

Benford's Law: Introduction

Austin Shapiro – Berkeley Math Circle – September 6, 2016

POWERS OF 3

n	3^n	n	3^n	n	3^n	n	3^n
0	1	10	59049	20	3486784401	30	205891132094649
1	3	11	177147	21	10460353203	31	617673396283947
2	9	12	531441	22	31381059609	32	1853020188851841
3	27	13	1594323	23	94143178827	33	5559060566555523
4	81	14	4782969	24	282429536481	34	16677181699666569
5	243	15	14348907	25	847288609443	35	50031545098999707
6	729	16	43046721	26	2541865828329	36	150094635296999121
7	2187	17	129140163	27	7625597484987	37	450283905890997363
8	6561	18	387420489	28	22876792454961	38	1350851717672992089
9	19683	19	1162261467	29	68630377364883	39	4052555153018976267

POWERS OF 2

n	2^n	n	2^n	n	2^n	n	2^n
0	1	10	1024	20	1048576	30	1073741824
1	2	11	2048	21	2097152	31	2147483648
2	4	12	4096	22	4194304	32	4294967296
3	8	13	8192	23	8388608	33	8589934592
4	16	14	16384	24	16777216	34	17179869184
5	32	15	32768	25	33554432	35	34359738368
6	64	16	65536	26	67108864	36	68719476736
7	128	17	131072	27	134217728	37	137438953472
8	256	18	262144	28	268435456	38	274877906944
9	512	19	524288	29	536870912	39	549755813888

FIBONACCI NUMBERS

n	F_n	n	F_n	n	F_n	n	F_n
1	1	11	89	21	10946	31	1346269
2	1	12	144	22	17711	32	2178309
3	2	13	233	23	28657	33	3524578
4	3	14	377	24	46368	34	5702887
5	5	15	610	25	75025	35	9227465
6	8	16	987	26	121393	36	14930352
7	13	17	1597	27	196418	37	24157817
8	21	18	2584	28	317811	38	39088169
9	34	19	4181	29	514229	39	63245986
10	55	20	6765	30	832040	40	102334155

POPULATIONS OF CALIFORNIA'S 58 COUNTIES (U. S. CENSUS ESTIMATES, 2015)

County	Population	County	Population	County	Population
Los Angeles	10,170,292	Solano	436,092	Lake	64,591
San Diego	3,299,521	Monterey	433,898	Tehama	63,308
Orange	3,169,776	Placer	375,391	San Benito	58,792
Riverside	2,361,026	San Luis Obispo	281,401	Tuolumne	53,709
San Bernardino	2,128,133	Santa Cruz	274,146	Calaveras	44,828
Santa Clara	1,918,044	Merced	268,455	Siskiyou	43,554
Alameda	1,638,215	Marin	261,221	Amador	37,001
Sacramento	1,501,335	Butte	225,411	Lassen	31,345
Contra Costa	1,126,745	Yolo	213,016	Glenn	28,017
Fresno	974,861	El Dorado	184,452	Del Norte	27,254
Kern	882,176	Imperial	180,191	Colusa	21,482
San Francisco	864,816	Shasta	179,533	Plumas	18,409
Ventura	850,536	Madera	154,998	Inyo	18,260
San Mateo	765,135	Kings	150,965	Mariposa	17,531
San Joaquin	726,106	Napa	142,456	Mono	13,909
Stanislaus	538,388	Humboldt	135,727	Trinity	13,069
Sonoma	502,146	Nevada	98,877	Modoc	8,965
Tulare	459,863	Sutter	96,463	Sierra	2,967
Santa Barbara	444,769	Mendocino	87,649	Alpine	1,110
		Yuba	74,492		

TALLY TABLES

1	1
2	2
3	3
4	4
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6	6
7	7
8	8
9	9
1	1
2	2
3	3
4	4
5	5
6	6
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9	9

Why?!