

# Ceulen, Ludolph Van | Encyclopedia.com

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(*b.* Hildesheim, Germany, 28 January 1540; *d.* Leiden, Netherlands, 31 December 1610),

*mathematics.*

Van Ceulen's name may originally have been Ackerman, latinized as Colonus and gradually modified to Van Ceulen. He was the son of a merchant; and after traveling widely, he settled in Holland, first, perhaps, in Breda and Amsterdam. In 1580 he was in Delft, where he became a fencing master and mathematics instructor. During 1589 he spent some time in Arnhem, and in 1594 Van Ceulen received permission to open a fencing school in Leiden. In 1600 he was appointed teacher of arithmetic, surveying, and fortification at the engineering school founded in Leiden by Prince [Maurice of Nassau](#). He held this position until his death. His second wife, Adriana Symons, whom he married in 1590, brought out Latin versions of two of his works posthumously, with the aid of Van Ceulen's pupil [Willebrord Snell](#).

Van Ceulen was an indefatigable computer and concentrated on the computation of  $\pi$ , sometimes called Ludolph's number. This brought him into controversy with the master reckoner Simon Van der Eycke, who had published an incorrect quadrature of the circle (1584–1586). Then he became acquainted with Archimedes' *The Measurement of the Circle*, which his friend Jan Cornets de Groot, a mayor of Delft and father of [Hugo Grotius](#), translated for him from the Greek. Now Van Ceulen began to work in the spirit of Archimedes, computing the sides of more regular polygons inscribed within and circumscribed about a circle than Archimedes had and inventing a special short division for such computation. In his principal work, *Van den Circkel* (1596), he published  $\pi$  to twenty decimal places by computing the sides of a regular polygon of  $15 \times 2^{31}$  sides. He continued to work on this subject; and in his *Arithmetische en geometrische fondamenten* (1615), published by his widow, he reached thirty-three decimal places, always enclosing  $\pi$  between an upper and a lower limit. Finally, [Willebrord Snell](#), in his *Cyclometricus* (1621), published Van Ceulen's final triumph:  $\pi$  to thirty-five decimal places. This was inscribed on his tombstone in the Pieterskerk in Leiden.

The *Van den Circkel* consists of four sections. The first contains the computation of  $\pi$ . The second shows how to compute the sides of regular polygons of any number of sides, which in modern terms amounts to the expression of  $\sin nA$  in terms of  $\sin A$  ( $n$  is an integer). The third section contains tables of sines up to a radius of  $10^7$  (not an original achievement), and the fourth has tables of interest.

The first and second sections are the most original; they contain not only the best approximation of  $\pi$  reached at that time but also show Van Ceulen to be as expert in trigonometry as his contemporary Viète. In 1595 the two men competed in the solution of a forty-fifth degree equation proposed by Van Roomen in his *Ideae mathematicae* (1593) and recognized its relation to the expression of  $\sin 45A$  in terms of  $\sin A$ .

Van Ceulen's tables of interest were not the first to be published. He was anticipated by others, including his friend [Simon Stevin](#) (1583). Van Ceulen probably had computed his tables before he knew of Stevin's work.

## BIBLIOGRAPHY

I. Original Works. Two of Van Ceulen's books are *Van den Circkel* (Delft, 1596); and *Arithmetische en geometrische fondamenten* (Leiden, 1615). For the titles of Van Ceulen's early polemical writings and the full titles of his books, see Bierens de Haan and Bosmans (below). Snell's Latin versions are *Fundamenta arithmetica et geometrica* (Leiden, 1615; Amsterdam, 1619), a translation; and *L. à Ceulen De circulo et adscriptis liber* (Leiden, 1619), a modified version of the original. Van Ceulen also wrote a manuscript entitled "Algebra," which seems to have been lost.

II. Secondary Literature. On Van Ceulen or his work, see D. Bierens de Haan, *Bouwstoffen voor de Geschiedenis der Wis- en Natuurkundige Wetenschappen in de Nederlanden*, 2 vols. (Amsterdam, 1876–1878), nos. 8, 9, 17 (repr. from *Verlagen en mededeelingen der Koninklijke Akademie van Wetenschappen Amsterdam*); H. Bosmans, "Un é mulede Viète," in *Annales de la Société scientifique de Bruxelles*, **34**, pt. 2 (1910), 88–139, with an analysis of *Van den Circkel*; and "Ludolphe van Ceulen," in *Mathésis. Recueil mathématique à l'usage des écoles spéciales* (Ghent), **39** (1925), 352–360, with a portrait; and C. de Waard, "Ceulen," in *Nieuw Nederlandsch Biographisch Woordenboek*, VII (1927), cols. 291–295. See also P. Beydals, in *Nieuwe Rotterdamsche courant* (1 Oct. 1936). On his tables of interest, see Simon C. Stevin, *Tafelen van Interest* (Antwerp, 1583), repr. with English translation in *The Principal Works of S. Stevin*, IIa, Dirk J. Struik, ed. (Amsterdam, 1958), 13–24;

and C. Waller Zeeper, *De oudste interestafels* (Amsterdam, 1927). The fate of the tombstone is discussed by C. de Jong and W. Hope-Jones in *Mathematical Gazette*, **22** (1938), 281–282.

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