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#### Mathematical Reasonings 2

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**Clemency Montelle** (University of Canterbury, New Zealand, & SAW Project)

*What can numerical data reveal about approximation? Trigonometry and the associated interpolation rules in Brahmagupta's Khaṇḍakhādyaka*

**Abstract** – In his *Khaṇḍakhādyaka*, Brahmagupta presents four rules which concern the determination of the sine and the inverse procedure of retrieving the arc. One of these verses includes his six tabulated sines–differences with a rule for linear interpolation to find a non–tabulated value. Another of these gives a second order interpolation procedure for determining non–tabulated sines. In a related manner, another verse gives a rule to determine the arc given the sine via a linear procedure, and the last gives a rule to find the arc from a given sine using an iterative procedure. The variety of rules and their placement in the text raise many pertinent questions. When should a linear approach be used over a non–linear one? Which ones has Brahmagupta used and when? What does the existence of more accurate alternative rules reveal about how these procedures and the data they generated were regarded by those that used the texts? In order to understand these issues, I survey all places in the *Khaṇḍakhādyaka* where Brahmagupta presents versified numerical data to detect where possible the procedures used to obtain the values. Furthermore, I analyze the twelfth century commentary of Āmarāja on these verses and the numerical derivations he includes to appreciate the rules and procedures used to generate the numerical data. Āmarāja's reflections on the precision of the results he generates reveal an ever increasing theoretical approach to approximation.