A new interpretation of Babylonian math
Samuel Pfister

According to a new interpretation of a 3,800-year-old clay tablet, the ancient Babylonians may have developed the first inklings of trigonometry more than a thousand years before Pythagoras, the namesake of the Pythagorean Theorem, or Hipparchus, considered the father of trigonometry. This fresh examination of the tablet—known as Plimpton 322 (P322)—by scholars at the University of New South Wales (UNSW) could revolutionize our understanding of Babylonian math.

The tablet under scrutiny dates to around 1800 B.C.E. and was discovered in the early 20th century in modern-day southern Iraq by Edgar Banks, a diplomat, archaeologist, explorer, and one of the inspirations for George Lucas’s Indiana Jones. Banks sold the tablet to collector George Arthur Plimpton, its namesake, who in 1936 donated his artifacts to Columbia University. The tablet is now on display in Columbia’s Rare Book and Manuscript Library.

Plimpton 322 consists of 60 inscribed cuneiform numbers in four columns and 15 rows on a clay slate only slightly larger than an iPhone. As early as 1945, the organization of the tablet was identified by mathematician Otto Neugebauer and Assyriologist Abraham Sachs as a Babylonian trigonometry table. A modern trig table is essentially a reference of sines, cosines, tangents, and other mathematical functions of angles in right triangles. This table, however, is broken and incomplete, and it is unknown how much of the fragmented tablet is missing.

UNSW mathematicians Daniel Mansfield and Norman Wildberger, authors of a recent article in the journal Historia Mathematica reinterpreting P322, agree that the tablet is an example of ancient trigonometry, but they take the claim one step further. Whereas we use angles, sines, and cosines to calculate mathematical equations of right triangles, Mansfield and Wildberger suggest the Babylonians used ratios of side lengths recorded in this tablet to determine unknown lengths.

Because the Babylonians utilized a base-60 numerical system (like how we interpret time) rather than our modern base-10, Mansfield and Wildberger conclude that the authors of this tablet could attain more real integers from the fractions of triangle side lengths like those represented on
P322. This would make P322 the world’s oldest trigonometry table.

“This is a whole different way of looking at trigonometry,” Mansfield told Science. “We prefer sines and cosines … but we have to really get outside our own culture to see from their perspective to be able to understand it.”

However, not all scholars share the researchers’ enthusiasm for the new interpretation. Writing for Scientific American, University of Utah mathematician Evelyn Lamb criticizes Mansfield and Wildberger for misrepresenting and exaggerating the importance of the new discovery. Lamb instead contends the duo is amplifying upon the artifact the importance of rational integers, which happens to be a crucial facet of Wildberger’s not-well-accepted theory of “rational trigonometry.”

“It’s hard not to see their work on Plimpton 322 as motivated by a desire to legitimize an approach that has almost no traction in the mathematical community,” wrote Lamb.

While the contents of the tablet are quite clear, the purpose and use of the so-called Babylonian trigonometry table remains questionable. One proposal was that the tablet was merely a pedagogical instrument that instructed or assisted students solving mathematical equations. Alexander R. Jones, Director of the Institute for the Study of the Ancient World at New York University, remains skeptical given the lack of contextual evidence that could hint at a function of the tablet, calling Mansfield and Wildberger’s interpretation “rather speculative.”

The tablet raises important questions about mathematical history and how we understand the way the ancients performed mathematics and qualified the world in which they lived.

“It’s arrogant and will probably lead to incorrect conclusions to look at ancient artifacts primarily through the lens of our modern understanding of mathematics,” Evelyn Lamb opined in Scientific American.

While the interpretation and purpose of the tablet remains controversial, the importance of Plimpton 322 to the study of Babylonian math is without question. Examination of this remarkable tablet opens the door to begin interpreting how ancient Mesopotamians rationalized their world and solved problems.