Test 7: Translate and evaluate the following statements (If QL is given, translate it into English. When English is give, translate it to QL.)

P	Q	9	T
1	3	R	E
I	J	8	2
F	B	5	M

UD {x : x is in the grid.}

referent Each letter in the grid is referred to by the lower-cased version of the same letter.

s The number 1.

Nx x is a number.

Tx ..letter.

Vx ..vowel.

Cx ..consonant.

Ex .. even.

Dx .. odd.

Axy x is above y.

Uxy ..under..

Rxy ..right of..

Lxy ..left of..

Gxy ..greater than..

Oxy $\{(x, y) : y = x + 1\}$

Sxy ..subsequent to..

Notes: Spatial predicates do not imply directly. E.g., Apm is true even though p is not directly above m. Only 2, 3 and 5 are prime. G is a relation between numbers only. S is a relation between letters only. Sea is true because e comes after a in the alphabet. No number other than 1 has a name and you may not introduce any.

Hint: Be absolutely sure to interpret and translate definite descriptions correctly.

1. The odd number between two consonants is greater than 1.

2. The number 3 exists.

3. Some number is *immediately* above a letter.

4. No consonant except for 'R' is above two different numbers.

5. There are no more than two numbers to the right of the letter E.

6. $\exists x(Nx \land Gxs \land \forall z((z \neq s \land z \neq x) \to \neg Gxz))$

7. $\exists x \exists y \exists z[(Lxy \land Rzy \land Dy) \land \forall u((Lxu \land Rzu \land Du) \to u = y)]$

8. $\exists x(Nx \land Lxm \land Rxb \land Dx \land \forall y((Ny \land Lym \land Ryb) \to y = x))$