

SAW Three-Month Workshop:

Mathematical Practices in relation to the Astral Sciences

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Pr̥thūdhaka's commentary on Brahmagupta's rules on operations with sexagesimal numbers or measuring units. (BSS.12.62-65)

Abstract: The mathematical chapter of the *Brahmasphuṭasiddhānta* presents two rules involving computations with a kind of quantity having sexagesimal parts. A translation and my own first edition of Pr̥thūdhaka's commentary on the rule contained during BSS.12.62 was read during this session. The rule given by Brahmagupta would have been to provide an approximation of the following type:

$$(a; b)^2 \approx \frac{ab}{30} + a^2$$

The reading involved closely examining the vocabulary used both by the author of the treatise (Brahmagupta) and the commentator (Pr̥thūdhaka), concerning this quantity and the mathematical operation to provide what appears an approximation of its square, contrasting different possible interpretations and past translation of the rules. By trying to account for Pr̥thūdhaka's understanding of the rule, and with the help of a collective discussion, it was understood that the quantity shaped, of which the square was to be taken was of the form of a couple: $a; b$.

a represents a number in decimal place value notation,

b would be the number of 1/60th a should be increased by.

b then appears as an integer smaller than 60, but can also be seen as the numerator of the fraction $b/60$. The number thus shaped can thus alternatively be noted: $a+b/60$. The vocabulary used by Brahmagupta, in this context, would have been to consider the couple $a; b$ as called a *vikala*, a would have been called *sakala*, and b *sva-vikala*. But this remained debatable at the end of the session.