

## Recent advances in refutation and confirmation using Meth8 modal logic model checker

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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 331 artifacts in 1669 assertions to confirm 343 as tautology and 1326 as *not* (79%). 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  $V\mathcal{L}4$  which corrects the quaternary  $\mathcal{L}4$  of Łukasiewicz. There are two sets of truth values on the 2-tuple  $\{00, 10, 01, 11\}$  as respectively  $\{\text{False for contradiction; Contingent for falsity; Non contingent for truthity; Tautology for proof}\}$  and  $\{\text{Unevaluated; Improper; Proper; Evaluated}\}$ . The designated *proof* value is  $\mathbb{T}$  for tautology and  $\mathbb{E}$  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  $\{\text{and, or, imply, equivalent}\}$  are  $\{\&, +, >, =\}$ . The negated connectives for  $\{\text{nand; nor; not imply; exclusive-or}\}$  are  $\{\backslash, -, <, @\}$ . The operators for  $\{\text{not; possibility } \diamond \exists; \text{necessity } \square \forall\}$  are  $\{\sim, \%, \#\}$ . 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	$p=p$	$\mathbb{T}$	tautology	proof	11	3
2	$p@p$	$\mathbb{F}$	contradiction	absurdum	00	0
3	$\%p\#\#p$	$\mathbb{N}$	non-contingency	truthity	01	1
4	$\%p<\#p$	$\mathbb{C}$	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.

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No.	Name of artifact	Type of artifact	Results with instances
1	ABC	Conjecture	Invalidated
2	Abductive reasoning	System	Invalidated
3	Agnosticism as subset of atheism from no-belief	Conjecture	Invalidated (4) Validated (2)
4	Alcoholics Anonymous BB: We agnostics, p 53	Conjecture	Invalidated (5)
5	Alexandroff correspondence	Conditional	Invalidated (3)
6	Analysis as both correct and informative	Paradox	Invalidated (5)
7	Anderson division by zero as nullity	Theorem	Invalidated
8	Athanasian creed (Holy Trinity)	Credo	Invalidated (1) Validated (2)
9	Axiomatizing category theory in free logic	Axioms	Invalidated
10	Banach-Tarski	Paradox	Invalidated
11	Barcan	Formula	Validated
12	Bayes rule	Rule	Invalidated (11) Validated(11)
13	BCI / BCK algebra	System	Invalidated (5) Validated (3)
14	Bell / CHSH / Spekken toy model	Inequalities	Invalidated
15	A shorter refutation	Theorem	Invalidated (2)
16	A simpler refutation	Theorem	Invalidated (2)
17	Bell's inequality by axiom of empty set	Theorem	Invalidated (2)
18	Bogus Bellian logic (BBL)	Theorem	Invalidated (5)
19	Coercive proof	Theorem	Invalidated (2)
20	Coin toss proof	Conjectures	Invalidated (2)
21	Original inequality with assumption	Conjecture	Invalidated (4)
22	Original inequality with assumptions	Conjectures	Invalidated (5)
23	Original inequality and CHSH	Conjectures	Invalidated (6)
24	Positive reasons proof	Theorem	Invalidated (6) Validated (3)
25	Berkeley	Paradox	Invalidated
26	Bernstein-Vazirani	Algorithm	Invalidated (4) Validated (1)
27	No-cloning theorem	Theorem	Invalidated (2)
28	Bertrand-Chebyshev theorem / postulate	Theorem	Invalidated (2)
29	Biscuit conditionals	System	Invalidated (13)
30	Bogdanov map, 2D conjugate of Hénon map	Formula	Invalidated
31	Born rule	Theorem	Invalidated (6)
32	Exclusivity rule as basis	Theorem	Invalidated (5)
33	Borsuk-Ulam theorem (BUT)	Conjecture	Invalidated (1)
34	Branching quantifier (Hintikka)	System	Invalidated

No.	Name of artifact	Type of artifact	Results with instances
35	Brouwer fixed point theorem (BFPT)	Conjecture	Invalidated (3) Validated (2)
36	Browder's theorem	Conjecture	Invalidated (1)
37	Buddhist logic	Tetralemma	Invalidated (12)
38	Buridan's Ass	Paradox	Invalidated
39	Cantor's continuum conjecture, binary injection	Hypothesis	Invalidated (2)
40	Continuum conjecture, interpreted	Hypothesis	Invalidated (3)
41	Diagonal argument	Proof	Invalidated (3)
42	Pairing	Functor	Invalidated (2)
43	Carroll's tortoise and Achilles	Paradox	Invalidated
44	Causality	Axiom	Invalidated (3) Validated (2)
45	Category composition of morphisms	Definition	Invalidated (1)
46	CC conjecture of Lin Fan Mao	Conjecture	Invalidated (2)
47	Chaitin incompleteness and L constant	Theorem	Invalidated (3) Validated (1)
48	Chinese room argument: Brain Simulator Reply	Conjecture	Validated (3)
49	CHSH inequality	Conjecture	Invalidated (1)
50	Church	Thesis	Invalidated
51	Clausius-Clapeyron on spacial dimension	Equation	Invalidated (1)
52	Clifford tori 2D / Kanban cell neuron	Definition	Validated
53	Collatz	Conjecture	Invalidated (6)
54	Commutative short circuit on propositional logic	System	Invalidated (1)
55	Complementarity inequality	Refutation	Invalidated (2) Validated (1)
56	Complex (C), imaginary number rendering	Method	Invalidated (1) Validated (1)
57	Conceptivistic / containment logic: proscription	Systems	Invalidated (3)
58	Conditional logic: improved Adams	Hypothesis	Invalidated (7)
59	Events in QL	Conjectures	Invalidated (8) Validated (1)
60	Connexive logic: Wansing's nightmare	System	Invalidated (2)
61	Aristotle, Boethius justifying connexive	Theses	Invalidated (4)
62	Stit logic (see to it that)	System	Invalidated (13)
63	Constructivistic logic	System	Invalidated (14) Validated (2)
64	Continuum hypothesis	Conjecture	Invalidated (2) Validated (1)
65	Craig's interpolation	Theorem	Invalidated (1)
66	Creative theories in degrees of unsolvability	Theorem	Invalidated
67	D Ultrafilter contra continuum problem	Equation	Invalidated (1)
68	De Morgan algebras, existentially closed	System	Invalidated (2)

No.	Name of artifact	Type of artifact	Results with instances
69	Dedekind lattice identity	Axiom	Validated
70	Density of all Turing and truth table degrees	Formula	Invalidated (2)
71	Description logic	System	Invalidated (2)
72	Dialetheism	System	Invalidated (4)
73	Dialetheism: inconsistent	System	Invalidated (2)
74	Dichotomy of selection	System	Invalidated
75	Diverse double compiling	Schema	Invalidated
76	Doxastic logic	System	Invalidated (8) Validated (13)
77	Drinker's paradox	Paradox	Invalidated
78	$E=mc^2$	Theorem	Invalidated (3) Validated (1)
79	EF-axiom: topology and near sets	Axiom	Invalidated
80	Ehrenfeucht-Mostowski indiscernables	Theorem	Invalidated (1)
81	Einstein–Podolsky–Rosen (EPR)	Paradox	Invalidated (1)
82	Energy-mass equation, $E=mc^2$	Theorem	Invalidated (3) Validated (1)
83	Entanglement vs untanglement: no-no go-go	Conjecture	Invalidated (28)
84	Epicurus invoked by Epictetus	Paradox	Invalidated (1)
85	Epimenides the Cretan	Paradox	Invalidated (1)
86	Epistemic coalition	Perfect recall	Invalidated (4) Validated (3)
87	Epistemic dynamic reasoning	System	Invalidated (2)
88	Epistemic Hilbert substructure	System	Invalidated (5)
89	Epistemic navigation	System	Invalidated (8)
90	Epistemic quantifiers over agents	Conjecture	Invalidated (8) Validated (12)
91	Erdős-Strauss	Conjecture	Invalidated
92	Euathlus paradox	Paradox	Invalidated (9)
93	Fictional logic based on Levi-identity / AGM	System	Invalidated (5) Validated (4)
94	Fixedpoint operator mapping mu-calculus	Conjecture	Invalidated (2)
95	Fitch's knowability	Paradox	Invalidated (4)
96	FOL disjunctive normal forms (DNF): minimize	FOL Optimizer	Invalidated (2) Validated (1)
97	Fredkin	Paradox	Invalidated (1)
98	Free will argument of Maimonides	Paradox	Invalidated (1)
99	Free will non-existence	Refutation	Invalidated (8) Validated (2)
100	Free will theorem: Clifton-Kochen-Specker	Theorem	Invalidated (1)
101	Free will theorem: FIN axiom	Hypothesis	Invalidated (2) Validated (2)
102	Free will theorem: MIN' axiom	Hypothesis	Invalidated (1)

No.	Name of artifact	Type of artifact	Results with instances
103	Frequency dependence of mass	Theorem	Invalidated (3) Validated (1)
104	Functions as injective, surjective, bijective	Theorems	Validated (4)
105	Gentzen proof of sequent System G-M	System	Invalidated (6) Validated (2)
106	Gettier (justified belief)	Problem	Invalidated (6)
107	GHZ (Greenberger-Horne-Zeilinger)	Experiments	Invalidated (1)
108	Gleason	Theorem	Invalidated (1)
109	Gödel compactness	Theorem	Invalidated (6) Validated (2)
110	Gödel completeness	Theorem	Invalidated
111	Gödel completeness, shortest	Theorem	Invalidated (2)
112	Gödel first incompleteness	Theorem	Invalidated (4)
113	Gödel incompleteness	Equations	Invalidated (14) Validated (1)
114	Gödel incompleteness FOL	Contradictions	Invalidated (14) Validated (1)
115	Gödel incompleteness theorem	Assistant tools	Invalidated (2) Validated (2)
116	Gödel incompleteness theorem	Refutation	Invalidated (7)
117	Gödel incompleteness via two counter-examples	Refutation	Invalidated (9) Validated (2)
118	Gödel-Löb	Axiom	Invalidated
119	Gödel pairing function	Axiom	Invalidated (3) Validated (1)
120	Gödel recursion	Theorem	Validated
121	Gödel-Scott on God	Theorem schema	Invalidated
122	Goldbach's conjectures	Conjectures	Invalidated
123	Grassmannian ( <i>recently discovered</i> )	Paradox	Invalidated
124	Hadamard gate	Theory	Invalidated (3) Validated (1)
125	Hall	Effect	Invalidated
126	Hamiltonian quaternion	Definition	Invalidated (3)
127	Hardy's generalized paradox	Conjecture	Invalidated (6)
128	Hegel's dialectic	Method	Invalidated (6) Validated (3)
129	Heider inspired international relations theory	Theory	Invalidated (5) Validated (1)
130	Heisenberg uncertainty principle	Axiom	Invalidated (2)
131	Conjecture	Principle	Invalidated (1)
132	Replacement theorem	Axiom	Invalidated (2) Validated (3)
133	Take a picture of an electron	Principle	Invalidated (6) Validated (2)
134	Henkin cyclic algebra and first order logic	System	Invalidated (9) Validated (6)
135	Applications to logic	Axioms	Invalidated (8) Validated (6)
136	Permutation model nonrepresentable	Assertion	Invalidated (1)

No.	Name of artifact	Type of artifact	Results with instances
137	Herbrand semantics	System	Invalidated (6)
138	Heyting-Brouwer intuitionistic logic	Systems	Invalidated (9) Validated (1)
139	Heyting logic	Idempotency	Invalidate (2) Validated (1)
140	Higher order logic	Systems	Invalidated (2) Validated (1)
141	Hilbert #10 Diophantine universal solution	Formulas	Invalidated
142	Hilbert generalization	System	Invalidated
143	Hilbert grand hotel	Paradox	Invalidated (1)
144	Huhn 2-distributive lattice identity	Formula	Invalidated
145	Hydraulic forgiveness (confirmed)	Theorem	Invalidated (6) Validated (2)
146	Hydraulic corollary of peace	Corollary	Validated (1)
147	Ignorance of first choice	System	Invalidated
148	Imaginary numbers	Defintion	Invalidated (2)
149	Imperative logic	System	Invalidated (3) Validated (4)
150	Implication combination forms from $(p \rightarrow r) \rightarrow r$	Theorems	Invalidated (3) Validated (16)
151	Inconsistent theory	Theorem	Invalidated
152	Extending the monad to a triad	Formulas	Invalidated
153	Kunen inconsistency	Theorem	Invalidated
154	Independence-friendly logic (Kreiselization)	System	Invalidated (2)
155	Indicative conditionals	Encyclopedia entry	Invalidated
156	Induction: Black raven (swan); Kripkenstein	System	Invalidated (3)
157	Induction: New riddle	Paradox	Invaliddted (2)
158	Inequality: 'arbitrarily' vs 'sufficiently large'	Conjecture	Invalidated (2) Validated (1)
159	Infinite set theory	Theorem	Invalidated
160	Information theory: mutual information	Definition	Invalidated (4)
161	Join-prime in lattice theory	Definition	Validated
162	Jonsson positive logic: retromorphism	System	Invalidated (3)
163	Kanban cell neuron maps whole brain	Model	Invalidated(242)Validated(14)
164	Kant: falsity of syllogistic figures	Theorems	Invalidated (8) Validated (2)
165	Karpenko, S.A.	System K-Ł4	Invalidated
166	Kramers-Kronig	Relation	Invalidated
167	Kuratowski–Zorn lemma (Zorn's lemma)	Lemma	Invalidated
168	Lachlan problem solution	Problem	Invalidated (4)
169	Lean prover from Microsoft	System	Invalidated (3)
170	Leibniz' ontological proof	Proof	Invalidated (1) Validated (1)

No.	Name of artifact	Type of artifact	Results with instances
171	Briefest known ontological proof of God	Proof	Validated (2)
172	Lemmon D	Axiom	Invalidated
173	van Leunen deformation field	Conjecture	Invalidated (4)
174	van Leunen lattice logic, weak modular	Theorem	Invalidated (2)
175	Liar	Paradox	Invalidated
176	Prior rendition	Paradox	Invalidated
177	Kripke rendition	Paradox	Invalidated
178	Line through a circle	Conjecture	Validated (1)
179	Linear algebra	Theorems	Invalidated (4)
180	Liouville	Theorem	Invalidated (2) Validated (1)
181	Löb original, corrected	Theorem	Invalidated (1) Validated (1)
182	Löwenheim–Skolem	Theorem	Invalidated (5)
183	Löwenheim–Skolem, Hilbert style	Metatheorem	Invalidated (4)
184	Luce model (general)	Definitions/Axioms	Validated (5)
185	Majorana's 'root'	Equations	Invalidated (5)
186	Metaphysics: "Something rather than nothing"	Problem	Validated (2)
187	Meth8/VL4 self-proof in one variable	Theorem	Validated (8)
188	Meth8 versus Prover9 via Lifshitz	Problem	Validated
189	Minkowski plane, classical set of points/cycles	Theorems	Invalidated (2) Validated (1)
190	Modal logics: 2; 3; 4; B; D; E; K; M; T; and W	Systems	Invalidated (2) Validated (8)
191	Modern modal logics (2): JYB4 and AR4	Axioms	Invalidated (13) Validated (6)
192	Modified divine command	Theory	Invalidated
193	Molyneux's problem	Problem	Invalidated (1)
194	Moral absolutism impossible	Conjecture	Invalidated (3) Validated (1)
195	Relativity of moral absolutism	Conjecture	Invalidated (2) Validated (1)
196	Necessitation: K,T,4,B,D,5; D,M,S4,B,S5	Axiom	Invalidated (10) Validated (7)
197	Leonard Nelson's criticism of epistemology	System	Invalidated
198	von Neuman-Bernays-Gödel [NBG]	Theory	Invalidated (2) Validated (3)
199	Neutrosophic logic	Theorems	Invalidated (5)
200	Dezert-Smarandache	Theory	Invalidated (2)
201	Generalized Hegel's dialectics	Method	Invalidated (4)
202	Generalized intuitionistic, fuzzy logic	System	Invalidated (2)
203	MANET attack genetics	Algorithm	Invalidated (1)
204	Negated adjectival phrases	Lattices	Invalidated (2)



No.	Name of artifact	Type of artifact	Results with instances
205	Neutrosophic logic: theory of everything	Theorem	Invalidated (2)
206	Neutrosophic sets	Properties	Invalidated (3)
207	Quinary	System	Invalidated (2)
208	Smarandache multi-space theory	System	Invalidated (5)
209	Soft lattice theory	Theorem	Invalidated (2)
210	Unification of other logics	Axioms / Rules	Invalidated (2)
211	Values as 1, 0, between 0 and 1	Designated logic	Invalidated (2)
212	Vector space on $\{-0, 0, 0 < p < 1, 1, 1+\}$	Multi-valued logic	Invalidated (3)
213	Newcomb's game	Paradox	Invalidated (2)
214	Non-deterministic logic	Completeness	Invalidated (8)
215	Nothing does not imply a non existent null set	Definition	Invalidated (7)
216	Nucleosynthesis	Definitions	Invalidated (4)
217	Optimization for complex number programming	Conjecture	Invalidated (1)
218	P=NP; 3-SAT	Conjectures	Invalidated (5)
219	Paraconsistency, machine-assisted view	Axioms	Invalidated
220	Paraconsistent contradiction	Conext	Invalidated
221	Paradox refutation reduced to one variable	Method	Validated
222	Pauli exclusion	Principle	Invalidated (4)
223	Peano arithmetic 9, 1-8	Axioms	Invalidated (1) Validated (8)
224	Playfair axiom	Axiom	Validated (1)
225	Poincaré recurrence theorem	Theorem	Invalidated (2)
226	Karl Popper on God	Proof	Validated
227	PowerEpsilon mathematical induction	Axiom	Validated (1)
228	Prenex normal format	Rules	Invalidated (11) Validated (3)
229	Shortest refutation based on implication	Rules	Invalidated (2) Validated (2)
230	Prisoner's paradox	Paradox	Invalidated (3)
231	Prover9 vs Meth8 differences	System	Invalidated
232	Quantum arithmetic for repeat-until-success	Circuits	Invalidated (2)
233	Block chain	Cryptography	Invalidated (1)
234	Classical logic as completion of QL	System	Invalidated (16) Validated (6)
235	Control by observation	System	Invalidated
236	Entanglement	Conjecture	Invalidated (5)
237	Gates correspond to logical operators	Theorems	Invalidated (4) Validated (1)
238	Gates refuted	Theorems	Invalidated (8) Validated (1)

No.	Name of artifact	Type of artifact	Results with instances
239	Gedanken experiment	Conjectures	Invalidated (8)
240	Logic	System	Invalidated (17) Validated (2)
241	Masking	Conjectures	Invalidated (5) Validated (2)
242	Probability	Axiom	Invalidated (1)
243	Probability	Rule	Invalidated (2)
244	Simulation of Hamiltonian spectra	Operator	Invalidated (1)
245	Superposition as the red herring	Conjecture	Invalidated (3)
246	Superposition disproves Schrödinger cat	Conjecture	Invalidate (5) Validated (2)
247	Ternary probability of qutrit	Hypothesis	Invalidated (3)
248	Three lights experiment of qutrit	Conjecture	Invalidated (1)
249	Questions and answers	Problem	Invalidated (4) Validated (1)
250	Ramsey's theorem for the 2-color case	Theorem	Validated (2)
251	Ranjan, A.	Problem	Validated
252	Realizability semantics for QML	Theorems	Invalidated (3)
253	Reichenbach common cause / event-splitting	Principle	Invalidated
254	Riemann: only zeroes at 0, 1/2	Hypothesis	Invalidated
255	Extended complex numbers on sphere	Operators	Invalidated (3) Validated (2)
256	Zeta function, Caceres 6	Proposition	Invalidated (4)
257	Relevance logic	System	Invalidated (7)
258	Roman Catholic Church (RCC)	(Dogma)	Invalidated (7)
259	Canon law as noncontradictory/infallible	Theorem	Invalidated (4)
260	Erasmus contra Luther	Controversy	Validated
261	Infallibility and the Historic Church	Pius IX	Invalidated (2)
262	Magisterium	Paul VI	Invalidated (1)
263	Primacy of the Roman See	Pius XI	Invalidated (1)
264	Sacred heart of Jesus	Pius XI	Invalidated (3)
265	Tradition above scripture	Pius IX	Invalidated (4)
266	Twelfth promise of St Alacoque	Vision	Invalidated (3)
267	Rota lattice theory, distributive	Axiom	Invalidated
268	Russell	Paradox	Invalidated
269	S5II+ propositional quantification	System	Invalidated
270	Schrödinger's cat	Paradox	Invalidated
271	Self-equilibrium	Law / Paradox	Invalidated
272	Sliding scale in law	Theorem	Invalidated (3)

No.	Name of artifact	Type of artifact	Results with instances
273	Solovay arithmetical / semantical completeness	Theorem	Invalidated (10) Validated (2)
274	Sorites	Paradox	Invalidated
275	Special theory of relativity: Crothers refutation	Confirmation	Validated
276	Square of Opposition Meth8 Corrected	System	Validated
277	Square of Opposition Modern Revised	System	Invalidated
278	Square of Opposition	Proportions	Invalidated (3)
279	Stone space type lattice logic model	Theory	Invalidated (2)
280	Stone-Wales rotation transform reversibility	Theorem	Invalidated (2) Validated (1)
281	Superposition of states	Principle	Invalidated (6)
282	Supply and demand	Conjecture	Invalidated (6)
283	Symplectic vector space	Theorem	Invalidated (2)
284	Tarski's undefinability of truth	Theorem	Invalidated (2)
285	Tarski–Grothendieck set theory	Axiom	Invalidated (2)
286	Tarski–Grothendieck Metamath ax-garth	Axiom	Invalidated (1)
287	Time as God	Conjecture	Validated (2)
288	Time as coexisting past, present, future states	Conjecture	Invalidated (3)
289	Time as tense via converse implication (EQT)	Conjectue	Validated (1)
290	Topological manifold transition	Function	Invalidated (1)
291	Topological $T_0$ -space	Differ modality	Invalidated (3)
292	Totherian sets	Theory	Invaiddated (5)
293	Translation invariance of superposition calculus	Property	Invalidated (2)
294	Triangle inequality	Conjecture	Validated (1)
295	Trivial proofs for a troll	Conjectures	Validated (3)
296	Turing halting problem	Problem	Invalidated (2) Validated (1)
297	Twin paradox	Paradox	Invalidated (2)
298	Universal finite set	Theorem	Invalidated (2)
299	Unanswered logic questions	Conjectures	Invalidate (2) Validated (1)
300	Unfalsifiability	Conjecture	Invalidate (2) Validated (2)
301	Veblen (corrected)	Axiom	Invalidated (1) Validated (1)
302	Vector conjectue for two points implying a third	Conjecture	Validated (1)
303	Vickrey auction	Theorem	Invalidated (10) Validated (2)
304	Veronoï regions (with "nonempty sets")	Definition	Invalidated
305	Vongehr's shift rendering QM "natural"	Paradigm	Invalidated (2) Validated (3)
306	W (K4W)	Theorem	Invalidated

No.	Name of artifact	Type of artifact	Results with instances
307	Well ordering property	Axiom	Invalidated
308	Wittgenstein's ab-notation	System	Invalidated (3)
309	X-homology on manifolds in topology	Axiom	Invalidated (1)
310	Yalcin logic	Axioms	Invalidated (2)
311	Zadeh first operators on fuzzy logic	System	Invalidated (5)
312	Resolution and symmetry in Z-numbers	Definitions	Invalidated (2)
313	Zermello-Fraenkel (ZFC):	(Axioms)	Invalidated (25) Validated (2)
314	Shortest refutation of 9 axioms	Axioms	Invalidated (10)
315	ZFC Choice	Axiom	Invalidated
316	ZFC Empty set	Axiom	Invalidated
317	Shortest refutation	Axiom	Invalidated (3)
318	ZFC Extensionality	Axiom	Invalidated (1) Validated (1)
319	ZFC Infinity	Axiom	Invalidated (2)
320	ZF INF	Axiom	Invalidated
321	ZFC Pairing	Axiom	Invalidated
322	ZFC Power set	Axiom	Invalidated
323	ZFC Regularity or foundation	Axiom	Invalidated
324	ZFC Schema of replacement	Axiom	Invalidated
325	ZFC Specification	Axiom	Validated
326	ZFC Union	Axiom	Invalidated
327	ZFC Well ordering	Axiom	Invalidated (2)
328	ZF Law of excluded middle: infinite set	Axiom	Invalidated (2)
329	Zero and one in fractions	Axioms	Invalidated (3) Validated (8)
330	Zero knowledge proof	Theorem	Invalidated
331	Zeroth law of thermodynamics	Theorem	Invalidated (3) Validated (2)