Obx$

M: [_ is a map]; O: [_ owns _]; S: [_ shows _]; b: Bob; d: Dafter

5. Nothing anyone said bothered Dave

everyone is such that (nothing he or she said bothered Dave)

$(\forall x\text{: } x$ is a person$)$ nothing x said bothered Dave

$(\forall x\text{: } Px)$ nothing x said is such that (it bothered Dave)

$(\forall x\text{: } Px)\ (\forall y\text{: } y$ is a thing x said$) \neg\ y$ bothered Dave

$(\forall x\text{: } Px)\ (\forall y\text{: } x \text{ said } y) \neg\ Byd$

$(\forall x\text{: } Px)\ (\forall y\text{: } Sxy) \neg\ Byd$

B: [_ bothered _]; P: [_ is a person]; S: [_ said _]; d: Dave

6.

	$\forall x\ (Fx \wedge Gx)$	a:2
	ⓐ	
2 UI	$Fa \wedge Ga$	3
3 Ext	Fa	
3 Ext	Ga	(4)
	●	
4 QED	Fa	1
1 UG	$\forall x\ Fx$	

7.

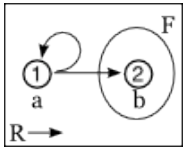
	$\forall x\ (Rxa \rightarrow \forall y\ Rxy)$			$\forall x\ (Rxa \rightarrow \forall y\ Ryx)$	c:4
	ⓒ			ⓒ	
	$\forall y\ Rcy$	a:3		$\forall y\ Rcy$	a:3
3 UI	Rcb	(4)	3 UI	Rca	(5)
	●		4 UI	$Rca \rightarrow \forall y\ Ryc$	5
			5 MPP	$\forall y\ Ryc$	b:6
4 QED	Rcb	2	6 UI	Rbc	(7)
				●	
2 CP	$\forall y\ Rcy \rightarrow Rcb$	1		Rbc	2
			7 QED		
1 UG	$\forall x\ (\forall y\ Rxy \rightarrow Rxb)$		2 CP	$\forall y\ Rcy \rightarrow Rbc$	1
			1 UG	$\forall x\ (\forall y\ Rxy \rightarrow Rbx)$	

[The first premise is never used in the derivation for this question (shown at the left). The fact that it was not needed was a slip on my part in making up the question; at the right is the sort of example I probably had in mind.]

8.

	∀x (Fx → Rax)	b:3, a:5
	ⓑ	
	Fb	(4)
3 UI	Fb → Rab	4
4 MPP	Rab	
5 UI	Fa → Raa	7
	¬ Rba	
	¬ Fa	
	○	Fb, Rab, ¬ Rba, ¬ Fa ⇏ ⊥
	⊥	8
8 IP	Fa	7
	Raa	
	○	Fb, Rab, ¬ Rba, Raa ⇏ ⊥
	⊥	7
7 RC	⊥	6
6 IP	Rba	2
2 CP	Fb → Rba	1
1 UG	∀x (Fx → Rxa)	

The structure below divides both gaps; it will divide only the first gap if the arrow from 1 to itself is dropped.



9a. (∀x: x is a door) (the key opens x → (∀y: y is a door) the key opens y)

(∀x: x is a door) (the key opens x → every door is such that (the key opens it))

(∀x: x is a door) (the key opens x → the key opens every door)

(∀x: x is a door) if the key opens x, then it opens every door

every door is such that (if the key opens it, then it opens every door)

If the key opens any door, then it opens every door

9b.

	∀x ∀y (Rxy → ¬ Fy)	a:2
	∀x (Fx → Rxx)	a:4
	ⓐ	
2 UI	∀y (Ray → ¬ Fy)	a:6
	Fa	(5), (8)
4 UI	Fa → Raa	5
5 MPP	Raa	(7)
6 UI	Raa → ¬ Fa	7
7 MPP	¬ Fa	(8)
	●	
8 Nc	⊥	3
3 RAA	¬ Fa	1
1 UG	∀x ¬ Fx	

Phi 270 F96 test 4

(questions 1-3 are from quiz 4 and 4-9 are from quiz 5 out of 6 quizzes—these two quizzes addressed the part of the course your test is designed to cover)

1. Identify individual terms and quantifier phrases in the following sentence and indicate links between pronouns and their antecedents. (You can do this by marking up an English sentence; you are *not* being asked to provide a symbolic analysis.)

Al called everyone who left him a message concerning the accident and told them he had seen it.

answer

Analyze the following generalizations in as much detail as possible. Provide a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer *and restate the result using an unrestricted quantifier*.

2. Every employee received the letter.

answer

3. Among bystanders, Sam interviewed only soldiers.

answer

Analyze the following sentences in as much detail as possible, providing a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer.

4. If anyone guessed the number, the prize was awarded.

answer

5. Everyone who worked on any part of the project was honored.

answer

Synthesize an English sentence whose analysis would yield the following form.

6. (∀x: Px) ¬ ∀y Axy

A: [_ ate _]; P: [_ is a person]

answer

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

7.
$$\frac{\forall x\, Fx \qquad \forall x\, Gx}{\forall x\, (Fx \wedge Gx)}$$

answer

8.
$$\frac{\forall x\, (Fx \rightarrow Rxa) \qquad \forall x\, (Rxa \rightarrow \forall y\, Ryx)}{\forall x\, \forall y\, (Fy \rightarrow Rxy)}$$

answer

9. Use a derivation to show that the following argument is not valid and describe a structure dividing one of the derivation's open gaps. (You will *not* need the rules UG+ and ST introduced in §7.8 that are designed to avoid unending gaps.)

$$\frac{\forall x\, Rxx}{Rab \rightarrow \forall x\, Rxa}$$

answer

Phi 270 F96 test 4 answers

1.

Al called everyone who left him a message concerning the accident and told them he had seen it

T Q Q T

[it could instead have a message concerning the accident as its antecedent]

2. Every employee received the letter

Every employee is such that (he or she received the letter)

(∀x: x is an employee) x received the letter

(∀x: Ex) Rxl

∀x (Ex → Rxl)

E: [_ is an employee]; R: [_ received _]; l: the letter

3. Among bystanders, Sam interviewed only soldiers

Among bystanders, only soldiers are such that (Sam interviewed them)

(∀x: x was a bystander ∧ ¬ x was a soldier) ¬ Sam interviewed x

(∀x: Bx ∧ ¬ Sx) ¬ Isx

∀x ((Bx ∧ ¬ Sx) → ¬ Isx)

B: [_ was a bystander]; I: [_ interviewed _]; S: [_ was a soldier]; s: Sam

4. If anyone guessed the number, the prize was awarded

Everyone is such that (if he or she guessed the number, the prize was awarded)

(∀x: x is a person) (if x guessed the number, the prize was awarded)

(∀x: Px) (x guessed the number → the prize was awarded)

(∀x: Px) (Gxn → Ap)

P: [_ is a person]; G: [_ guessed _]; n: the number

5. Everyone who worked on any part of the project was honored

Every part of the project is such that (everyone who worked on it was honored)

(∀x: x is a part of the project) everyone who worked on x was honored

(∀x: Rxj) (∀y: y is a person who worked on x) y was honored

(∀x: Rxj) (∀y: y is a person ∧ y worked on x) Hy

(∀x: Rxj) (∀y: Py ∧ Wyx) Hy

H: [_ was honored]; P: [_ is a person]; R: [_ is a part of _]; W: [_ worked on _]; j: the project

6. (∀x: x is a person) ¬ ∀y x ate y

(∀x: x is a person) ¬ x ate everything

No one is such that (he or she ate everything)

No one ate everything

7.

	∀x Fx	a:2
	∀x Gx	a:3
	ⓐ	
2 UI	Fa	(5)
3 UI	Ga	(6)
	●	
5 QED	Fa	4
	●	
6 QED	Ga	4
4 Cnj	Fa ∧ Ga	1
1 UG	∀x (Fx ∧ Gx)	1

8.

	∀x (Fx → Rxa)	c:4
	∀x (Rxa → ∀y Ryx)	c:6
	ⓑ	
	ⓒ	
	Fc	(5)
4 UI	Fc → Rca	5
5 MPP	Rca	(7)
6 UI	Rca → ∀y Ryc	7
7 MPP	∀y Ryc	b:8
8 UI	Rbc	(9)
	●	
9 QED	Rbc	3
3 CP	Fc → Rbc	2
2 UG	∀y (Fy → Rby)	1
1 UG	∀x ∀y (Fy → Rxy)	

9.

	∀x Rxx	a:1,b:2,c:5
1 UI	Raa	
2 UI	Rbb	
	Rab	
	ⓒ	
5 UI	Rcc	
	¬ Rca	
	○	Raa,Rab,Rbb,Rcc,¬Rca ⇏ ⊥
	⊥	6
6 IP	Rca	4
4 UG	∀x Rxa	3
3 CP	Rab → ∀x Rxa