Even Conjectures

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Abstract

The author Stephen Marshall, through research, recently discovered six new Mathematical Conjectures, they can be stated simply, but surprisingly are very easy to prove. This is unusual for most Number Theory Conjectures, usually they are very difficult to prove. The author also provides the proof for each of the six conjectures.

1st Even Conjecture

This conjecture is called 1st Even Conjecture and can be simply stated as follows:

1st Even Conjecture: Every even number can be stated by the following Equation 1, where *e* is every even number:

Equation 1: $$e = \sqrt{\sqrt{a} + \sqrt{a}} = \sqrt{2\sqrt{a}},$$

where *a* is any positive number where, $a \geq 1$, and $\sqrt{2\sqrt{a}}$ is equal to an integer then the integer will always be equal to one and only even number. Every even number is always equal to $\sqrt{2\sqrt{a}}$ for a unique *a*.

Experimental Data Analysis and Conjecture 1 Evidence

Experimental data analysis was conducted, by the author, using Excel to justify enough mathematical evidence to justify claiming this conjecture. The author exhausted the capability of Excel by verifying 1st Even Conjecture up to 1,048,575. It is important to notice that the author sorted the Excel file for results that only provided integers, as they are the only results, we are interested in for the 1,048,575 calculations. This verification was limited by the maximum number of rows allowed in Excel; version available in Office 365 which was used by the author. These results provide the author confidence that a high-speed supercomputer could verify this conjecture to an extremely high number. The author is so bold to project that a high-speed computer could verify this conjecture to hold up through 4×10^{18}. The reason for this high estimate is that the Goldbach Conjecture has been verified up through 4×10^{18}, since both conjectures cover all even numbers, then it is reasonable to expect a high-speed computer to be able to match the Goldbach Conjecture. The results of the Excel data analysis conducted during this research is provided in Table 1, below. The results show that the even numbers through 44

were verified for values of a up through 937,024. Calculations were conducted up through 1,048,575 although no further even numbers were generated, verifying that 46 is found at a value of $a \geq 1{,}048{,}575$.

Table 1. Data Analysis for 1st Even Conjecture

a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	$\sqrt{b}$	Integer?
4	2	2	4	2	TRUE
64	8	8	16	4	TRUE
324	18	18	36	6	TRUE
1024	32	32	64	8	TRUE
2500	50	50	100	10	TRUE
5184	72	72	144	12	TRUE
9604	98	98	196	14	TRUE
16384	128	128	256	16	TRUE
26244	162	162	324	18	TRUE
40000	200	200	400	20	TRUE
58564	242	242	484	22	TRUE
82944	288	288	576	24	TRUE
114244	338	338	676	26	TRUE
153664	392	392	784	28	TRUE
202500	450	450	900	30	TRUE
262144	512	512	1024	32	TRUE
334084	578	578	1156	34	TRUE
419904	648	648	1296	36	TRUE
521284	722	722	1444	38	TRUE
640000	800	800	1600	40	TRUE
777924	882	882	1764	42	TRUE
937024	968	968	1936	44	TRUE

Proof of 1st Even Conjecture

Basically, 1st Even Conjecture states: Every even number is always equal to $\sqrt{2\sqrt{a}}$ for a unique a. The definition for a positive even integer is $2m$, where $m \geq 1$. If our conjecture is true, then the following is true:

$$2m = \sqrt{2\sqrt{a}}$$

Therefore, our approach to this proof is to assume our conjecture is false, and then prove it is true by contradiction. If our conjecture is false, then $\sqrt{2\sqrt{a}}$ must be an odd number since all integers

are either even or odd. Therefore, since all odd numbers are defined by $2m + 1$, where $m \geq 1$, then the following must be true:

$$2m + 1 = \sqrt{2\sqrt{a}}$$

$$\text{Rearranging, } 2m = \sqrt{2\sqrt{a}} - 1$$

For the right side of the above equation to be even, then $\sqrt{2\sqrt{a}}$ must be odd. Recall, our conjecture has defined a as being a positive integer, which is unique because we only select a when $\sqrt{2\sqrt{a}}$ is a positive integer. Therefore, $\sqrt{2\sqrt{a}}$ must be an odd integer. Since we have defined a as any positive number where, $a \geq 1$, then for $\sqrt{2\sqrt{a}}$ to be an integer, then $\sqrt{a}$ must also be an integer. Therefore, $\sqrt{a}$ can be either odd or even, however, this means that $2\sqrt{a}$ must be even. Since $2\sqrt{a}$ is always even, then the only way $\sqrt{2\sqrt{a}}$ can be an integer is if $\sqrt{2\sqrt{a}}$ is an even integer. This is because the square root of an even number must be even if it is an integer, just like the square root of an odd number must be odd. Likewise, an even number squared must always be even, and an odd number squared must be odd. Thus, we have shown a contradiction that $\sqrt{2\sqrt{a}}$ is not odd as assumed, and have proven that $\sqrt{2\sqrt{a}}$ is always even. Thus, we have proven that 1st Even Conjecture is true.

2nd Even Conjecture

This conjecture is called 2nd Even Conjecture and can be simply stated as follows:

2nd Even Conjecture: Every even number can be stated by the following Equation 2, where e is every even number:

Equation 2: $$e = \sqrt{a} + \sqrt{a} = 2\sqrt{a},$$

where a is any positive number where, $a \geq 1$, and $2\sqrt{a}$ is equal to an integer then the integer will always be equal to one and only even number. Every even number is always equal to $2\sqrt{a}$ for a unique a.

Experimental Data Analysis and 2nd Conjecture Evidence

Experimental data analysis was conducted, by the author, using Excel to justify enough mathematical evidence to justify claiming this conjecture. The author exhausted the capability of Excel by verifying 2nd Even Conjecture up to 1,048,575. It is important to notice that the author sorted the Excel file for results that only provided integers, as they are the only results, we are interested in for the 1,048,575 calculations. This verification was limited by the maximum number of rows allowed in Excel; version available in Office 365 which was used by the author. These results provide the author confidence that a high-speed supercomputer could verify this conjecture to an extremely high number. The author is so bold to project that a high-speed

computer could verify this conjecture to hold up through 4×10^{18}. The reason for this high estimate is that the Goldbach Conjecture has been verified up through 4×10^{18}, since both conjectures cover all even numbers, then it is reasonable to expect a high-speed computer to be able to match the Goldbach Conjecture. The results of the Excel data analysis conducted during this research is provided in Table 2, below. The results show that the even numbers through 2,046 were verified for values of a up through 1,046,529. Calculations were conducted up through 1,048,575 although no further even numbers were generated, verifying that 2,048 is found at a value of $a \geq 1{,}048{,}575$.

Table 2. Data Analysis for 2nd Even Conjecture

$m = \sqrt{a}$	a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	Integer?
1	1	1	1	2	TRUE
2	4	2	2	4	TRUE
3	9	3	3	6	TRUE
4	16	4	4	8	TRUE
5	25	5	5	10	TRUE
6	36	6	6	12	TRUE
7	49	7	7	14	TRUE
8	64	8	8	16	TRUE
9	81	9	9	18	TRUE
10	100	10	10	20	TRUE
11	121	11	11	22	TRUE
12	144	12	12	24	TRUE
13	169	13	13	26	TRUE
14	196	14	14	28	TRUE
15	225	15	15	30	TRUE
16	256	16	16	32	TRUE
17	289	17	17	34	TRUE
18	324	18	18	36	TRUE
19	361	19	19	38	TRUE
20	400	20	20	40	TRUE
21	441	21	21	42	TRUE
22	484	22	22	44	TRUE
23	529	23	23	46	TRUE
24	576	24	24	48	TRUE
25	625	25	25	50	TRUE
26	676	26	26	52	TRUE
27	729	27	27	54	TRUE
28	784	28	28	56	TRUE
29	841	29	29	58	TRUE
30	900	30	30	60	TRUE
31	961	31	31	62	TRUE
32	1024	32	32	64	TRUE

$m = \sqrt{a}$	a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	Integer?
33	1089	33	33	66	TRUE
34	1156	34	34	68	TRUE
35	1225	35	35	70	TRUE
36	1296	36	36	72	TRUE
37	1369	37	37	74	TRUE
38	1444	38	38	76	TRUE
39	1521	39	39	78	TRUE
40	1600	40	40	80	TRUE
41	1681	41	41	82	TRUE
42	1764	42	42	84	TRUE
43	1849	43	43	86	TRUE
44	1936	44	44	88	TRUE
45	2025	45	45	90	TRUE
46	2116	46	46	92	TRUE
47	2209	47	47	94	TRUE
48	2304	48	48	96	TRUE
49	2401	49	49	98	TRUE
50	2500	50	50	100	TRUE
51	2601	51	51	102	TRUE
52	2704	52	52	104	TRUE
53	2809	53	53	106	TRUE
54	2916	54	54	108	TRUE
55	3025	55	55	110	TRUE
56	3136	56	56	112	TRUE
57	3249	57	57	114	TRUE
58	3364	58	58	116	TRUE
59	3481	59	59	118	TRUE
60	3600	60	60	120	TRUE
61	3721	61	61	122	TRUE
62	3844	62	62	124	TRUE
63	3969	63	63	126	TRUE
64	4096	64	64	128	TRUE
65	4225	65	65	130	TRUE
66	4356	66	66	132	TRUE
67	4489	67	67	134	TRUE
68	4624	68	68	136	TRUE
69	4761	69	69	138	TRUE
70	4900	70	70	140	TRUE
71	5041	71	71	142	TRUE
72	5184	72	72	144	TRUE
73	5329	73	73	146	TRUE
74	5476	74	74	148	TRUE

$m = \sqrt{a}$	a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	Integer?
75	5625	75	75	150	TRUE
76	5776	76	76	152	TRUE
77	5929	77	77	154	TRUE
78	6084	78	78	156	TRUE
79	6241	79	79	158	TRUE
80	6400	80	80	160	TRUE
81	6561	81	81	162	TRUE
82	6724	82	82	164	TRUE
83	6889	83	83	166	TRUE
84	7056	84	84	168	TRUE
85	7225	85	85	170	TRUE
86	7396	86	86	172	TRUE
87	7569	87	87	174	TRUE
88	7744	88	88	176	TRUE
89	7921	89	89	178	TRUE
90	8100	90	90	180	TRUE
91	8281	91	91	182	TRUE
92	8464	92	92	184	TRUE
93	8649	93	93	186	TRUE
94	8836	94	94	188	TRUE
95	9025	95	95	190	TRUE
96	9216	96	96	192	TRUE
97	9409	97	97	194	TRUE
98	9604	98	98	196	TRUE
99	9801	99	99	198	TRUE
100	10000	100	100	200	TRUE
101	10201	101	101	202	TRUE
102	10404	102	102	204	TRUE
103	10609	103	103	206	TRUE
104	10816	104	104	208	TRUE
105	11025	105	105	210	TRUE
106	11236	106	106	212	TRUE
107	11449	107	107	214	TRUE
108	11664	108	108	216	TRUE
109	11881	109	109	218	TRUE
110	12100	110	110	220	TRUE
111	12321	111	111	222	TRUE
112	12544	112	112	224	TRUE
113	12769	113	113	226	TRUE
114	12996	114	114	228	TRUE
115	13225	115	115	230	TRUE
116	13456	116	116	232	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
117	13689	117	117	234	TRUE
118	13924	118	118	236	TRUE
119	14161	119	119	238	TRUE
120	14400	120	120	240	TRUE
121	14641	121	121	242	TRUE
122	14884	122	122	244	TRUE
123	15129	123	123	246	TRUE
124	15376	124	124	248	TRUE
125	15625	125	125	250	TRUE
126	15876	126	126	252	TRUE
127	16129	127	127	254	TRUE
128	16384	128	128	256	TRUE
129	16641	129	129	258	TRUE
130	16900	130	130	260	TRUE
131	17161	131	131	262	TRUE
132	17424	132	132	264	TRUE
133	17689	133	133	266	TRUE
134	17956	134	134	268	TRUE
135	18225	135	135	270	TRUE
136	18496	136	136	272	TRUE
137	18769	137	137	274	TRUE
138	19044	138	138	276	TRUE
139	19321	139	139	278	TRUE
140	19600	140	140	280	TRUE
141	19881	141	141	282	TRUE
142	20164	142	142	284	TRUE
143	20449	143	143	286	TRUE
144	20736	144	144	288	TRUE
145	21025	145	145	290	TRUE
146	21316	146	146	292	TRUE
147	21609	147	147	294	TRUE
148	21904	148	148	296	TRUE
149	22201	149	149	298	TRUE
150	22500	150	150	300	TRUE
151	22801	151	151	302	TRUE
152	23104	152	152	304	TRUE
153	23409	153	153	306	TRUE
154	23716	154	154	308	TRUE
155	24025	155	155	310	TRUE
156	24336	156	156	312	TRUE
157	24649	157	157	314	TRUE
158	24964	158	158	316	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
159	25281	159	159	318	TRUE
160	25600	160	160	320	TRUE
161	25921	161	161	322	TRUE
162	26244	162	162	324	TRUE
163	26569	163	163	326	TRUE
164	26896	164	164	328	TRUE
165	27225	165	165	330	TRUE
166	27556	166	166	332	TRUE
167	27889	167	167	334	TRUE
168	28224	168	168	336	TRUE
169	28561	169	169	338	TRUE
170	28900	170	170	340	TRUE
171	29241	171	171	342	TRUE
172	29584	172	172	344	TRUE
173	29929	173	173	346	TRUE
174	30276	174	174	348	TRUE
175	30625	175	175	350	TRUE
176	30976	176	176	352	TRUE
177	31329	177	177	354	TRUE
178	31684	178	178	356	TRUE
179	32041	179	179	358	TRUE
180	32400	180	180	360	TRUE
181	32761	181	181	362	TRUE
182	33124	182	182	364	TRUE
183	33489	183	183	366	TRUE
184	33856	184	184	368	TRUE
185	34225	185	185	370	TRUE
186	34596	186	186	372	TRUE
187	34969	187	187	374	TRUE
188	35344	188	188	376	TRUE
189	35721	189	189	378	TRUE
190	36100	190	190	380	TRUE
191	36481	191	191	382	TRUE
192	36864	192	192	384	TRUE
193	37249	193	193	386	TRUE
194	37636	194	194	388	TRUE
195	38025	195	195	390	TRUE
196	38416	196	196	392	TRUE
197	38809	197	197	394	TRUE
198	39204	198	198	396	TRUE
199	39601	199	199	398	TRUE
200	40000	200	200	400	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
201	40401	201	201	402	TRUE
202	40804	202	202	404	TRUE
203	41209	203	203	406	TRUE
204	41616	204	204	408	TRUE
205	42025	205	205	410	TRUE
206	42436	206	206	412	TRUE
207	42849	207	207	414	TRUE
208	43264	208	208	416	TRUE
209	43681	209	209	418	TRUE
210	44100	210	210	420	TRUE
211	44521	211	211	422	TRUE
212	44944	212	212	424	TRUE
213	45369	213	213	426	TRUE
214	45796	214	214	428	TRUE
215	46225	215	215	430	TRUE
216	46656	216	216	432	TRUE
217	47089	217	217	434	TRUE
218	47524	218	218	436	TRUE
219	47961	219	219	438	TRUE
220	48400	220	220	440	TRUE
221	48841	221	221	442	TRUE
222	49284	222	222	444	TRUE
223	49729	223	223	446	TRUE
224	50176	224	224	448	TRUE
225	50625	225	225	450	TRUE
226	51076	226	226	452	TRUE
227	51529	227	227	454	TRUE
228	51984	228	228	456	TRUE
229	52441	229	229	458	TRUE
230	52900	230	230	460	TRUE
231	53361	231	231	462	TRUE
232	53824	232	232	464	TRUE
233	54289	233	233	466	TRUE
234	54756	234	234	468	TRUE
235	55225	235	235	470	TRUE
236	55696	236	236	472	TRUE
237	56169	237	237	474	TRUE
238	56644	238	238	476	TRUE
239	57121	239	239	478	TRUE
240	57600	240	240	480	TRUE
241	58081	241	241	482	TRUE
242	58564	242	242	484	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
243	59049	243	243	486	TRUE
244	59536	244	244	488	TRUE
245	60025	245	245	490	TRUE
246	60516	246	246	492	TRUE
247	61009	247	247	494	TRUE
248	61504	248	248	496	TRUE
249	62001	249	249	498	TRUE
250	62500	250	250	500	TRUE
251	63001	251	251	502	TRUE
252	63504	252	252	504	TRUE
253	64009	253	253	506	TRUE
254	64516	254	254	508	TRUE
255	65025	255	255	510	TRUE
256	65536	256	256	512	TRUE
257	66049	257	257	514	TRUE
258	66564	258	258	516	TRUE
259	67081	259	259	518	TRUE
260	67600	260	260	520	TRUE
261	68121	261	261	522	TRUE
262	68644	262	262	524	TRUE
263	69169	263	263	526	TRUE
264	69696	264	264	528	TRUE
265	70225	265	265	530	TRUE
266	70756	266	266	532	TRUE
267	71289	267	267	534	TRUE
268	71824	268	268	536	TRUE
269	72361	269	269	538	TRUE
270	72900	270	270	540	TRUE
271	73441	271	271	542	TRUE
272	73984	272	272	544	TRUE
273	74529	273	273	546	TRUE
274	75076	274	274	548	TRUE
275	75625	275	275	550	TRUE
276	76176	276	276	552	TRUE
277	76729	277	277	554	TRUE
278	77284	278	278	556	TRUE
279	77841	279	279	558	TRUE
280	78400	280	280	560	TRUE
281	78961	281	281	562	TRUE
282	79524	282	282	564	TRUE
283	80089	283	283	566	TRUE
284	80656	284	284	568	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
285	81225	285	285	570	TRUE
286	81796	286	286	572	TRUE
287	82369	287	287	574	TRUE
288	82944	288	288	576	TRUE
289	83521	289	289	578	TRUE
290	84100	290	290	580	TRUE
291	84681	291	291	582	TRUE
292	85264	292	292	584	TRUE
293	85849	293	293	586	TRUE
294	86436	294	294	588	TRUE
295	87025	295	295	590	TRUE
296	87616	296	296	592	TRUE
297	88209	297	297	594	TRUE
298	88804	298	298	596	TRUE
299	89401	299	299	598	TRUE
300	90000	300	300	600	TRUE
301	90601	301	301	602	TRUE
302	91204	302	302	604	TRUE
303	91809	303	303	606	TRUE
304	92416	304	304	608	TRUE
305	93025	305	305	610	TRUE
306	93636	306	306	612	TRUE
307	94249	307	307	614	TRUE
308	94864	308	308	616	TRUE
309	95481	309	309	618	TRUE
310	96100	310	310	620	TRUE
311	96721	311	311	622	TRUE
312	97344	312	312	624	TRUE
313	97969	313	313	626	TRUE
314	98596	314	314	628	TRUE
315	99225	315	315	630	TRUE
316	99856	316	316	632	TRUE
317	100489	317	317	634	TRUE
318	101124	318	318	636	TRUE
319	101761	319	319	638	TRUE
320	102400	320	320	640	TRUE
321	103041	321	321	642	TRUE
322	103684	322	322	644	TRUE
323	104329	323	323	646	TRUE
324	104976	324	324	648	TRUE
325	105625	325	325	650	TRUE
326	106276	326	326	652	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
327	106929	327	327	654	TRUE
328	107584	328	328	656	TRUE
329	108241	329	329	658	TRUE
330	108900	330	330	660	TRUE
331	109561	331	331	662	TRUE
332	110224	332	332	664	TRUE
333	110889	333	333	666	TRUE
334	111556	334	334	668	TRUE
335	112225	335	335	670	TRUE
336	112896	336	336	672	TRUE
337	113569	337	337	674	TRUE
338	114244	338	338	676	TRUE
339	114921	339	339	678	TRUE
340	115600	340	340	680	TRUE
341	116281	341	341	682	TRUE
342	116964	342	342	684	TRUE
343	117649	343	343	686	TRUE
344	118336	344	344	688	TRUE
345	119025	345	345	690	TRUE
346	119716	346	346	692	TRUE
347	120409	347	347	694	TRUE
348	121104	348	348	696	TRUE
349	121801	349	349	698	TRUE
350	122500	350	350	700	TRUE
351	123201	351	351	702	TRUE
352	123904	352	352	704	TRUE
353	124609	353	353	706	TRUE
354	125316	354	354	708	TRUE
355	126025	355	355	710	TRUE
356	126736	356	356	712	TRUE
357	127449	357	357	714	TRUE
358	128164	358	358	716	TRUE
359	128881	359	359	718	TRUE
360	129600	360	360	720	TRUE
361	130321	361	361	722	TRUE
362	131044	362	362	724	TRUE
363	131769	363	363	726	TRUE
364	132496	364	364	728	TRUE
365	133225	365	365	730	TRUE
366	133956	366	366	732	TRUE
367	134689	367	367	734	TRUE
368	135424	368	368	736	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
369	136161	369	369	738	TRUE
370	136900	370	370	740	TRUE
371	137641	371	371	742	TRUE
372	138384	372	372	744	TRUE
373	139129	373	373	746	TRUE
374	139876	374	374	748	TRUE
375	140625	375	375	750	TRUE
376	141376	376	376	752	TRUE
377	142129	377	377	754	TRUE
378	142884	378	378	756	TRUE
379	143641	379	379	758	TRUE
380	144400	380	380	760	TRUE
381	145161	381	381	762	TRUE
382	145924	382	382	764	TRUE
383	146689	383	383	766	TRUE
384	147456	384	384	768	TRUE
385	148225	385	385	770	TRUE
386	148996	386	386	772	TRUE
387	149769	387	387	774	TRUE
388	150544	388	388	776	TRUE
389	151321	389	389	778	TRUE
390	152100	390	390	780	TRUE
391	152881	391	391	782	TRUE
392	153664	392	392	784	TRUE
393	154449	393	393	786	TRUE
394	155236	394	394	788	TRUE
395	156025	395	395	790	TRUE
396	156816	396	396	792	TRUE
397	157609	397	397	794	TRUE
398	158404	398	398	796	TRUE
399	159201	399	399	798	TRUE
400	160000	400	400	800	TRUE
401	160801	401	401	802	TRUE
402	161604	402	402	804	TRUE
403	162409	403	403	806	TRUE
404	163216	404	404	808	TRUE
405	164025	405	405	810	TRUE
406	164836	406	406	812	TRUE
407	165649	407	407	814	TRUE
408	166464	408	408	816	TRUE
409	167281	409	409	818	TRUE
410	168100	410	410	820	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
411	168921	411	411	822	TRUE
412	169744	412	412	824	TRUE
413	170569	413	413	826	TRUE
414	171396	414	414	828	TRUE
415	172225	415	415	830	TRUE
416	173056	416	416	832	TRUE
417	173889	417	417	834	TRUE
418	174724	418	418	836	TRUE
419	175561	419	419	838	TRUE
420	176400	420	420	840	TRUE
421	177241	421	421	842	TRUE
422	178084	422	422	844	TRUE
423	178929	423	423	846	TRUE
424	179776	424	424	848	TRUE
425	180625	425	425	850	TRUE
426	181476	426	426	852	TRUE
427	182329	427	427	854	TRUE
428	183184	428	428	856	TRUE
429	184041	429	429	858	TRUE
430	184900	430	430	860	TRUE
431	185761	431	431	862	TRUE
432	186624	432	432	864	TRUE
433	187489	433	433	866	TRUE
434	188356	434	434	868	TRUE
435	189225	435	435	870	TRUE
436	190096	436	436	872	TRUE
437	190969	437	437	874	TRUE
438	191844	438	438	876	TRUE
439	192721	439	439	878	TRUE
440	193600	440	440	880	TRUE
441	194481	441	441	882	TRUE
442	195364	442	442	884	TRUE
443	196249	443	443	886	TRUE
444	197136	444	444	888	TRUE
445	198025	445	445	890	TRUE
446	198916	446	446	892	TRUE
447	199809	447	447	894	TRUE
448	200704	448	448	896	TRUE
449	201601	449	449	898	TRUE
450	202500	450	450	900	TRUE
451	203401	451	451	902	TRUE
452	204304	452	452	904	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
453	205209	453	453	906	TRUE
454	206116	454	454	908	TRUE
455	207025	455	455	910	TRUE
456	207936	456	456	912	TRUE
457	208849	457	457	914	TRUE
458	209764	458	458	916	TRUE
459	210681	459	459	918	TRUE
460	211600	460	460	920	TRUE
461	212521	461	461	922	TRUE
462	213444	462	462	924	TRUE
463	214369	463	463	926	TRUE
464	215296	464	464	928	TRUE
465	216225	465	465	930	TRUE
466	217156	466	466	932	TRUE
467	218089	467	467	934	TRUE
468	219024	468	468	936	TRUE
469	219961	469	469	938	TRUE
470	220900	470	470	940	TRUE
471	221841	471	471	942	TRUE
472	222784	472	472	944	TRUE
473	223729	473	473	946	TRUE
474	224676	474	474	948	TRUE
475	225625	475	475	950	TRUE
476	226576	476	476	952	TRUE
477	227529	477	477	954	TRUE
478	228484	478	478	956	TRUE
479	229441	479	479	958	TRUE
480	230400	480	480	960	TRUE
481	231361	481	481	962	TRUE
482	232324	482	482	964	TRUE
483	233289	483	483	966	TRUE
484	234256	484	484	968	TRUE
485	235225	485	485	970	TRUE
486	236196	486	486	972	TRUE
487	237169	487	487	974	TRUE
488	238144	488	488	976	TRUE
489	239121	489	489	978	TRUE
490	240100	490	490	980	TRUE
491	241081	491	491	982	TRUE
492	242064	492	492	984	TRUE
493	243049	493	493	986	TRUE
494	244036	494	494	988	TRUE

$m = \sqrt{a}$	a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	Integer?
495	245025	495	495	990	TRUE
496	246016	496	496	992	TRUE
497	247009	497	497	994	TRUE
498	248004	498	498	996	TRUE
499	249001	499	499	998	TRUE
500	250000	500	500	1000	TRUE
501	251001	501	501	1002	TRUE
502	252004	502	502	1004	TRUE
503	253009	503	503	1006	TRUE
504	254016	504	504	1008	TRUE
505	255025	505	505	1010	TRUE
506	256036	506	506	1012	TRUE
507	257049	507	507	1014	TRUE
508	258064	508	508	1016	TRUE
509	259081	509	509	1018	TRUE
510	260100	510	510	1020	TRUE
511	261121	511	511	1022	TRUE
512	262144	512	512	1024	TRUE
513	263169	513	513	1026	TRUE
514	264196	514	514	1028	TRUE
515	265225	515	515	1030	TRUE
516	266256	516	516	1032	TRUE
517	267289	517	517	1034	TRUE
518	268324	518	518	1036	TRUE
519	269361	519	519	1038	TRUE
520	270400	520	520	1040	TRUE
521	271441	521	521	1042	TRUE
522	272484	522	522	1044	TRUE
523	273529	523	523	1046	TRUE
524	274576	524	524	1048	TRUE
525	275625	525	525	1050	TRUE
526	276676	526	526	1052	TRUE
527	277729	527	527	1054	TRUE
528	278784	528	528	1056	TRUE
529	279841	529	529	1058	TRUE
530	280900	530	530	1060	TRUE
531	281961	531	531	1062	TRUE
532	283024	532	532	1064	TRUE
533	284089	533	533	1066	TRUE
534	285156	534	534	1068	TRUE
535	286225	535	535	1070	TRUE
536	287296	536	536	1072	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
537	288369	537	537	1074	TRUE
538	289444	538	538	1076	TRUE
539	290521	539	539	1078	TRUE
540	291600	540	540	1080	TRUE
541	292681	541	541	1082	TRUE
542	293764	542	542	1084	TRUE
543	294849	543	543	1086	TRUE
544	295936	544	544	1088	TRUE
545	297025	545	545	1090	TRUE
546	298116	546	546	1092	TRUE
547	299209	547	547	1094	TRUE
548	300304	548	548	1096	TRUE
549	301401	549	549	1098	TRUE
550	302500	550	550	1100	TRUE
551	303601	551	551	1102	TRUE
552	304704	552	552	1104	TRUE
553	305809	553	553	1106	TRUE
554	306916	554	554	1108	TRUE
555	308025	555	555	1110	TRUE
556	309136	556	556	1112	TRUE
557	310249	557	557	1114	TRUE
558	311364	558	558	1116	TRUE
559	312481	559	559	1118	TRUE
560	313600	560	560	1120	TRUE
561	314721	561	561	1122	TRUE
562	315844	562	562	1124	TRUE
563	316969	563	563	1126	TRUE
564	318096	564	564	1128	TRUE
565	319225	565	565	1130	TRUE
566	320356	566	566	1132	TRUE
567	321489	567	567	1134	TRUE
568	322624	568	568	1136	TRUE
569	323761	569	569	1138	TRUE
570	324900	570	570	1140	TRUE
571	326041	571	571	1142	TRUE
572	327184	572	572	1144	TRUE
573	328329	573	573	1146	TRUE
574	329476	574	574	1148	TRUE
575	330625	575	575	1150	TRUE
576	331776	576	576	1152	TRUE
577	332929	577	577	1154	TRUE
578	334084	578	578	1156	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
579	335241	579	579	1158	TRUE
580	336400	580	580	1160	TRUE
581	337561	581	581	1162	TRUE
582	338724	582	582	1164	TRUE
583	339889	583	583	1166	TRUE
584	341056	584	584	1168	TRUE
585	342225	585	585	1170	TRUE
586	343396	586	586	1172	TRUE
587	344569	587	587	1174	TRUE
588	345744	588	588	1176	TRUE
589	346921	589	589	1178	TRUE
590	348100	590	590	1180	TRUE
591	349281	591	591	1182	TRUE
592	350464	592	592	1184	TRUE
593	351649	593	593	1186	TRUE
594	352836	594	594	1188	TRUE
595	354025	595	595	1190	TRUE
596	355216	596	596	1192	TRUE
597	356409	597	597	1194	TRUE
598	357604	598	598	1196	TRUE
599	358801	599	599	1198	TRUE
600	360000	600	600	1200	TRUE
601	361201	601	601	1202	TRUE
602	362404	602	602	1204	TRUE
603	363609	603	603	1206	TRUE
604	364816	604	604	1208	TRUE
605	366025	605	605	1210	TRUE
606	367236	606	606	1212	TRUE
607	368449	607	607	1214	TRUE
608	369664	608	608	1216	TRUE
609	370881	609	609	1218	TRUE
610	372100	610	610	1220	TRUE
611	373321	611	611	1222	TRUE
612	374544	612	612	1224	TRUE
613	375769	613	613	1226	TRUE
614	376996	614	614	1228	TRUE
615	378225	615	615	1230	TRUE
616	379456	616	616	1232	TRUE
617	380689	617	617	1234	TRUE
618	381924	618	618	1236	TRUE
619	383161	619	619	1238	TRUE
620	384400	620	620	1240	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
621	385641	621	621	1242	TRUE
622	386884	622	622	1244	TRUE
623	388129	623	623	1246	TRUE
624	389376	624	624	1248	TRUE
625	390625	625	625	1250	TRUE
626	391876	626	626	1252	TRUE
627	393129	627	627	1254	TRUE
628	394384	628	628	1256	TRUE
629	395641	629	629	1258	TRUE
630	396900	630	630	1260	TRUE
631	398161	631	631	1262	TRUE
632	399424	632	632	1264	TRUE
633	400689	633	633	1266	TRUE
634	401956	634	634	1268	TRUE
635	403225	635	635	1270	TRUE
636	404496	636	636	1272	TRUE
637	405769	637	637	1274	TRUE
638	407044	638	638	1276	TRUE
639	408321	639	639	1278	TRUE
640	409600	640	640	1280	TRUE
641	410881	641	641	1282	TRUE
642	412164	642	642	1284	TRUE
643	413449	643	643	1286	TRUE
644	414736	644	644	1288	TRUE
645	416025	645	645	1290	TRUE
646	417316	646	646	1292	TRUE
647	418609	647	647	1294	TRUE
648	419904	648	648	1296	TRUE
649	421201	649	649	1298	TRUE
650	422500	650	650	1300	TRUE
651	423801	651	651	1302	TRUE
652	425104	652	652	1304	TRUE
653	426409	653	653	1306	TRUE
654	427716	654	654	1308	TRUE
655	429025	655	655	1310	TRUE
656	430336	656	656	1312	TRUE
657	431649	657	657	1314	TRUE
658	432964	658	658	1316	TRUE
659	434281	659	659	1318	TRUE
660	435600	660	660	1320	TRUE
661	436921	661	661	1322	TRUE
662	438244	662	662	1324	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
663	439569	663	663	1326	TRUE
664	440896	664	664	1328	TRUE
665	442225	665	665	1330	TRUE
666	443556	666	666	1332	TRUE
667	444889	667	667	1334	TRUE
668	446224	668	668	1336	TRUE
669	447561	669	669	1338	TRUE
670	448900	670	670	1340	TRUE
671	450241	671	671	1342	TRUE
672	451584	672	672	1344	TRUE
673	452929	673	673	1346	TRUE
674	454276	674	674	1348	TRUE
675	455625	675	675	1350	TRUE
676	456976	676	676	1352	TRUE
677	458329	677	677	1354	TRUE
678	459684	678	678	1356	TRUE
679	461041	679	679	1358	TRUE
680	462400	680	680	1360	TRUE
681	463761	681	681	1362	TRUE
682	465124	682	682	1364	TRUE
683	466489	683	683	1366	TRUE
684	467856	684	684	1368	TRUE
685	469225	685	685	1370	TRUE
686	470596	686	686	1372	TRUE
687	471969	687	687	1374	TRUE
688	473344	688	688	1376	TRUE
689	474721	689	689	1378	TRUE
690	476100	690	690	1380	TRUE
691	477481	691	691	1382	TRUE
692	478864	692	692	1384	TRUE
693	480249	693	693	1386	TRUE
694	481636	694	694	1388	TRUE
695	483025	695	695	1390	TRUE
696	484416	696	696	1392	TRUE
697	485809	697	697	1394	TRUE
698	487204	698	698	1396	TRUE
699	488601	699	699	1398	TRUE
700	490000	700	700	1400	TRUE
701	491401	701	701	1402	TRUE
702	492804	702	702	1404	TRUE
703	494209	703	703	1406	TRUE
704	495616	704	704	1408	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
705	497025	705	705	1410	TRUE
706	498436	706	706	1412	TRUE
707	499849	707	707	1414	TRUE
708	501264	708	708	1416	TRUE
709	502681	709	709	1418	TRUE
710	504100	710	710	1420	TRUE
711	505521	711	711	1422	TRUE
712	506944	712	712	1424	TRUE
713	508369	713	713	1426	TRUE
714	509796	714	714	1428	TRUE
715	511225	715	715	1430	TRUE
716	512656	716	716	1432	TRUE
717	514089	717	717	1434	TRUE
718	515524	718	718	1436	TRUE
719	516961	719	719	1438	TRUE
720	518400	720	720	1440	TRUE
721	519841	721	721	1442	TRUE
722	521284	722	722	1444	TRUE
723	522729	723	723	1446	TRUE
724	524176	724	724	1448	TRUE
725	525625	725	725	1450	TRUE
726	527076	726	726	1452	TRUE
727	528529	727	727	1454	TRUE
728	529984	728	728	1456	TRUE
729	531441	729	729	1458	TRUE
730	532900	730	730	1460	TRUE
731	534361	731	731	1462	TRUE
732	535824	732	732	1464	TRUE
733	537289	733	733	1466	TRUE
734	538756	734	734	1468	TRUE
735	540225	735	735	1470	TRUE
736	541696	736	736	1472	TRUE
737	543169	737	737	1474	TRUE
738	544644	738	738	1476	TRUE
739	546121	739	739	1478	TRUE
740	547600	740	740	1480	TRUE
741	549081	741	741	1482	TRUE
742	550564	742	742	1484	TRUE
743	552049	743	743	1486	TRUE
744	553536	744	744	1488	TRUE
745	555025	745	745	1490	TRUE
746	556516	746	746	1492	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
747	558009	747	747	1494	TRUE
748	559504	748	748	1496	TRUE
749	561001	749	749	1498	TRUE
750	562500	750	750	1500	TRUE
751	564001	751	751	1502	TRUE
752	565504	752	752	1504	TRUE
753	567009	753	753	1506	TRUE
754	568516	754	754	1508	TRUE
755	570025	755	755	1510	TRUE
756	571536	756	756	1512	TRUE
757	573049	757	757	1514	TRUE
758	574564	758	758	1516	TRUE
759	576081	759	759	1518	TRUE
760	577600	760	760	1520	TRUE
761	579121	761	761	1522	TRUE
762	580644	762	762	1524	TRUE
763	582169	763	763	1526	TRUE
764	583696	764	764	1528	TRUE
765	585225	765	765	1530	TRUE
766	586756	766	766	1532	TRUE
767	588289	767	767	1534	TRUE
768	589824	768	768	1536	TRUE
769	591361	769	769	1538	TRUE
770	592900	770	770	1540	TRUE
771	594441	771	771	1542	TRUE
772	595984	772	772	1544	TRUE
773	597529	773	773	1546	TRUE
774	599076	774	774	1548	TRUE
775	600625	775	775	1550	TRUE
776	602176	776	776	1552	TRUE
777	603729	777	777	1554	TRUE
778	605284	778	778	1556	TRUE
779	606841	779	779	1558	TRUE
780	608400	780	780	1560	TRUE
781	609961	781	781	1562	TRUE
782	611524	782	782	1564	TRUE
783	613089	783	783	1566	TRUE
784	614656	784	784	1568	TRUE
785	616225	785	785	1570	TRUE
786	617796	786	786	1572	TRUE
787	619369	787	787	1574	TRUE
788	620944	788	788	1576	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
789	622521	789	789	1578	TRUE
790	624100	790	790	1580	TRUE
791	625681	791	791	1582	TRUE
792	627264	792	792	1584	TRUE
793	628849	793	793	1586	TRUE
794	630436	794	794	1588	TRUE
795	632025	795	795	1590	TRUE
796	633616	796	796	1592	TRUE
797	635209	797	797	1594	TRUE
798	636804	798	798	1596	TRUE
799	638401	799	799	1598	TRUE
800	640000	800	800	1600	TRUE
801	641601	801	801	1602	TRUE
802	643204	802	802	1604	TRUE
803	644809	803	803	1606	TRUE
804	646416	804	804	1608	TRUE
805	648025	805	805	1610	TRUE
806	649636	806	806	1612	TRUE
807	651249	807	807	1614	TRUE
808	652864	808	808	1616	TRUE
809	654481	809	809	1618	TRUE
810	656100	810	810	1620	TRUE
811	657721	811	811	1622	TRUE
812	659344	812	812	1624	TRUE
813	660969	813	813	1626	TRUE
814	662596	814	814	1628	TRUE
815	664225	815	815	1630	TRUE
816	665856	816	816	1632	TRUE
817	667489	817	817	1634	TRUE
818	669124	818	818	1636	TRUE
819	670761	819	819	1638	TRUE
820	672400	820	820	1640	TRUE
821	674041	821	821	1642	TRUE
822	675684	822	822	1644	TRUE
823	677329	823	823	1646	TRUE
824	678976	824	824	1648	TRUE
825	680625	825	825	1650	TRUE
826	682276	826	826	1652	TRUE
827	683929	827	827	1654	TRUE
828	685584	828	828	1656	TRUE
829	687241	829	829	1658	TRUE
830	688900	830	830	1660	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
831	690561	831	831	1662	TRUE
832	692224	832	832	1664	TRUE
833	693889	833	833	1666	TRUE
834	695556	834	834	1668	TRUE
835	697225	835	835	1670	TRUE
836	698896	836	836	1672	TRUE
837	700569	837	837	1674	TRUE
838	702244	838	838	1676	TRUE
839	703921	839	839	1678	TRUE
840	705600	840	840	1680	TRUE
841	707281	841	841	1682	TRUE
842	708964	842	842	1684	TRUE
843	710649	843	843	1686	TRUE
844	712336	844	844	1688	TRUE
845	714025	845	845	1690	TRUE
846	715716	846	846	1692	TRUE
847	717409	847	847	1694	TRUE
848	719104	848	848	1696	TRUE
849	720801	849	849	1698	TRUE
850	722500	850	850	1700	TRUE
851	724201	851	851	1702	TRUE
852	725904	852	852	1704	TRUE
853	727609	853	853	1706	TRUE
854	729316	854	854	1708	TRUE
855	731025	855	855	1710	TRUE
856	732736	856	856	1712	TRUE
857	734449	857	857	1714	TRUE
858	736164	858	858	1716	TRUE
859	737881	859	859	1718	TRUE
860	739600	860	860	1720	TRUE
861	741321	861	861	1722	TRUE
862	743044	862	862	1724	TRUE
863	744769	863	863	1726	TRUE
864	746496	864	864	1728	TRUE
865	748225	865	865	1730	TRUE
866	749956	866	866	1732	TRUE
867	751689	867	867	1734	TRUE
868	753424	868	868	1736	TRUE
869	755161	869	869	1738	TRUE
870	756900	870	870	1740	TRUE
871	758641	871	871	1742	TRUE
872	760384	872	872	1744	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
873	762129	873	873	1746	TRUE
874	763876	874	874	1748	TRUE
875	765625	875	875	1750	TRUE
876	767376	876	876	1752	TRUE
877	769129	877	877	1754	TRUE
878	770884	878	878	1756	TRUE
879	772641	879	879	1758	TRUE
880	774400	880	880	1760	TRUE
881	776161	881	881	1762	TRUE
882	777924	882	882	1764	TRUE
883	779689	883	883	1766	TRUE
884	781456	884	884	1768	TRUE
885	783225	885	885	1770	TRUE
886	784996	886	886	1772	TRUE
887	786769	887	887	1774	TRUE
888	788544	888	888	1776	TRUE
889	790321	889	889	1778	TRUE
890	792100	890	890	1780	TRUE
891	793881	891	891	1782	TRUE
892	795664	892	892	1784	TRUE
893	797449	893	893	1786	TRUE
894	799236	894	894	1788	TRUE
895	801025	895	895	1790	TRUE
896	802816	896	896	1792	TRUE
897	804609	897	897	1794	TRUE
898	806404	898	898	1796	TRUE
899	808201	899	899	1798	TRUE
900	810000	900	900	1800	TRUE
901	811801	901	901	1802	TRUE
902	813604	902	902	1804	TRUE
903	815409	903	903	1806	TRUE
904	817216	904	904	1808	TRUE
905	819025	905	905	1810	TRUE
906	820836	906	906	1812	TRUE
907	822649	907	907	1814	TRUE
908	824464	908	908	1816	TRUE
909	826281	909	909	1818	TRUE
910	828100	910	910	1820	TRUE
911	829921	911	911	1822	TRUE
912	831744	912	912	1824	TRUE
913	833569	913	913	1826	TRUE
914	835396	914	914	1828	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
915	837225	915	915	1830	TRUE
916	839056	916	916	1832	TRUE
917	840889	917	917	1834	TRUE
918	842724	918	918	1836	TRUE
919	844561	919	919	1838	TRUE
920	846400	920	920	1840	TRUE
921	848241	921	921	1842	TRUE
922	850084	922	922	1844	TRUE
923	851929	923	923	1846	TRUE
924	853776	924	924	1848	TRUE
925	855625	925	925	1850	TRUE
926	857476	926	926	1852	TRUE
927	859329	927	927	1854	TRUE
928	861184	928	928	1856	TRUE
929	863041	929	929	1858	TRUE
930	864900	930	930	1860	TRUE
931	866761	931	931	1862	TRUE
932	868624	932	932	1864	TRUE
933	870489	933	933	1866	TRUE
934	872356	934	934	1868	TRUE
935	874225	935	935	1870	TRUE
936	876096	936	936	1872	TRUE
937	877969	937	937	1874	TRUE
938	879844	938	938	1876	TRUE
939	881721	939	939	1878	TRUE
940	883600	940	940	1880	TRUE
941	885481	941	941	1882	TRUE
942	887364	942	942	1884	TRUE
943	889249	943	943	1886	TRUE
944	891136	944	944	1888	TRUE
945	893025	945	945	1890	TRUE
946	894916	946	946	1892	TRUE
947	896809	947	947	1894	TRUE
948	898704	948	948	1896	TRUE
949	900601	949	949	1898	TRUE
950	902500	950	950	1900	TRUE
951	904401	951	951	1902	TRUE
952	906304	952	952	1904	TRUE
953	908209	953	953	1906	TRUE
954	910116	954	954	1908	TRUE
955	912025	955	955	1910	TRUE
956	913936	956	956	1912	TRUE

m = √a	*a*	*√a*	*√a*	*√a + √a = b*	Integer?
957	915849	957	957	1914	TRUE
958	917764	958	958	1916	TRUE
959	919681	959	959	1918	TRUE
960	921600	960	960	1920	TRUE
961	923521	961	961	1922	TRUE
962	925444	962	962	1924	TRUE
963	927369	963	963	1926	TRUE
964	929296	964	964	1928	TRUE
965	931225	965	965	1930	TRUE
966	933156	966	966	1932	TRUE
967	935089	967	967	1934	TRUE
968	937024	968	968	1936	TRUE
969	938961	969	969	1938	TRUE
970	940900	970	970	1940	TRUE
971	942841	971	971	1942	TRUE
972	944784	972	972	1944	TRUE
973	946729	973	973	1946	TRUE
974	948676	974	974	1948	TRUE
975	950625	975	975	1950	TRUE
976	952576	976	976	1952	TRUE
977	954529	977	977	1954	TRUE
978	956484	978	978	1956	TRUE
979	958441	979	979	1958	TRUE
980	960400	980	980	1960	TRUE
981	962361	981	981	1962	TRUE
982	964324	982	982	1964	TRUE
983	966289	983	983	1966	TRUE
984	968256	984	984	1968	TRUE
985	970225	985	985	1970	TRUE
986	972196	986	986	1972	TRUE
987	974169	987	987	1974	TRUE
988	976144	988	988	1976	TRUE
989	978121	989	989	1978	TRUE
990	980100	990	990	1980	TRUE
991	982081	991	991	1982	TRUE
992	984064	992	992	1984	TRUE
993	986049	993	993	1986	TRUE
994	988036	994	994	1988	TRUE
995	990025	995	995	1990	TRUE
996	992016	996	996	1992	TRUE
997	994009	997	997	1994	TRUE
998	996004	998	998	1996	TRUE

$m = \sqrt{a}$	a	$\sqrt{a}$	$\sqrt{a}$	$\sqrt{a} + \sqrt{a} = b$	Integer?
999	998001	999	999	1998	TRUE
1000	1000000	1000	1000	2000	TRUE
1001	1002001	1001	1001	2002	TRUE
1002	1004004	1002	1002	2004	TRUE
1003	1006009	1003	1003	2006	TRUE
1004	1008016	1004	1004	2008	TRUE
1005	1010025	1005	1005	2010	TRUE
1006	1012036	1006	1006	2012	TRUE
1007	1014049	1007	1007	2014	TRUE
1008	1016064	1008	1008	2016	TRUE
1009	1018081	1009	1009	2018	TRUE
1010	1020100	1010	1010	2020	TRUE
1011	1022121	1011	1011	2022	TRUE
1012	1024144	1012	1012	2024	TRUE
1013	1026169	1013	1013	2026	TRUE
1014	1028196	1014	1014	2028	TRUE
1015	1030225	1015	1015	2030	TRUE
1016	1032256	1016	1016	2032	TRUE
1017	1034289	1017	1017	2034	TRUE
1018	1036324	1018	1018	2036	TRUE
1019	1038361	1019	1019	2038	TRUE
1020	1040400	1020	1020	2040	TRUE
1021	1042441	1021	1021	2042	TRUE
1022	1044484	1022	1022	2044	TRUE
1023	1046529	1023	1023	2046	TRUE

Proof of 2nd Even Conjecture

Basically, 2nd Even Conjecture states: Every even number is always equal to $2\sqrt{a}$ for a unique a. The definition for a positive even integer is $2m$, where $m \geq 1$. If our conjecture is true, then the following is true:

$$2m = 2\sqrt{a}$$

Therefore, our approach to this proof is to assume our conjecture is false, and then prove it is true by contradiction. If our conjecture is false, then $2\sqrt{a}$ must be an odd number since all integers are either even or odd. Therefore, since all odd numbers are defined by $2m + 1$, where $m \geq 1$, then the following must be true:

$$2m + 1 = 2\sqrt{a}$$

Rearranging, $2m = 2\sqrt{a} - 1$

For the right side of the above equation to be even, then $2\sqrt{a}$ must be odd. Recall, our conjecture has defined *a* as being a positive integer, which is unique because we only select *a* when $2\sqrt{a}$ is a positive integer. Therefore, $2\sqrt{a}$ must be an odd integer. Since we have defined *a* as any positive number where, $a \geq 1$, then for $2\sqrt{a}$ to be an integer, then $\sqrt{a}$ must also be an integer. Therefore, $\sqrt{a}$ can be either odd or even, however, this means that $2\sqrt{a}$ must be even. Thus, we have shown a contradiction that $2\sqrt{a}$ is not odd as assumed, and have proven that $2\sqrt{a}$ is always even. Thus, we have proven that 2nd Even Conjecture is true.

3rd Even Conjecture

This conjecture is called 3rd Even Conjecture and can be stated as follows:

3rd Even Conjecture: The results of the following Equation 3 is always an even number, where *e* is every even number:

First, recall $e = \sqrt{2\sqrt{a}} = (2\sqrt{a})^{1/2}$

Equation 3: $e = (2\sqrt{a})^{1/2k}$,

where *k* is any positive number where, $k \geq 1$, and where *a* is any positive number where, $a \geq 1$, and $2\sqrt{a}$ is equal to an integer then the integer will always be equal to one and only even number. Every $(2\sqrt{a})^{1/2k}$ is always equal to an even number for a unique *a*.

Experimental Data Analysis and 3rd Conjecture Evidence

Experimental data analysis was conducted, by the author, using Excel to justify enough mathematical evidence to justify claiming this conjecture. The author only needed to use the data analysis used in verifying 2nd Even Conjecture up to 1,048,575. Recall that the 1st Even Conjecture was proven for $e = \sqrt{2\sqrt{a}} = (2\sqrt{a})^{1/2}$, which is equal to $(2\sqrt{a})^{1/2k}$ for $k = 1$. It is important that since we will use Mathematical Induction for our proof, that the proof of the 1st Even Conjecture will be used as the first step of the induction proof.

Proof of 3rd Even Conjecture

Basically, the 3rd Even Conjecture states: $(2\sqrt{a})^{1/2k}$ is always an even integer for a unique *a*, and where *k* is any positive number where, $k \geq 1$. Since Mathematical Induction will be used for our proof, we will explain the steps of induction here using the following description:

If

1) **when a statement is true for a natural number** $n = k$**, then it will also be true for its successor,** $n = k + 1$**; and**

2) **the statement is true for** $n = 1$**;**

then the statement will be true for every natural number n**.**

To prove a statement by induction, we must prove parts 1) and 2)above.

The hypothesis of Step 1) -- "*The statement is true for n = k*" -- is called the induction assumption, or the induction hypothesis. It is what we *assume* when we prove a theorem by induction.

Now we will prove Equation 3, above, specifically that every even number is always equal to $(2\sqrt{a})^{1/2k}$ for a unique a, and for $k \geq 1$. The proof will use Mathematical Induction.

First, we shall assume $e = (2\sqrt{a})^{1/2k}$ is even when it is true for natural number $n = k$.

Second, we will prove it is true for $n = 1$, or equivalently $k = 1$.

Substituting 1 for k, then $(2\sqrt{a})^{1/2k} = (2\sqrt{a})^{1/2}$, which was already proven during the proof of the 1st Even Conjecture on page 2-3.

Third, we must prove that $e = (2\sqrt{a})^{1/2k}$ is even when it is true for natural number $n = k + 1$, that is:

$$e = (2\sqrt{a})^{(1/2(k+1))} = (2\sqrt{a})^{(1/2k + ½)} = (2\sqrt{a})^{1/2}\,(2\sqrt{a})^{1/2k}$$

Recall, $(2\sqrt{a})^{1/2}$ was already proven to be every even number in the proof of the 1st Even Conjecture. Additionally, our assumption in our induction proof was that $(2\sqrt{a})^{1/2k}$ is even when it is true for natural number $n = k$. Thus, $(2\sqrt{a})^{1/2}\,(2\sqrt{a})^{1/2k}$ is the product of two even numbers, therefore it is always even. Thus, we have proven that the 3rd Even Conjecture is true.

4th Even Conjecture

This conjecture is called 4th Even Conjecture and can be stated as follows:

4th Even Conjecture: Every even number can be stated by the following Equations 4 and 5 below, where e is every even number:

Equation 4: $$e = \sqrt{\sqrt{a} + \sqrt{a}} = \sqrt{2\sqrt{a}}\,,$$

where a is any positive number where, $a \geq 1$, and $\sqrt{2\sqrt{a}}$ is equal to an integer then the integer will always be equal to one and only even number.

Additionally, Equation 4 below is also always true for every $\sqrt{2\sqrt{a}}$ that is ≥ 4, and as it is defined above:

Equation 5: $e = \sqrt{2\sqrt{a}} = p_1 + p_1$, where p_1 and p_1 are both prime.

Proof of 4th Even Conjecture

The proof of 4th Even Conjecture is a direct result of another proof by this author, which proves the Goldbach Conjecture (see reference 1). The Goldbach Conjecture can be stated as "Every even integer which is ≥ 4 can be written as the sum of two primes". Since the author has proven the Goldbach Conjecture, which provides the following for every even number, $e \geq 4$:

$$e = 2m = p_1 + p_1, \text{ for every } m > 1$$

Therefore, since $\sqrt{2\sqrt{a}}$ is equal to every even number, then the following is always true for every $\sqrt{2\sqrt{a}} \geq 4$:

$$\sqrt{2\sqrt{a}} = p_1 + p_1$$

This proves the 4th Even Conjecture directly using the proof of Goldbach Conjecture.

5th Even Conjecture

This conjecture is called 5th Even Conjecture and can be stated as follows:

5th Even Conjecture: Every even number can be stated by the following Equations 6 and 7 below, where e is every even number:

Equation 6: $e = \sqrt{a} + \sqrt{a} = 2\sqrt{a}$,

where a is any positive number where, $a \geq 1$, and $2\sqrt{a}$ is equal to an integer then the integer will always be equal to one and only even number.

Additionally, Equation 7 below is also always true for every $2\sqrt{a}$ that is ≥ 4, and as it is defined above:

Equation 7: $e = 2\sqrt{a} = p_1 + p_1$, where p_1 and p_1 are both prime.

Proof of 5th Even Conjecture

The proof of 5th Even Conjecture is a direct result of another proof by this author, which proves the Goldbach Conjecture (see reference 1). The Goldbach Conjecture can be stated as "Every even integer which is ≥ 4 can be written as the sum of two primes". Since the author has proven the Goldbach Conjecture, which provides the following for every even number, $e \geq 4$:

$$e = 2m = p_1 + p_1, \text{ for every } m > 1$$

Therefore, since $2\sqrt{a}$ is equal to every even number, then the following is always true for every $2\sqrt{a} \geq 4$:

$$2\sqrt{a} = p_1 + p_1$$

This proves the 5th Even Conjecture directly using the proof of Goldbach Conjecture.

6th Even Conjecture

This conjecture is called 6th Even Conjecture and can be stated as follows:

6th Even Conjecture: Every even number can be stated by the following Equations 8 and 9 below, where e is every even number:

Equation 8: $$e = (2\sqrt{a})^{1/2k},$$

where k is any positive number where, $k \geq 1$, and where a is any positive number where, $a \geq 1$, and $2\sqrt{a}$ is equal to an integer then the integer will always be equal to one and only even number. Every $(2\sqrt{a})^{1/2k}$ is always equal to an even number for a unique a.

Additionally, Equation 7 below is also always true for every $(2\sqrt{a})^{1/2k}$ that is ≥ 4, and as it is defined above:

Equation 9: $e = (2\sqrt{a})^{1/2k} = p_1 + p_1$, where p_1 and p_1 are both prime.

Proof of 6th Even Conjecture

The proof of 6th Even Conjecture is a direct result of another proof by this author, which proves

the Goldbach Conjecture (see reference 1). The Goldbach Conjecture can be stated as "Every even integer which is ≥ 4 can be written as the sum of two primes". Since the author has proven the Goldbach Conjecture, which provides the following for every even number, $e \geq 4$:

$$e = 2m = p_1 + p_1, \text{ for every } m > 1$$

Therefore, since $(2\sqrt{a})^{1/2k}$ is always equal to an even number, then the following is always true for every $(2\sqrt{a})^{1/2k} \geq 4$:

$$(2\sqrt{a})^{1/2k} = p_1 + p_1$$

This proves the 6th Even Conjecture directly using the proof of Goldbach Conjecture.

References:

1) Marshall, Stephen. (2020). "Elementary Proof of the Goldbach Conjecture". viXra:1702.0150