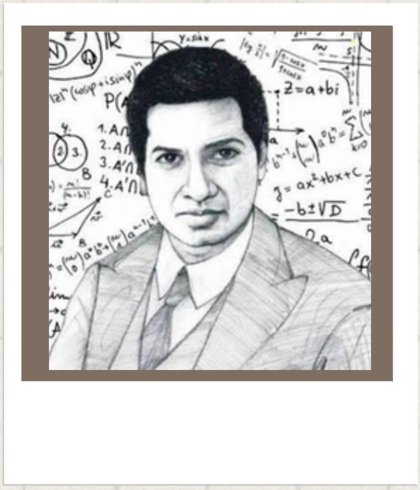
INVENTIONS BY INDIAN MATHEMATICIAN



SRINIVASA RAMANUJAN

Srinivasa Ramanujan was one of India's greatest mathematical geniuses. He made substantial contributions to the analytical theory of numbers and worked on elliptic functions, continued fractions, and infinite series.

Ramanujan was born in his grandmother's house in Erode, a small village about 400 km southwest of Madras (now Chennai). When Ramanujan was a year old his mother took him to the town of Kumbakonam, about 160 km nearer Madras. His father worked in Kumbakonam as a clerk in a cloth merchant's shop. In December 1889 he contracted smallpox.

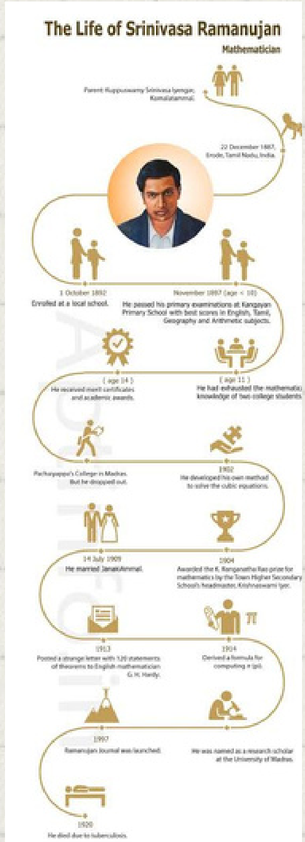
When he was nearly five years old, Ramanujan entered the primary school in Kumbakonam although he would attend several different primary schools before entering the Town High School in Kumbakonam in January 1898. At the Town High School, Ramanujan was to do well in all his school subjects and showed himself an able all round scholar. In 1900 he began to work on his own on mathematics summing geometric and arithmetic series.

ROGERS-RAMANUJAN IDENTITIES

$$\sum_{n=0}^{\infty} \frac{q^{n^2}}{(q;q)_n} = \prod_{n=1}^{\infty} \left(1-q^{5n-1}\right)^{-1}\left(1-q^{5n-4}\right)^{-1}$$

$$\sum_{n=0}^{\infty} \frac{q^{n^2+n}}{(q;q)_n} = \prod_{n=1}^{\infty} \left(1-q^{5n-2}\right)^{-1}\left(1-q^{5n-3}\right)^{-1}$$

Ramanujan's knowledge of mathematics (most of which he had worked out for himself) was startling. Although he was almost completely unaware of modern developments in mathematics, his mastery of continued fractions was unequaled by any living mathematician. He worked out the Riemann series, the elliptic integrals, hypergeometric series, the functional equations of the zeta function, and his own theory of divergent series, in which he found a value for the sum of such series using a technique he invented that came to be called Ramanujan summation. On the other hand, he knew nothing of doubly periodic functions, the classical theory of quadratic forms, or Cauchy's theorem, and he had only the most nebulous idea of what constitutes a mathematical proof. Though brilliant, many of his theorems on the theory of prime numbers were wrong.



Ramanujan's nested radical

S. Ramanujan (1887-1920)

$$3 = \sqrt{1+2\sqrt{1+3\sqrt{1+4\sqrt{1+\cdots}}}}$$

Proof: Define $f(x) = x + n + a$, so that $f(x)^2 = ax + (n+a)^2 + xf(x+n)$.

Set $a = 0$, $n = 1$, $x = 2$ and substitute recursively for $f(x)$.

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