Leonardo da Vinci's infinitesimal methods

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Our study of the historical and didactical roots of the methods of calculation of the area of a circle, in particular, of the so-called "rearrangement method" that offers visual and intuitive support in dealing with infinitesimal approximations (Freiman and Volkov 2022), brought us to Leonardo's contribution which certainly merits a detailed analysis. In his study of Leonardo da Vinci (1452–1519) published in 1909, Pierre Duhem (1861–1916) devoted a short section titled "L'infiniment grand et l'infiniment petit dans les notes de Léonard de Vinci" to Leonardo's concepts of infinitely small and infinitely large entities. Duhem quoted Leonardo's claim that "La Géométrie est infinie parce que toute quantité continue est divisible à l'infini dans l'un et l'autre sens"; Duhem borrowed this quote from Manuscript M of the Bibliothèque de l'Institut and provided his own reconstruction of Leonardo's drawing that was supposed to support this claim. Surprisingly, Duhem did not mention another Leonardo's fragment and accompanying diagrams directly related to the calculation of the area of a sector found in Manuscript E in which Leonardo gave a verbal formula for the area of a circle as follows: "The circle is equal to a quadrilateral made of a half of the diameter of this circle, multiplied by a half of the circumference of the same circle". In our MACAS presentation we will briefly discuss Leonardo's interest in mathematics (in particular, his studies of perspective), then focus on the infinitesimal methods mentioned by Leonardo and compare them with the methods developed by other authors and adapted for didactical purposes by mathematics educators of the 19th and 20th centuries.

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