

Recent advances in the modal model checker Meth8 and VL4 universal logic

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In applied and theoretical mathematics, assertions are categorized in alphabetical order as: axiom; conjecture; definition, entry; equation; expression; formula; functor; hypothesis; inequality; metatheorem; paradox; problem; proof; schema; system; theorem; and thesis. We evaluate 635 artifacts in 3304 assertions to confirm 548 as tautology and 2756 as *not* (83.4%). We use Meth8, a modal logic checker in five models.

The semantic content or predicate basis of some expressions on their face does not disqualify them from evaluation by Meth8 in classical modal logic. However, the rules of classical logic, as based on the corrected Square of Opposition by Meth8, apply to virtually any logic system. Consequently some numerical equations are mapped to classical logic as Meth8 scripts.

The rationale for mapping quantifiers as modal operators is based on satisfiability and reproducibility of validation of the 24-syllogisms from the corrected Square of Opposition.

Test results are refuted as *not* tautologous, confirmed as tautologous, or neither. For a paradox, *not* tautologous means it is not a paradox, but not necessarily a contradiction either.

The experimental tests used variables for 4 propositions, 4 theorems, and 11 propositions. The size of truth tables are respectively for 16-, 256-, and 2048- truth values, using recent advances in look up table indexing.

The Meth8 modal theorem prover implements the logic system variant VL4 which corrects the quaternary Ł4 of Łukasiewicz. There are two sets of truth values on the 2-tuple {00, 10, 01, 11} as respectively {False for contradiction; Contingent for falsity; Non contingent for truthity; Tautology for proof} and {Unevaluated; Improper; Proper; Evaluated}. The designated *proof* value is T for tautology and E for evaluated. The model checker contains recent advances in parsing technology named sliding window.

The mapping of formulas in Meth8 script was performed by hand, checked, and tested for accuracy of intent. The Meth8 script uses literals and connectives in one-character. Propositions are p-z, and theorems are A-B. The connectives for {and, or, imply, equivalent} are {&, +, >, =}. The negated connectives for {nand; nor; not imply; exclusive-or} are {\, -, <, @}. The operators for {not; possibility $\diamond\exists$; necessity $\square\forall$ } are {~, %, #}. Expressions are adopted for clarity as: (p=p) for tautologous; (p@p) for contradiction; and (x<y) for $x \in y$. The expression $x \leq y$ as "x less than or equal to y" is rendered in the negative as $\sim(y < x)$ or as $(\sim x > \sim y)$.

Definition	Axiom	Symbol	Name	Meaning	2-tuple	Binary ordinal
1	p=p	T	tautology	proof	11	3
2	p@p	F	contradiction	absurdum	00	0
3	%p>#p	N	non-contingency	truthity	01	1
4	%p<#p	C	contingency	falsity	10	2

Note the meaning of (%p>#p): a possibility of p implies the necessity of p; and some p implies all p. In other words, if a possibility of p then the necessity of p; and if some p then all p.

This shows equivalence of respective modal operators and quantified operators as in Appendix.

For Meth8 an immediate further application is mapping sentences of natural language into logical formulas, so a semi-automation of that linguistic process is near completion.

References

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No.	Name of artifact	Type of artifact	Non Taut.	Tautology
1	ABC	Conjecture	1	
2	Shevenyonov's proof	Conjecture	6	
3	Abductive reasoning	System	1	
4	Abduction, induction, deduction: Peirce	Inference	2	1
5	Abstract theory of segments using Prolog	Proofs	15	3
6	Adaptive algorithm for molecular simulation	Conjecture	5	
7	AGM / Levi and Harper bridging principles	Postulates	7	3
8	AGM: remainder sets, paraconsistent revisions	Operators	5	
9	Agnostic hypothesis testing	Hexagon	9	2
10	Agnosticism as subset of atheism from no-belief	Conjecture	4	2
11	AI: divide the dollar competition	Experiment	1	
12	AI: reduction for scalable deep learning	Algorithm	3	
13	Ackermann's approach to quantifier reduction	System	20	2
14	Alcoholics Anonymous BB: We agnostics, p 53	Conjecture	5	
15	Aphorism acceptance inverse expectation	Proportion	1	
16	Contradictory sayings	Paradoxes	4	
17	Alexandroff correspondence	Conditional	3	
18	Alternating Turing machines (ATMs)	Problem	3	
19	Analysis as both correct and informative	Paradox	5	
20	Analytic principles of choice and dependent choice	Axioms	3	
21	Anderson division by zero as nullity	Theorem	3	
22	Approximations of theories	System	1	
23	Arrow's impossibility	Theorem	7	
24	Athanasian creed (Holy Trinity)	Credo	1	2
25	Axiomatizing category theory in free logic	Axioms	5	5
26	Axiomatizing fuzzy logic with graded modalities	Conjecture	1	
27	Banach order space, generating positive cone	Definition	2	1
28	Banach-Tarski, shorter resuscitation attempt	Paradox	2	
29	Crucial claim in Step 3 of proof, shortest	Paradox	1	
30	Bar recursion	Mapping	2	
31	Barcan	Formula	37	32
32	Barwise compactness	Theorem	2	
33	Bayes rule	Rule	11	11
34	BCI / BCK algebra	System	5	3

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
35	Bell / CHSH / Spekken toy model	Inequalities	7	
36	A shorter refutation	Theorem	2	
37	A simpler refutation	Theorem	2	
38	Bell's inequality by axiom of empty set	Theorem	2	
39	Bogus Bellian logic (BBL)	Theorem	5	
40	Coercive proof	Theorem	2	
41	Coin toss proof	Conjectures	2	
42	Original inequality with assumption	Conjecture	4	
43	Original inequality with assumptions	Conjectures	5	
44	Original inequality and CHSH	Conjectures	6	
45	Positive reasons proof	Theorem	6	3
46	Temporal logic	Theorem	1	
47	Tropical sum	Method	1	
48	Bellman's Lost in the forest problem, solution	Theorem		4
49	Berkeley	Paradox	1	
50	Bernstein-Vazirani	Algorithm	4	1
51	No-cloning theorem	Theorem	2	
52	Bertrand-Chebyshev theorem / postulate	Theorem	2	
53	Betweenness theory	Axioms	9	7
54	BF calculus, Spencer-Brown Primitive arithmetic	System	8	
55	Biscuit conditionals	System	13	
56	Bisimulation, coinduction, Howes' congruence	Proof method	5	
57	Bitstring and question-answer	Semantics	18	
58	Blameworthiness degrees	Coalition	3	5
59	Block argumentation	Method	15	
60	Blok-Esakia	Theorems	5	
61	Bogdanov map, 2D conjugate of Hénon map	Formula	1	
62	Boolean polynomials	Conjecture	3	
63	Boone-Rogers, uniform word problem	Theorem	2	1
64	Borel base and hull	Conjectures	2	
65	Born rule	Theorem	6	
66	Exclusivity rule as basis	Theorem	5	
67	Borsuk-Ulam theorem (BUT)	Conjecture	1	
68	Bounded and Σ_1 formulas in PA	Conjecture	1	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
69	Bounding modal logics on transitive frames	Conjecture	6	
70	Bourbaki-Moroianu-Tarski fixed point theorem	Theorems	10	
71	Boyer's question	Paradox	3	
72	Branching quantifier (Hintikka)	System	3	
73	Brouwer fixed point theorem (BFPT)	Conjecture	3	2
74	Browder's theorem	Conjecture	1	
75	Buddhist logic	Tetralemma	12	
76	Buridan's Ass	Paradox	11	
77	Buss's bounded arithmetics	Hierachy	6	
78	Cabannas objectivity	Theory	1	1
79	Hypothesis recast in equational arithmetic	Conjecture	13	
80	Cantor's continuum conjecture, binary injection	Hypothesis	2	
81	Continuum conjecture, interpreted	Hypothesis	3	
82	Diagonal argument	Proof	3	
83	Pairing	Functor	2	
84	Carroll's tortoise and Achilles	Paradox	3	2
85	Caswell's significant curriculum issues (1952)	Theorem	5	1
86	Causality	Axiom	3	2
87	Category composition of morphisms	Definition	1	
88	Category Tannakian via Iwasawa embedding	Axioms	1	
89	Category theory by lattice identity / partitions	Conjectures	5	1
90	CC conjecture of Lin Fan Mao	Conjecture	2	
91	Chaitin incompleteness and L constant	Theorem	3	1
92	Chinese room argument: Brain Simulator Reply	Conjecture		3
93	CHSH inequality	Conjecture	1	
94	Dual reality	Conjecture	1	
95	Church	Thesis	2	
96	Church-Rosser	Theorem	2	
97	Clausius-Clapeyron on spacial dimension	Equation	1	
98	Clifford tori 2D / Kanban cell neuron	Definition	2	3
99	Coherence in modal logic	Refutation	1	
100	Collatz (briefest known confirmation)	Conjecture	4	1
101	Collection theory as set of all closure sentences	Schema	1	
102	Commutative short circuit on propositional logic	System	1	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
103	Comorphism of sites for Grothendieck toposes	Theory	1	
104	Complementarity inequality	Refutation	2	1
105	Completeness: inclusion/equivalence of universality	Conjecture	1	
106	Complex (\mathbb{C}), imaginary number rendering	Method	1	1
107	Computer simulation model theory (CSMT)	Method	2	
108	Conceivable statement of Perez confirmed	Definition	18	1
109	Conceptivistic / containment logic: proscription	Systems	3	
110	Conditional logic: improved Adams	Hypothesis	7	
111	Events in QL	Conjectures	8	1
112	Conditional necessitarianism	Conjectures	6	
113	Confluence in rewrite systems	Property	3	
114	Connexive logic: Wansing's nightmare	System	2	
115	Aristotle, Boethius justifying connexive	Theses	4	
116	De Finettian logic conditionals	Indicatives	10	
117	Constructive math: Ishihara tricks onLPO/WLPO	Principles	3	
118	Constructivistic logic	System	14	2
119	Contingent, necessitarian, and internal, external	Conjectures	5	
120	Continuum hypothesis	Conjecture	2	1
121	Cook-Reckhow	Definition	6	
122	Coq proof assistant	Prover	1	
123	Counterfactual analysis of causation	Reversal	1	
124	Counterpart theory on intensionality logic	Theory	7	3
125	Craig interpolation, constructive Fefferman	Theorem	4	2
126	Constructive using Maehara's technique	Theorem	7	
127	Creative theories in degrees of unsolvability	Theorem	1	
128	Curry-Howard correspondence	Conjecture	4	
129	D Ultrafilter contra continuum problem	Equation	1	
130	De Morgan algebras, existentially closed	System	2	
131	Decoherence (pre-measurement) quantum mechanics	Formula	1	
132	Dedekind lattice identity	Axiom		1
133	Dempster-Shafer belief and plausibility	Theory	3	
134	Density of all Turing and truth table degrees	Formula	2	
135	Dependent choices (DC) on supercompactness	Axiom	2	
136	DC with axiom of determinacy (AC) on mice	Axioms	2	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
137	Description logic	System	2	
138	Power set POW on of any Ω -model	Operator	4	
139	Unions in descriptively near sets	Operator	6	2
140	Dialetheism	System	4	
141	Dialetheism: inconsistent	System	2	
142	Dichotomy of selection	System	1	
143	Differential reasoning	Logic	1	
144	Distributive bilattices	Variety	1	
145	Disturbance	Feature	4	
146	Diverse double compiling	Schema	1	
147	Domain theory of Dana Scott	System	6	
148	Poset: reflexive, antisymmetric, transitive	Definitions	2	1
149	Doxastic logic	System	8	13
150	Drinker's paradox	Paradox	1	
151	Duality corrected for weak by refuting strong	Theorem	7	2
152	Dyatic semantics on paraconsistent logic C_1	Approach	4	
153	$E=mc^2$	Theorem	3	1
154	EF-axiom: topology and near sets	Axiom	1	
155	Ehrenfeucht-Mostowski indiscernables	Theorem	1	
156	Einstein–Podolsky–Rosen (EPR)	Paradox	1	
157	Elementary constructive set theory (ECST)/CZF	Definitions	6	
158	Entanglement vs untanglement: no-no go-go	Conjecture	28	
159	Enumeration reducibility, degrees, topology	Method	1	
160	Epicurus invoked by Epictetus	Paradox	1	
161	Epimenides the Cretan	Paradox	1	
162	Epistemic coalition	Perfect recall	4	3
163	Epistemic dynamic reasoning	System	2	
164	Epistemic Hilbert substructure	System	5	
165	Epistemic for knowledge and probability	System	2	
166	Epistemic navigation	System	8	
167	Epistemic quantifiers over agents	Conjecture	8	12
168	Erdős-Strauss	Conjecture	1	
169	Ethical reasoning and HOL proof assistant	System	1	
170	Euathlus paradox	Paradox	9	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
171	Euclidean geometry embedded in non Euclidean	Conjecture	3	
172	"Ex nihilo": some thing from nothing	Conjecture	4	4
173	Fictional logic based on Levi-identity / AGM	System	5	4
174	Finitary, algebraizable logic undecidable in Hilbert	System	2	
175	Finite direct powers of ω for modal model	System	1	
176	First-order proofs without syntax	Method	7	
177	Fitch's knowability	Paradox	4	
178	Fixedpoint operator mapping mu-calculus	Conjecture	2	
179	FOL disjunctive normal forms (DNF): minimize	FOL Optimizer	2	1
180	FOL continuous induction on real closed fields	System	11	1
181	Force speed greater than light speed	Conjecture		3
182	FOT first order team logic	System	1	
183	Fodor weaker/stronger, class	Principle	5	1
184	Forcing method	Paradoxes	2	
185	Forcing to change large cardinal strength	Theorems	3	
186	Formalization of AC as equivalents using Coq	Claims	6	
187	Frauchiger-Renner thought experiment	Paradox	5	
188	Frauchiger-Renner thought quantum model	Paradox	14	2
189	Fredkin	Paradox	1	
190	Free choice permission (FCP) in deontic logic	Paradox	1	
191	Free logic (presupposition) for FOP (implication)	Conjecture	12	
192	Free will argument of Maimonides	Paradox	1	
193	Free will non-existence	Refutation	8	2
194	Free will theorem: Clifton-Kochen-Specker	Theorem	1	
195	Free will theorem: FIN axiom	Hypothesis	2	2
196	Free will theorem: MIN axiom	Hypothesis	1	
197	Frequency dependence of mass	Theorem	3	1
198	Functions as injective, surjective, bijective	Theorems		4
199	Gentzen proof of sequent System G-M	System	6	2
200	Gettier (justified belief)	Problem	6	
201	GHZ (Greenberger-Horne-Zeilinger)	Experiments	1	
202	Gleason	Theorem	1	
203	Gobbay separation	Theorem	17	
204	Gödel class with identity un-solvable	Conjecture	10	1

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
205	Gödel compactness	Theorem	6	2
206	Gödel completeness, short	Theorem	2	
207	Gödel completeness, shorter	Theorem	4	
208	Gödel first incompleteness	Theorem	4	
209	Gödel incompleteness	Equations	14	1
210	Gödel incompleteness FOL	Contradictions	14	1
211	Gödel incompleteness theorem	Assistant tools	2	2
212	Gödel incompleteness theorem, shortest	Refutation	7	
213	Gödel incompleteness via Löb counter-examples	Refutation	9	2
214	Gödel-justification logic	Refutation	7	2
215	Gödel-justification subsets	Models	2	
216	Gödel-Löb	Axiom	1	
217	Gödel-McKinsey-Tarski translation of IPC	Theorem	1	
218	Gödel pairing function	Axiom	3	1
219	Gödel recursion	Theorem		1
220	Gödel-Scott on God	Theorem schema	5	2
221	Goldbach's conjectures	Conjectures	8	2
222	Strong conjecture	Conjecture	5	1
223	Goldblatt-Thomason with back/forth duality	Theorem	3	
224	Goodstein (with Ackermannian)	Theorem	3	
225	Graded modal logic	Frame classes	4	2
226	Grassmannian discovery	Paradox	4	
227	Hadamard gate	Theory	3	1
228	Hahn-Banach	Theorem	5	
229	Hall	Effect	1	
230	Hamiltonian quaternion	Definition	3	
231	Hamkins' embeddings in sets	Theorem	1	
232	Hardy's generalized paradox	Conjecture	6	
233	Hegel's dialectic	Method	6	3
234	Heider inspired international relations theory	Theory	5	1
235	Heisenberg uncertainty principle	Axiom	2	
236	Conjecture	Principle	1	
237	Replacement theorem	Axiom	2	3
238	Take a picture of an electron	Principle	6	2

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239	Hempel's raven	Paradox	6	
240	Henkin cyclic algebra and FOL applications	Axioms	8	6
241	Permutation model nonrepresentable	Assertion	1	
242	Herbrand semantics	System	6	
243	Heyting algebra	Algebra	21	
244	Heyting-Brouwer intuitionistic logic	Systems	9	1
245	Heyting distributive lattices / binary operator	Conjecture	1	
246	Heyting logic	Idempotency	2	1
247	Hoop and pocrim with Prover9/Mace8	Theorems	14	
248	Hexagons of opposition for statistical modalities	Conjectures	9	1
249	Higher-order mathematical induction	Principle	2	1
250	Hilbert H10 undecidable: extended to Q in R	Problem	6	4
251	Hilbert generalization	System	1	
252	Hilbert grand hotel	Paradox	1	
253	Hilbert / Kolmogorov intuitionistic logic	Systems	9	
254	Hilbert's first epsilon theorem quantifier shift	Logics	7	
255	HOL rejection of Lowe's modal ontology	Argument	16	4
256	Horty's puzzles in stit logic	Corollaries	3	3
257	Hrushovski (<i>now</i> confirms Lachlan and Zil'ber)	Construction	2	
258	Huemer's confirmation theory for induction	Proposal	3	2
259	Huhn 2-distributive lattice identity	Formula	1	
260	Hybrid systems via predicate transform semantics	Assistant	5	
261	Hydraulic forgiveness (confirmed)	Theorem	6	2
262	Hydraulic corollary of peace	Corollary		1
263	Hypersequent calculus for modal logic S5	System	2	
264	Ideals	Definition	4	
265	Ignorance of first choice	System	3	
266	Imaginary numbers	Definition	2	
267	Imperative logic	System	3	4
268	Implication combination forms from $(p \rightarrow r) \rightarrow r$	Theorems	3	16
269	Implicit logic (IL) to explicit logic (EL)	Translation	7	
270	Impossible worlds: none necessary; all possible	Definitions	4	4
271	Inclusion, dependence, independence logics	Theorem	1	
272	Inconsistent theory	Theorem	6	2

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273	Extending the monad to a triad	Formulas	10	2
274	Kunen inconsistency	Theorem	1	1
275	Independence-friendly logic (Kreiselization)	System	2	
276	Indicative conditionals	Encyclopedia entry	5	1
277	Indiscernibles in saturated free algebras	Theory	2	
278	Induction: Black raven (swan); Kripkenstein	System	3	
279	Induction: intuitionistic logic Martin-Löf type theory	Axiom	4	
280	Induction: New riddle	Paradox	2	
281	Induction, coinduction: standard and mutual	System	4	
282	Induction in Elem. Arith. for reduction property	Formulas	2	
283	Inequality: 'arbitrarily' vs 'sufficiently large	Conjecture	2	1
284	Infinite set theory	Theorem	2	
285	Information theory: mutual information	Definition	4	
286	Innovation contest in two sequential stages	Definition	2	
287	Inquisitive modal logic via flatness grade	System	2	
288	Internal logic of extensive restriction categories	Duality	3	
289	Interpretability logic	System	3	
290	Interval logic for model checking	System	3	
291	Intuitionistic fuzzy decisions in Dempster-Shafer	Comparison	2	
292	Intuitionistic Zermelo-Fraenkel set theory (IZF)	Axioms	10	
293	Isabelle/HOL interactive tools	Prover	14	3
294	Isabelle/HOL prover assistant	System	1	
295	Jaccard index	Statistic	3	
296	Jensen polynomial partition roots for Riemann	Hypothesis	1	
297	Join-prime in lattice theory	Definition		1
298	Jonsson positive logic: retromorphism	System	3	
299	k -triangular set function logic	Definition		1
300	Kanban cell neuron maps whole brain	Model	242	14
301	Kant: falsity of syllogistic figures	Theorems	8	2
302	Karpenko, S.A.	System K-L4	6	8
303	Keisler measure in NIP theory	Formula	1	
304	Keisler's ultraproduct	Construction	7	1
305	Kent algebras on rough set concept analysis	Algebra	5	
306	Kleene algebra, free with domain (binary relations)	Conjecture	2	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
307	Kleene lattices, reversible	Axiomization	3	1
308	Knowledge representation	Refutations	15	
309	Kramers-Kronig	Relation	1	
310	Kripke frames via BAOs with $\diamond\perp=\perp$	Theory	10	
311	Kripke-Platek and CZF	Set Theory	1	
312	Kuratowski–Zorn lemma (Zorn's lemma)	Lemma	1	
313	Lachlan problem solution	Problem	4	
314	Lambda λ -calculus and LISP	System	7	1
315	Lattice effect algebra	Conjecture	1	
316	Lean prover from Microsoft	System	3	
317	Lebesgue spaces	Conjecture	1	
318	Leibniz' identity of indiscernibles	Theorem	1	
319	Leibniz' ontological proof	Proof	1	1
320	Briefest known ontological proof of God	Proof		2
321	Lemmon D	Axiom	1	
322	van Leunen deformation field	Conjecture	4	
323	van Leunen lattice logic, weak modular	Theorem	2	
324	Liar	Paradox	5	
325	Liar's antimony	Paradox	7	
326	Prior rendition	Paradox	4	
327	Saul Kripke rendition	Paradox	1	
328	Line through a circle	Conjecture		1
329	Linear algebra	Theorems	4	
330	Linear programming: Kharun-Kush-Tucker	Conditions	4	
331	Linear temporal logic	System	2	
332	Liouville	Theorem	2	1
333	Lipschitz horizontal vector fields	Conjecture	4	
334	Löb original, corrected	Theorem	1	1
335	Löb with Gödel incompleteness	Theorems	3	
336	Lobachevskii non Euclidean geometry	Consistency	1	1
337	Lonely runner	Conjecture	8	1
338	Refutation of and strong Löwenheim–Skolem	Theorem	4	
339	Löwenheim–Skolem, Hilbert style	Metatheorem	4	
340	Luce model (general)	Definitions/axioms		5

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341	Łukasiewicz nightmare: $(\diamond p \& \diamond q) \rightarrow \diamond(p \& q)$	Allegation	4	3
342	Łukasiewicz modal Ł4	Objections	8	1
343	Lusin's separation	Theorem	2	
344	Lyndon interpolation and GL	Interpolation	8	1
345	Majorana's 'root'	Equations	9	
346	Malice and Alice	Puzzle	7	
347	Matita prover superposition	Algorithms	3	
348	Mereology, behavioral	System	2	
349	Mereotopology, distributive	Relations	9	
350	Metaphysics: "Something rather than nothing"	Problem		2
351	Meth8/VŁ4 self-proof in one variable	Theorem		8
352	Meth8 versus Prover9 via Lifshitz	Problem		1
353	Minimalist foundation (MF) via Church's thesis	System	1	
354	Minkowski plane, classical set of points/cycles	Theorems	2	1
355	Modal aleatoric calculus	System	6	
356	Modal coalgebraic geometric logic	System	2	
357	Modal logics: 2; 3; 4; B; D; E; K; M; T; and W	Systems	2	8
358	Modal GL ₂	Logic	8	1
359	Modal logic for supervised learning	System	11	
360	Modal operators on rings of continuous functions	Conjecture	6	
361	Model theory = univ. algebra + mathematical logic	Language	1	
362	Modern modal logics (2): JYB4 and AR4	Axioms	12	17
363	Modified divine command	Theory	4	1
364	Modus ponens consequent as conditional	Rule	3	1
365	Molyneux's problem	Problem	1	
366	Moore's paradox	Paradox	2	1
367	Moral absolutism impossible	Conjecture	3	1
368	Relativity of moral absolutism	Conjecture	2	1
369	Most	Quantifier	2	
370	Naive scale invariance for 't Hooft world hologram	Conjecture	1	
371	Necessitation: K, T, 4, B, D, 5; D, M, S4, B, S5	Axiom	10	7
372	Leonard Nelson's criticism of epistemology	System	2	2
373	von Neuman-Bernays-Gödel [NBG]	Theory	2	3
374	Neutrosophic logic	Theorems	5	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
375	Dezert-Smarandache	Theory	2	
376	Generalized Hegel's dialectics	Method	4	
377	Generalized intuitionistic, fuzzy logic	System	2	
378	Geometry of Smarandache / Lin Fan Mao	Definition	2	
379	MANET attack genetics	Algorithm	1	
380	Negated adjectival phrases	Lattices	2	
381	Neutrosophic logic: theory of everything	Theorem	2	
382	Neutrosophic sets	Properties	3	
383	Neutrosophy with dependent probability	Definitions	3	2
384	Pseudo-trinitarian human consciousness	Model	2	
385	Quinary	System	2	
386	Retract crisp set topology	Propositions	5	
387	Smarandache multi-space theory	System	5	
388	Soft lattice theory	Theorem	2	
389	Unification of other logics	Axioms / Rules	2	
390	Values as 1, 0, between 0 and 1	Designated logic	2	
391	Vector space on $\{-0, 0, 0 < p < 1, 1, 1+\}$	Multi-valued logic	3	
392	Newcomb's game	Paradox	2	
393	Noncontingency variants	Operator	5	
394	Non-deterministic logic	Completeness	8	
395	Nothing does not imply a non existent null set	Definition	7	
396	Nucleosynthesis	Definitions	4	
397	Ontology engineering for complete-debug problems	Conjecture	6	
398	Open universe causal reasoning	Conjecture	2	
399	Optimization for complex number programming	Conjecture	1	
400	Ordinal notation via simultaneous definition	Conjecture	5	
401	Ordinal Turing machine (OTM) on set theory	Conjectures	3	
402	Orthomodular law	Theorem	1	
403	Overlap algebra on constructive Boolean algebra	Conjecture	4	
404	P=NP; 3-SAT	Conjectures	5	
405	Satisfiability via claimed Boolean rules	Conjectures	4	
406	Paraconsistency, machine-assisted view	Axioms	2	3
407	Paraconsistent contradiction	Conext	4	
408	Paraconsistent logic on one conjecture	Theorem	1	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
409	Paradox refutation reduced to one variable	Method	3	9
410	Parikh's logic G and completeness of system Par	Axiomatization	3	
411	Partial awareness	System	8	1
412	Pascal's wager thought experiment	Theorem	4	1
413	Pauli exclusion	Principle	4	
414	Peano arithmetic 9, 1-8	Axioms	1	8
415	Extended truth definitions	Theorems	3	
416	PL4	System	10	
417	Playfair axiom	Axiom		1
418	Plonka sums of inclusive consequence relations	Inclusion	1	
419	Poincaré recurrence theorem	Theorem	2	
420	Poison modal logic (PML)	System	4	
421	Karl Popper on God	Proof	4	14
422	Positive modal logic	Variety	4	
423	PowerEpsilon mathematical induction	Axiom		1
424	Pratt-Floyd-Hoare logic correctness	System	5	
425	Predicative collapse, arithmetical comprehension	Conjectures	5	
426	Preference profiles	Algorithm	6	
427	Prenex normal format	Rules	11	3
428	Shortest refutation based on implication	Rules	2	2
429	Pre-orderable groups	Conjecture	3	
430	Presburger arithmetic	System	3	
431	Presupposition different from entailment	Conjecture	3	
432	Prevarieties and quasivarieties of logic	Monoids	4	
433	Prisoner's paradox	Paradox	3	
434	Probabilistic approximate logic (PALO)	System	1	
435	Program verification	Reduction	1	
436	Provability logic GL, Japaridze polymodal GLP	Logics	8	
437	Prover9 vs Meth8 differences	System	6	
438	Pure alethic modal logic	System	1	1
439	Quantified modal logic theorem proof (QMLTP)	Library	5	
440	Quantifiers and operators	Connectives	12	
441	Quantum arithmetic for repeat-until-success	Circuits	2	
442	Block chain	Cryptography	1	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
443	Classical logic as completion of QL	System	16	6
444	Control by observation	System	1	
445	Entanglement	Conjecture	5	
446	Gates correspond to logical operators	Theorems	4	1
447	Gates refuted	Theorems	8	1
448	Gedanken experiment	Conjectures	8	
449	Logic	System	17	2
450	Masking	Conjectures	5	2
451	Probability	Axiom	1	
452	Probability	Rule	2	
453	Simulation of Hamiltonian spectra	Operator	1	
454	Spin-statistics	Theorem	4	4
455	Superposition as the red herring	Conjecture	3	
456	Superposition disproves Schrödinger cat	Conjecture	5	2
457	Temporal logic based on Löwner order	System	4	
458	Ternary probability of qutrit	Hypothesis	3	
459	Three lights experiment of qutrit	Conjecture	1	
460	Questions and answers	Problem	4	1
461	Ramsey's theorem / Pythagorean triple of integers	Theorem	8	
462	Ranjan, A.	Problem		2
463	Rational emotive behavior therapy (REBT/LBT)	Systems	16	
464	Rauszer 'concrete' Boolean algebra by preorder	Systems	13	
465	Realizability semantics for QML	Theorems	3	
466	Reichenbach common cause / event-splitting	Principle	6	3
467	Relativization (structural induction) in weighting	Method	1	
468	Relevance logic	System	7	
469	Definition in R	Model	2	
470	Resolution-based decision procedure, 2-vars equality	Methodology	9	
471	Reverse mathematics: recursive comprehension	Principle	10	2
472	Measurability and computability	Theory	1	2
473	Nets	Conjectures	4	
474	Rewriting logic for compositional specification	Conjectures	4	
475	Riemann: only zeroes at 0, 1/2	Hypothesis	1	
476	Excluded middle	Conjecture	4	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
477	Extended complex numbers on sphere	Operators	3	2
478	Zeta function, Caceres 6	Proposition	4	
479	Zeta function, properties	Axioms	7	
480	Roman Catholic Church (RCC) Canon law	Theorem	4	
481	Erasmus contra Luther	Controversy		1
482	Infallibility and the Historic Church	Pius IX	2	
483	Invalid epiclesis with silent Holy Ghost	Canons	4	1
484	Magisterium	Paul VI	1	
485	Primacy of the Roman See	Pius XI	1	
486	Sacred heart of Jesus	Pius XI	3	
487	Tradition above scripture	Pius IX	4	
488	Twelfth promise of St Alacoque	Vision	3	
489	Rosser's theorem on consistency	Theorem	6	1
490	Rota lattice theory, distributive	Axiom	1	
491	Russell	Paradox	4	
492	Russell-Prawitz embedding	Conjectures	7	
493	S5II+ propositional quantification	System	1	
494	Sabotage modal logic (revisited)	System	6	
495	Sacchetti's modal logics of provability	Definition	1	
496	Sahlqvist modal / quantified correspondence	Theory	7	
497	Sahlqvist non formulas as tautologous	Theory	1	
498	Schaeffer for graphs, P, NP, NPC, NPH, NPI	Theorem	10	
499	Schematic refutations of formula schemata	Method	2	
500	Schrödinger's cat	Paradox	2	
501	Scott's existence axiom in sheaf theory	Conjecture	5	
502	Scott's topology, temporal types, landscapes	Theory	4	
503	Search fund study	Model	2	
504	Security barrier	Model	5	2
505	Self-equilibrium	Law / Paradox	1	
506	Self-proving fixed-point predicate modal logic on GL	Definition / Theorem	4	
507	Self-verifying axioms for grounding functions	Conjecture	7	
508	Shallow embedding for rewriting equality in MLTL	Rule	7	
509	Shevenyonov extension nary antropic to PL	System	16	2
510	Simulation argument and incompleteness	Conjecture	1	

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
511	Mistakes in rebuttal of refutation above	Conjectures	6	2
512	Imply operator injected for Bayes' pipe	Conjecture	1	
513	Skolem form	Axiom	1	
514	Sliding scale in law	Theorem	3	
515	Solovay arithmetical / semantical completeness	Theorem	10	2
516	Sorites	Paradox		1
517	Special theory of relativity: Crothers refutation	Confirmation	1	4
518	Square (Łukasiewicz) and Cube (Seuren)	Systems	27	15
519	Square of Opposition Meth8 Corrected	System		6
520	Square of Opposition Modern Revised	System	2	
521	Square of Opposition	Proportions	3	
522	Stable set lattices	Modal operators	2	
523	Stit logic (see to it that)	System	13	
524	Stone space type lattice logic model	Theory	2	
525	Stone-Wales rotation transform reversibility	Theorem	2	1
526	Strong jump inversion, decided saturated model	Logic	1	
527	Student quiz conjecture	Paradox	1	
528	Subdirect products on bounded homomorphisms	Lattices	2	
529	Superposition of states	Principle	6	
530	Supply and demand	Conjecture	6	
531	Surveillance objectives	Subgames	2	
532	Suzko's minimal truth values for universal logic	Problem	3	
533	Symmetry breaking, skeleton, ensemble, SMT solver	Methodology	3	
534	Symplectic vector space	Theorem	2	
535	Tarski's geometric axioms and betweenness	System	8	5
536	Tarski's undefinability of truth	Theorem	2	
537	Tarski–Grothendieck set theory	Axiom	2	
538	Tarski–Grothendieck Metamath ax-groth	Axiom	7	
539	Tarski's planar Euclidean R-geometry	System	8	2
540	Temporal logic properties	System	7	
541	Temporal logic over infinite intervals, completeness	Conjecture	6	
542	Term rewriting for automated theorem proving	Method	2	
543	Theory of logic for glutty, gappy relations	System	16	
544	Three-valued, bivalent logic VL3	System		10

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
545	Time algorithm	Conjecture	3	
546	Time as God	Conjecture		2
547	Time as past, present, future coexisting states	Conjecture	3	
548	Time as tense via converse implication (EQT)	Conjecture		1
549	Topological manifold transition	Function	1	
550	Topological T_0 -space	Differ modality	3	
551	Totherian sets	Theory	5	
552	Translation invariance of superposition calculus	Property	2	
553	Traveling salesman complexity problem	Conjecture	1	1
554	Triangle inequality	Conjecture		1
555	Trivial proofs for a troll	Conjectures		3
556	Trolley ethical thought experiment	Problem	3	
557	Turing halting problem	Problem	2	1
558	Turing's halting problem as logically unsolvable	Problem	2	
559	Twin paradox	Paradox	2	
560	Two-sided page	Paradox	5	1
561	Type theory	Conjecture	2	
562	Ultrapower of universe, projective determinacy	Hypotheses	2	
563	Unanswered logic questions	Conjectures	2	1
564	Unfalsifiability	Conjecture	2	2
565	Unification nets (canonical proof net quantifiers)	Conjecture	9	
566	Unification of simple symmetrical modal logics	Type	2	
567	Universal finite set	Theorem	2	
568	Universal network	Operator	5	
569	Universal logic $\forall\exists$	Logic		1
570	Veblen (corrected)	Axiom	1	1
571	Vector conjecture for two points implying a third	Conjecture		1
572	Verilog / VHDL hardware logic	Connectives	36	
573	Veronoï regions (with "nonempty sets")	Definition	3	
574	Vickrey auction	Theorem	10	2
575	Vietoris space modal operators	Definitions	2	
576	Visibility graph / Kanban cell resuscitation	Algorithm	1	1
577	$\forall\exists$ completeness confirmed	Theorem	1	1
578	$\forall\exists$ soundness confirmed	Theorem	2	1

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
579	VŁ4 theorems for S5	Theorems	8	
580	Vongehr's shift rendering QM "natural"	Paradigm	2	3
581	W (K4W)	Theorem	1	
582	Wadge order (and on Scott domain)	Theorem	4	
583	Weak set H to prove its own consistency	Theory	3	
584	Well ordering property	Axiom	1	
585	Wellfoundedness of multiset order	Theorem	2	
586	White's model of creation	System	7	1
587	Wittgenstein's ab-notation	System	3	
588	X-homology on manifolds in topology	Axiom	1	
589	Yalcin logic	Axioms	2	
590	Yinyang	System	1	3
591	Zadeh first operators on fuzzy logic	System	5	
592	Historical assumptions	Axioms	4	1
593	Perfect / strong functions, residuated operator	Conjectures	3	
594	Resolution and symmetry in Z-numbers	Definitions	3	
595	Swedes and Italians logic challenge	Problem	3	
596	Zariski topology affine varieties, scheme theory	Definitions	3	
597	Zermelo-Fraenkel constructive (CZF)	Axioms	9	1
598	Zermelo-Fraenkel (ZF) shortest contra 9 axioms	Axioms	10	
599	ZFC Empty set	Axiom	2	
600	Shortest refutation	Axiom	3	
601	ZFC Extensionality	Axiom	1	1
602	ZFC Extensionality (another rendition)	Axiom	1	
603	Other refutations of ZFC axioms (10)	Axioms	10	1
604	ZF Law of excluded middle: infinite set	Axiom	2	
605	ZF supremum and infimum	Definitions	3	
606	ZFC ⁰ : schemas of comprehension, replacement	Axioms	2	
607	Zero and three in arithmetic	Theorems		9
608	Zero knowledge proof	Theorem	1	
609	Zeroth law of thermodynamics	Theorem	3	2
610	Rendering quantifiers as modal operators	Appendix		
611	Meth8 on Modus Cesare and Modus Camestros	Appendix		
612	Availability of Meth8/VŁ4	Marketing collateral		

No.	Name of artifact	Type of artifact	Non Taut.	Tautology
613	Availability of Meth8/VŁ4 demo for 2-variables (p,q)	Marketing collateral		
614	Scalability of Meth8/VŁ4	Marketing collateral		
		630 artifacts = 3277	2740	548

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