APPROXIMATION OF SQUARE ROOT OF 2 – DIAGONAL AND SIDE NUMBERS

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ABSTRACT

Pythagoreans discovered that there are magnitudes which have not a common measure. These magnitudes were called incommensurable and their discovery caused a crisis in Greek mathematics. The ratio of incommensurable magnitudes cannot be expressed as the ratio of whole numbers. One example of such magnitudes are the side and diagonal (or diameter) of a square.
All these were known to Pythagoreans, who tried to solve the problem of finding hole numbers whose ratio is 'close' to the ratio of the side and diagonal of a square, or,(in modern language) to find a rational approximation of square root of 2.
This inquiry lead to the discovery by Pythagoreans of 'diagonal and side' numbers. These numbers have the property that their ratio can give approximation to square root of 2 as close as we need. This discovery is described by Proclus and Theon Smyrnaeus. Though their properties are not described by Euclid, his Elements contain propositions which are needed for their proof.
In our work we will describe the construction and the properties of 'diagonal and side' numbers, the passages of Proclus and Theon, and the proofs of related propositions, as they are described in ancient texts.