

Perfect, Abundant, and Deficient Numbers

The abundance quotient is the sum of its factors (except for the number itself) divided by the number itself. For example, with 24, the sum of its factors is 36, so the abundance quotient for 24 is $36 \div 24 = 1.5$.

All perfect numbers, by definition, have an abundance quotient exactly equal to one. The first nine perfect numbers are:

6	8,589,869,056
28	137,438,691,328
496	2,305,843,008,139,952,128
8128	2,658,455,991,569,831,744,654,692,615,953,842,176.
33,550,336	

The tenth perfect number has 54 digits! It is still unknown if any odd perfect number exists.

Interestingly, the first 231 abundant numbers are all even numbers. The first odd-numbered abundant number is 945 (quotient = 1.032), and the second one is 1575 (quotient = 1.047). The *abundance quotients* of each of the “biggest” abundant numbers (i.e., having an abundance quotient greater than any previous number) from 6 up to 30,000 are listed below.

12 is abundant with a quotient of 1.333	720 is abundant with a quotient of 2.358
24 is abundant with a quotient of 1.500	840 is abundant with a quotient of 2.429
36 is abundant with a quotient of 1.528	1260 is abundant with a quotient of 2.467
48 is abundant with a quotient of 1.583	1680 is abundant with a quotient of 2.543
60 is abundant with a quotient of 1.800	2520 is abundant with a quotient of 2.714
120 is abundant with a quotient of 2.000	5040 is abundant with a quotient of 2.838
180 is abundant with a quotient of 2.033	10080 is abundant with a quotient of 2.900
240 is abundant with a quotient of 2.100	15120 is abundant with a quotient of 2.937
360 is abundant with a quotient of 2.250	25200 is abundant with a quotient of 2.966
	27720 is abundant with a quotient of 3.052

Here are the abundance quotients for the abundant numbers up to 150:

12 has a quotient of 1.333	80 has a quotient of 1.325
18 has a quotient of 1.167	84 has a quotient of 1.667
20 has a quotient of 1.100	88 has a quotient of 1.045
24 has a quotient of 1.500	90 has a quotient of 1.600
28 has a quotient of 1.000	96 has a quotient of 1.625
30 has a quotient of 1.400	100 has a quotient of 1.170
36 has a quotient of 1.528	102 has a quotient of 1.118
40 has a quotient of 1.250	104 has a quotient of 1.019
42 has a quotient of 1.286	108 has a quotient of 1.593
48 has a quotient of 1.583	112 has a quotient of 1.214
54 has a quotient of 1.222	114 has a quotient of 1.105
56 has a quotient of 1.143	120 has a quotient of 2.000
60 has a quotient of 1.800	126 has a quotient of 1.476
66 has a quotient of 1.182	132 has a quotient of 1.545
70 has a quotient of 1.057	138 has a quotient of 1.087
72 has a quotient of 1.708	140 has a quotient of 1.400
78 has a quotient of 1.154	