

MTT is intended to be used as a universal Tarski meta-language including a meta-language to itself. Because MTT has its own provability operator: “ \vdash ” provability can be analyzed directly within the deductive inference model instead indirectly through diagonalization. This allows us to see exactly why an expression of language can be neither proved nor disproved, details that diagonalization cannot provide. All of the symbolic logic operators retain their conventional semantic meaning.

```

%left IDENTIFIER      // Letter+ (Letter | Digit)* // Letter includes UTF-8
%left SUBSET_OF      //  $\subseteq$ 
%left ELEMENT_OF     //  $\in$ 
%left FOR_ALL        //  $\forall$ 
%left THERE_EXISTS   //  $\exists$ 
%left IMPLIES        //  $\rightarrow$ 
%left PROVES         //  $\vdash$ 
%left IFF            //  $\leftrightarrow$ 
%left AND            //  $\wedge$ 
%left OR             //  $\vee$ 
%left NOT            //  $\sim$ 
%left ASSIGN_ALIAS   // := LHS is assigned as an alias name for the RHS (macro substitution)
%%                  // An alias named expression is treated syntactically as a propositional
                  // variable in the next higher level of logic specifying HOL using FOL syntax.

sentence
: atomic_sentence
| '~' sentence %prec NOT
| '(' sentence ')'
| sentence IMPLIES sentence
| sentence IFF sentence
| sentence AND sentence
| sentence OR sentence
| quantifier IDENTIFIER sentence
| quantifier IDENTIFIER type_of IDENTIFIER sentence // Enhancement to FOL
| sentence PROVES sentence // Enhancement to FOL
| IDENTIFIER ASSIGN_ALIAS sentence // Enhancement to FOL
;

atomic_sentence
: IDENTIFIER '(' term_list ')' // ATOMIC PREDICATE
| IDENTIFIER // SENTENTIAL VARIABLE // Enhancement to FOL
;

term
: IDENTIFIER '(' term_list ')' // FUNCTION
| IDENTIFIER // CONSTANT or VARIABLE
;

term_list
: term_list ',' term
| term
;

type_of
: ELEMENT_OF // Enhancement to FOL
| SUBSET_OF // Enhancement to FOL
;

quantifier
: THERE_EXISTS
| FOR_ALL
;

```