

P-set 4.1: *Translate and provide truth values* for the following statements (If QL is given, translate it into English. When English is given, translate it to QL).

P	Q	9	T
1	3	R	E
I	J	8	4
F	B	5	M

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..

Xxy ..same row as

Yxy ..same column as

UD $\{x : x \text{ is in the grid.}\}$

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.

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

Note 2: *When translating from QL to English, your translation must express the quantity in a way that makes sense in English!* Example: you should not translate $\forall x \forall y ([Cx \wedge Cy] \rightarrow (x = y))$ as ‘For every x and every y , if...’ Instead, say ‘there are at most...’

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. $\exists x(Nx \wedge Gxs \wedge \forall z((z \neq s \wedge z \neq x) \rightarrow \neg Gxz))$
7. $\exists x(Nx \wedge Lxm \wedge Rxb \wedge Dx \wedge \forall y((Ny \wedge Lym \wedge Ryb) \rightarrow y = x))$
8. $\forall x \forall y \forall z [(Yxz \wedge Dy \wedge Yyz \wedge Vz \wedge Dx) \rightarrow (x = y)]$