

Powers of Two

If one grain of rice with a length of 1 centimeter is doubled 80 times then the length of that one grain (with each grain placed end to end in a continuous line) would be:

$2^{80} = 1,208,925,819,614,629,174,706,176$ cm or **7,511,916,778,604,382,000 miles or 1,277,859.98 light years.**

$2^{93} = 9,903,520,314,283,042,199,192,993,792$ cm (or **10,468,029,232 light years**).
The diameter of the known universe is thought to be at least 10 billion light years.

That grain doubled in length 100 times would be:

$2^{100} = 1,267,650,600,228,229,401,496,703,205,376$ or **(1,339,933,302,216.29 light years)**

In terms of human population, if the world population were to double every 50 years, as it has since 1850, then by the year 2200 the world population would be 96,000,000,000 and in the year 3000 the population would be 412,000 trillion (412,000,000,000,000,000).

Powers of 2 Table

2^0	=	1 cm
2^1	=	2
2^2	=	4
2^3	=	8
2^4	=	16
2^5	=	32
2^6	=	64
2^7	=	128
2^8	=	256
2^9	=	512
2^{10}	=	1,024
2^{11}	=	2,048
2^{12}	=	4,096
2^{13}	=	8,192
2^{14}	=	16,384
2^{15}	=	32,768
2^{16}	=	65,536
2^{17}	=	131,072
2^{18}	=	262,144
2^{19}	=	524,288
2^{20}	=	1,048,576
2^{21}	=	2,097,152
2^{22}	=	4,194,304
2^{23}	=	8,388,608

$2^{24} = 16,777,216$
 $2^{25} = 33,554,432$
 $2^{26} = 67,108,864$
 $2^{27} = 134,217,728$
 $2^{28} = 268,435,456$
 $2^{29} = 536,870,912$
 $2^{30} = 1,073,741,824$
 $2^{31} = 2,147,483,648$
 $2^{32} = 4,294,967,296$
 $2^{33} = 8,589,934,592$
 $2^{34} = 17,179,869,184$
 $2^{35} = 34,359,738,368$
 $2^{36} = 68,719,476,736$
 $2^{37} = 137,438,953,472$
 $2^{38} = 274,877,906,944$
 $2^{39} = 549,755,813,888$
 $2^{40} = 1,099,511,627,776$
 $2^{41} = 2,199,023,255,552$
 $2^{42} = 4,398,046,511,104$
 $2^{43} = 8,796,093,022,208$
 $2^{44} = 17,592,186,044,416$
 $2^{45} = 35,184,372,088,832$
 $2^{46} = 70,368,744,177,664$
 $2^{47} = 140,737,488,355,328$
 $2^{48} = 281,474,976,710,656$
 $2^{49} = 562,949,953,421,312$
 $2^{50} = 1,125,899,906,842,624$
 $2^{51} = 2,251,799,813,685,248$
 $2^{52} = 4,503,599,627,370,496$
 $2^{53} = 9,007,199,254,740,992$
 $2^{54} = 18,014,398,509,481,984$
 $2^{55} = 36,028,797,018,963,968$
 $2^{56} = 72,057,594,037,927,936$
 $2^{57} = 144,115,188,075,855,872$
 $2^{58} = 288,230,376,151,711,744$
 $2^{59} = 576,460,752,303,423,488$
 $2^{60} = 1,152,921,504,606,846,976$
 $2^{61} = 2,305,843,009,213,693,952$
 $2^{62} = 4,611,686,018,427,387,904$
 $2^{63} = 9,223,372,036,854,775,808$
 $2^{64} = 18,446,744,073,709,551,616$
 $2^{65} = 36,893,488,147,419,103,232$
 $2^{66} = 73,786,976,294,838,206,464$
 $2^{67} = 147,573,952,589,676,412,928$
 $2^{68} = 295,147,905,179,352,825,856$
 $2^{69} = 590,295,810,358,705,651,712$

$$\begin{aligned}
2^{70} &= 1,180,591,620,717,411,303,424 \\
2^{71} &= 2,361,183,241,434,822,606,848 \\
2^{72} &= 4,722,366,482,869,645,213,696 \\
2^{73} &= 9,444,732,965,739,290,427,392 \\
2^{74} &= 18,889,465,931,478,580,854,784 \\
2^{75} &= 37,778,931,862,957,161,709,568 \\
2^{76} &= 75,557,863,725,914,323,419,136 \\
2^{77} &= 151,115,727,451,828,646,838,272 \\
2^{78} &= 302,231,454,903,657,293,676,544 \\
2^{79} &= 604,462,909,807,314,587,353,088 \\
2^{80} &= 1,208,925,819,614,629,174,706,176 \\
2^{81} &= 2,417,851,639,229,258,349,412,352 \\
2^{82} &= 4,835,703,278,458,516,698,824,704 \\
2^{83} &= 9,671,406,556,917,033,397,649,408 \\
2^{84} &= 19,342,813,113,834,066,795,298,816 \\
2^{85} &= 38,685,626,227,668,133,590,597,632 \\
2^{86} &= 77,371,252,455,336,267,181,195,264 \\
2^{87} &= 154,742,504,910,672,534,362,390,528 \\
2^{88} &= 309,485,009,821,345,068,724,781,056 \\
2^{89} &= 618,970,019,642,690,137,449,562,112 \\
2^{90} &= 1,237,940,039,285,380,274,899,124,224 \\
2^{91} &= 2,475,880,078,570,760,549,798,248,448 \\
2^{92} &= 4,951,760,157,141,521,099,596,496,896 \\
2^{93} &= 9,903,520,314,283,042,199,192,993,792 \\
2^{94} &= 19,807,040,628,566,084,398,385,987,584 \\
2^{95} &= 39,614,081,257,132,168,796,771,975,168 \\
2^{96} &= 79,228,162,514,264,337,593,543,950,336 \\
2^{97} &= 158,456,325,028,528,675,187,087,900,672 \\
2^{98} &= 316,912,650,057,057,350,374,175,801,344 \\
2^{99} &= 633,825,300,114,114,700,748,351,602,688 \\
2^{100} &= 1,267,650,600,228,229,401,496,703,205,376 \text{ (1,339,933,302,216.29 light years)}
\end{aligned}$$

Massing all of the rice into one clump:

The mass of one grain of rice (at 1 cm) doubled 100 times (formed into rice ball) would form an object with the diameter of approximately 136,000,000 meters or 84,506.5 miles.

The rice ball diameter at 2^{80} is **1,320,000 meters** which equals **820.21 miles**.

The rice ball diameter at 2^{100} is **136,000,000 meters** which equals **84,506.5 miles**

The diameter of Jupiter is 88,865 miles (142,984 kilometers). The Sun's diameter is 870,000 miles (1.4 million km).

Below is a table with the approximate radius (found using the equation: $4/3\pi r^3$) of a rice ball where one grain of rice is doubled as indicated in the table below. The first number is the power of two and the second number is the approximate radius in meters:

2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9	2^{10}
				.02					
2^{11}	2^{12}	2^{13}	2^{14}	2^{15}	2^{16}	2^{17}	2^{18}	2^{19}	2^{20}
	.10			.20			.40		.60
2^{21}	2^{22}	2^{23}	2^{24}	2^{25}	2^{26}	2^{27}	2^{28}	2^{29}	2^{30}
.80	1.0	1.25	1.56	2.0	2.5	3.2	4.0	5.05	6.3
2^{31}	2^{32}	2^{33}	2^{34}	2^{35}	2^{36}	2^{37}	2^{38}	2^{39}	2^{40}
8	10	12	16	20	25	30	40	50	60
2^{41}	2^{42}	2^{43}	2^{44}	2^{45}	2^{46}	2^{47}	2^{48}	2^{49}	2^{50}
80	100	120	160	200	260	325	410	500	650
2^{51}	2^{52}	2^{53}	2^{54}	2^{55}	2^{56}	2^{57}	2^{58}	2^{59}	2^{60}
800	1,050	1,300	1,650	2,000	2,600	3,300	4,100	5,200	6,300
2^{61}	2^{62}	2^{63}	2^{64}	2^{65}	2^{66}	2^{67}	2^{68}	2^{69}	2^{70}
8,000	10,000	13,000	16,000	20,000	26,000	33,000	40,000	52,000	65,000
2^{71}	2^{72}	2^{73}	2^{74}	2^{75}	2^{76}	2^{77}	2^{78}	2^{79}	2^{80}
80,000	100,000	130,000	170,000	210,000	260,000	330,000	420,000	530,000	660,000
2^{81}	2^{82}	2^{83}	2^{84}	2^{85}	2^{86}	2^{87}	2^{88}	2^{89}	2^{90}
840,000	1,050,000	1,320,000	1,650,000	2,100,000	2,650,000	3,350,000	4,250,000	5,300,000	6,600,000
2^{91}	2^{92}	2^{93}	2^{94}	2^{95}	2^{96}	2^{97}	2^{98}	2^{99}	2^{100}
8,400,000	11,000,000	14,000,000	17,000,000	22,000,000	27,000,000	33,000,000	42,500,000	55,000,000	68,000,000