Example Sentences in FOL

Example 1

- Every child loves Santa.
- Everyone who loves Santa loves any reindeer.
- Rudolph is a reindeer, and Rudolph has a red nose.
- Anything which has a red nose is weird or is a clown.
- No reindeer is a clown.
- Scrooge does not love anything which is weird.
- Scrooge is not a child.

Example 2

- Anyone who buys carrots by the bushel owns either a rabbit or a grocery store.
- Every dog chases some rabbit.
- Mary buys carrots by the bushel.
- Anyone who owns a rabbit hates anything that chases any rabbit.
- John owns a dog.
- Someone who hates something owned by another person will not date that person.
- If Mary does not own a grocery store, she will not date John.

- Every child loves Santa.

  $\forall x\ (CHILD(x) \rightarrow LOVES(x,Santa))$

- Everyone who loves Santa loves any reindeer.

  $\forall x\ (LOVES(x,Santa) \rightarrow \forall y\ (REINDEER(y) \rightarrow LOVES(x,y)))$

- Rudolph is a reindeer, and Rudolph has a red nose.
  $REINDEER(Rudolph) \wedge REDNOSE(Rudolph)$

- Anything which has a red nose is weird or is a clown.

  $\forall x\,(REDNOSE(x) \rightarrow WEIRD(x) \vee CLOWN(x))$

- No reindeer is a clown.

  $\neg \exists x (REINDEER(x) \wedge CLOWN(x))$

- Scrooge does not love anything which is weird.

  $\forall x\,(WEIRD(x) \rightarrow \neg\, LOVES(Scrooge,x))$

- Scrooge is not a child.

  ¬ *CHILD(Scrooge)*

Example 2

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- Every dog chases some rabbit.
- Mary buys carrots by the bushel.
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- John owns a dog.
- Someone who hates something owned by another person will not date that person.
- If Mary does not own a grocery store, she will not date John.

- Anyone who buys carrots by the bushel owns either a rabbit or a grocery store.
  $\forall x\ (BUY(x) \rightarrow \exists y\ (OWNS(x,y) \wedge (RABBIT(y) \vee GROCERY(y))))$

- Every dog chases some rabbit.
  $\forall x\ (DOG(x) \rightarrow \exists y\ (RABBIT(y) \wedge CHASE(x,y)))$

- Mary buys carrots by the bushel.
  $BUY(Mary)$

- Anyone who owns a rabbit hates anything that chases any rabbit.
  $\forall x\ \forall y\ (OWNS(x,y) \wedge RABBIT(y) \rightarrow \forall z\ \forall w\ (RABBIT(w) \wedge CHASE(z,w) \rightarrow HATES(x,z)))$

- John owns a dog.
  $\exists x\ (DOG(x) \wedge OWNS(John,x))$

- Someone who hates something owned by another person will not date that person.
  $\forall x\ \forall y\ \forall z\ (OWNS(y,z) \wedge HATES(x,z) \rightarrow \neg\ DATE(x,y))$

- (Conclusion) If Mary does not own a grocery store, she will not date John.
  $((\neg\ \exists x\ (GROCERY(x) \wedge OWN(Mary,x))) \rightarrow \neg\ DATE(Mary,John))$

Example 3

a.Some dragon is sleeping

b. No dragon is sleeping

c. Every dragon is sleeping

d. Not every dragon is sleeping

a. Some dragon is sleeping

$\exists x\,(D(x) \wedge S(x))$

b. No dragon is sleeping

$\neg \exists x\,(D(x) \wedge S(x))$

c. Every dragon is sleeping

$\forall x\,(D(x) \rightarrow S(x))$

d. Not every dragon is sleeping

$\neg \forall x\,(D(x) \rightarrow S(x))$

Example 4

a. Some dragon is sleeping or twitching

b. No dragon is sleeping or twitching

c. Every dragon is sleeping or twitching

d. Not every dragon is sleeping or twitching

a. Some dragon is sleeping or twitching

$\exists x\,[D(x) \wedge (S(x) \vee T(x))]$

b. No dragon is sleeping or twitching

$\neg \exists x\,[D(x) \wedge (S(x) \vee T(x))]$

c. Every dragon is sleeping or twitching

$\forall x\,[D(x) \rightarrow (S(x) \vee T(x))]$

d. Not every dragon is sleeping or twitching

$\neg \forall x\,[D(x) \rightarrow (S(x) \vee T(x))]$

Example 5

Paul and Fred left home but Mary did not

Let L = left home, p = Paul, f = Fred, m = Mary

Translate into FOL

Paul left home L(p)

Fred left home L(f)

Mary left home L(m)

Mary didn’t leave home ¬L(m)

Paul and Fred left home (L(p) ⋀ L(f))

Paul and Fred left home but Mary did not ((L(p) ⋀ L(f)) ⋀ ¬L(m))