Types

TABLE 7-1

Category Name	Categorial Definition of Name	Nearest Transformational Equivalent	Basic Expressions
e		None	None
t		Sentence	None
IV	*t/e*	Verb Phrase *and* Intransitive Verb (*IV* is mnemonic for "Intransitive Verb Phrase")	**run, walk, talk, rise, change**
T	*t/IV*	Noun Phrase *and* Proper Name (*T* is mnemonic for "Term Phrase")	**John, Mary, Bill, ninety,** $\mathbf{he_0}$**,** $\mathbf{he_1}$**,** $\mathbf{he_2}$**, . . .**
TV	*IV/T*	Transitive Verb	**find, lose, eat, love, date, be, seek, conceive**
IAV	*IV/IV*	Verb Phrase Adverb (*IAV* is mnemonic for "Intransitive Adverb")	**rapidly, slowly, voluntarily, allegedly**
CN	*t//e*	Common Noun	**man, woman, park, fish, pen, unicorn, price, temperature**
t/t		Sentence Adverb	**necessarily**
IAV/T		Preposition (one that forms a *VP*-modifying prepositional phrase)	**in, about**
IV/t		Sentence-complement Verb	**believe, assert**
IV//IV		Infinitive-complement Verb	**try, wish**
DET[2]	*T/CN*	Determiner	**every, the, a(n)**

Figure 1: English Types

Syntactic Rules

S2. $\delta \in \text{Det}, \zeta \in \text{CN} \implies F_2(\delta, \zeta) \in \text{Tm}$. [a/an/the/every]

```
F2 :: Det -> CN -> Tm
```

S3. $\zeta \in \text{CN}, \phi \in \text{T} \implies F_{3,n}(\zeta, \phi) \in \text{CN}$. [such that]

```
F3 :: Int -> CN -> T -> CN
```

TABLE 7-2

Category Name	Categorial Definition of Name	Corresponding Type by Rule (7-2)	Name of Semantical Object Denoted by this Type
e	e	e	individual
t	t	t	truth value
IV	t/e	$\langle\langle s, e\rangle, t\rangle$	set of individual concepts
T	t/IV $(= t/(t/e))$	$\langle\langle s, \langle\langle s, e\rangle, t\rangle\rangle, t\rangle$	set of properties of individual concepts
CN	$t//e$	$\langle\langle s, e\rangle, t\rangle$	set of individual concepts
t/t	t/t	$\langle\langle s, t\rangle, t\rangle$	set of propositions
etc.	etc.	etc.	etc.

Figure 2: Intensional Logic Types

S4. $\alpha \in \mathrm{Tm}$, $\delta \in \mathrm{IV} \implies F_4(\alpha, \delta) \in \mathrm{T}$. [subj-IV]

```
F4 :: Tm -> IV -> T
```

S5. $\delta \in \mathrm{TV}$, $\beta \in \mathrm{Tm} \implies F_5(\delta, \beta) \in \mathrm{IV}$. [TV-obj]

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F5 :: TV -> Tm -> IV
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S6. $\delta \in \mathrm{Prep}$, $\alpha \in \mathrm{Tm} \implies F_5(\delta, \alpha) \in \mathrm{IAV}$. [prep-obj]

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F5 :: Prep -> Tm -> IAV
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S7. $\alpha \in \mathrm{StV}$, $\phi \in \mathrm{T} \implies F_{11}(\alpha, \phi) \in \mathrm{IV}$. [that]

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F11 :: StV -> T -> IV
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S8. $\delta \in \mathrm{ItV}$, $\beta \in \mathrm{IV} \implies F_{17}(\delta, \beta) \in \mathrm{IV}$. [to]

```
F17 :: ItV -> IV -> IV
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S9. $\delta \in \mathrm{SmA}$, $\phi \in \mathrm{T} \implies F_6(\delta, \phi) \in \mathrm{T}$. [necessarily]

TABLE 7-3

Category Name	Categorial Definition of Name	Corresponding Type by Bennett's Rule (7-3)	Name of Semantical Object Denoted by this Type
t	t	t	truth value
CN	CN	$\langle e, t \rangle$	set of individuals
IV	IV	$\langle e, t \rangle$	set of individuals
T	t/IV	$\langle\langle s, \langle e, t \rangle\rangle, t \rangle$	set of properties of individuals
IAV	IV/IV	$\langle\langle s, \langle e, t \rangle\rangle, \langle e, t \rangle\rangle$	function from properties of individuals to sets of individuals
TV	IV/T $(= IV/(t/IV))$	$\langle\langle s, \langle\langle s, \langle e, t \rangle\rangle, t \rangle\rangle, \langle e, t \rangle\rangle$	function from properties of properties of individuals to sets of individuals
T/CN	$(t/IV)/CN$	$\langle\langle s, \langle e, t \rangle\rangle, \langle\langle s, \langle e, t \rangle\rangle, t \rangle\rangle$	function from properties of individuals to sets of properties of individuals
t/t	t/t	$\langle\langle s, t \rangle, t \rangle$	set of propositions
IV/t	IV/t	$\langle\langle s, t \rangle, \langle e, t \rangle\rangle$	function from propositions to sets of individuals
$IV//IV$	$IV//IV$	$\langle\langle s, \langle e, t \rangle\rangle, \langle e, t \rangle\rangle$	function from properties of individuals to sets of individuals
IAV/T	$(IV/IV)/T$	$\langle\langle s, \langle\langle s, \langle e, t \rangle\rangle, t \rangle\rangle, \langle\langle s, \langle e, t \rangle\rangle, \langle e, t \rangle\rangle\rangle$	function from properties of properties of individuals to functions from properties of individuals to sets of individuals

Figure 3: Mapping

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F6 :: SmA -> T -> T
```

S10. $\delta \in$ IAV, $\beta \in$ IV $\implies F_7(\delta, \beta) \in$ IV. [adverb]

```
F7 :: IAV -> IV -> IV
```

S11. $\phi, \psi \in$ T $\implies F_8(\phi, \psi), F_9(\phi, \psi) \in$ T. [and, or]

```
F8 :: T -> T -> T
F9 :: T -> T -> T
```

S12. $\delta, \gamma \in$ IV $\implies F_8(\delta, \gamma), F_9(\delta, \gamma) \in$ IV. [and, or]

```
F8 :: IV -> IV -> IV
F9 :: IV -> IV -> IV
```

S13. $\alpha, \beta \in$ Tm $\implies F_9(\alpha, \beta) \in$ Tm. [or]

```
F9 :: Tm -> Tm -> Tm
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S14. $\alpha \in$ Tm, $\phi \in$ T $\implies F_{10,n}(\alpha, \phi) \in$ T. [replacement]

```
F10 :: Int -> Tm -> T -> T
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S17. $\alpha \in$ Tm, $\delta \in$ IV $\implies F_{12}(\alpha, \delta), F_{13}(\alpha, \delta), F_{14}(\alpha, \delta), F_{15}(\alpha, \delta), F_{16}(\alpha, \delta) \in$ T. [neg., fut., neg. fut., pres. perf., neg. pres. perf.]

```
F12 :: Tm -> IV -> T
F13 :: Tm -> IV -> T
F14 :: Tm -> IV -> T
F15 :: Tm -> IV -> T
F16 :: Tm -> IV -> T
```

Translation Rules

T2. $F_2(\delta, \zeta) \to \delta'({}^\wedge\zeta')$.

T3. $F_{3,n}(\zeta, \phi) \to \lambda x_n(\zeta'(x_n) \wedge \phi')$.

T4. $F_4(\alpha, \delta) \to \alpha'({}^\wedge\delta')$.

T5. $F_5(\delta, \beta) \to \delta'(^\wedge\beta')$.

T6. $F_5(\delta, \alpha) \to \delta'(^\wedge\alpha')$.

T7. $F_{11}(\alpha, \phi) \to \alpha'(^\wedge\phi')$.

T8. $F_{17}(\delta, \beta) \to \delta'(^\wedge\beta')$.

T9. $F_6(\delta, \phi) \to \delta'(^\wedge\phi')$.

T10. $F_7(\delta, \beta) \to \delta'(^\wedge\beta')$.

T11. $F_8(\phi, \psi) \to [\phi' \wedge \psi]$
$F_9(\phi, \psi) \to [\phi' \vee \psi']$.

T12. $F_8(\delta, \gamma) \to \lambda x[\delta'(x) \wedge \gamma'(x)]$
$F_9(\delta, \gamma) \to \lambda x[\delta'(x) \vee \gamma'(x)]$.

T13. $F_9(\alpha, \beta) \to \lambda P[\alpha'(P) \wedge \beta'(P)]$.

T14. $F_{10,n}(\alpha, \phi) \to \alpha'(^\wedge\lambda x_n \phi')$.

T17. $F_{12}(\alpha, \delta) \to \neg\alpha'(^\wedge\delta')$
$F_{13}(\alpha, \delta) \to \mathbf{F}\alpha'(^\wedge\delta')$
$F_{14}(\alpha, \delta) \to \neg\mathbf{F}\alpha'(^\wedge\delta')$
$F_{15}(\alpha, \delta) \to \mathbf{P}\alpha'(^\wedge\delta')$
$F_{16}(\alpha, \delta) \to \neg\mathbf{P}\alpha'(^\wedge\delta')$.