MATH FOR PHYSICS

Unit 1,2 Dr. John P. Cise, Professor of Physics, Austin Com. College, 11928 Stonehollow Dr., Austin Tx. 78758, jpcise@austincc.edu, & NYTimes Aug. 29, 2017 by Kenneth Chang

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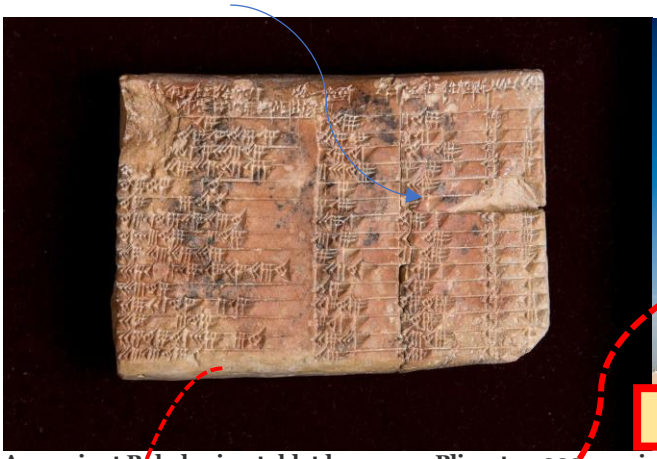
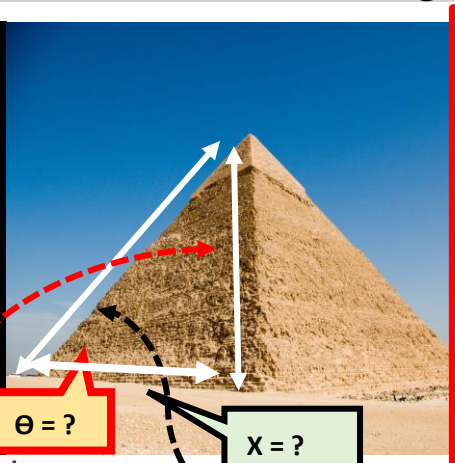
Hints of Trigonometry on a 3,700-Year-Old Babylonian Tablet





An ancient Babylonian tablet known as Plimpton 322 consists of a table of 60 numbers organized into 15 rows and four columns.

INTRODUCTION: Here is a great opportunity to practice with a 3700 yr. old trig. application.

QUESTIONS: (a) Find sin.Θ =? , (b) Θ = ? , (c) Find cos. Θ = ? , (d) Find X in units of cubits using trig.?, (e) Find X(in cubits) using Pythagoras ?, (f) Find X In foot units ? (continued below)

Suppose that a ramp leading to the top of a ziggurat wall is 56 cubits long, and the vertical height of the ziggurat is 45 cubits. What is the distance x from the outside base of the ramp to the point directly below the top? (Ziggurats were terraced pyramids built in the ancient Middle East; a cubit is a length of measure equal to about 18 inches or 44 centimeters.).Could the Babylonians who lived in what is now Iraq more than 3,700 years ago solve a word problem like this? Two Australian mathematicians assert that an ancient clay tablet was a tool for working out trigonometry problems, possibly adding to the many techniques that Babylonian mathematicians had mastered. **"It's a trigonometric table, which is 3,000 years ahead of its time,"** said Daniel F. Mansfield of the University of New South Wales. Dr. Mansfield and his colleague Norman J. Wildberger reported their findings last week in the journal Historia Mathematica. The tablet, known as Plimpton 322, was discovered in the early 1900s in southern Iraq and has long been of interest to scholars. It contains 60 numbers organized into 15 rows and four columns inscribed on a piece of clay about 5 inches wide and 3.5 inches tall. It eventually entered the collection of George Arthur Plimpton, an American publisher, who later donated his collection to Columbia University. **With all the publicity, the tablet has been put on display at the university's Rare Book & Manuscript Library.**

HINTS: sin = opposite/hypotonus , cos. Θ = adjacent/hypotonus ,

$A^2 + B^2 = C^2$

ANSWERS: (a) sin. Θ = 0.80357 , (b) Θ = ~ 53.47^0 , (c) cos. Θ = 0.5952 , (d) X = 33.33 cubits , (e) X = 33.33 cubits , (f) X = 50 feet

COMMENT: Amazing the Babylonians knew some trigonometry 3700 years ago……1200 years before Pythagoras in Grease (~ 500 BC).

Dr. Daniel Mansfield of the University of New South Wales holding the Plimpton 322 tablet at the Rare Book and Manuscript Library at Columbia University. Based on the style of cuneiform script used for the numbers, Plimpton 322 has been dated to between 1822 and 1762 B.C. One of the columns on Plimpton 322 is just a numbering of the rows from 1 to 15. The other three columns are much more intriguing. In the 1940s, Otto E. Neugebauer and Abraham J. Sachs, mathematics historians, pointed out that the other three columns were essentially Pythagorean triples — sets of integers, or whole numbers, that **(((satisfy the equation $a^2 + b^2 = c^2$. This equation also represents a fundamental property of right triangles)))— that the square of the longest side, or hypotenuse, is the sum of the squares of the other two shorter sides.That by itself was remarkable given that the Greek mathematician Pythagoras**, for whom the triples were named, would not be born for another thousand years. Why the Babylonians compiled the triples and wrote them down has remained a matter of debate. One interpretation was that it helped teachers generate and check problems for students.