Phi 270 F11 test 4

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Also restate your analyses using unrestricted quantifiers.*

1. Everyone who called Bill praised Al.

2. The show didn't please any critic.

3. No bid met every specification.

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

4. (∀x: (Tx ∧ Nxs) ∧ Pxr) ¬ Ftx

F: [_ found _]; N: [_ was in _]; P: [_ predated _]; T: [_ was a tree]; r: the storm s: the stand t: Tom

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

5. ∀x (Fx ∧ Gx)
____
∀x Gx

6. ∀x (Rxa → ∀y Rxy)
∀x Rxx
____
∀x Rax

Use a derivation to show that the following argument is not valid and present a counterexample that lurks in an open gap. (You may present the counterexample either by a diagram or by tables.)

7. ∀x Rxa
____
∀x ∀y Rxy

F11 test 4 answers

1. Everyone who called Bill praised Al
Everyone who called Bill is such that (he or she praised Al)
(∀x: x is a person who called Bill) x praised Al
(∀x: x is a person ∧ x called Bill) x praised Al

(∀x: Px ∧ Cxb) Rxa
∀x ((Px ∧ Cxb) → Rxa)

C: [_ called _]; P: [_ is a person]; R: [_ praised _]; a: Al; b: Bill

2. The show didn't please any critic
every critic is such that (the show didn't please him or her)
(∀x: x is a critic) the show didn't please x
(∀x: x is a critic) ¬ the show pleased x

(∀x: Cx) ¬ Psx
∀x (Cx → ¬ Psx)

C: [_ is a critic]; P: [_ pleased _]; s: the show

3. No bid met every specification
No bid is such that (it met every specification)
(∀x: x is a bid) ¬ x met every specification
(∀x: Bx) ¬ every specification is such that (x met it)
(∀x: Bx) ¬ (∀y: y is a specification) x met y

(∀x: Bx) ¬ (∀y: Sy) Mxy
∀x (Bx → ¬ ∀y (Sy → Mxy))

B: [_ is a bid]; M: [_ met _]; S: [_ is a specification]

4. (∀x: (x was a tree ∧ x was in the stand) ∧ x predated the storm) ¬ Tom found x
(∀x: x was a tree in the stand ∧ x predated the storm) ¬ Tom found x
(∀x: x was a tree in the stand that predated the storm) ¬ Tom found x
no tree in the stand that predated the storm it such that (Tom found it)
every tree in the stand that predated the storm it such that (Tom didn't find it)
Tom found no tree in the stand that predated the storm
or: Tom didn't find any tree in the stand that predated the storm

incorrect: Tom didn't find every tree in the stand that predated the storm

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	

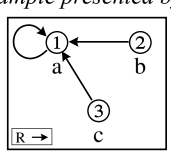
6.

	∀x (Rxa → ∀y Rxy)	a:2
	∀x Rxx	a:3
	ⓑ	
2 UI	Raa → ∀y Ray	4
3 UI	Raa	(4)
4 MPP	∀y Ray	b:5
5 UI	Rab	(6)
	●	
6 QED	Rab	1
1 UG	∀x Rax	

7.

	∀x Rxa	a:3, b:4, c:5
	ⓑ	
	ⓒ	
3 UI	Raa	
4 UI	Rba	
5 UI	Rca	
	¬ Rbc	
	○	¬ Rbc, Rca, Rba, Raa ⊭ ⊥
	⊥	6
6 IP	Rbc	2
2 UG	∀y Rby	1
1 UG	∀x ∀y Rxy	

Counterexample presented by a diagram



Counterexample presented by tables

a	b	c
1	2	3

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

Phi 270 F10 test 4

F10 test 4 topics

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 analyze 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.

F10 test 4 questions

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Also restate your analyses using unrestricted quantifiers.*

1. No one was disappointed.

2. If any part was missing, the set wasn't assembled.

3. Only cartoons appealed to everyone.

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

4. ¬ (∀x: Jx ∧ ¬ Sx) ¬ Fx
F: [_ was finished]; J: [_ is a job]; S: [_ is small]

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

5.
∀x Mx
∀x (Mx → Qx)
———
∀x Qx

6.
∀x ∀y (Fx → Gy)
———
Fa → ∀x Gx

Use a derivation to show that the following argument is not valid and present a counterexample that lurks in an open gap. (You may present the counterexample either by a diagram or by tables.)

7.
Rab
∀x Rxa
———
∀x Rxb

F10 test 4 answers

1. no one was disappointed.
no one is such that (he or she was disappointed)
(∀x: x is a person) ¬ x was disappointed
(∀x: Px) ¬ Dx
∀x (Px→ ¬ Dx)
D: [_ was disappointed]; P: [_ is a person]

2. if any part was missing, the set wasn't assembled
every part is such that (if it was missing, the set wasn't assembled)
(∀x: x is a part) if x was missing, the set wasn't assembled
(∀x: Px) (x was missing → the set wasn't assembled)
(∀x: Px) (Mx → ¬ the set was assembled)
(∀x: Px) (Mx → ¬ As)
∀x (Px → (Mx → ¬ As))
A: [_ was assembled]; M: [_ was missing]; P: [_ is a part]; s: the set

3. only cartoons appealed to everyone
only cartoons were such that (they appealed to everyone)
(∀x: ¬ x is a cartoon) ¬ x appealed to everyone
(∀x: ¬ Cx) ¬ everyone is such that (x appealed to him or her)
(∀x: ¬ Cx) ¬ (∀y: y is a person) x appealed to y
(∀x: ¬ Cx) ¬ (∀y: Py) Axy
∀x (¬ Cx → ¬ ∀y (Py → Axy))
A: [_ appealed to _]; C: [_ is cartoon]; P: [_ is a person]

4. ¬ (∀x: x is a job ∧ ¬ x is small) ¬ x was finished
¬ (∀x: x is a job ∧ x isn't small) x was unfinished
¬ (∀x: x is a job that isn't small) x was unfinished
¬ every job that isn't small it such that (it was unfinished)
¬ every job that isn't small was unfinished
not every job that isn't small was unfinished
or: among jobs not only small ones were finished
or: not only small jobs were finished
or: it's false that no jobs that are not small were finished

5.

	∀x Mx	a:2
	∀x (Mx → Qx)	a:3
	ⓐ	
2 UI	Ma	(4)
3 UI	Ma → Qa	4
4 MPP	Qa	(5)
	●	
5 QED	Qa	1
1 UG	∀x Qx	

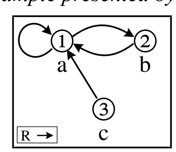
6.

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

7.

	Rab	
	∀x Rxa	a:2, b:3, c:4
	ⓒ	
2 UI	Raa	
3 UI	Rba	
4 UI	Rca	
	¬ Rcb	
	○	¬ Rcb, Rca, Rba, Raa, Rab ⊭ ⊥
	⊥	5
5 IP	Rcb	1
1 UG	∀x Rxb	

Counterexample presented by a diagram



Counterexample presented by tables

a	b	c
1	2	3

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

Phi 270 F09 test 4

F09 test 4 topics

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.

F09 test 4 questions

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Also restate your analyses using unrestricted quantifiers.*

1. Everyone saw the eclipse.

2. Al didn't find any book that he was looking for.

3. No one ate only potato chips.

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

4. (∀x: ¬ Sbx) Sax

S: [_ saw _]; a: Al; b: Bill

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

5.

∀x (Gx → Hx)
∀x (Fx ∧ Gx)
————————
∀x Hx

6.

∀y ∀x (Px → ¬ Fxy)
————————
∀x ∀y (Fyx → ¬ Py)

Use a derivation to show that the following argument is not valid and present a counterexample that lurks in an open gap.

7.

∀x Rxa
————
∀x Rxx

F09 test 4 answers

1. everyone saw the eclipse

everyone is such that (he or she saw the eclipse)

(∀x: x is a person) x saw the eclipse

(∀x: Px) Sxe
∀x (Px→ Sxe)

P: [_ is a person]; S: [_ saw _]; e: the eclipse

2. Al didn't find any book that he was looking for

every book that Al was looking for is such that (he didn't find it)

(∀x: x is a book that Al was looking for) Al didn't find x

(∀x: x is a book ∧ Al was looking for x) ¬ Al found x

(∀x: Bx ∧ Lax) ¬ Fax
∀x ((Bx ∧ Lax) → ¬ Fax)

B: [_ is a book]; F: [_ found _]; L: [_ was looking for _]; a: Al

3. no one ate only potato chips

no one is such that (he or she ate only potato chips)

(∀x: x is a person) ¬ x ate only potato chips

(∀x: Px) ¬ only potato chips are such that (x ate them)

(∀x: Px) ¬ (∀y: ¬ y is a potato chip) ¬ x ate y

(∀x: Px) ¬ (∀y: ¬ Cy) ¬ Axy
∀x (Px → ¬ ∀y (¬ Cy → ¬ Axy))

A: [_ ate _]; C: [_ is a potato chip]; P: [_ is a person]

4. (∀x: ¬ Bill saw x) Al saw x

(∀x: Bill didn't see x) Al saw x

everything that Bill didn't see is such that (Al saw it)

Al saw everything that Bill didn't see

5.

```
        │∀x (Gx → Hx)    a:2
        │∀x (Fx ∧ Gx)    a:3
        ├─
        │ⓐ
2 UI    ││Ga → Ha        5
3 UI    ││Fa ∧ Ga        4
4 Ext   ││Fa
4 Ext   ││Ga             (5)
5 MPP   ││Ha             (6)
        ││●
        │├─
6 QED   ││Ha             1
        ├─
1 UG    │∀x Hx
```

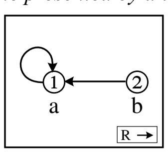
6.

```
        │∀y ∀x (Px → ¬ Fxy)          a:5
        ├─
        │ⓐ
        ││ⓑ
        │││Fba                       (8)
        ││├─
        ││││Pb                       (7)
        │││├─
5 UI    ││││∀x (Px → ¬ Fxa)          b:6
6 UI    ││││Pb → ¬ Fba               7
7 MPP   ││││¬ Fba                    (8)
        ││││●
        │││├─
8 Nc    ││││⊥                        4
        ││├─
4 RAA   │││¬ Pb                      3
        │├─
3 CP    ││Fba → ¬ Pb                 2
        ├─
2 UG    │∀y (Fya → ¬ Py)             1
        ├─
1 UG    │∀x ∀y (Fyx → ¬ Py)
```

7.

```
        │∀x Rxa       a:2, b:3
        ├─
        │ⓑ
2 UI    ││Raa
3 UI    ││Rba
        │││¬ Rbb
        ││├─
        │││○   ¬ Rbb, Rba, Raa ⊭ ⊥
        ││├─
        │││⊥          4
        │├─
4 IP    ││Rbb         1
        ├─
1 UG    │∀x Rxx
```

Counterexample presented by a diagram



Phi 270 F08 test 4

F08 test 4 topics

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.

F08 test 4 questions

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. No cover fit the container.

2. Everyone who Sam spoke to had seen the movie.

3. Only dogs chewed every bone.

4. No one who everyone knew bought anything.

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

5. ∀x (Fx → Hx) / ∀x ((Fx ∧ Gx) → Hx)

6. ∀x (Px → ∀y (Rxy → Txy)) / ∀x ∀y ((Px → Rxy) → (Px → Txy))

Use a derivation to show that the following argument is not valid and present a counterexample by using a diagram to describe a structure that is a counterexample lurking an open gap.

7. ∀x Rax / ∀x (Rxx → Rxa)

F08 test 4 answers

1. no cover fit the container

no cover is such that (it fit the container)

(∀x: x is a cover) ¬ x fit the container

(∀x: Cx) ¬ Fxc

∀x (Cx→ ¬ Fxc)

C: [_ is a cover]; F: [_ fit _]; c: the container

2. everyone who Sam spoke to had seen the movie

everyone who Sam spoke to is such that (he or she had seen the movie)

(∀x: x is a person who Sam spoke to) x had seen the movie

(∀x: x is a person ∧ Sam spoke to x)) Sxm

(∀x: Px ∧ Ksx) Sxm

∀x ((Px ∧ Ksx) → Sxm)

K: [_ spoke to _]; P: [_ is a person]; S: [_ had seen _]; m: the movie; s: Sam

3. only dogs chewed every bone

only dogs are such that (they chewed every bone)

(∀x: ¬ x is a dog) ¬ x chewed every bone

(∀x: ¬ Dx) ¬ every bone is such that (x chewed it)

(∀x: ¬ Dx) ¬ (∀y: y is a bone) x chewed y

(∀x: ¬ Dx) ¬ (∀y: By) Cxy

∀x (¬ Dx → ¬ ∀y (By → Cxy))

B: [_ is a bone]; C: [_ chewed _]; D: [_ is a dog]

4. No one who everyone knew bought anything

everything is such that (no one who everyone knew bought it)

∀x no one who everyone knew bought x

∀x no one who everyone knew is such that (he or she bought x)

∀x (∀y: y is a person who everyone knew) ¬ y bought x

∀x (∀y: y is a person ∧ everyone knew y) ¬ Byx

∀x (∀y: Py ∧ everyone is such that (he or she knew y)) ¬ Byx

∀x (∀y: Py ∧ (∀z: z is a person) z knew y) ¬ Byx

∀x (∀y: Py ∧ (∀z: Pz) Kzy) ¬ Byx

∀x ∀y ((Py ∧ ∀z (Pz → Kzy)) → ¬ Byx)

B: [_ bought _]; K: [_ knew _]; P: [_ is person]

5.

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

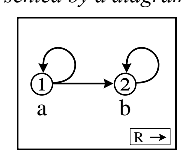
6.

	∀x (Px → ∀y (Rxy → Txy))	a:6
	ⓐ	
	ⓑ	
	Pa → Rab	5
	Pa	(5), (7)
5 MPP	Rab	(9)
6 UI	Pa → ∀y (Ray → Tay)	7
7 MPP	∀y (Ray → Tay)	b:8
8 UI	Rab → Tab	9
9 MPP	Tab	(10)
	●	
10 QED	Tab	4
4 CP	Pa → Tab	3
3 CP	(Pa → Rab) → (Pa → Tab)	2
2 UG	∀y ((Pa → Ray) → (Pa → Tay))	1
1 UG	∀x ∀y ((Px → Rxy) → (Px → Txy))	

7.

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

Counterexample presented by a diagram



Phi 270 F06 test 4

F06 test 4 topics

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 and exceptions (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.

F06 test 4 questions

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.

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.]

3. No key opened every door.

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

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

4. (∀x: Px ∧ Nxa) (Dxm ∨ Axm)

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

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

5.

∀x (Fx → (Gx → Hx))
∀x Gx
____
∀x (Fx → Hx)

6.

∀x (Fx → ∀y Rxy)
∀x Fx
____
∀x ∀y Ryx

Use a derivation to show that the following argument is not valid and present a counterexample by describing a structure that is a counterexample lurking 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.

∀x Rax
∀x Rxb
____
∀x Rxx

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) says only people *who had witnessed*...
(∀x: ¬ Px ∧ Wxe) ¬ Fx(de) says only *people* who had witnessed ...
Not a possible interpretation: (∀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)	

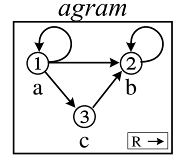
6.

	∀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

F05 test 4 topics

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 (§7.2), how to incorporate bounds and exceptions (§7.2), ways of handling compound quantifier phrases (such as only cats and dogs, §7.3), the distinction between every and any (§§7.3 and 7.4), how to represent multiple quantifier phrases with overlapping scope (§7.4). Be able restate you analysis using unrestricted quantifiers, 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. (This sort of question is less likely to appear than a question about analysis and there would certainly be substantially fewer such questions.)
- *Derivations.* Be able to construct derivations to show that entailments hold and to show that they fail (derivations that hold are more likely). 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 (by either tables or a diagram). In derivations involving restricted universals you will have the option using the rules RUG, SB, SC, and MRC or instead using RUP and RUC along with rules for unrestricted universals and conditionals. You will *not* be responsible for the rules introduced in §7.8.

F05 test 4 questions

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.]

2. Sam heard only tunes that he knew.
[Remember to restate your answer in 2 using an unrestricted quantifier.]

3. No one liked everything on the menu.

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

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

5.
∀x (Fx ∧ Gx)
―――――――
∀x (Gx ∧ Fx)

6.
∀x ∀y (Gy → Rxy)
∀x (Fx → Gx)
―――――――
∀x (Fx → ∀y Ryx)

Use a derivation to show that the following argument is not valid and present a counterexample by describing a structure that is a counterexample lurking 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.
∀x (Fx → Rax)
Fa
―――――――
∀x Rxa

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)	

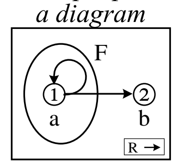
6.

	∀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)	a:1, b:4
	Fa	(2)
1 UI	Fa → Raa	2
2 MPP	Raa	
	ⓑ	
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 lurks in 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

F04 test 4 topics

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 (§7.2), how to incorporate bounds and exceptions (§7.2), ways of handling compound quantifier phrases (such as only cats and dogs, §7.3), the distinction between every and any (§§7.3 and 7.4), how to represent multiple quantifier phrases with overlapping scope (§7.4). Be able restate you analysis using unrestricted quantifiers, 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. (This sort of question is less likely to appear than a question about analysis and there would certainly be substantially fewer such questions.)
- *Derivations.* Be able to construct derivations to show that entailments hold and to show that they fail (derivations that hold are more likely). 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. In derivations involving restricted universals you will have the option using the rules RUG, SB, SC, and MRC or instead using RUP and RUC along with rules for unrestricted universals and conditionals. You will *not* be responsible for the rules introduced in §7.8.

F04 test 4 questions

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

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

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

3. Ralph got the joke if anyone did

4. Only bestsellers were on every list

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

5.

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

6.

$$\frac{\forall x\, (Rxa \to \forall y\, Txy)}{\forall x\, \forall y\, (Rya \to Tyx)}$$

Use a derivation to show that the following argument is not valid and present a counterexample by describing a structure that is a counterexample lurking 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.

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

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

$$(\forall x: Lx)\ Csx$$

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

$$(\forall x: Px \land Nxo)\ \neg Axc$$
$$\forall x\, ((Px \land Nxo) \to \neg Axc)$$

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)

$$(\forall x: Px)\ (Grj \leftarrow Gxj)$$
$$(\forall x: Px)\ (Gxj \to Grj)$$

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

$$(\forall x: \neg Bx)\ \neg (\forall y: Ly)\ Nxy$$

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)	

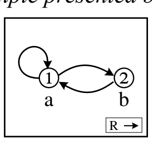
6.

	∀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

F03 test 4 topics

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 (§7.2), how to incorporate bounds and exceptions (§7.2), ways of handling compound quantifier phrases (such as only cats and dogs, §7.3), the distinction between every and any (§§7.3 and 7.4), how to represent multiple quantifier phrases with overlapping scope (§7.4). Be able restate you analysis using unrestricted quantifiers, 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. (This sort of question is less likely to appear than a question about analysis and there would certainly be substantially fewer such questions.)
- *Derivations*. Be able to construct derivations to show that entailments hold and to show that they fail (derivations that hold are more likely). 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.

F03 test 4 questions

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

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

3. If any door was opened, the alarm sounded

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

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

5. ∀x (Fx ∧ Gx)
―――――
∀x Gx

6. ∀x (Fx → Gx)
∀x ∀y (Gy → Rxy)
―――――
∀x ∀y (Fy → Rxy)

Use a derivation to show that the following argument is not valid and describe a structure (by using either a diagram or tables) that is a counterexample lurking an open gap.

7. ∀x (Fx → Rxa)

―――――――――

Fa → ∀x Rxx

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

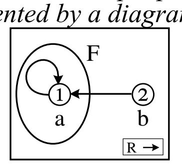
a	b
1	2

τ	Fτ
1	T
2	F

R	1	2
1	T	F
2	T	F

(This counterexample lurks in 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

F02 test 4 questions

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.

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

3. No one laughed at any performers except clowns.

Synthesize an English sentence with the following logical form:

4. (∀x: Px ∧ Cxt) Ctx

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

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

5. ∀x Fx, ∀x ¬ (Fx ∧ Gx) / ∀x ¬ Gx

6. ∀x ∀y (Fy → Rxy) / ∀x (Fx → ∀y Ryx)

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

7. ∀x Rax, ∀x (Rbx → ¬ Rxa) / ∀x ¬ Rbx

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
        │ │ │ │ ├─
        │ │ │ │ │ ○             Raa,Rab,Rac,¬Rba,
        │ │ │ │ │                    ¬Rbb,Rbc,¬Rca ⊭ ⊥
        │ │ │ │ ├─
        │ │ │ │ │ ⊥             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

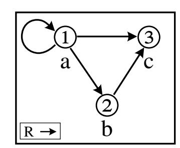
range: 1, 2, 3

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 for either gap, and the value for R22 is not required for the 2nd gap

Counterexample presented by a diagram



Phi 270 F00 test 4

F00 test 4 questions

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.]

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

3. No one received every vote

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.

$$\forall x\,(Dx \rightarrow Mx)$$
$$\forall x\,(\neg Ax \rightarrow \neg Mx)$$
$$\overline{\forall x\,(Dx \rightarrow Ax)}$$

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

5.

$$\forall x\,\forall y\,((Py \land Byx) \rightarrow Dyx)$$
$$\overline{\forall x\,(Px \rightarrow \forall y\,(Bxy \rightarrow Dxy))}$$

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

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

6.

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

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

$$(\forall x\!:\ \neg (Px \land Nx))\ \neg Fx$$

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

(∀x: Px ∧ ¬ Nx) ¬ Fx—i.e., No unnecessary projects were funded—and (∀x: Nx ∧ ¬ Px) ¬ Fx—i.e., Among the necessities only projects were funded—are not equivalent but are possible interpretations that would be marked by emphasis on necessary and projects, respectively.

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)

$$(\forall x\!:\ Px)\ (Stp \leftarrow Sxp)\ [\textit{or:}\ (\forall x\!:\ Px)\ (Sxp \rightarrow Stp)]$$
$$\forall x\,(Px \rightarrow (Stp \leftarrow Sxp))\ [\textit{or:}\ \forall x\,(Px \rightarrow (Sxp \rightarrow Stp))]$$

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

$$(\forall x\!:\ Px)\ \neg (\forall y\!:\ Vy)\ Rxy$$

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)	

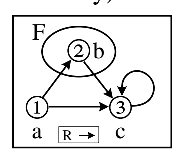
5.

	∀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,¬Fc,¬Raa,Rab,Rac, ¬Rbb,Rbc,Rcc ⊭ ⊥
	⊥	14
14 IP	Raa	13
	¬ Fa	
	○	¬Fa,Fb,¬Fc,Rab,Rac, ¬Rbb,Rbc,Rcc ⊭ ⊥
	⊥	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)	



lurks in both open gaps

Phi 270 F99 test 4

F99 test 4 questions

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
2. Tom didn't send anything to the printer
3. No game that every child liked was complete

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 _]

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

5. ∀x (Fx → Gx)
   ———
   ∀x Fx → ∀x Gx
6. ∀x ∀y (Fyx → ¬ Py)
   ———
   ∀x (Px → ∀y ¬ Fxy)

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

7. ∀x ∀y (Fy → ¬ Rxy)
   ∀x Rxx
   ———
   ∀x ∀y ¬ Rxy

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	

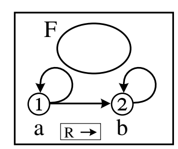
6.

	∀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 counterexample below lurks in both gaps:



Phi 270 F98 test 4

F98 test 4 questions

(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.)

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.)

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

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.

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

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

4. The movie delighted all boys and girls

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

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

6. ∀x (Fx ∨ Gx)
∀x ¬ Gx
―――――
∀x Fx

7. ∀x (Fx → ∀y (Pxy → Rxy))
―――――
∀y ∀x ((Fx ∧ Pxy) → Rxy)

Use a derivation to show that the following argument is not valid and describe a counterexample lurking in one of the derivation's open gaps.

8. ∀x (Fx → ¬ Rxx)
―――――
∀x ∀y (Fy → ¬ Rxy)

F98 test 4 answers

1. Sam ordered a book, but instead of it he received a book he didn't want
T (Sam) Q (a book) Q (a book he didn't want)

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	

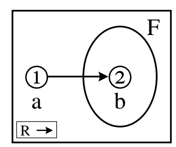
7.

	∀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 counterexample lurks in both gaps:



Phi 270 F97 test 4

F97 test 4 questions

(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.)

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.)

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

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.

3. Among contestants, only professionals were finalists.

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.

5. Nothing anyone said bothered Dave.

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

6. ∀x (Fx ∧ Gx) / ∀x Fx

7. ∀x (Rxa → ∀y Rxy) / ∀x (∀y Rxy → Rxb)

Use a derivation to show that the following argument is not valid and describe a counterexample lurking in 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.)

8. ∀x (Fx → Rax) / ∀x (Fx → Rxa)

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

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

9a. (∀x: Dx) (Okx → (∀y: Dy) Oky)

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

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

9b. ∀x ∀y (Rxy → ¬ Fy)
∀x (Fx → Rxx)
―――――
∀x ¬ Fx

F97 test 4 answers

1. Everyone who Carol lent the book to spoke to her at length about it
(Q: Everyone who Carol lent the book to; T: Carol; T: the book; her → Carol; it → the book)

2. Bob called no one

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

(∀x: x is an person) ¬ Bob called x

(∀x: Px) ¬ Cbx
∀x (Px → ¬ 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)

(∀x: x was a contestant ∧ ¬ x was a professional) ¬ x was a finalist

(∀x: Cx ∧ ¬ Px) ¬ Fx
∀x ((Cx ∧ ¬ Px) → ¬ 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)

(∀x: x is a map showing Dafter) ¬ Bob owns x

(∀x: x is a map ∧ x shows Dafter) ¬ Obx

(∀x: Mx ∧ Sxd) ¬ 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)

(∀x: x is a person) nothing x said bothered Dave

(∀x: Px) nothing x said is such that (it bothered Dave)

(∀x: Px) (∀y: y is a thing x said) ¬ y bothered Dave

(∀x: Px) (∀y: x said y) ¬ Byd

(∀x: Px) (∀y: Sxy) ¬ Byd

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

6.

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

7.

```
         │∀x (Rxa → ∀y Rxy)
         ├─
         │ⓒ
         ││ │∀y Rcy          a:3
         ││ ├─
3 UI     ││ │Rcb             (4)
         ││ │●
         ││ ├─
4 QED    ││ │Rcb             2
         │├─
2 CP     ││∀y Rcy → Rcb      1
         ├─
1 UG     │∀x (∀y Rxy → Rxb)
```

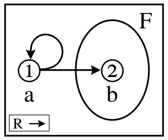
[The first premise is never used in the derivation for this question (shown above). The fact that it was not needed was a slip on my part in making up the question. Below is a derivation for a different conclusion, one that makes for the sort of argument I probably intended.]

```
         │∀x (Rxa → ∀y Ryx)   c:4
         ├─
         │ⓒ
         ││ │∀y Rcy          a:3
         ││ ├─
3 UI     ││ │Rca             (5)
4 UI     ││ │Rca → ∀y Ryc    5
5 MPP    ││ │∀y Ryc          b:6
6 UI     ││ │Rbc             (7)
         ││ │●
         ││ ├─
7 QED    ││ │Rbc             2
         │├─
2 CP     ││∀y Rcy → Rbc      1
         ├─
1 UG     │∀x (∀y Rxy → Rbx)
```

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 counterexample below lurks in both gaps. The arrow from 1 to itself is not needed for the first gap; and it would continue to be a counterexample lurking in the second gap if the extension of F were enlarged to include both objects.



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

F96 test 4 questions

(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.)

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.)

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

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.

3. Among bystanders, Sam interviewed only soldiers.

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.

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

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

6. (∀x: Px) ¬ ∀y Axy

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

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

7.

∀x Fx
∀x Gx
―――――
∀x (Fx ∧ Gx)

8.

∀x (Fx → Rxa)
∀x (Rxa → ∀y Ryx)
―――――
∀x ∀y (Fy → Rxy)

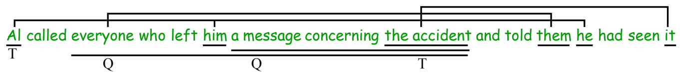
Use a derivation to show that the following argument is not valid and describe a counterexample lurking in one of the derivation's open gaps. (You will *not* need the rules UG+ and ST introduced in §7.8 that are designed to avoid unending gaps.)

9.

∀x Rxx
―――――
Rab → ∀x Rxa

F96 test 4 answers

1.



[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

$$(\forall x\colon Ex)\ Rxl$$
$$\forall x\ (Ex \to Rxl)$$

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

$$(\forall x\colon Bx \land \neg Sx)\ \neg Isx$$
$$\forall x\ ((Bx \land \neg Sx) \to \neg Isx)$$

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)

$$(\forall x\colon Px)\ (Gxn \to Ap)$$

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

$$(\forall x\colon Rxj)\ (\forall y\colon Py \land Wyx)\ Hy$$

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