ALEXANDER JONES, Classics, University of Toronto, 97 St. George Street, Toronto, ON, M5S 2E8
Some Properties of Arithmetical Functions in Ancient Astronomy

Babylonian mathematical astronomy and its Greco-Roman continuation employed arithmetical functions to model aspects of phenomena. The most characteristic type was the linear zigzag function, according to which a quantity alternately increases and decreases by constant differences between a fixed minimum and maximum value. In modern discussions, zigzag functions are typically described as a sequence of equally-spaced discrete values of a continuous "ideal" function, in which the independent variable is time (not necessarily measured in units of constant duration). For the ancient astronomers, however, the tabulated values of a zigzag function were generated algorithmically, each value from its immediate predecessor.

All zigzag functions used in ancient astronomy had parameters that can be expressed by terminating sexagesimal fractions, and the sequence of generated values repeats exactly after an integral number of steps. Neugebauer demonstrated in the 1940s that such sequences have certain properties that are not obvious from consideration of the ideal function; for example, the mean rate of increase of the running totals of a zigzag function may not be equal to the mean of the ideal maximum and minimum. The present paper will consider whether evidence exists that ancient astronomers were aware of these properties and developed mathematical methods for handling them.