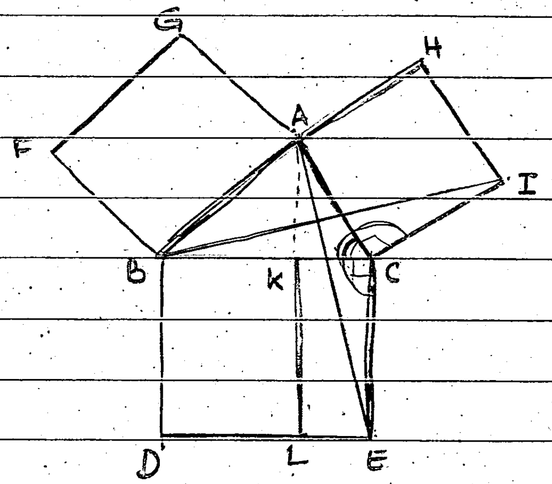
U3A Maths

10-Mar-2026 Term 1 / Week 7

Babylonian Number System

Review

~~Homework~~



* Show that Rect. Area KCEL = Square Area AHIC

Construct two triangles

10, △ ACE & △ BCI as shown.

We have, for △ACE & △BCI

CE = BC

AC = CI

∠ACE = ∠BCI

∴ △ACE ≡ △BCI

Let us show that.

Area of Rect. KLEC = △ACE + △BCI

or = 2 × △ACE

Area of KLEC = KC × CE

Area of △ACE = $\frac{1}{2}$ × CE × KC

∴ 2 × △ACE = $\cancel{2}$ × $\cancel{\frac{1}{2}}$ × CE × KC

= Area of KLEC.

Similarly, let us show that,

Area of Square ACIH = △ACE + △BCI

or = 2 × △BCI

Area of ACIH = CI × HI

Area of △BCI = $\frac{1}{2}$ × CI × HI

∴ 2 × △BCI = $\cancel{2}$ × $\cancel{\frac{1}{2}}$ × CI × HI

= Area of AHIC

∴ We have

Rect Area KCEL = Square Area ACIH

We have also shown that,

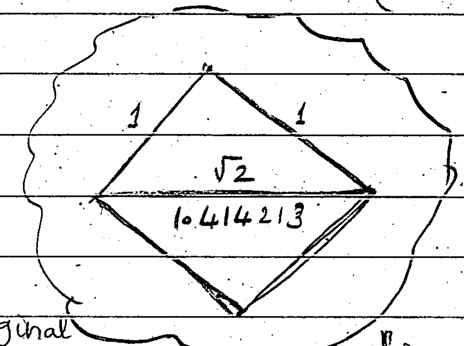
Rect Area BKLD = Square Area ABFG

Rect KCEL + Rect BKLD = Square Area BCED

∴ $BC^2 = AB^2 + AC^2$

Proof of Pythagoras Theorem!

- Babylonians (1600 BC) used the Pythagoras theorem to calculate the "square root" of a number geometrically.
- This is evidenced by a a clay tablet which was unearthed!
- Clay Tablet (Equivalent) (Decimal)



- The original clay tablet has "Base 60" numbers

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- Babylonians used the number system, with a base of 60. However, they did not have the concept of zero ('0').

- It is surmised that, when zero was required, they used a "space" between digits.

- Babylonian system had unique symbols for values from ① to (59).

- Let us see how Babylonians represented the numbers.

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Digits (1) to (10)

1
2
3
4
5
6
7
8
9
10

other digits are represented using these digits.

For Ex:

(12) ⇒ 10 + 2

(25) ⇒ 10 + 10 + 5

(50) ⇒ (10+10+10 +10+10)

(34) ⇒ 10+10+10 + 4

(41) ⇒ 10+10+10 +10 + 1

(59) ⇒ 50 + 9

Note: Stops at (59). No symbol for 60!

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- Ex. 1

What is the decimal value of the Babylonian number

(2) , (27)

∴ Decimal value is

60^1	60^0
(2)	(27)

$= 2\times60^1 + 27\times60^0$

$= 120 + 27 = \underline{147}$

- Ex. 2

Calculate the decimal equivalent of the Babylonian number below

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(6) space (0) (9)

Decimal value is

60^2	60^1	60^0
(6)	(0)	(9)

$= 6\times60^2 + 0\times60^1 + 9\times60^0$

$= \underline{21,609}$

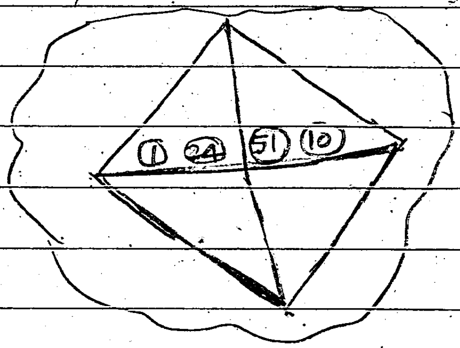
Note that $(147)^2 = \underline{21,609}$

- The above two Babylonian numbers were found on a tablet!

(Tablet AO 17264 – Loure, Paris!!)

- Babylonian clay tablet YBC 7289, has the following numbers indented on a clay tablet.

(The original, of course, has Base60 digits)



- It is believed to be the work of student in Southern Mesopotamia between 1800 - 1600 BC
- Refer to website en.wikipedia/wiki/YBC_7289

- Eventhough, it is not clear on the tablet, Babylonians did have a method to indicate the "decimal point" to represent fractional numbers.

Ex.3

Assuming a decimal point after 1, calculate the decimal equivalent of the number on the clay tablet, namely

1 . 24 51 10

Just to recap, the "decimal fraction" is interpreted as below:

For Ex: $1 \cdot 52$

$(10^0 \cdot 10^{-1}\ 10^{-2})$

$$\text{ie, } = 1\times 10^0 \cdot 5\times 10^{-1} + 2\times 10^{-2}$$
$$= 1 \cdot [0.5 + 0.02]$$
$$= \underline{1 \cdot 52}$$

Let us now convert the Babylonian number

$60^0 \cdot 60^{-1}\ 60^{-2}\ 60^{-3}$

1 . 24 51 10

$$= 1\times 60^0 \cdot [24\times 60^{-1} + 51\times 60^{-2} + 10\times 60^{-3}]$$

$$= 1 \cdot 414{,}212{,}96\ldots\ldots$$

The value of $\sqrt{2}$ from the modern electronic calculator is:

$$\sqrt{2} = 1 \cdot 414{,}213{,}56\ldots$$

- The result is accurate upto 6^{th} decimal place!!

- Babylonians also provided an algebraic method to calculate the square root of any given number. The procedure is clever and much simpler than our standard method for square root.