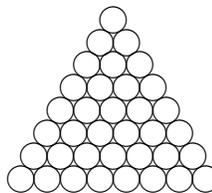
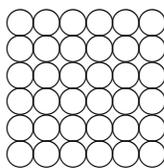


# 36 Thirty-Six XXXVI



Corresponding ordinal: thirty-sixth.

The number 36 is the nineteenth even number and the twenty-fourth composite number.

As a product of primes:  $36 = 2^2 \cdot 3^2$ .

The number 36 has nine divisors: 1, 2, 3, 4, 6, 9, 12, 18, 36.

The number 36 is the sixth abundant number:  $s(36) = 1 + 2 + 3 + 4 + 6 + 9 + 12 + 18 = 55 > 36$ . As 36 is a proper multiple of the perfect number 6, it is necessarily abundant.

The number 36 is the seventh square number:  $36 = 6^2$ .

As the sum of two triangular numbers,  $36 = 15 + 21$ .

As a sum of four or fewer squares:  $36 = 6^2 = 2^2 + 2 \cdot 4^2 = 2 \cdot 1^2 + 3^2 + 5^2 = 4 \cdot 3^2$ .

As a sum of nine or fewer cubes:  $36 = 1^3 + 2^3 + 3^3 = 4 \cdot 1^3 + 4 \cdot 2^3$ .

As a difference of two squares:  $36 = 10^2 - 8^2$ .

The number 36 appears in seven Pythagorean triples:

$$\begin{array}{ccccc} [15, 36, 39] & [27, 36, 45] & [36, 48, 60] & [36, 77, 85] \\ [36, 105, 111] & [36, 160, 164] & [36, 323, 325] & \end{array}$$

The fourth and the last are primitive.

As a sum of two odd primes:  $36 = 5 + 31 = 7 + 29 = 13 + 23 = 17 + 19$ .

The number 36 is the smallest number that can be expressed as a sum of consecutive primes in two different ways:  $17 + 19$  and  $5 + 7 + 11 + 13$ .

The number 36 is the eighth triangular number as it is equal to  $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$ . So 36 is both a square number and a triangular number. The theory of square triangular numbers is well developed. The next one is  $1225 = 35^2 = 49(49 + 1)/2$ ; the one after that is  $41616 = 204^2 = 288(288 + 1)/2$ . However, 36 is not just a square, but the square of the *triangular* number 6. It appears to be the only nondegenerate triangular number

that is the square of a triangular number, certainly the only one with fewer than thirty digits.

**The thirty-six officers problem.** Proposed by Euler. The problem is to arrange 36 officers—six officers of different ranks from six different regiments—in a six-by-six square so that no two officers of the same regiment are in the same row or column, and no two officers of the same rank are in the same row or column. Here is a solution to the 16 officers problem:

1B	2C	3D	4A
2D	1A	4B	3C
3A	4D	1C	2B
4C	3B	2A	1D

The numbers are ranks and the letters are regiments. There is no solution to the 36 officers problem. Euler conjectured that in 1782, and Tarry proved it in 1900. In 1959 it was shown that the only officers problems that can't be solved are 4 and 36.

The sum of the numbers from 1 to 36 is 666, the number of the beast (Revelation 13:18). So 666 is doubly triangular, being the 36-th triangle number.

The angle at a vertex of a pentagram is 36 degrees.



The thirty-sixth President of the United States was Lyndon Baines Johnson.

The thirty-sixth state to enter the Union was Nevada.

The thirty-sixth largest state in the United States is Tennessee.

There are 36 inches in a yard.