```
%start S

S[SEM=<?np(?vp)>]  -> NP[NUM=?n, SEM=?np] VP[NUM=?n, SEM=?vp]

NP[NUM=?n, SEM=<?d(?nom)>] -> Det[NUM=?n, SEM=?d] N[NUM=?n, SEM=?nom]
NP[NUM=sg, SEM=?pn]        -> PropN[SEM=?pn]

VP[NUM=?n, SEM=?v]         -> V[NUM=?n, SUBCAT=intrans, SEM=?v]
VP[NUM=?n, SEM=<?v(?np)>]  -> V[NUM=?n, SUBCAT=trans, SEM=?v] NP[SEM=?np]

Det[NUM=sg, SEM=<\Q P.exists x.(Q(x) & P(x))>] -> 'a'
Det[NUM=sg, SEM=<\Q P.all x.(Q(x) -> P(x))>] -> 'every'
Det[NUM=pl, SEM=<\Q P.all x.(Q(x) -> P(x))>] -> 'all'
Det[NUM=pl, SEM=<\Q P.all x.(P(x) -> Q(x))>] -> 'only'

PropN[SEM=<\P.P(cyril)>]             -> 'Cyril'
PropN[SEM=<\P.P(angus)>]             -> 'Angus'
PropN[SEM=<\P.P(irene)>]             -> 'Irene'

N[NUM=sg, SEM=<\x.dog(x)>]           -> 'dog'
N[NUM=pl, SEM=<\x.dog(x)>]           -> 'dogs'
N[NUM=sg, SEM=<\x.cat(x)>]           -> 'cat'
N[NUM=pl, SEM=<\x.cat(x)>]           -> 'cats'

V[SUBCAT=intrans, SEM=<\x.bark(x)>]  -> 'barks' | 'bark'
V[NUM=sg, SUBCAT=trans, SEM=<\X y.X(\x.chase(y, x))>] -> 'chases'
V[NUM=pl, SUBCAT=trans, SEM=<\X y.X(\x.chase(y, x))>] -> 'chase'
V[NUM=sg, SUBCAT=trans, SEM=<\X y.X(\x.hate(y, x))>]  -> 'hates'
V[NUM=pl, SUBCAT=trans, SEM=<\X y.X(\x.hate(y, x))>]  -> 'hate'
```

```
% start S

S -> NP[NUM=?n] VP[NUM=?n]

NP[NUM=?n] -> PropN[NUM=?n]
NP[NUM=?n] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl] -> N[NUM=pl]

VP[NUM=?n] -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n] -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n] -> V[SUBCAT=clause, NUM=?n] S

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

PropN[NUM=sg]-> 'Kim' | 'Jody'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n] -> 'said' | 'claimed'
```

```
% start S

S -> NP[NUM=?n] VP[NUM=?n]

NP[NUM=?n] -> PropN[NUM=?n]
NP[NUM=?n] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl] -> N[NUM=pl]
NP[NUM=pl] -> NP Conj NP
#  first incorrect attempt: NP[NUM=?n] -> NP[NUM=?n] Conj NP[NUM=?n]

VP[NUM=?n] -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n] -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n] -> V[SUBCAT=clause, NUM=?n] S

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

Conj   -> 'and'

PropN[NUM=sg]-> 'Kim' | 'Jody'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n] -> 'said' | 'claimed'
```

```
% start S

S -> NP[NUM=?n] VP[NUM=?n]

NP[NUM=?n] -> PropN[NUM=?n]
NP[NUM=?n] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl] -> N[NUM=pl]
NP[NUM=pl] -> NP Conj NP

VP[NUM=?n] -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n] -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n] -> V[SUBCAT=clause, NUM=?n] S

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

Conj   -> 'and'

PropN[NUM=sg]-> 'Kim' | 'Jody'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n] -> 'said' | 'claimed'

VP  -> VP Conj VP
N   -> N Conj N
V   -> V Conj V
```

```
% start S
S[-INV]     -> NP[NUM=?n] VP[NUM=?n]
S[-INV]/?x  -> NP[NUM=?n] VP[NUM=?n]/?x
S[+INV]     -> V[+AUX] NP VP
S[+INV]/?x  -> V[+AUX] NP VP/?x

NP[NUM=?n] -> PropN[NUM=?n]
NP[NUM=?n] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl] -> N[NUM=pl]

VP[NUM=?n]      -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n]      -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n]/?x   -> V[SUBCAT=trans, NUM=?n] NP/?x
VP[NUM=?n]      -> V[SUBCAT=clause, NUM=?n] S
VP[NUM=?n]/?x   -> V[SUBCAT=clause, NUM=?n] S/?x

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

Conj   -> 'and'

PropN[NUM=sg] -> 'Kim' | 'Jody'

NP          -> 'who' | 'you' | 'he' | 'she' | 'I'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg, -AUX] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg, -AUX] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg, -AUX] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl, -AUX] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl, -AUX] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl, -AUX] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n, -AUX] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n, -AUX] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n, -AUX] -> 'said' | 'claimed'
V[+AUX]     -> 'do' | 'does' | 'can'

NP[NUM=pl]  -> NP Conj NP
VP[NUM=?n]  -> VP[NUM=?n] Conj VP[NUM=?n]
N[NUM=?n]   -> N[NUM=?n] Conj N[NUM=?n]
V[NUM=?n]   -> V[NUM=?n] Conj V[NUM=?n]

NP/NP       ->
S[-INV]     -> NP S/NP
```

```
% start S
S[-INV]      -> NP[NUM=?n] VP[NUM=?n]
S[-INV]/?x   -> NP[NUM=?n] VP[NUM=?n]/?x
S[+INV]      -> V[+AUX] NP VP
S[+INV]/?x   -> V[+AUX] NP VP/?x

NP[NUM=?n, -WH] -> PropN[NUM=?n]
NP[NUM=?n, -WH] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl, -WH] -> N[NUM=pl]

VP[NUM=?n]       -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n]       -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n]/?x    -> V[SUBCAT=trans, NUM=?n] NP/?x
VP[NUM=?n]       -> V[SUBCAT=clause, NUM=?n] S
VP[NUM=?n]/?x    -> V[SUBCAT=clause, NUM=?n] S/?x

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

Conj   -> 'and'

PropN[NUM=sg] -> 'Kim' | 'Jody'

NP[+WH]      -> 'who'
NP[-WH]      -> 'you' | 'he' | 'she' | 'I'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg, -AUX] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg, -AUX] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg, -AUX] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl, -AUX] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl, -AUX] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl, -AUX] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n, -AUX] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n, -AUX] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n, -AUX] -> 'said' | 'claimed'
V[+AUX]      -> 'do' | 'does' | 'can'

NP[NUM=pl]  -> NP Conj NP
VP[NUM=?n]  -> VP[NUM=?n] Conj VP[NUM=?n]
N[NUM=?n]   -> N[NUM=?n] Conj N[NUM=?n]
V[NUM=?n]   -> V[NUM=?n] Conj V[NUM=?n]

NP/NP       ->
S[-INV]     -> NP[+WH] S/NP
```

```
% start S
S[-INV]      -> NP[NUM=?n] VP[NUM=?n]
S[-INV]/?x   -> NP[NUM=?n] VP[NUM=?n]/?x
S[+INV]      -> V[+AUX] NP VP
S[+INV]/?x   -> V[+AUX] NP VP/?x

NP[NUM=?n, -WH] -> PropN[NUM=?n]
NP[NUM=?n, -WH] -> Det[NUM=?n] N[NUM=?n]
NP[NUM=pl, -WH] -> N[NUM=pl]

VP[NUM=?n]       -> V[SUBCAT=intrans, NUM=?n]
VP[NUM=?n]       -> V[SUBCAT=trans, NUM=?n] NP
VP[NUM=?n]/?x    -> V[SUBCAT=trans, NUM=?n] NP/?x
VP[NUM=?n]       -> V[SUBCAT=clause, NUM=?n] S
VP[NUM=?n]/?x    -> V[SUBCAT=clause, NUM=?n] S/?x

Det[NUM=sg] -> 'a' | 'this' | 'every'
Det[NUM=pl] -> 'these' | 'all' | 'several' | 'some'
Det -> 'the'

Conj    -> 'and'

PropN[NUM=sg] -> 'Kim' | 'Jody'

NP[+WH]      -> 'who'
NP[-WH]      -> 'you' | 'he' | 'she' | 'I'

N[NUM=sg] -> 'dog' | 'girl' | 'car' | 'child'
N[NUM=pl] -> 'dogs' | 'girls' | 'cars' | 'children'

V[SUBCAT=intrans, NUM=sg, -AUX] -> 'disappears' | 'walks'
V[SUBCAT=trans, NUM=sg, -AUX] -> 'sees' | 'likes'
V[SUBCAT=clause, NUM=sg, -AUX] -> 'says' | 'claims'

V[SUBCAT=intrans, NUM=pl, -AUX] -> 'disappear' | 'walk'
V[SUBCAT=trans, NUM=pl, -AUX] -> 'see' | 'like'
V[SUBCAT=clause, NUM=pl, -AUX] -> 'say' | 'claim'

V[SUBCAT=intrans, NUM=?n, -AUX] -> 'disappeared' | 'walked'
V[SUBCAT=trans, NUM=?n, -AUX] -> 'saw' | 'liked'
V[SUBCAT=clause, NUM=?n, -AUX] -> 'said' | 'claimed'
V[+AUX]      -> 'do' | 'does' | 'can'

NP[NUM=pl, -WH]  -> NP[-WH] Conj NP[-WH]
VP[NUM=?n]  -> VP[NUM=?n] Conj VP[NUM=?n]
N[NUM=?n]   -> N[NUM=?n] Conj N[NUM=?n]
V[NUM=?n]   -> V[NUM=?n] Conj V[NUM=?n]

NP/NP       ->
S[-INV]      -> NP[+WH] S/NP
```