

Multiple Quantifiers

Provide clear English translations of the following symbolic sentences. The predicate $F(x,y)$ means x loves y . For 12-14 you can make up the predicates.

1. $\forall x \exists y F(x, y)$
2. $\forall x \exists y F(y, x)$
3. $\exists x \forall y F(x, y)$
4. $\exists x \forall y F(y, x)$
5. $\exists x \forall y \neg F(x, y)$
6. $\exists x \neg \forall y F(x, y)$
7. $\neg \exists x \forall y F(x, y)$
8. $\forall x \exists y \neg F(x, y)$
9. $\forall x \neg \exists y F(x, y)$
10. $\exists x \forall y \neg F(y, x)$
11. $\neg \exists x \forall y F(y, x)$
12. $\forall x \forall y [(C(x) \wedge D(y)) \rightarrow L(x, y)]$
13. $\forall x [S(x) \rightarrow \exists y (D(y) \wedge S(x, y))]$
14. $\exists x [(L(x) \wedge C(x)) \wedge \forall y (T(y) \rightarrow B(y, x))]$

Symbolize the following sentences with the tools of quantifier logic:

1. Large cubes are larger than small cubes.
2. Every small cube is in the same column as a dodecahedron.
3. Some tetrahedron is to the right of every cube.
4. There is a cube that only has dodecahedrons in front of it.
5. Nothing is in the same row as any cube.
6. Every person can sell something or other.
7. Some people cannot sell anything.
8. No person can sell everything.
9. Some people can sell anything.
10. Some people break everything they touch.
11. Some policemen arrest only traffic violators.
12. Some lawyers will represent any person who will not represent herself.
13. All children in the fourth grade can read any of the books in the library.
14. If there are any safe drivers, then some safe drivers will be hired.
15. If there are any safe drivers, then if none of the trucks breaks down they will be hired.
16. Only aircraft carriers are larger than battleships.