Unpublished Mathematical Text from Tell IBZIKH in the Iraqi Museum

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The Babylonians introduced the greatest of civilizational achievements in the history of mankind in different branches of knowledge, especially mathematics, because it is the language of sciences and the basis upon which the other sciences are built, such as astronomy, physics, chemistry, geometry and etc….Actually, the achievement, that took place in Mesopotamia are regarded as the cornerstone of all inventions that appeared in different adjacent countries and in later different periods. Also, the remains and the information that came down to us underline the greatness of this people and the originality of this civilization(١). Because of this development, we preferred to focus on a type of mathematics which is seen as one of the natural consequences of the economic and intellectual development in Mesopotamia. Despite its initial steps which are considered experimental knowledge, it Later took important steps towards discovering a number of scientific facts that resulted from the abstract theoretical meditations(٢). Among these achievements is our present research entitled "**Unpublished Mathematical Text from Tell Al-IBZIKH in the Iraqi Museum"** It discusses the square roots for numbers ٣١-٤٢. It is probable that the text may continue to other multiplications of number ٤٠ and other numbers. But we believe that the obverse of the tablet ended with number ٤٢ through the right edge of the tablet(٣) which seems to us that the text ended her. As regards the reverse side of the tablet nothing is written on it. It came from the excavations made by the Iraqi mission specifically in the second season of ٢٠٠٢ in ZABALUM whose remains are currently known by tell IBZIKH, which lies in THIQAR. by ٢٩٠ km south of Baghdad(٤) It was found in this first western point in square ١٢ with depth of ١٩٠ cm. Its dimensions were ٥.٦ cm x ٤.٨ cm x ١.٨ cm. It is presently preserved in the Iraqi museum under number ١٩٤٣٨٩ .

How to Read Square Roots ?

The Babylonian writer in mathematics depended on numerous way in writing, counting and tabulating numbers by using mathematical rules which he reached across a long period of time. We find that he organized number– related tables through writing the right numbers in the first column on the left. Then he leaves a space between the right number and the following number as a reference that this space is like a decimal point for the right number. After that, he writes the cuneiform mark ()(٥) with reading (e), which means the number itself. the required number comes after this mark, followed by the Sumerian mathematical term BA.SI, or ÍB. $SI_{٨}$ Its counterpart in Akkadian is (bâsum) which means the square root(٦) of the number. Thus, the ancient Iraqis left behind them tables with square roots as follows:(٧)

١	square roots of	١
٢	square roots of	٤
٣	square roots of	٩

Perhaps this text might have divided for the economy of effort exerted by the researcher in field of mathematics. In addition, the ancient Babylonian writer, through his experience discovered the multiplication of the number by itself, there by extracting the square root, Therefore, these tables were like a dictionary consulted by the writer. It is obvious that the writer used the sixty system when finding the square result for knowing the root of any number. An example is ٣٣

١٨*٦٠+٩=١٠٨٩

It is the square of the number; the same result of the number ٣٣*٣٣=١٠٨٩ .

The Akkadian Translation:

٣٣ e ١٨.٩ ÍB.SI٨

namely it is the square root of ٣٣=١٨.٩ .

It seems that the writer made many attempts until he arrived at a precise mathematical method which is the multiplication of the number by the biggest numerical value which is sixty because the arithmetic system depended on the sixty system, for example, the multiplication of ١٨*٦٠ gives the result ١٠٨٠, and it is an approximate number to the result of its root if we multiply ٣٣*٣٣ which equals ١٠٨٩ which is too near from the previous result. Hence, he added ٩ to get the number ١٨.٩ which is the square root of ٣٣, we find him continues extracting the roots of numbers which follow ٣١ until he comes to ٣٧ with successive results. For example, ٣١ had a square root which is ١٦.١, ٣٢ had ١٧.٤ and ٣٧ had ٢٢.٤٩, but when he reaches ٣٨, we did not find this succession in the results rather, he moved to ٢٤.٤ the reason is attributed to the fact that ٢٣, if multiplied by ٦٠, gives a different results from the requested number which is ١٤٤٤. this number is the result of multiplying ٣٨ by itself . the result is obtained by multiplying ٢٤ by ٦٠. then he added ٤ to give the same result. By this concord this mathematician arrived at scientific steps with positive results which now served the Iraqi society. the following is the translation of the cuneiform text:

IM(١٩٤٣٩٨)

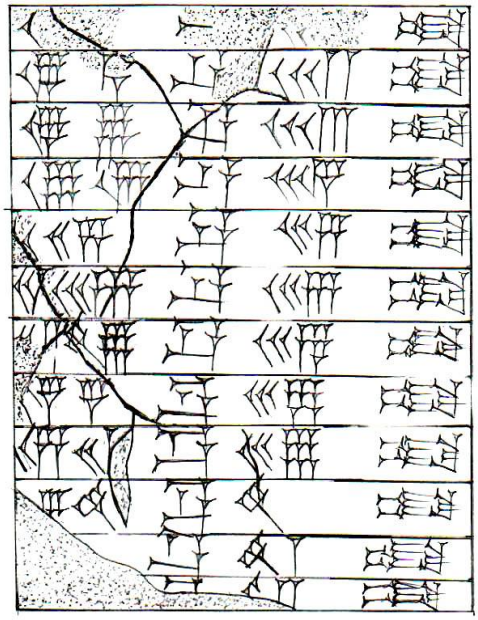
Obv.

١) ١٦.١	e ٣١	ÍB.SIₓ
١٧.٤	e ٣٢	ÍB.SIₓ
١٨. ٩	e ٣٣	ÍB.SIₓ
١٩.١٦	e ٣٤	ÍB.SIₓ
٥) ٢٠.٢٥	e ٣٥	ÍB.SIₓ
٢١.٣٦	e ٣٦	ÍB.SIₓ
٢٢.٤٩	e ٣٧	ÍB.SIₓ
٢٤.٤	e ٣٨	ÍB.SIₓ
٢٥.٢١	e ٣٩	ÍB.SIₓ
١٠) ٢[٦.٤٠]	e ٤٠	ÍB.SIₓ
[٢٨.١]	e ٤١	ÍB.SIₓ
[٢٩.٢٤]	e ٤٢	ÍB.SIₓ

Analysis

١) ١٦.١	= ٩٦١	٣١²
١٧.٤	= ١٠٢٤	٣٢²
١٨. ٩	= ١٠٨٩	٣٣²
١٩.١٦	= ١١٥٦	٣٤²
٥) ٢٠.٢٥	= ١٢٢٥	٣٥²
٢١.٣٦	= ١٢٩٦	٣٦²
٢٢.٤٩	= ١٣٦٩	٣٧²
٢٤.٤	= ١٤٤٤	٣٨²
٢٥.٢١	= ١٥٢١	٣٩²
١٠) ٢[٦.٤٠]	= ١٦٠٠	٤٠²
[٢٨.١]	= ١٦٨١	٤١²
[٢٩.٢٤]	= ١٧٦٤	٤٢²

the text size (٥.٦*٤.٨*١.٨)



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