Phi 270 F09 test 5

Analyze the following sentences in as much detail as possible, providing a key to the items of non-logical vocabulary (upper and lower case letters apart from variables) that appear in your answer. Notice the special instructions given for each of **1**, **2**, and **3**.

1. Someone spoke. [Give an analysis using a restricted quantifier, and restate it using an unrestricted quantifier.]

2. Al didn't run into anyone he knew. [Do not use ∀ in your analysis of this; that is, use ∃ in your analysis of any quantifier phrases.]

3. Every child was visited by someone. [On one way of understanding this sentence, it could be true even though no one person visited all children. Analyze it according to that interpretation.]

4. Ed's ship came close to at least two icebergs.

Analyze the sentence below using each of the two ways of analyzing the definite description. That is, give an analysis that uses Russell's treatment of definite descriptions as quantifier phrases as well as one that uses the description operator to analyze the definite description.

5. The agent that Ed spoke to spoke to Fred.

Use a derivation to show that the following argument is valid. You may use any rules.

6.

$$\exists x\, \neg Gx$$
$$\forall x\, (\neg Fx \to Gx)$$
$$\overline{\qquad\qquad\qquad}$$
$$\exists x\, Fx$$

Use a derivation to show that the following argument is not valid, and use either a diagram or tables to present a counterexample that divides an open gap of your derivation.

7.

$$\exists x\, (Fx \land Rxx)$$
$$\forall x\, (Fx \to Rax)$$
$$\overline{\qquad\qquad\qquad}$$
$$\exists x\, Rxa$$

Complete the following to give a definition of tautologousness in terms of truth values and possible worlds:

8. A sentence φ is a tautology (in symbols, ⊨ φ) if and only if ...

Analyze the sentence below using abstracts and variables to represent pronominal cross reference to individual terms (instead of replacing pronouns by such antecedents). A letter standing for an individual term should appear in your analysis only as often as the individual term appears in the original sentence.

9. Al congratulated himself.

Phi 270 F09 test 5 answers

1. Someone spoke

Someone is such that (he or she spoke)

(∃x: x is a person) x spoke

$(\exists x: Px)\, Sx$

$\exists x\, (Px \land Sx)$

P: [_ is a person]; S: [_ spoke]

2. Al didn't run into anyone he knew

¬ Al ran into someone he knew

¬ someone that Al knew is such that (Al ran into him or her)

¬ (∃x: x is a person Al knew) Al ran into x

¬ (∃x: x is a person ∧ Al knew x) Al ran into x

$\neg\, (\exists x: Px \land Kax)\, Rax$

K: [_ knew _]; P: [_ is a person]; R: [_ ran into _]

The analysis $(\exists x: Px \land Kax)\, \neg Rax$ would say that there was someone Al knew who he didn't run into

3. Every child was visited by someone

every child is such that (he or she was visited by someone)

(∀x: x is a child) x was visited by someone

(∀x: Cx) someone is such that (x was visited by him or her)

(∀x: Cx) (∃y: y is a person) x was visited by y

$(\forall x: Cx)\, (\exists y: Py)\, Vxy$

C: [_ is a child]; P: [_ is a person]; V: [_ was visited by _]

The alternative interpretation Someone is such that (every child was visited by him or her) would not be true unless some one person visited all children

4. Ed's ship came close to at least two icebergs

at least two icebergs are such that (Ed's ship came close to them)

(∃x: x is an iceberg) (∃y: y is an iceberg ∧ ¬ y = x) (Ed's ship came close to x ∧ Ed's ship came close to y)

(∃x: Ix) (∃y: Iy ∧ ¬ y = x) (C(Ed's ship)x ∧ C(Ed's ship)y)

$(\exists x: Ix)\, (\exists y: Iy \land \neg\, y = x)\, (C(se)x \land C(se)y)$

C: [_ came close to _]; I: [_ is an iceberg]; e: Ed; s: [_'s ship]

5. *Using Russell's analysis:*

The agent that Ed spoke to spoke to Fred

The agent that Ed spoke to is such that (he or she spoke to Fred)

(∃x: x is an agent that Ed spoke to ∧ only x is an agent that Ed spoke to) x spoke to Fred

(∃x: (x is an agent ∧ Ed spoke to x) ∧ (∀y: ¬ y = x) ¬ (y is an agent ∧ Ed spoke to y)) Sxf

(∃x: (Ax ∧ Sex) ∧ (∀y: ¬ y = x) ¬ (Ay ∧ Sey)) Sxf

also correct: (∃x: (Ax ∧ Sex) ∧ ¬ (∃y: ¬ y = x) (Ay ∧ Sey)) Sxf

also correct: (∃x: (Ax ∧ Sex) ∧ (∀y: Ay ∧ Sey) x = y) Sxf

Using the description operator:

The agent that Ed spoke to spoke to Fred

[_ spoke to _] the agent that Ed spoke to Fred

S(Ix x is an agent that Ed spoke to)f

S(Ix (x is an agent ∧ Ed spoke to x))f

S(Ix (Ax ∧ Sex))f

A: [_ is an agent]; S: [_ spoke to _]; e: Ed; f: Fred

6.

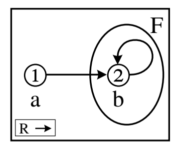
	∃x ¬ Gx	1
	∀x (¬ Fx → Gx)	a:2
	ⓐ	
	¬ Ga	(3)
2 UI	¬ Fa → Ga	3
3 MTT	Fa	(6)
	∀x ¬ Fx	a:5
5 UI	¬ Fa	(6)
	●	
6 Nc	⊥	4
4 NCP	∃x Fx	1
1 PCh	∃x Fx	

or

	∃x ¬ Gx	1
	∀x (¬ Fx → Gx)	a:2
	ⓐ	
	¬ Ga	(3)
2 UI	¬ Fa → Ga	3
3 MTT	Fa	(4)
4 EG	∃x Fx	X, (5)
	●	
5 QED	∃x Fx	1
1 PCh	∃x Fx	

7.

	∃x (Fx ∧ Rxx)	1
	∀x (Fx → Rax)	b:3, a:7
	ⓑ	
	Fb ∧ Rbb	2
2 Ext	Fb	(4)
2 Ext	Rbb	
3 UI	Fb → Rab	4
4 MPP	Rab	
	∀x ¬ Rxa	a:6, b:9
6 UI	¬ Raa	(8)
7 UI	Fa → Raa	8
8 MTT	¬ Fa	
9 UI	¬ Rba	
	○	¬ Rba, ¬ Fa, ¬ Raa, Rab, Fb, Rbb ⊭ ⊥
	⊥	5
5 NCP	∃x Rxa	1
1 PCh	∃x Rxa	



range: 1, 2

a	b
1	2

τ	Fτ
1	F
2	T

R	1	2
1	F	T
2	F	T

8. A sentence φ is a tautology if and only if there is no possible world in which φ is false

or

A sentence φ is a tautology if and only if φ is true in every possible world

9. Al congratulated himself

Al is such that (he congratulated himself)

$[\text{x congratulated x}]_x$ Al

$[\text{Cxx}]_x\text{a}$

C: [_ congratulated _]; a: Al

Phi 270 F08 test 5

Analyze the following sentences in as much detail as possible, providing a key to the items of non-logical vocabulary (upper and lower case letters apart from variables) that appear in your answer. Notice the special instructions given for each of **1**, **2**, and **3**.

1. Dave found a coin. [Give an analysis using a restricted quantifier, and restate it using an unrestricted quantifier.]

2. There is an elf who neglects no one. [Do not use ∀ in your analysis of this; that is, use ∃ in your analysis of any quantifier phrases.]

3. Everyone watched a movie. [On one way of understanding this sentence, it would not be true unless everyone watched the same movie. Analyze it according to that interpretation.]

4. Someone sang to someone else.

Analyze the sentence below using each of the two ways of analyzing the definite description. That is, give an analysis that uses Russell's treatment of definite descriptions as quantifier phrases as well as one that uses the description operator to analyze the definite description.

5. Rudolph guided the sleigh that flew.

Use a derivation to show that the following argument is valid. You may use any rules.

6. ∃x Gx
∀x Fx
____
∃x (Fx ∧ Gx)

Use a derivation to show that the following argument is not valid, and use either a diagram or tables to present a counterexample that divides an open gap of your derivation.

7. ∃x ∀y Rxy
____
∀x ∃y Rxy

Complete the following to give a definition of equivalence in terms of truth values and possible worlds:

8. A pair of sentences φ and ψ entails a sentence χ (in symbols, φ, ψ ⊨ χ) if and only if ...

Analyze the sentence below using abstracts and variables to represent pronominal cross reference to individual terms (instead of replacing pronouns by such antecedents). A letter standing for an individual term should appear in your analysis only as often as the individual term appears in the original sentence.

9. Bill called Carol and mentioned his father to her.

Phi 270 F08 test 5 answers

1. Dave found a coin
A coin is such that (Dave found it)
(∃x: x is a coin) Dave found x
(∃x: Cx) Fdx
∃x (Cx ∧ Fdx)
C: [_ is a coin]; F: [_ found _]; d: Dave

2. There is an elf who neglects no one
Something is an elf who neglects no one
∃x x is an elf who neglects no one
∃x (x is an elf ∧ x neglects no one)
∃x (x is an elf ∧ ¬ x neglects someone)
∃x (Ex ∧ ¬ someone is such that (x neglects him or her))
∃x (Ex ∧ ¬ (∃y: y is a person) x neglects y)
∃x (Ex ∧ ¬ (∃y: Py) Nxy)
E: [_ is an elf]; N: [_ neglects _]; P: [_ is a person]

3. Everyone watched a movie
some movie is such that (everyone watched it)
(∃x: x is a movie) everyone watched x
(∃x: Mx) everyone is such that (he or she watched x)
(∃x: Mx) (∀y: y is a person) y watched x
(∃x: Mx) (∀y: Py) Wyx
M: [_ is a movie]; P: [_ is a person]; W: [_ watched _]

The alternative interpretation Everyone is such that (he or she watched a movie) could be true even if there was no one movie that everyone watched

4. Someone sang to someone else
Someone is such that (he or she sang to someone else)
(∃x: x is a person) x sang to someone else
(∃x: Px) someone other than x is such that (x sang to him or her)
(∃x: Px) (∃y: y is a person ∧ ¬ y = x) x sang to y
(∃x: Px) (∃y: Py ∧ ¬ y = x) Sxy
P: [_ is a person]; S: [_ sang to _]

5. *Using Russell's analysis:*

Rudolph guided the sleigh that flew

the sleigh that flew is such that (Rudolph guided it)

(∃x: x is a sleigh that flew ∧ only x is a sleigh that flew) Rudolph guided x

(∃x: (x is a sleigh ∧ x flew) ∧ (∀y: ¬ y = x) ¬ (y is a sleigh ∧ y flew)) Grx

(∃x: (Sx ∧ Fx) ∧ (∀y: ¬ y = x) ¬ (Sy ∧ Fy)) Grx

also correct: (∃x: (Sx ∧ Fx) ∧ ¬ (∃y: ¬ y = x) (Sy ∧ Fy)) Grx

also correct: (∃x: (Sx ∧ Fx) ∧ (∀y: Sy ∧ Fy) x = y) Grx

Using the description operator:

Rudolph guided the sleigh that flew

[_ guided _] Rudolph the sleigh that flew

Gr(lx x is a sleigh that flew)

Gr(lx (x is a sleigh ∧ x flew))

Gr(lx (Sx ∧ Fx))

F: [_ flew]; G: [_ guided _]; S: [_ is a sleigh]; r: Rudoph

6.

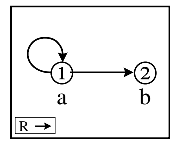
	∃x Gx	1
	∀x Fx	a:2
ⓐ	Ga	(6)
2 UI	Fa	(5)
	∀x ¬ (Fx ∧ Gx)	a:4
4 UI	¬ (Fa ∧ Ga)	5
5 MPT	¬ Ga	(6)
	●	
6 Nc	⊥	3
3 NCP	∃x (Fx ∧ Gx)	1
1 PCh	∃x (Fx ∧ Gx)	

or

	∃x Gx	1
	∀x Fx	a:2
ⓐ	Ga	(3)
2 UI	Fa	(3)
3 Adj	Fa ∧ Ga	X, (4)
4 EG	∃x (Fx ∧ Gx)	X, (5)
	●	
5 QED	∃x (Fx ∧ Gx)	1
1 PCh	∃x (Fx ∧ Gx)	

7.

	∃x ∀y Rxy	1
ⓐ	∀y Ray	a:4, b:5
ⓑ	∀y ¬ Rby	a:6, b:7
4 UI	Raa	
5 UI	Rab	
6 UI	¬ Rba	
7 UI	¬ Rbb	
	○	Raa, Rab, ¬ Rba, ¬ Rbb ⊭ ⊥
	⊥	3
3 NCP	∃y Rby	2
2 UG	∀x ∃y Rxy	1
1 PCh	∀x ∃y Rxy	



range: 1, 2

a	b
1	2

R	1	2
1	T	T
2	F	F

8. A pair of sentences φ and ψ entails a sentence χ if and only if there is no possible world in which both φ and ψ are true and χ is false

or

A pair of sentences φ and ψ entails a sentence χ if and only if χ is true in every possible world in which both φ and ψ are true

9. Bill called Carol and mentioned his father to her

Bill and Carol are such that (he called her and mentioned his father to her)

[x called y and mentioned x's father to y]$_{xy}$ Bill Carol

[x called y ∧ x mentioned x's father to y]$_{xy}$bc

[Cxy ∧ Mx(x's father)y]$_{xy}$bc

[Cxy ∧ Mx(fx)y]$_{xy}$bc

C: [_ called _]; M: [_ mentioned _ to _]; b: Bill; c: Carol; f: [_'s father]

Phi 270 F06 test 5

Analyze the following sentences in as much detail as possible, providing a key to the items of non-logical vocabulary (upper and lower case letters apart from variables) that appear in your answer. Notice the special instructions given for each of **1**, **2**, and **3**.

1. Someone called Tom. [Give an analysis using a restricted quantifier, and restate it using an unrestricted quantifier.]

2. Not a crumb was left, but there was a note from Santa. [Do not use ∀ in your analysis of this; that is, use ∃ in your analysis of any quantifier phrases.]

3. A card was sent to each customer. [On one way of understanding this sentence, it would be true even if no two customers were sent the same card. Analyze it according to that interpretation.]

4. At most one size was left.

Analyze the sentence below using each of the two ways of analyzing the definite description. That is, give an analysis that uses Russell's treatment of definite descriptions as quantifier phrases as well as one that uses the description operator.

5. Ann found the note that Bill left.

Use a derivation to show that the following argument is valid. You may use any rules.

6. $\exists x\,(Fx \land Gx)$
$\forall x\,(Gx \to Hx)$
———
$\exists x\,Hx$

Use a derivation to show that the following argument is not valid, and use either a diagram or tables to present a counterexample that divides an open gap of your derivation.

7. $\exists x\,\exists y\,(Rxa \land Ray)$
———
$\exists x\,Rxx$

Complete the following to give a definition of equivalence in terms of truth values and possible worlds:

8. A pair of sentences φ and ψ are logically equivalent (in symbols, $\varphi \simeq \psi$) if and only if ...

Analyze the sentence below using abstracts and variables to represent pronominal cross reference to individual terms (instead of replacing pronouns by such antecedents). An individual term should appear in your analysis only as often as it appears in the original sentence.

9. Ann wrote to Bill and he called her.

Phi 270 F06 test 5 answers

1. Someone called Tom
Someone is such that (he or she called Tom)
$(\exists x$: x is a person) x called Tom
$(\exists x: Px)\,Cxt$
$\exists x\,(Px \land Cxt)$
C: [_ called _]; P: [_ is a person]; t: Tom

2. Not a crumb was left, but there was a note from Santa
Not a crumb was left ∧ there was a note from Santa
¬ a crumb was left ∧ something was a note from Santa
¬ some crumb is such that (it was left) ∧ something is such that (it was a note from Santa)
¬ $(\exists x$: x is a crumb) x was left ∧ $\exists y$ (y was a note from Santa)
¬ $(\exists x: Cx)\,Lx \land \exists y$ (y was a note ∧ y was from Santa)
$\neg (\exists x: Cx)\,Lx \land \exists y\,(Ny \land Fys)$
C: [_ is a crumb]; F: [_ was from _]; L: [_ was left]; N: [_ was a note]; s: Santa

3. A card was sent to each customer
each customer is such that (a card was sent to him or her)
$(\forall x$: x is a customer) a card was sent to x
$(\forall x: Cx)$ some card is such that (it was sent to x)
$(\forall x: Cx)\,(\exists y$: y is a card) y was sent to x
$(\forall x: Cx)\,(\exists y: Dy)\,Syx$
C: [_ is a customer]; D: [_ is a card]; S: [_ was sent to _]

Some card is such that (it was sent to each customer) would be true only if there was at least one card that was sent to all customers, so an analysis of it would not be a correct answer

4. At most one size was left
¬ at least two sizes were left
¬ at least two sizes are such that (they were left)
¬ $(\exists x$: x is a size) $(\exists y$: y is a size ∧ ¬ y = x) (x was left ∧ y was left)
$\neg (\exists x: Sx)\,(\exists y: Sy \land \neg\, y = x)\,(Lx \land Ly)$
S: [_ is a size]; L: [_ was left]

also correct: $(\forall x: Sx)\,(\forall y: Sy \land \neg\, y = x)\,\neg (Lx \land Ly)$
also correct: $(\forall x: Sx \land Lx)\,(\forall y: Sy \land Ly)\,x = y$

5. *Using Russell's analysis:*

Ann found the note that Bill left

the note that Bill left is such that (Ann found it)

(∃x: x is a note that Bill left ∧ only x is a note that Bill left) Ann found x

(∃x: (x is a note ∧ Bill left x) ∧ (∀y: ¬ y = x) ¬ (y is a note ∧ Bill left x)) Fax

(∃x: (Nx ∧ Lbx) ∧ (∀y: ¬ y = x) ¬ (Ny ∧ Lby)) Fax

also correct: (∃x: (Nx ∧ Lbx) ∧ ¬ (∃y: ¬ y = x) (Ny ∧ Lby)) Fax

also correct: (∃x: (Nx ∧ Lbx) ∧ (∀y: Ny ∧ Lby) x = y) Fax

Using the description operator:

Ann found the note that Bill left

[_ found _] Ann (the note that Bill left)

Fa(lx x is note that Bill left)

Fa(lx (x is a note ∧ Bill left x))

Fa(lx (Nx ∧ Lbx))

F: [_ found _]; L: [_ left _]; N: [_ is a note]; a: Ann; b: Bill

6.

	∃x (Fx ∧ Gx)	1
	∀x (Gx → Hx)	a: 3
	ⓐ Fa ∧ Ga	2
2 Ext	Fa	
2 Ext	Ga	(4)
3 UI	Ga → Ha	4
4 MPP	Ha	(5)
5 EG	∃x Hx	X,6
	●	
6 QED	∃x Hx	1
1 Pch	∃x Hx	

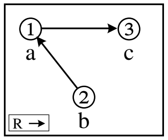
Many different orders are possible for the rules used. In particular, NcP could be used before PCh in the second.

or

	∃x (Fx ∧ Gx)	1
	∀x (Gx → Hx)	a: 3
	ⓐ Fa ∧ Ga	2
2 Ext	Fa	
2 Ext	Ga	(4)
3 UI	Ga → Ha	4
4 MPP	Ha	(7)
	∀x ¬ Hx	a: 6
6 UI	¬ Ha	(7)
	●	
7 Nc	⊥	5
5 NcP	∃x Hx	1
1 PCh	∃x Hx	

7.

	∃x ∃y (Rxa ∧ Ray)	1
	ⓑ ∃y (Rba ∧ Ray)	2
	ⓒ Rba ∧ Rac	3
3 Ext	Rba	
3 Ext	Rac	
	∀x ¬ Rxx	a:5, b:6, c:7
5 UI	¬ Raa	
6 UI	¬ Rbb	
7 UI	¬ Rcc	
	○	Rba, Rac, ¬ Raa, ¬ Rbb, ¬ Rcc ⊭ ⊥
	⊥	4
4 NcP	∃x Rxx	2
2 PCh	∃x Rxx	1
1 PCh	∃x Rxx	



range: 1, 2, 3

a	b	c
1	2	3

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

8. A pair of sentences φ and ψ are logically equivalent if and only if there is no possible world in which φ and ψ have different truth values

or

A pair of sentences φ and ψ are logically equivalent if and only if φ and ψ have the same truth value as each other in every possible world

9. Ann wrote to Bill and he called her

Ann and Bill are such that (she wrote to him and he called her)

$[x \text{ wrote to } y \text{ and } y \text{ called } x]_{xy}$ Ann Bill

$[x \text{ wrote to } y \wedge y \text{ called } x]_{xy}ab$

$[Wxy \wedge Cyx]_{xy}ab$

C: [_ called _]; W: [_ wrote to _]; a: Ann; b: Bill

Phi 270 F05 test 5

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. Notice the special instructions given for each of **1**, **2**, and **3**.

1. A bell rang. [Give an analysis using a restricted quantifier, and restate it using an unrestricted quantifier.]

2. There was a storm but no flight was delayed. [Avoid using ∀ in your analysis of any quantifier phrases in this sentence.]

3. Everyone was humming a tune. [On one way of understanding this sentence, it would be false if people were humming different tunes. Analyze it according to that interpretation.]

4. Tom saw at least two snowflakes.

Analyze the sentence below using each of the two ways of analyzing the definite description. That is, give an analysis that uses Russell's treatment of definite descriptions as quantifier phrases as well as one that uses the description operator.

5. Ann saw the play.

Use a derivation to show that the following argument is valid. You may use any rules.

6. ∃x (Fa → Gx)
―――――
Fa → ∃x Gx

Use a derivation to show that the following argument is not valid, and use either a diagram or tables to present a counterexample that divides an open gap of your derivation.

7. ∃x Fx
∃x Rxa
―――――
∃x (Fx ∧ Rxa)

Complete the following to give a definition of inconsistency in terms of truth values and possible worlds:

8. A set Γ of sentences is inconsistent (in symbols, Γ ⊨ or, equivalently, Γ ⊨ ⊥) if and only if …

Complete the following truth table for the two rows shown. In each row, indicate the value of each compound component of the sentence on the right by writing the value under the main connective of that component (so, in each row, every connective should have a value under it); also circle the value that is under the main connective of the whole sentence.

9.

A	B	C	D	(A → ¬ C) ∧ ¬ (B ∨ D)
T	F	F	F	
F	F	T	T	

Phi 270 F05 test 5 answers

1. A bell rang

Some bell is such that (it rang)

(∃x: x is a bell) x rang

(∃x: Bx) Rx

∃x (Bx ∧ Rx)

B: [_ is a bell]; R: [_ rang]

2. There was a storm but no flight was delayed

There was a storm ∧ no flight was delayed

Something was a storm ∧ ¬ some flight was delayed

Something is such that (it was a storm) ∧ ¬ some flight is such that (it was delayed)

∃x x was a storm ∧ ¬ (∃x: x is a flight) x was delayed

∃x Sx ∧ ¬ (∃x: Fx) Dx

D: [_ was delayed]; F: [_ is a flight]; S: [_ was a storm]

3. Everyone was humming a tune

Some tune is such that (everyone was humming it)

(∃x: x is a tune) everyone was humming x

(∃x: Tx) everyone is such that (he or she was humming x)

(∃x: Tx) (∀y: y is a person) (y was humming x)

(∃x: Tx) (∀y: Py) Hyx

H: [_ was humming _]; P: [_ is a person]; T: [_ is a tune]

Everyone is such that (he or she was humming a tune) could be true even though people were humming different tunes, so an analysis of it would not be a correct answer.

4. Tom saw at least two snowflakes

At least two snowflakes are such that (Tom saw them)

(∃x: x is a snowflake) (∃y: y is a snowflake ∧ ¬ y = x) (Tom saw x ∧ Tom saw y)

(∃x: Fx) (∃y: Fy ∧ ¬ y = x) (Stx ∧ Sty)

F: [_ is a snowflake]; S: [_ saw _]; t: Tom

5. *Using Russell's analysis:*

Ann saw the play

The play is such that (Ann saw it)

(∃x: x is a play ∧ (∀y: ¬ y = x) ¬ y is a play) Ann saw x

(∃x: Px ∧ (∀y: ¬ y = x) ¬ Py) Sax

also correct:

(∃x: Px ∧ ¬ (∃y: ¬ y = x) Py) Sax

or:

(∃x: Px ∧ (∀y: Py) x = y) Sax

Using the description operator:

Ann saw the play

S Ann the play

Sa (Ix x is a play)

Sa(Ix Px)

P: [_ is a play]; S: [_ saw _]; a: Ann

6.

	∃x (Fa → Gx)	2
	Fa	(3)
	ⓑ Fa → Gb	3
3 MPP	Gb	(4)
4 EG	∃x Gx	X,(5)
	●	
5 QED	∃x Gx	2
2 PCh	∃x Gx	1
1 CP	Fa → ∃x Gx	

or

	∃x (Fa → Gx)	2
	Fa	(3)
	ⓑ Fa → Gb	3
3 MPP	Gb	(6)
	∀x ¬ Gx	b:5
5 UI	¬ Gb	(6)
	●	
6 Nc	⊥	4
4 NcP	∃x Gx	2
2 PCh	∃x Gx	1
1 CP	Fa → ∃x Gx	

The order of CP and PCh can be reversed in these and the use of MPP in the second could come after NcP and UI.

7.

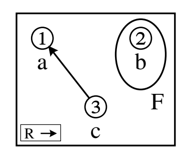
	∃x Fx	1
	∃x Rxa	2
	ⓑ Fb	(5)
	ⓒ Rca	(7)
	∀x ¬ (Fx ∧ Rxa)	b:4, c:6, a:8
4 UI	¬ (Fb ∧ Rba)	5
5 MPT	¬ Rba	
6 UI	¬ (Fc ∧ Rca)	7
7 MPT	¬ Fc	
8 UI	¬ (Fa ∧ Raa)	9
	¬ Fa	
	○	Fb,Rca,¬Rba,¬Fc,¬Fa ⊭ ⊥
	⊥	11
11 IP	Fa	10
	¬ Raa	
	○	Fb,Rca,¬Rba,¬Fc,¬Raa ⊭ ⊥
	⊥	12
12 IP	Raa	10
10 Cnj	Fa ∧ Raa	9
9 CR	⊥	3
3 NcP	∃x (Fx ∧ Rxa)	2
2 PCh	∃x (Fx ∧ Rxa)	1
1 PCh	∃x (Fx ∧ Rxa)	

range: 1, 2, 3

a	b	c
1	2	3

τ	Fτ
1	F
2	T
3	F

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



This interpretation divides both gaps; the value for F1 is needed only for the first gap and the value for R11 is needed only for the second.

8. A set Γ of sentences is inconsistent if and only if there is no possible world in which all members of Γ are true

or

A set Γ of sentences is inconsistent if and only if, in each possible world, at least one member of Γ is false

9.

A	B	C	D	(A → ¬ C) ∧ ¬ (B ∨ D)
T	F	F	F	T T Ⓣ T F
F	F	T	T	T F Ⓕ F T

Phi 270 F04 test 5

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. Notice the special instructions given for **1** and **3**.

1. Someone was singing [Present your analysis also using an unrestricted quantifier.]

2. There is a package that isn't addressed to anyone.

3. An airline served each airport. [This sentence is ambiguous. On one way of interpreting it, it could be true even if no one airline served all airports. Analyze the sentence according to that interpretation of it.]

4. At least two people called.

Analyze the sentence below using each of the two ways of analyzing the definite description the sleigh Santa drove. That is, give an analysis that uses Russell's treatment of definite descriptions as quantifier phrases and another analysis that uses the description operator.

5. The sleigh Santa drove was red.

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

6. ∃x (Fx ∧ Gx)

———————

∃x Gx

7. ∃x (Fx ∧ ∃y Rxy)

———————

∃x ∃y (Fy ∧ Ryx)

Complete the following to give a definition of entailment in terms of truth values and possible worlds:

8. A sentence φ is entailed by a set Γ (i.e., Γ ⊨ φ) if and only if …

Complete the following truth table for the two rows shown. Indicate the value of each component of the sentence on the right by writing the value under the main connective of that component.

9.

A	B	C	D	¬ (A ∧ B) → (¬ C ∨ D)
T	T	F	F	
F	F	T	F	

Use either tables or a diagram to describe a structure in which the following sentences are true. (That is, do what would be required to present a counterexample when a dead-end gap of a derivation had these sentences as its active resources.)

10. a = c, fa = fb, ¬ Ga, Gb, G(fc), Ra(fb), Rb(fa)

Phi 270 F04 test 5 answers

1. Someone was singing
Someone is such that (he or she was singing)
(∃x: x is a person) x was singing
(∃x: Px) Sx
∃x (Px ∧ Sx)
P: [_ is a person]; S: [_ was singing]

2. There is a package that isn't addressed to anyone
Something is a package that isn't addressed to anyone
∃x x is a package that isn't addressed to anyone
∃x (x is a package ∧ x isn't addressed to anyone)
∃x (Kx ∧ ¬ x is addressed to someone)
∃x (Kx ∧ ¬ someone is such that (x is addressed to him or her))
∃x (Kx ∧ ¬ (∃y: y is a person) x is addressed to y)
∃x (Kx ∧ ¬ (∃y: Py) Axy)
or: ∃x (Kx ∧ (∀y: Py) ¬ Axy)
A: [_ is addressed to _]; K: [_ is a package]; P: [_ is a person]

3. An airline served each airport
Every airport is such that (an airline served it)
(∀x: x is an airport) an airline served x
(∀x: Ax) some airline is such that (it served x)
(∀x: Ax) (∃y: y is an airline) y served x
(∀x: Ax) (∃y: Ly) Syx
P: [_ is an airport]; L: [_ is an airline]; S: [_ served _]
(∃x: Lx) (∀y: Ay) Sxy would be incorrect since it is true only if there is a single airline that serves all airports

4. At least two people called
At least two people are such that (they called)
(∃x: x is a person) (∃y: y is a person ∧ ¬ y = x) (x called ∧ y called)
(∃x: Px) (∃y: Py ∧ ¬ y = x) (Cx ∧ Cy)
C: [_ called]; P: [_ is a person]

5. Using Russell's analysis:
The sleigh Santa drove was red
The sleigh Santa drove is such that (it was red)
(∃x: x is a sleigh Santa drove ∧ (∀y: ¬ y = x) ¬ y is a sleigh Santa drove) x was red
(∃x: (x is a sleigh ∧ Santa drove x) ∧ (∀y: ¬ y = x) ¬ (y is a sleigh ∧ Santa drove y)) x was red
(∃x: (Sx ∧ Dsx) ∧ (∀y: ¬ y = x) ¬ (Sy ∧ Dsy)) Rx
Using the description operator:
<u>The sleigh Santa drove</u> was red
R (the thing such that (it is a sleigh Santa drove))
R (lx x is a sleigh Santa drove)
R (lx (x is a sleigh ∧ Santa drove x))
R(lx (Sx ∧ Dsx))
D: [_ drove _]; R: [_ was red]; S: [_ is a sleigh]; s: Santa

6.

	∃x (Fx ∧ Gx)	1
	ⓐ Fa ∧ Ga	2
2 Ext	Fa	
2 Ext	Ga	(3)
3 EG	∃x Gx	X, (4)
	●	
4 QED	∃x Gx	1
1 PCh	∃x Gx	

or

	∃x (Fx ∧ Gx)	1
	ⓐ Fa ∧ Ga	2
2 Ext	Fa	
2 Ext	Ga	(5)
	∀x ¬ Gx	a: 4
4 UI	¬ Ga	(5)
	●	
5 Nc	⊥	3
3 NcP	∃x Gx	1
1 PCh	∃x Gx	

7.

	∃x (Fx ∧ ∃y Rxy)	1
	ⓐ Fa ∧ ∃y Ray	2
2 Ext	Fa	(4)
2 Ext	∃y Ray	3
	ⓑ Rab	(4)
4 Adj	Fa ∧ Rab	X, (5)
5 EG	∃y (Fy ∧ Ryb)	X, (6)
6 EG	∃x ∃y (Fy ∧ Ryx)	X, (7)
	●	
7 QED	∃x ∃y (Fy ∧ Ryx)	3
3 PCh	∃x ∃y (Fy ∧ Ryx)	1
1 PCh	∃x ∃y (Fy ∧ Ryx)	

or

	∃x (Fx ∧ ∃y Rxy)	1
	ⓐ Fa ∧ ∃y Ray	2
2 Ext	Fa	(9)
2 Ext	∃y Ray	
	ⓑ Rab	(10
	∀x ¬ ∃y (Fy ∧ Ryx)	b: 5
5 UI	¬ ∃y (Fy ∧ Ryb)	6
	∀y ¬ (Fy ∧ Ryb)	a :8
8 UI	¬ (Fa ∧ Rab)	9
9 MPT	¬ Rab	(10
	●	
10 Nc	⊥	7
7 NcP	∃y (Fy ∧ Ryb)	6
6 CR	⊥	4
4 NcP	∃x ∃y (Fy ∧ Ryx)	3
3 PCh	∃x ∃y (Fy ∧ Ryx)	1
1 PCh	∃x ∃y (Fy ∧ Ryx)	

8. A sentence φ is entailed by a set Γ if and only if there is no possible world in which φ is false while all members of Γ are true

or: A sentence φ is entailed by a set Γ if and only φ is true in every possible world in which all members of Γ are true

9.

A B C D	¬ (A ∧ B) → (¬ C ∨ D)
T T F F	F T Ⓣ T T
F F T F	T F Ⓕ F F

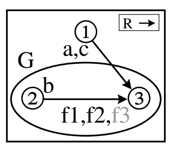
10. range: 1, 2, 3

a	b	c
1	2	1

τ	fτ
1	3
2	3
3	3

τ	Gτ
1	F
2	T
3	T

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



(The diagram provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
c		c: 1
b	2	b: 2
fa	3	f1: 3
fb		f2: 3
fc		f1: 3

resources	*values*
¬ Ga	G1: **F**
Gb	G2: **T**
G(fc)	G3: **T**
Ra(fb)	R13: **T**
Rb(fa)	R23: **T**

Phi 270 F03 test 5

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. Notice theadditional instructions given for the first.

1. Tom sent something to Sue

2. Everyone heard a sound. [This is ambiguous but you need only analyze one interpretation; justchoose the one that seems most natural to you.]

3. There is someone who knows just one other person.

Analyze the sentence below using each of the two ways of analyzing the definite description the package. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. The package rattled.

Use derivations to show that the following argument is valid. You may use any rules.

5.
∃x Fx
∀x Gx
―――――
∃x (Fx ∧ Gx)

Use a derivation to show that the following argument is not valid and use either tables or a diagram to describe a structure dividing an open gap.

6.
∃x ∀y Rxy
―――――
∃x Rax

Complete the following to give a definition of equivalence in terms of truth values and possible worlds:

7. A sentence φ is equivalent to a sentence ψ (i.e., φ ≃ ψ) if and only if …

Answer the following question and explain your answer in terms of the definitions of the basic concepts it involves.

8. Suppose you are told that (i) φ ⊨ ψ and (ii) ψ is inconsistent with χ (i.e., the set formed of the two is inconsistent). What can you conclude about the relation between of φ and χ? That is, what patterns of truth values for the two are ruled out (if any are); and, if any are ruled out, what logical relation or relations holds as a result.

Complete the following truth table by calculating the truth value of the sentence on each of the given assignments. In each row, write under each connective the value of the component of which it is the main connective and circle the truth value of the sentence as a whole.

9.

A	B	C	D	(A ∧ ¬ B) ∨ ¬ (C → D)
T	T	T	T	
F	F	T	F	

Phi 270 F03 test 5 answers

1. Tom sent something to Sue

∃x Tom sent x to Sue

∃x Ntxs

C: [_ sent _ to _]; s: Sue; t: Tom

2. Everyone heard a sound

(∃x: x is a sound) everyone heard x

(∃x: x is a sound) (∀y: y is a person) y heard x

(∃x: Sx) (∀y: Py) Hyx

H: [_ heard _]; P: [_ is a person]; S: [_ is a sound]

3. There is someone who knows just one other person

∃x x is a person who knows just one other person

∃x (x is a person ∧ x knows just one other person)

∃x (Px ∧ (∃y: Py ∧ ¬ y = x) x knows y and no other person besides y)

∃x (Px ∧ (∃y: Py ∧ ¬ y = x) (Kxy ∧ x knows no other person besides y))

∃x (Px ∧ (∃y: Py ∧ ¬ y = x) (Kxy ∧ (∀z: Pz ∧ ¬ z = x ∧ ¬ z = y) ¬ Kxz))

or: ∃x (Px ∧ (∃y: Py ∧ ¬ y = x) (Kxy ∧ (∀z: Pz ∧ ¬ z = x ∧ Kxz) y = z))

K: [_ knows _]; P: [_ is a person]

4. *using Russell's analysis:*

The package rattled

(∃x: x and only x is a package) x rattled

(∃x: x is a package ∧ (∀y: ¬ y = x) ¬ y is a package) Rx

(∃x: Px ∧ (∀y: ¬ y = x) ¬ Py) Rx

or: (∃x: Px ∧ (∀y: Py) x = y) Rx

using the description operator:

The package rattled

R(the package)

R (lx x is a package)

R(lx Px)

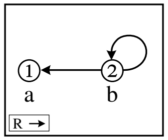
P: [_ is a package]; r: [_ rattled]

5.

	∃x Fx	1
	∀x Gx	a: 2
	ⓐ	
	Fa	(3)
2 UI	Ga	(3)
3 Adj	Fa ∧ Ga	X, (4)
4 EG	∃x (Fx ∧ Gx)	X, (5)
	●	
5 QED	∃x (Fx ∧ Gx)	1
1 PCh	∃x (Fx ∧ Gx)	

6.

	∃x ∀y Rxy	1
	ⓑ	
	∀y Rby	a:3, b:4
	∀x ¬ Rax	a:5, b:6
3 UI	Rba	
4 UI	Rbb	
5 UI	¬ Raa	
6 UI	¬ Rab	
	○	Rba,Rbb,¬Raa,¬Rab ⊭ ⊥
	⊥	2
2 NcP	∃x Rax	1
1 PCh	∃x Rax	



7. φ and ψ are equivalent if and only if there is no possible world in which they have different truth values (or: if and only, in every possible world, each has the same value as the other)

8. φ and χ are inconsistent. That is, φ and χ cannot be both true because ψ will be true when φ is, and ψ and χ cannot be both true. Other patterns of values for φ and χ are possible because they are not ruled out for ψ and χ by the fact that they are inconsistent and, for all weknow, φ and ψ may be equivalent.

9.

A	B	C	D	(A ∧	¬ B)	∨	¬	(C → D)
T	T	T	T	F	F	Ⓕ	F	T
F	F	T	F	F	T	Ⓣ	T	F

Phi 270 F02 test 5

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. Notice the additional instructions given for the first.

1. Al received a card that made him laugh [Give this analysis also using an unrestricted quantifier.]

2. There is a toy that every child wanted

3. Santa left at least two packages

Analyze the sentence below using each of the two ways of analyzing the definite description the battery. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. The battery is dead

Use derivations to show that the following argument is valid. You may use any rules.

5. $\exists x\,(Fx \land Gx)$

$\exists x\,(Gx \land Fx)$

Use a derivation to show that the following argument is not valid and use either tables or a diagram to describe a structure dividing an open gap.

6. $\exists x\,\exists y\,Rxy$

$\exists x\,Rax$

Complete the following to give a definition of entailment in terms of truth values and possible worlds:

7. A set Γ entails a sentence φ (i.e., $\Gamma \vDash \varphi$) if and only if …

Complete the following truth table by calculating the truth value of the sentence on the given assignment. Show the value of each component by writing it under the main connective of that component, and circle the truth value of the sentence as a whole.

8.

A	B	C	D	$(A \to B) \land \neg (C \lor \neg D)$
T	F	F	T	

Give at least two restatements of the following sentence as an expansion on a term appearing in it (i.e., as an abstract applied to such a term):

9. Raba

Phi 270 F02 test 5 answers

1. Al received a card that made him laugh
some card that made Al laugh is such that (Al received it)
($\exists$x: x is a card that made Al laugh) Al received x
($\exists$x: x is a card $\land$ x made Al laugh) Rax
$(\exists x: Cx \land Lxa)\ Rax$
$\exists x\,((Cx \land Lxa) \land Rax)$
C: [_ is a card]; L: [_ made _ laugh]; R: [_ received _]; a: Al

2. There is a toy that every child wanted
Something is a toy that every child wanted
Something is such that (it is a toy that every child wanted)
$\exists$x x is a toy that every child wanted
$\exists$x (x is a toy $\land$ every child wanted x)
$\exists$x (Tx $\land$ every child is such that (he or she wanted x))
$\exists$x (Tx $\land$ ($\forall$y: y is a child) y wanted x)
$\exists x\,(Tx \land (\forall y: Cy)\ Wyx)$
C: [_ is a child]; T: [_ is a toy]; W: [_ wanted _]

3. Santa left at least two packages
at least two packages are such that (Santa left them)
($\exists$x: x is a package) ($\exists$y: y is a package $\land \neg$ y = x) (Santa left x $\land$ Santa left y)
$(\exists x: Px)\ (\exists y: Py \land \neg\, y = x)\ (Lsx \land Lsy)$
L: [_ left _]; P: [_ is a package]; s: Santa

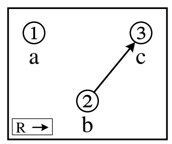
4. *using Russell's analysis:*
The battery is dead
The battery is such that (it is dead)
($\exists$x: x and only x is a battery) x is dead
($\exists$x: x is a battery $\land$ ($\forall$y: $\neg$ y = x) $\neg$ y is a battery) x is dead
$(\exists x: Bx \land (\forall y: \neg\, y = x)\ \neg By)\ Dx$
or: $(\exists x: Bx \land (\forall y: By)\ x = y)\ Dx$
B: [_ is a battery]; D: [_ is dead]
using the description operator:
The battery is dead
D the battery
D(lx x is a battery)
D(lx Bx)

5.

	$\exists x\,(Fx \wedge Gx)$	1
	ⓐ $Fa \wedge Ga$	2
2 Ext	Fa	(6)
2 Ext	Ga	(5)
	$\forall x\, \neg (Gx \wedge Fx)$	a:4
4 UI	$\neg (Ga \wedge Fa)$	5
5 MPT	$\neg Fa$	(6)
	●	
6 Nc	$\bot$	3
3 NcP	$\exists x\,(Gx \wedge Fx)$	1
1 PCh	$\exists x\,(Gx \wedge Fx)$	

6.

	$\exists x\, \exists y\, Rxy$	1
	ⓑ $\exists y\, Rby$	2
	ⓒ Rbc	
	$\forall x\, \neg Rax$	a:4, b:5, c:6
4 UI	$\neg Raa$	
5 UI	$\neg Rab$	
6 UI	$\neg Rac$	
	○	$Rbc, \neg Raa, \neg Rab, \neg Rac \nvDash \bot$
	$\bot$	3
3 NcP	$\exists x\, Rax$	2
2 PCh	$\exists x\, Rax$	1
1 PCh	$\exists x\, Rax$	



7. A set Γ entails a sentence φ if and only if there is no possible world in which every member of Γ is true but φ is false (*or:* if and only if φ is true in every possible world in which all members of Γ are true)

8.

A	B	C	D	(A → B)	∧	¬	(C ∨	¬ D)
T	F	F	T	F	Ⓕ	T	F	F

9. Up to the choice of variables, the possibilities are the following:

$[Rabx]_x a$, $[Rxba]_x a$, $[Rxbx]_x a$, $[Raxa]_x b$

Phi 270 F00 test 5

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. Notice the additional instructions given for each of the first two.

1. There is a yak that someone yoked. [Give this analysis also using an unrestricted quantifier.]

2. Each explorer mapped a route. [This sentence is ambiguous. Analyze it in two nonequivalent ways, and describe a situation in which the sentence is true on one of your analyses and false on the other.]

3. Exactly one reindeer was red nosed. [You may leave the predicate _ was red nosed unanalyzed.]

Analyze the sentence below using each of the two ways of analyzing the definite description the fireplace. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. Santa gained entry through the fireplace.

Use derivations to show that the following argument is valid. You may use any rules.

5. $\exists x\, \forall y\, (Fy \to Rxy)$
———
$\forall x\, (Fx \to \exists y\, Ryx)$

That is: Something is relevant to all findings / Each finding has something relevant to it [Don't hesitate to ignore this English reading if it doesn't help you think about the argument.]

Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

6. $\exists x\, \exists y\, (\neg\, y = x \wedge Rxy)$
———
$\exists x\, \neg Rxx$

Complete the following to give a definition of inconsistency in terms of truth values and possible worlds:

7. A set Γ is inconsistent if and only if …

Complete the following truth table by calculating the truth value of the sentence on the given assignment. Show the value of each component by writing it under the main connective of that component.

8.

A	B	C	D	(A ∨ ¬ B) ∧ ¬ (C → D)
T	F	T	F	

Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the sentences below all true. (You may use either tables or a diagram.)

9. a = c, fc = b, d = e, Fc, Fd, ¬ Fb, Rab, Rea, R(fa)b, ¬ Re(fc)

Phi 270 F00 test 5 answers

1. There is a yak that someone yoked
something is a yak that someone yoked
something is such that (it is a yak that someone yoked)
∃x x is a yak that someone yoked
∃x (x is a yak ∧ someone yoked x)
∃x (Yx ∧ someone is such that (he or she yoked x))
∃x (Yx ∧ (∃y: y is a person) y yoked x)

$\exists x\,(Yx \wedge (\exists y{:}\ Py)\,Kyx)$

$\exists x\,(Yx \wedge \exists y\,(Py \wedge Kyx))$

K: [_ yoked _]; P: [_ is a person]; Y: [_ is a yak]

2. *first analysis:*
Each explorer mapped a route
each explorer is such (he or she mapped a route)
(∀x: x is an explorer) x mapped a route
(∀x: Ex) some route is such that (x mapped it)
(∀x: Ex) (∃y: y is a route) x mapped y

$(\forall x{:}\ Ex)\,(\exists y{:}\ Ry)\,Mxy$

second analysis:
Each explorer mapped a route
some route is st (each explorer mapped it)
(∃x: x is a route) each explorer mapped x
(∃x: Rx) each explorer is such that (he or she mapped x)
(∃x: Rx) (∀y: y is an explorer) y mapped x

$(\exists x{:}\ Rx)\,(\forall y{:}\ Ey)\,Myx$

P: [_ is an explorer]; M: [_ mapped _]; R: [_ is a route]
The first is true and the second false if every explorer mapped some route or other but no one route was mapped by all explorers

3. Exactly one reindeer was red nosed
at least one reindeer was red nosed ∧ ¬ at least two reindeer were red nosed
some reindeer is such that (it was red nosed) ∧ ¬ at least two reindeer were such that (they were red nosed)
(∃x: x is a reindeer) x was red nosed ∧ ¬ (∃x: x is a reindeer) (∃y: y is a reindeer ∧ ¬ y = x) (x was red nosed ∧ y was red nosed)

$(\exists x{:}\ Rx)\,Nx \wedge \neg\,(\exists x{:}\ Rx)\,(\exists y{:}\ Ry \wedge \neg\, y = x)\,(Nx \wedge Ny)$

or:
Exactly one reindeer was red nosed
some reindeer is such that (it was red nosed and no other reindeer was red nosed)
(∃x: x is a reindeer) (x was red nosed and no other reindeer was red nosed)
(∃x: Rx) (Nx ∧ no reindeer other than x was red nosed)
(∃x: Rx) (Nx ∧ no reindeer other than x is such that (it was red nosed)
(∃x: Rx) (Nx ∧ (∀y: y is a reindeer ∧ ¬ y = x) ¬ y was red nosed)

$(\exists x{:}\ Rx)\,(Nx \wedge (\forall y{:}\ Ry \wedge \neg\, y = x)\,\neg Ny)$

or: $(\exists x{:}\ Rx)\,(Nx \wedge (\forall y{:}\ Ry \wedge Ny)\,x = y)$

N: [_ was red nosed]; R: [_ is a reindeer]
The generalization using the variable y must be resricted to reindeer or else the sentence will say that some reindeer is the only and only thing that is red nosed—i.e., that there is exactly one red-nosed thing and it is a reindeer.

4. *using Russell's analysis:*
Santa gained entry through the fireplace
the fireplace is such that (Santa gained entry through it)
(∃x: x and only x is a fireplace) Santa gained entry through x
(∃x: x is a fireplace ∧ (∀y: ¬ y = x) ¬ y is a fireplace) Gsx

$(\exists x{:}\ Fx \wedge (\forall y{:}\ \neg\, y = x)\,\neg Fy)\,Gsx$

or: $(\exists x{:}\ Fx \wedge (\forall y{:}\ Fy)\,x = y)\,Gsx$

using the description operator:
Santa gained entry through the fireplace
G s (the fireplace)
G s (Ix x is a fireplace)

Gs(Ix Fx)

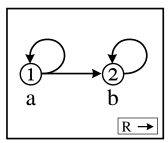
F: [_ is a fireplace]; G: [_ gained entry through _]; s: Santa

5.

	∃x ∀y (Fy → Rxy)	
	ⓐ ∀y (Fy → Ray)	b:4
	ⓑ Fb	(5)
4 UI	Fb → Rab	5
5 MPP	Rab	(6)
6 EG	∃y Ryb	X, (7)
	●	
7 QED	∃y Ryb	3
3 CP	Fb → ∃y Ryb	2
2 UG	∀x (Fx → ∃y Ryx)	1
1 PCh	∀x (Fx → ∃y Ryx)	

6.

	∃x ∃y (¬ y = x ∧ Rxy)	1
	ⓐ ∃y (¬ y = a ∧ Ray)	2
	ⓑ ¬ b = a ∧ Rab	3
3 Ext	¬ b = a	
3 Ext	Rab	
	∀x Rxx	a:5, b:6
5 UI	Raa	
6 UI	Rbb	
	○	¬ b = a, Rab, Raa, Rbb ⊭ ⊥
	⊥	4
4 NcP	∃x ¬ Rxx	2
2 PCh	∃x ¬ Rxx	1
1 PCh	∃x ¬ Rxx	



7. A set Γ is inconsistent if and only if there is no possible world in which every member of Γ is true

8.

A	B	C	D	(A ∨ ¬ B) ∧ ¬ (C → D)
T	F	T	F	T T Ⓣ T F

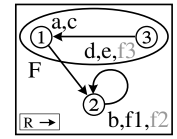
9. range: 1, 2, 3

a	b	c	d	e
1	2	1	3	3

τ	fτ
1	2
2	2
3	3

τ	Fτ
1	T
2	F
3	T

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



(The diagram above provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
c		c: 1
b	2	b: 2
fa		f1: 2
fc		f1: 2
d	3	d: 3
e		e: 3

resources	*values*
Fc	F1: **T**
Fd	F3: **T**
¬ Fb	F2: **F**
Rab	R12: **T**
Rea	R31: **T**
R(fa)b	R22: **T**
¬ Re(fc)	R32: **F**

Phi 270 F99 test 5

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. Notice the additional instructions given for each of the first two.

1. Sam mentioned someone Tina didn't know. [Give this analysis also using an unrestricted quantifier.]
2. Every shoe fit someone. [This sentence is ambiguous. Analyze it in two different ways, and describe a situation in which the sentence is true on one of your interpretations and false on the other.]
3. Sam found at least two pieces.

Analyze the sentence below using each of the two ways of analyzing definite descriptions. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. The elephant standing on Sam sighed.

[The following question was on a topic not covered this year] Put the following sentence into prenex normal form (i.e., into a form which contains no restricted quantifiers and in which no quantifier is in the scope of a connective). Show each step where you move a quantifier past a connective separately.

5. $\neg \forall x\, ((Px \land \exists y\, Rxy) \rightarrow \exists z\, Sxz)$

Use derivations to show that the following argument is valid. You may use attachment rules (but not replacement by equivalence).

6. $\forall x\, \forall y\, (Rxy \rightarrow (Ryx \rightarrow Rxx))$
$\exists x\, \exists y\, (Rxy \land Ryx)$
———
$\exists x\, Fxx$

Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

7. $\exists x\, Fx$
$\exists x\, (Gx \land Hx)$
———
$\exists x\, (Fx \land Hx)$

Complete the following to give a definition of entailment by a single sentence (i.e., implication) in terms of truth values and possible worlds:

8. A sentence φ entails a sentence ψ if and only if …

Complete the following truth table by calculating the truth value of the sentence on the given assignment. Show the value of each component by writing it under the main connective of that component.

9.

A	B	C	D	$\neg (A \land B) \rightarrow (C \lor \neg D)$
T	F	F	T	

Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the sentences below all true. (You may use either tables or a diagram.)

10. $a = fb,\ fb = fc,\ fa = c,\ Pa,\ Pb,\ \neg Pc,\ Rab,\ Rbc,\ Rc(fb)$

Phi 270 F99 test 5 answers

1. Sam mentioned someone Tina didn't know
someone Tina didn't know is such that (Sam mentioned him or her)
(∃x: x is a person Tina didn't know) Sam mentioned x
(∃x: x is a person ∧ ¬ Tina knew x) Sam mentioned x

$(\exists x: Px \land \neg Ktx)\, Msx$

$\exists x\, ((Px \land \neg Ktx) \land Msx)$

K: [_ knew _]; M: [_ mentioned _]; P: [_ is a person]; s: Sam; t: Tina

2. *first analysis:*
Every shoe fit someone
every shoe is such that (it fit someone)
(∀x: x is a shoe) x fit someone
(∀x: Sx) someone is such that (x fit him or her)
(∀x: Sx) (∃y: y is a person) x fit y

$(\forall x: Sx)\, (\exists y: Py)\, Fxy$

second analysis:
Every shoe fit someone
someone is such that (every shoe fit him or her)
(∃x: x is a person) every shoe fit x
(∃x: Px) every shoe is such that (it fit x)
(∃x: Px) (∀y: y is a shoe) y fit x

$(\exists x: Px)\, (\forall y: Sy)\, Fyx$

F: [_ fit _]; P: [_ is a person]; S: [_ is a shoe]
The first is true and the second false if every shoe could be worn but not all by the same person

3. Sam found at least two pieces

at least two pieces are such that (Sam found them)

(∃x: x is a piece) (∃y: y is a piece ∧ ¬ y = x) (Sam found x ∧ Sam found y)

$$(\exists x: Px)(\exists y: Py \wedge \neg y = x)(Fsx \wedge Fsy)$$

F: [_ found _]; P: [_ is a piece]; s: Sam

4. *using Russell's analysis:*

The elephant standing on Sam sighed

The elephant standing on Sam is such that (it sighed)

(∃x: x and only x is an elephant standing on Sam) x sighed

(∃x: x is an elephant standing on Sam ∧ (∀y: ¬ y = x) ¬ y is an elephant standing on Sam) Sx

(∃x: (x is an elephant ∧ x is standing on Sam) ∧ (∀y: ¬ y = x) ¬ (y is an elephant ∧ y is standing on Sam)) Sx

$$(\exists x: (Ex \wedge Txs) \wedge (\forall y: \neg y = x)\neg(Ey \wedge Tys))\, Sx$$

or:

$$(\exists x: (Ex \wedge Txs) \wedge (\forall y: Ey \wedge Tys)\, x = y)\, Sx$$

using the description operator:

The elephant standing on Sam sighed

S (the elephant standing on Sam)

S (ιx x is an elephant standing on Sam)

S (ιx (x is an elephant ∧ x is standing on Sam))

$$S(\iota x\,(Ex \wedge Txs))$$

E: [_ is an elephant]; S: [_ sighed]; T: [_ is standing on _]; s: Sam

5. [The following question was on a topic not covered this year]

$\neg \forall x\, ((Px \wedge \exists y\, Rxy) \to \exists z\, Sxz)$

$\exists x\, \neg ((Px \wedge \exists y\, Rxy) \to \exists z\, Sxz)$

$\exists x\, \neg (\exists y\, (Px \wedge Rxy) \to \exists z\, Sxz)$

$\exists x\, \neg \forall y\, ((Px \wedge Rxy) \to \exists z\, Sxz)$

$\exists x\, \exists y\, \neg ((Px \wedge Rxy) \to \exists z\, Sxz)$

$\exists x\, \exists y\, \neg \exists z\, ((Px \wedge Rxy) \to Sxz)$

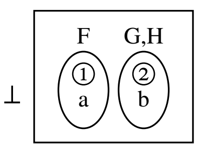
$\exists x\, \exists y\, \forall z\, \neg ((Px \wedge Rxy) \to Sxz)$

6.

	∀x ∀y (Rxy → (Ryx → Rxx))	a:4
	∃x ∃y (Rxy ∧ Ryx)	1
	ⓐ ∃y (Ray ∧ Rya)	2
	ⓑ Rab ∧ Rba	3
3 Ext	Rab	(6)
3 Ext	Rba	(7)
4 UI	∀y (Ray → (Rya → Raa))	b:5
5 UI	Rab → (Rba → Raa)	6
6 MPP	Rba → Raa	7
7 MPP	Raa	(8)
8 EG	∃x Rxx	X, (9)
	●	
9 QED	∃x Rxx	2
2 PCh	∃x Rxx	1
1 PCh	∃x Rxx	

7.

	∃x Fx	1
	∃x (Gx ∧ Hx)	2
	ⓐ Fa	(7)
	ⓑ Gb ∧ Hb	3
3 Ext	Gb	
3 Ext	Hb	(8)
	∀x ¬ (Fx ∧ Hx)	a:5, b:6
5 UI	¬ (Fa ∧ Ha)	7
6 UI	¬ (Fb ∧ Hb)	8
7 MPT	¬ Ha	
8 MPT	¬ Fb	
	○	Fa,Gb,Hb,¬Ha,¬Fb ⊭ ⊥
	⊥	4
4 NcP	∃x (Fx ∧ Hx)	2
2 PCh	∃x (Fx ∧ Hx)	1
1 PCh	∃x (Fx ∧ Hx)	



8. A sentence φ entails a sentence ψ if and only if there is no possible world in which φ is true but ψ is false (*or:* if and only if ψ is true in every possible world in which φ is true)

9.

A	B	C	D	¬ (A ∧ B) → (C ∨ ¬ D)
T	F	F	T	T F Ⓕ F F

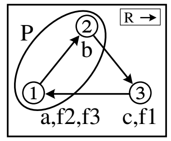
10. range: 1, 2, 3

a	b	c
1	2	3

τ	fτ
1	3
2	1
3	1

τ	Pτ
1	T
2	T
3	F

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



The diagram above provides a complete answer, as do the tables to its left. The tables below illustrate a way of finding this structure.

alias sets	*IDs*	*values*
a	1	a: 1
fb		f2: 1
fc		f3: 1
b	2	b: 2
c	3	c: 3
fa		f1: 3

resources	*values*
Pa	P1: **T**
Pb	P2: **T**
¬ Pc	P3: **F**
Rab	R12: **T**
Rbc	R23: **T**
Rc(fb)	R31: **T**

Phi 270 F98 test 5

(questions from the last of 6 quizzes)

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. George traveled to LA by way of some town in Wyoming. [Give this analysis also using an unrestricted quantifier.]

2. Everyone is afraid of something. [This sentence is ambiguous. Analyze it in two different ways, and describe a situation in which the sentence is true on one of your interpretations and false on the other.]

3. Spot knew exactly one trick.

4. Analyze the sentence below using each of the two ways of analyzing definite descriptions. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

Tom opened the letter from Bulgaria

5. Use derivations to show that the following argument is valid. You may use any rules.

$$\frac{\exists x\,(Fx \land \exists y\, \neg\, x = y)}{\exists x\, \exists y\,(\neg\, y = x \land Fy)}$$

That is: Some finding is different from something ⊨ Something is such that something different from it is a finding [but don't hesitate to ignore the English if it doesn't help].

6. Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

$$\frac{\exists x\, \exists y\, Rxy}{\exists x\, Rxx}$$

7. Complete the following to give a definition of equivalence in terms of truth values and possible worlds:

A sentence φ is equivalent to a sentence ψ if and only if …

8. Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the 8 sentences at the left below all true.

fab = fba, ga = fab, fba = c, Fb, F(ga), Rab, ¬ Rba, R(ga)c

9. [This question was on a topic not covered this year]

Use replacement by equivalence to put the following sentence into disjunctive normal form. Show how you reach your result; you may combine uses of associativity and commutativity with other principles in a single step but there should be no more than one use of De Morgan's laws or distributivity in each step.

¬ ((A ∧ B) ∨ (C ∨ D))

Phi 270 F98 test 5 answers

1. George traveled to LA by way of some town in Wyoming

some town in Wyoming is such that (George traveled to LA by way of it)

(∃x: x is a town in Wyoming) George traveled to LA by way of x

(∃x: x is a town ∧ x is in Wyoming) George traveled to LA by way of x

(∃x: Tx ∧ Nxm) Rglx

∃x ((Tx ∧ Nxm) ∧ Rglx)

N: [_ is in _]; R: [_ traveled to _ by way of _]; T: [_ is a town]; g: George; l: LA; m: Wyoming

2. *first analysis:*

Everyone is afraid of something

everyone is such that (he or she is afraid of something)

(∀x: x is a person) x is afraid of something

(∀x: Px) something is such that (x is afraid of it)

(∀x: Px) ∃y x is afraid of y

(∀x: Px) ∃y Axy

second analysis:

Everyone is afraid of something

something is such that (everyone is afraid of it)

∃x everyone is afraid of x

∃x everyone is such that (he or she is afraid of x)

∃x (∀y: y is a person) y is afraid of x

∃x (∀y: Py) Ayx

A: [_ is afraid of _]; P: [_ is a person]

The first is true and the second false if all people are fearful but not all fearful of the same thing

3. Spot knew exactly one trick

Spot knew a trick ∧ ¬ Spot knew at least two tricks

(∃ x: x is a trick) Spot knew x ∧ ¬ (∃ x: x is a trick) (∃ y: y is a trick ∧ ¬ y = x) (Spot knew x ∧ Spot knew y)

(∃ x: Tx) Ksx ∧ ¬ (∃ x: Tx) (∃ y: Ty ∧ ¬ y = x) (Ksx ∧ Ksy)

or: (∃ x: Tx) (Ksx ∧ (∀ y: Ty ∧ ¬ y = x) ¬ Ksy)

or: (∃ x: Tx) (Ksx ∧ (∀ y: Ty ∧ Ksy) x = y)

K: [_ knew _]; T: [_ is a trick]; s: Spot

4. *using Russell's analysis:*

Tom opened the letter from Bulgaria

the letter from Bulgaria is such that (Tom opened it)

(∃x: x and only x is a letter from Bulgaria) Tom opened x

(∃x: x is a letter from Bulgaria ∧ (∀y: ¬ y = x) ¬ y is a letter from Bulgaria) Otx

(∃x: x is a letter ∧ x is from Bulgaria ∧ (∀y: ¬ y = x) ¬ y is a letter ∧ y is from Bulgaria) Otx

(∃x: (Lx ∧ Fxb) ∧ (∀y: ¬ y = x) ¬ (Ly ∧ Fyb)) Otx

or: (∃x: (Lx ∧ Fxb) ∧ (∀y: Ly ∧ Fyb) x = y) Otx

using the description operator:

Tom opened the letter from Bulgaria

Ot(the letter from Bulgaria)

Ot(lx x is a letter from Bulgaria)

Ot(lx (x is a letter ∧ x is from Bulgaria))

Ot(lx (Lx ∧ Fxb))

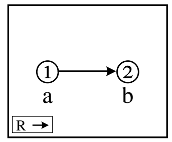
F: [_ is from _]; L: [_ is a letter]; O: [_ opened _]; b: Bulgaria; t: Tom

5.

	∃x (Fx ∧ ∃y ¬ x = y)	1
	ⓐ	
	Fa ∧ ∃y ¬ a = y	2
2 Ext	Fa	(4)
2 Ext	∃y ¬ a = y	3
	ⓑ	
	¬ a = b	(4)
4 Adj	¬ a = b ∧ Fa	X, (5)
5 EG	∃y (¬ y = b ∧ Fy)	X, (6)
6 EG	∃x ∃y (¬ y = x ∧ Fy)	X, (7)
	●	
7 QED	∃x ∃y (¬ y = x ∧ Fy)	3
3 PCh	∃x ∃y (¬ y = x ∧ Fy)	1
1 PCh	∃x ∃y (¬ y = x ∧ Fy)	

6.

	∃x ∃y Rxy	1
	ⓐ ∃y Ray	2
	ⓑ Rab	
	∀x ¬ Rxx	a:4,b:5
4 UI	¬ Raa	
5 UI	¬ Rbb	
	○	Rab, ¬Raa, ¬Rbb ⊭ ⊥
	⊥	3
3 NcP	∃x Rxx	2
2 PCh	∃x Rxx	1
1 PCh	∃x Rxx	



7. A sentence φ is equivalent to a sentence ψ if and only if there is no possible world in which φ and ψ have different truth values

8. range: 1, 2, 3

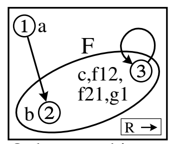
a	b	c
1	2	3

f	1	2	3
1	1	3	1
2	3	1	1
3	1	1	1

τ	gτ
1	3
2	1
3	1

τ	Fτ
1	F
2	T
3	T

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



Only non-arbitrary values are shown for f and g

The diagram provides a complete answer, as do the tables to its left. The tables below are a way of finding this structure.

alias sets	*IDs*	*values*
a	1	a: 1
b	2	b: 2
c	3	c: 3
fab		f12: 3
fba		f21: 3
ga		g1: 3

resources	*values*
Fb	F2: **T**
F(ga)	F3: **T**
Rab	R12: **T**
¬ Rba	R21: **F**
R(ga)c	R33: **T**

9. [This question was on a topic not covered this year]

¬ ((A ∧ B) ∨ (C ∨ ¬ D))
≃
¬ (A ∧ B) ∧ ¬ (C ∨ ¬ D)
≃
(¬ A ∨ ¬ B) ∧ (¬ C ∧ D)
≃
(¬ A ∧ ¬ C ∧ D) ∨ (¬ B ∧ ¬ C ∧ D)

Phi 270 F97 test 5

(questions from the last of 6 quizzes)

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. Tom phoned someone who had left a message for him. [Give this analysis also using an unrestricted quantifier.]
2. Santa said something to each child. [This sentence is ambiguous. Analyze it in two different ways, and describe a situation in which the sentence is true on one of your interpretations and false on the other.]
3. Ron asked Santa for at least two things.
4. Analyze the sentence below using each of the two ways of analyzing definite descriptions. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

   Bill lent the book Ann gave him to Carol
5. Use derivations to show that the following argument is valid. You may use any rules.

   ∃x ∃y (Rxy ∧ Sxy)
   ―――――――――
   ∃y ∃x (Sxy ∧ Rxy)
6. Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

   ∃x Rax
   ――――
   ∃x Rxa
7. Complete the following to give a definition of inconsistency in terms of truth values and possible worlds:

   A set Γ is inconsistent if and only if …
8. Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the list of 5 sentences below all true and use it to calculate a truth value for the sentence that follows them. (You may present the structure using either tables or a diagram.)

   make these true: b = ga, fa = f(ga), Rab, R(fa)a, ¬ R(fb)b

   calculate the value: (b = gb ∨ Ra(ga)) → (R(fa)(ga) ∧ f(gb) = g(fb))
9. Give two different restatements of the sentence below in expanded form as a complex predicate (i.e., an abstract) applied to a term.

   ∃y Rayb

Phi 270 F97 test 5 answers

1. Tom phoned someone who had left a message for him
   someone who had left a message for Tom is such that (Tom phoned him or her)
   (∃x: x is a person who had left a message for Tom) Tom phoned x
   (∃x: x is a person ∧ x had left a message for Tom) Htx
   (∃x: Px ∧ some message is such (x had left it for Tom)) Htx
   (∃x: Px ∧ (∃y: y is a message) x had left y for Tom) Htx

$$(\exists x: Px \land (\exists y: My)\ Lxyt)\ Htx$$
$$\exists x\ ((Px \land \exists y\ (My \land Lxyt)) \land Htx)$$

   H: [_ phoned _]; L: [_ had left _ for _]; M: [_ is a message]; P: [_ is a person]; t: Tom

2. *first analysis:*
   each child is such that (Santa said something to him or her)
   (∀x: x is a child) Santa said something to x
   (∀x: Cx) something is such that (Santa said it to x)
   (∀x: Cx) ∃y Santa said y to x

$$(\forall x: Cx)\ \exists y\ Dsyx$$

   second analysis:
   something is such that (Santa said it to each child)
   ∃x Santa said x to each child
   ∃x each child is such that (Santa said x to him or her)
   ∃x (∀y: y is a child) Santa said x to y

$$\exists x\ (\forall y: Cy)\ Dsxy$$

   C: [_ is a child]; D: [_ said _ to _]; s: Santa
   The first is true and the second false if Santa spoke to each child but said different things to different children

3. Ron asked Santa for at least two things
   ∃x (∃y: ¬ y = x) (Ron asked Santa for x ∧ Ron asked Santa for y)

$$\exists x\ (\exists\, y: \neg\, y = x)\ (Arsx \land Arsy)$$

   A: [_ asked _ for _]; r: Ron; s: Santa

4. *using Russell's analysis:*
   Bill lent the book Ann gave him to Carol
   the book Ann gave Bill is such that (Bill lent it to Carol)
   (∃x: x and only x is a book Ann gave Bill) Bill lent x to Carol
   (∃x: x is a book Ann gave Bill ∧ (∀y: ¬ y = x) ¬ y is a book Ann gave Bill) Lbxc
   (∃x: (x is a book ∧ Ann gave Bill x) ∧ (∀y: ¬ y = x) ¬ (y is a book ∧ Ann gave Bill y)) Lbxc

$$(\exists x: (Bx \land Gabx) \land (\forall y: \neg\, y = x)\ \neg\, (By \land Gaby))\ Lbxc$$

or:

$$(\exists x: (Bx \land Gabx) \land (\forall y: By \land Gaby)\ x = y)\ Lbxc$$

   using the description operator:
   Bill lent the book Ann gave him to Carol
   Lb(the book Ann gave Bill)c
   Lb(lx x is a book Ann gave Bill)c
   Lb(lx (x is a book ∧ Ann gave Bill x))c

$$Lb(lx\ (Bx \land Gabx))c$$

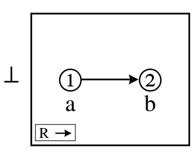
   B: [_ is a book]; G: [_ gave _ _]; L: [_ lent _ to _]; a: Ann; b: Bill; c: Carol

5.

	∃x ∃y (Rxy ∧ Sxy)	1
	ⓐ ∃y (Ray ∧ Say)	2
	ⓑ Rab ∧ Sab	3
3 Ext	Rab	(4)
3 Ext	Sab	(4)
4 Adj	Sab ∧ Rab	X, (5)
5 EG	∃x (Sxb ∧ Rxb)	X, (6)
6 EG	∃y ∃x (Sxy ∧ Rxy)	X, (7)
	●	
7 QED	∃y ∃x (Sxy ∧ Rxy)	2
2 PCh	∃y ∃x (Sxy ∧ Rxy)	1
1 PCh	∃y ∃x (Sxy ∧ Rxy)	

6.

	∃x Rax	
	ⓑ Rab	
	∀x ¬ Rxa	a:3,b:4
3 UI	¬ Raa	
4 UI	¬ Rba	
	○	Rab, ¬Raa, ¬Rba ⊭ ⊥
	⊥	2
2 NcP	∃x Rxa	1
1 PCh	∃x Rxa	



7. A set Γ is inconsistent if and only if there is no possible world in which every member of Γ is true.

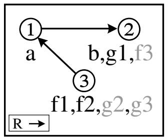
8. range: 1, 2, 3

a	b
1	2

τ	fτ
1	3
2	3
3	2

τ	gτ
1	2
2	3
3	3

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



(b = gb ∨ Ra(ga)) → (R(fa)(ga) ∧ f(gb) = g(fb))

2 F 3 2 T T 1 21 Ⓕ F 31 21 F 2 32 F 3 32

Your values for some of the compound terms and equations may differ from those shown here in gray, but your values for other predications and for truth-functional compounds should be the same as those shown.

The diagram above provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.

alias sets	*IDs*	*values*
a	1	a: 1
b	2	b: 2
ga		g1: 2
fa	3	f1: 3
fb		f2: 3
f(ga)		f2: 3

resources	*values*
Rab	R12: **T**
R(fa)a	R31: **T**
¬ R(fb)b	R32: **F**

9. The following are 3 possibilities (up to choice of the variable) from which your two might be chosen; in the last, τ may be any term:

$[\exists y\ Rxyb]_x a$, $[\exists y\ Rayx]_x b$, $[\exists y\ Rayb]_x \tau$

Phi 270 F96 test 5

(questions from the last of 6 quizzes)

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. Ned has visited a museum in Linden. [Give this analysis also using an unrestricted quantifier.]

2. Something blocked each route. [This sentence is ambiguous. Analyze it in two ways, as making a claim of *general exemplification* and as making the stronger claim of *uniformly general exemplification*, and indicate which analysis is which.]

3. At most one plan was implemented.

Analyze the sentence below using each of the two ways of analyzing definite descriptions. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. The scout you saw saw you.

Use derivations to show that the following argument is valid. You may use any rules.

5.
∃x Rax
∀x (∃y Ryx → Fx)
―――――――――
∃x Fx

Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

6.
∃x Fx
Ga
―――――――――
∃x (Fx ∧ Gx)

Complete the following to give a definition of entailment in terms of truth values and possible worlds:

7. A sentence φ is entailed by a set Γ if and only if …

Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the following sentences all true. (You may present the structure using either tables or a diagram.)

8. a = b, fb = fc, Pa, ¬ P(fa), Rab, ¬ Rbc, Rb(fb)

Give two different restatements of the sentence below in expanded form as a complex predicate (i.e., an abstract) applied to a term.

9. Fa ∧ Ga

Phi 270 F96 test 5 answers

1. Ned has visited a museum in Linden

(∃x: x is a museum in Linden) Ned has visited x

(∃x: x is a museum ∧ x is in Linden) Ned has visited x

(∃x: Mx ∧ Nxl) Vnx

∃x ((Mx ∧ Nxl) ∧ Vnx)

M: [_ is a museum]; N: [_ is in _]; V: [_ has visited _]; l: Linden; n: Ned

2. *general exemplification*

(∀x: x is a route) something blocked x

(∀x: Rx) ∃y y blocked x

(∀x: Rx) ∃y Byx

uniformly general exemplification

∃y y blocked each route

∃y (∀x: x is a route) y blocked x

∃y (∀x: Rx) Byx

B: [_ blocked _]; R: [_ is a route]

3. At most one plan was implemented

¬ at least two plans were implemented

¬ (∃x: x is a plan) (∃y: y is a plan ∧ ¬ y = x) (x was implemented ∧ y was implemented)

¬ (∃x: Px) (∃y: Py ∧ ¬ y = x) (Ix ∧ Iy)

I: [_ was implemented]; P: [_ is a plan]

4. *using Russell's analysis:*

the scout you saw is such that (he or she saw you)

(∃x: x and only x is a scout you saw) Sxo

(∃x: x is a scout you saw ∧ (∀y: ¬y = x) ¬ y is a scout you saw) Sxo

(∃x: (Tx ∧ Sox) ∧ (∀y: ¬y = x) ¬ (Ty ∧ Soy)) Sxo

using the description operator:

the scout you saw saw you

S(the scout you saw)o

S(ɩ x x is a scout you saw)o

S(ɩ x (x is a scout ∧ you saw x))o

S(ɩ x (Tx ∧ Sox))o

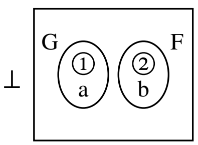
S: [_ saw _]; T: [_ is a scout]; o: you

5.

	∃x Rax	1
	∀x (∃y Ryx → Fx)	b:2
	ⓑ Rab	(3)
2 UI	∃y Ryb → Fb	4
3 EG	∃y Ryb	X, (4)
4 MPP	Fb	(4)
5 EG	∃x Fx	X, (6)
	●	
6 QED	∃x Fx	1
1 PCh	∃x Fx	

6.

	∃x Fx	1
	Ga	(4)
	ⓑ Fb	(6)
	∀x ¬ (Fx ∧ Gx)	a:3, b:5
3 UI	¬ (Fa ∧ Ga)	4
4 MPT	¬ Fa	
5 UI	¬ (Fb ∧ Gb)	6
6 MPT	¬ Gb	
	○	¬Fa, Fb, Ga, ¬Gb ⊭ ⊥
	⊥	2
2 NcP	∃x (Fx ∧ Gx)	1
1 PCh	∃x (Fx ∧ Gx)	



7. A sentence φ is entailed by a set Γ of sentences if and only if there is no possible world in which φ is false while each member of Γ is true.

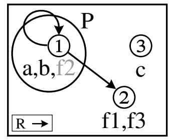
8. range: 1, 2, 3

a	b	c
1	1	3

τ	fτ
1	2
2	1
3	2

τ	Pτ
1	T
2	F
3	F

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



(The diagram provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
b		b: 1
fa	2	f1: 2
fb		f1: 2
fc		f3: 2
c	3	c: 3

resources	*values*
Pa	P1: **T**
¬ P(fa)	P2: **F**
Rab	R11: **T**
¬ Rbc	R13: **F**
Rb(fb)	R12: **T**

9. The following are 4 possibilities (up to choice of the variable) from which your two might be chosen; in the last, τ may be any term:

$[Fx \land Gx]_x a$

$[Fx \land Ga]_x a$

$[Fa \land Gx\ ]_x a$

$[Fa \land Ga]_x \tau$