French lawyer and magistrate for whom mathematics was an absorbing hobby. He contributed greatly to the development of number theory, analytical geometry, and calculus; carried out important research in probability theory and in optics; and was at the same time a competent classical scholar. Yet it is thanks only to his letters to various scientists and theoreticians that many of his accomplishments did not vanish into obscurity.

Born on 20 August 1601 in Beaumont de Lomagne, Fermat obtained a classical education locally. Between the ages of 20 and 30 he was in Bordeaux, possibly at the University of Toulouse. It was not, however, until he was 30 that he gained his bachelor's degree in civil law from the University of Orléans, set up a legal practice in Toulouse, and became commissioner of requests for the local parliament. In that parliament he was gradually promoted, gaining the high rank of king's counsellor in 1648, an office he retained until 1665. In 1652, however, he suffered a severe attack of the plague after which he devoted much of his time to mathematics, being particularly concerned with reconstructing some of the missing texts of the ancient Greeks such as Euclid and Apollonius of Perga. Curiously, he refused to publish any of his achievements, which were considerable despite the occasionally eccentric style in which they were presented. In increasing isolation, therefore, from the rest of the European mathematical community, Fermat lived to an old age. He died in Castres on 12 January 1675.

While Fermat was in Bordeaux, he became fascinated by the work of the mathematician François Viète; it was from then that most of his mathematical achievements were attained. And it was through Viète's influence that Fermat came to regard number theory as a 'lingua franca' between geometry and arithmetic, and went on to make many significant discoveries in the field. Himself responsible for the development of number theory as an independent branch of mathematics, Fermat's work on the theory was later revived by Leonhard Euler and continued to stimulate further research well into the 19th century. In 1657 Fermat published a series of problems as challenges to other mathematicians, in the form of theorems to be proved. All of them have since been proved - including 'Fermat's last theorem', the proof of which eluded mathematicians for more than 300 years. The theorem states that there is no solution in whole integers to the equation:

\[ x^n + y^n = z^n \]

where \( n \) is greater than 2. In 1993, Andrew Wiles, an English mathematician at Princeton University, USA, announced a proof; this turned out to be premature, but he put forward a revised proof in 1994. Fermat's last theorem was finally laid to rest in June 1997 when Wiles collected the Wolfskehl prize (the legacy bequeathed in the 19th century for the problem's solution).

Fermat's technique in much of his work was 'reduction analysis', a reversible process in which a particular problem is 'reduced' until it can be seen to be part of a group of problems for which solutions...
are already known. Using this procedure, Fermat turned his attention to geometry. Unfortunately, analytical geometry was developed simultaneously both by Fermat (in letters written before 1636) and by the great René Descartes (who published his Géométrie in 1637). There followed a protracted and bitter dispute over priority. The discipline permitted the use of equations to describe geometric figures, and Fermat demonstrated that a second-degree equation could be used to describe seven 'irreducible forms', each of which gave complete descriptions for different curves (such as parabolas and ellipses). He tried to extend this system into three dimensions to describe solids (in 1643), but was unsuccessful in the attempt beyond the establishment (in 1650) of the algebraic foundation for solid analytical geometry.

In 1636 he turned to the concept of 'infinitesimals' and applied it to equations of quadrature, the determination of the maxima and minima of curves, and the method of finding the tangent to a curve. All his work in these fields was superseded within 50 years through the development of calculus by Isaac Newton and Gottfried Leibniz; Newton did, however, acknowledge the importance of Fermat's work in the evolution of his own ideas.

Correspondence between Fermat and Blaise Pascal resulted in the foundation of probability theory. Their joint conclusion was that if the probability of two independent events is respectively p and q, the probability of both occurring is $pq$.

In the field of optics, yet another disagreement with Descartes - this time on his law of refraction - led Fermat to investigate it mathematically. Ultimately obliged to confirm the law - but incidentally discovering the fact that light travels more slowly through denser mediums - Fermat also derived what is now known as ‘Fermat's principle’ - which states that light travels by the path of least duration - after making a study of the transmission of light through materials with different refractive indices.

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