Meth8/VŁ4 on one and three in arithmetic

Abstract: We evaluate arithmetic using 0 and 3 as binary 00 and 11. Arithmetic holds in nine theorems. For division by zero, the result is Not(0 and 3).

We assume the method and apparatus of Meth8/VŁ4 with Tautology as the designated proof value, F as contradiction, N as truthity (non-contingency), and C as falsity (contingency). The 16-valued truth table is row-major and horizontal, or repeating fragments of 128-tables, sometimes with table counts, for more variables. (See ersatz-systems.com.)

LET \( \sim \) Not, \( \neg \); \( + \) Or, \( \lor \); \( - \) Not Or; \( \& \) And, \( \land \); \( \\setminus \) Not And;
\( > \) Imply, greater than, \( \rightarrow \), \( \Rightarrow \), \( > \), \( \triangleright \), \( \vartriangleright \), \( \subset \), \( \succ \), \( \supset \), \( \vdash \), \( \models \);
\( \% \) possibility, for one or some, \( \exists \), \( \diamond \), \( M \); \( \# \) necessity, for every or all, \( \forall \), \( \Box \), \( L \);
\( (z=z) \) T as tautology, \( T \), ordinal 3; \( (z\neq z) \) F as contradiction, \( \varnothing \), Null, \( \bot \), zero;
\( (%z<#z) \) C as contingency, \( \Delta \), ordinal 1; \( (%z\neq#z) \) N as non-contingency, \( \nabla \), ordinal 2;
\( \sim(y<x) \) (x \( \leq \) y), (x \( \leq \) y); (A=B) (A\( \sim \)B).

Note: For clarity we usually distribute quantifiers on each variable as designated.

LET \((r=r)\) ordinal 3; \((r\neq r)\) number 0.

Subtraction:

If \(3>0\), then \(3-3=0\).

\[
((r=r)>>(r@r))>((((r=r)-(r=r))<(r=r))) ;
\]

\(TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \)

(1.1)

If \(3>0\), then \(3-0=3\).

\[
((r=r)>>(r@r))>(((((r=r)-(r@r))=(r=r))) ;
\]

\(TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \)

(2.1)

Addition:

If \(3>0\), then \(3+3>3\).

\[
((r=r)>>(r@r))>((((r=r)+(r=r))>(r=r)) ;
\]

\(TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \)

(3.1)

If \(3>0\), then \(3+0=3\).

\[
((r=r)>>(r@r))>(((((r=r)+(r@r))=(r=r)) ;
\]

\(TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \)

(4.1)

Multiplication:

If \(3>0\), then \(3*3>3\).

\[
((r=r)>>(r@r))>((((r=r)&(r=r))>(r=r)) ;
\]

\(TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \hspace{1cm} TTTT \)

(5.1)
If $3 > 0$, then $3 \cdot 0 = 0$. \hspace{1cm} (6.1)

\[ (((r=r) \land (r@r)) = (r@r)) \quad ; \quad \text{TTTT TTTT TTTT TTTT} \]

(6.2)

**Division:**

If $3 > 0$, then $0/3 = 0$. \hspace{1cm} (7.1)

\[ (((r=r) \land (r@r)) = (r@r)) \quad ; \quad \text{TTTT TTTT TTTT TTTT} \]

(7.2)

If $3 > 0$, then $3/3 > 0$. \hspace{1cm} (8.1)

\[ (((r=r) \land (r@r)) = (r@r)) \quad ; \quad \text{TTTT TTTT TTTT TTTT} \]

(8.2)

If $3 > 0$, then $3/0 = \neg (0 \land 3)$. \hspace{1cm} (9.1)

\[ (((r=r) \land (r@r)) = (r@r)) \quad ; \quad \text{TTTT TTTT TTTT TTTT} \]

(9.2)

Arithmetic holds as theorems in Eqs. 1.2-9.2.