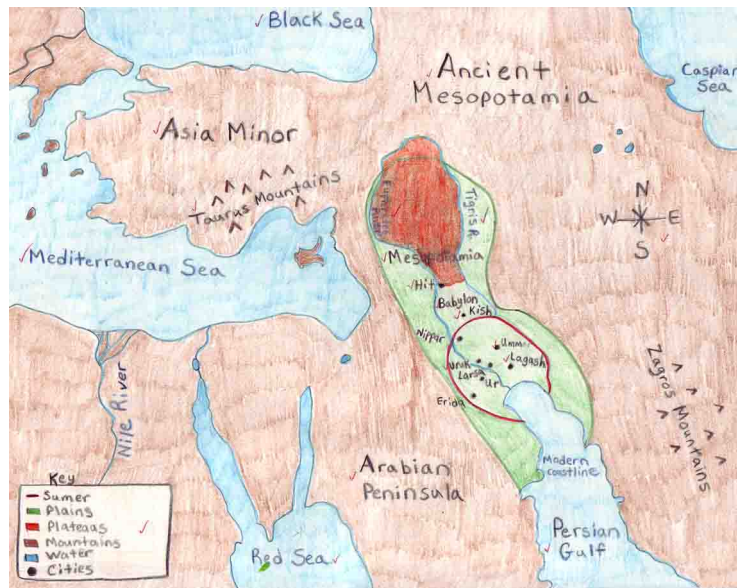


**Objectives**

This lesson describes a method for finding square roots used by the Babylonian people of Mesopotamia. The method involves dividing and averaging, over and over, to find a more accurate solution with each repeat of the process.



**History**

- Ancient Mesopotamia was a civilization that existed in the area of modern Turkey, Syria, Iraq and Iran, between the Mediterranean Sea and the Persian Gulf. In the period 1900-1600 BC, Babylon was the capital city of Mesopotamia and the mathematics recorded at this time came to be known as Babylonian Mathematics.
- Babylonian scribes used wet clay tablets written on with reeds the size of pencils. Corrections were difficult to make, since once the clay dried it was no longer possible to write on or change the tablet. Tablets from the size of postage stamps to pillows have been found in the area of the Babylonian civilization and now can be found in museums around the world.
- The Babylonians had an accurate and simple method for finding the square roots of numbers. This method is also known as Heron's method, after the Greek mathematician who lived in the first century AD. Indian mathematicians also used a similar method as early as 800 BC. The Babylonians are credited with having first invented this square root method, possibly as early as 1900 BC.

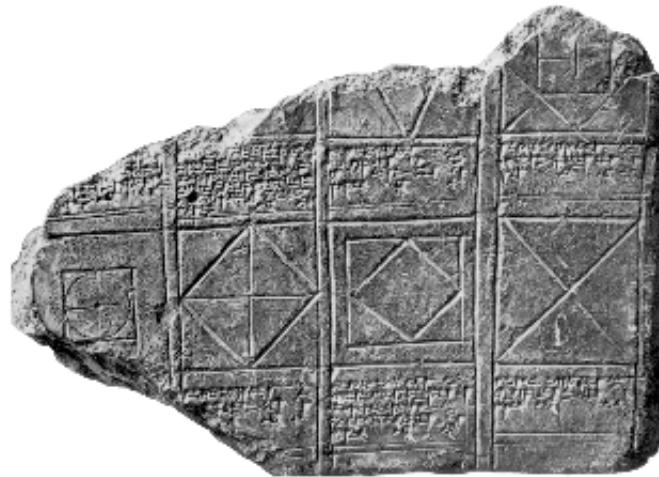
B8 <span style="float:right">fx) Σ = =(B7+C7)/2</span>				
	A	B	C	D
1	<b>Babylonian algorithm for square root</b>			
2				
3	<b>Number A</b>	<b>2</b>	<b>Square root of A</b>	
4	<b>Start number</b>	<b>1</b>	<b>1,414213562373100</b>	
5				
6	<b>Iteration</b>	<b>1° side</b>	<b>2° side</b>	<b>Area</b>
7	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
8	<b>2</b>	<b>1,5</b>	<b>1,33</b>	<b>2</b>
9	<b>3</b>	<b>1,416666666666670</b>	<b>1,411764705882350</b>	<b>2</b>

The Babylonian method for finding square roots involves dividing and averaging, over and over, to obtain a more accurate solution with each repeat of the process.

### Babylonian Square Roots Algorithm

- Step 1 : Make a guess.
- Step 2 : Divide your original number by your guess.
- Step 3 : Find the average of these numbers.
- Step 4 : Use this average as your next guess.

REPEAT THE PROCESS THREE TIMES.



For example, find  $\sqrt{5}$

#### 1/ FIRST PROCESS

- Step 1 : Guess 2 (because  $2 \times 2 = 4$ , close to 5)
- Step 2 : Divide 5 by 2 give 2,5
- Step 3 : Find average of 2 and 2.5 is equal to 2,25 (because  $\frac{2 + 2,5}{2} = 2,25$ )
- Step 4 : Next guess is 2.25

#### 2/ SECOND PROCESS

- Step 1 : Guess 2,25
- Step 2 : Divide 5 by 2,25 = 2,22222222 (go 8 decimal places for accuracy)
- Step 3 : Find average of 2.25 and 2,22222222 = 2,23611111
- Step 4 : Next guess is 2,23611111

#### 3/ THIRD PROCESS

- Step 1 : Guess 2,236111111
- Step 2 : Divide 5 by 2,23611111 = 2,2360248
- Step 3 : Find average of 2,23611111 and 22360248 = 2,2360679
- Step 4 : FINAL guess is 2,2360679

4/ Now CHECK your final guess with a calculator :  $\sqrt{5} \approx 2,2360679$

#### 5/ YOUR PROJECT :

- 1. Find sqrt. 1 000 using the Babylonian square root method.
- 2. Write out each of your steps.
- 3. Check your result using OOO-calc.