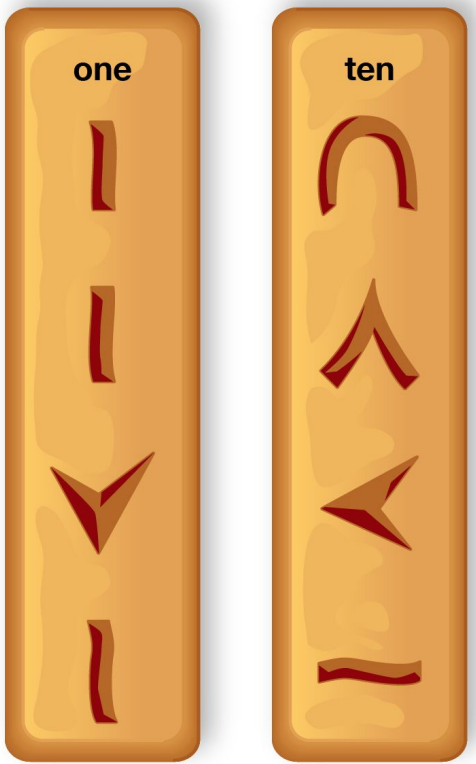



# NUMBER SYSTEMS

# WRITING A VALUE

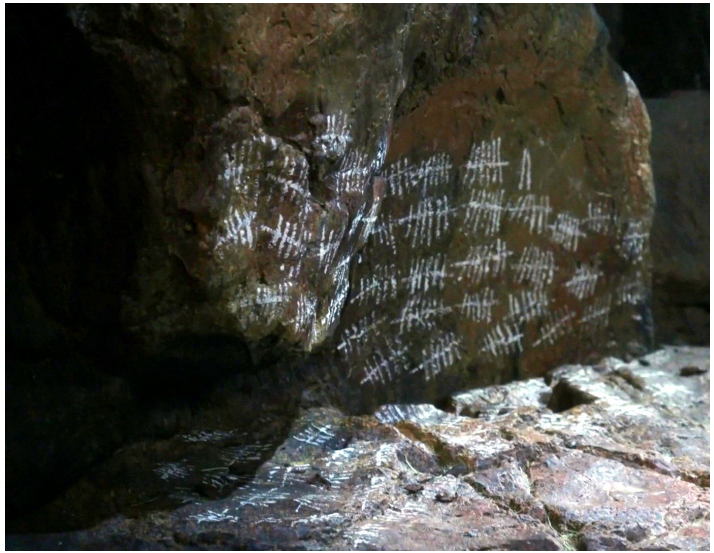
**How many different ways can you represent the number ‘7’**

# WRITING A VALUE

**How many different ways can you represent the number ‘7’**

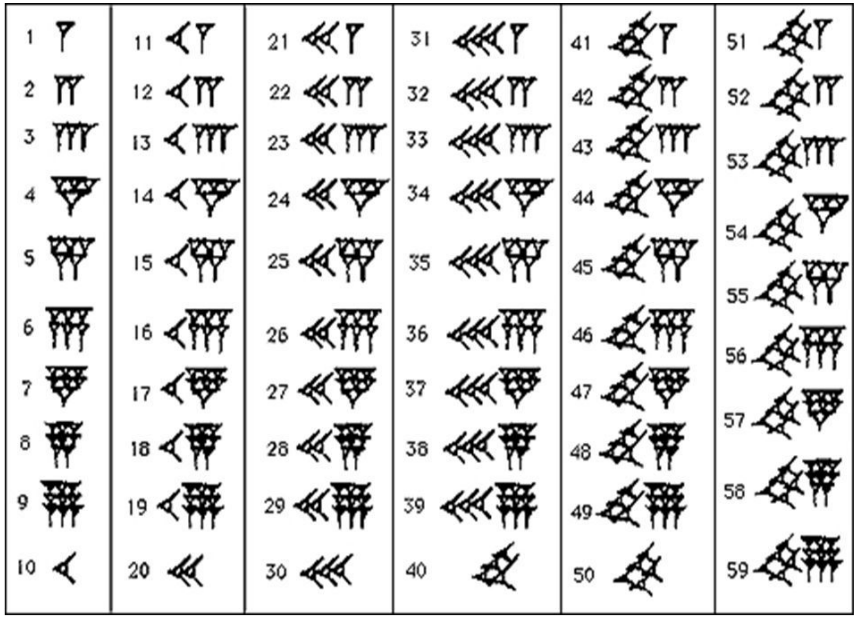
**7, VII, IIIIIII, 𝍸 ||, 7 apples etc**

# EARLY HUMANS



**How did they communicate numbers?**

# IMPROVED SYSTEMS...

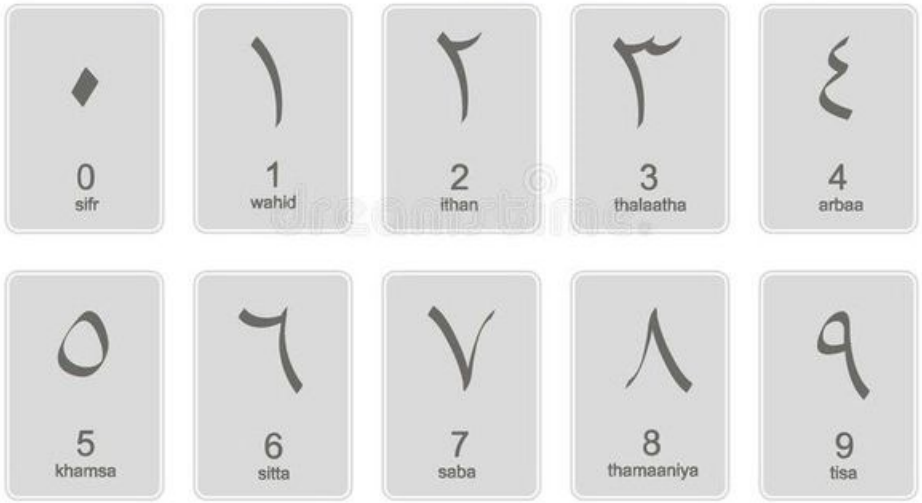


# FURTHER IMPROVEMENTS...

| | | | | | |
|---|---|---|---|---|---|
| 1 | I | 11 | XI | 50 | L |
| 2 | II | 12 | XII | 100 | C |
| 3 | III | 13 | XIII | 500 | D |
| 4 | IV | 14 | XIV | 1000 | M |
| 5 | V | 15 | XV | | |
| 6 | VI | 16 | XVI | | |
| 7 | VII | 17 | XVII | | |
| 8 | VIII | 18 | XVIII | | |
| 9 | IX | 19 | XIX | | |
| 10 | X | 20 | XX | | |

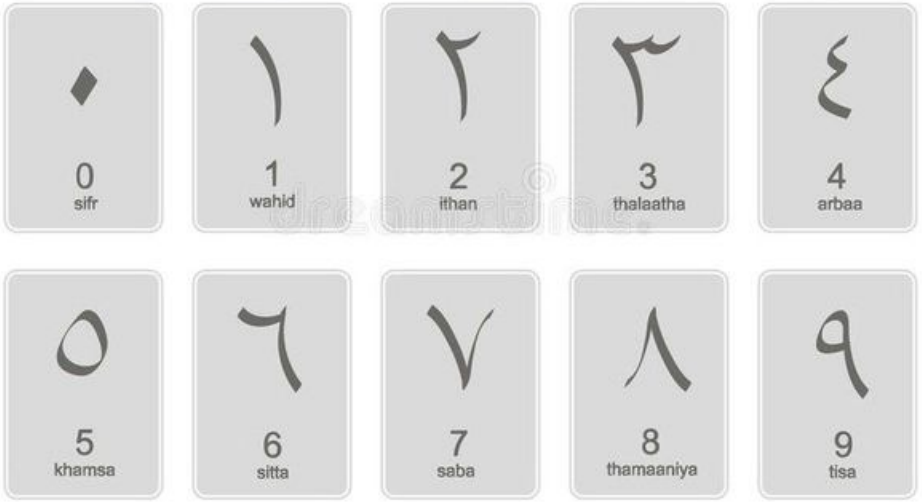
**What patterns do you observe in the roman numbering system?**

# TODAY...




**The decimal number system - How many symbols? Why this quantity?**

# TODAY...




**After the last symbol, the numbers will repeat for the first time. Hence we put a ‘1’ before them.**

10

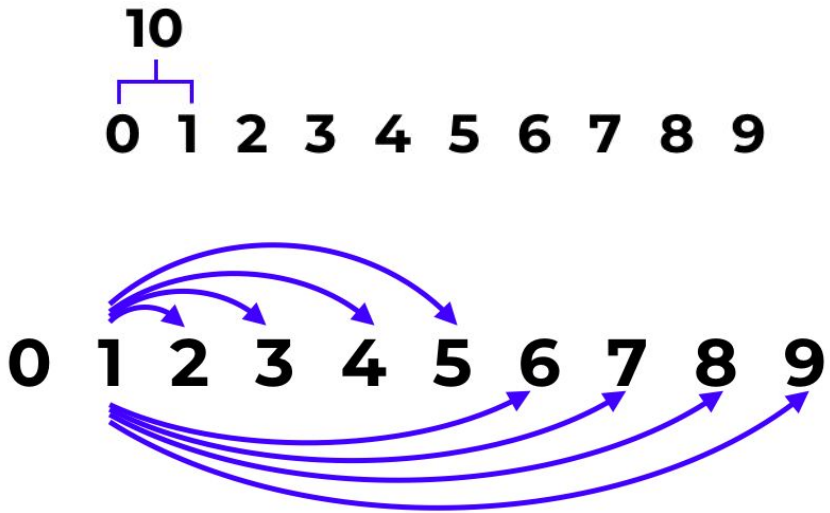
The number ‘10’ means 0 is repeating for the first time.

20

The number ‘20’ means 0 is repeating for the second time.

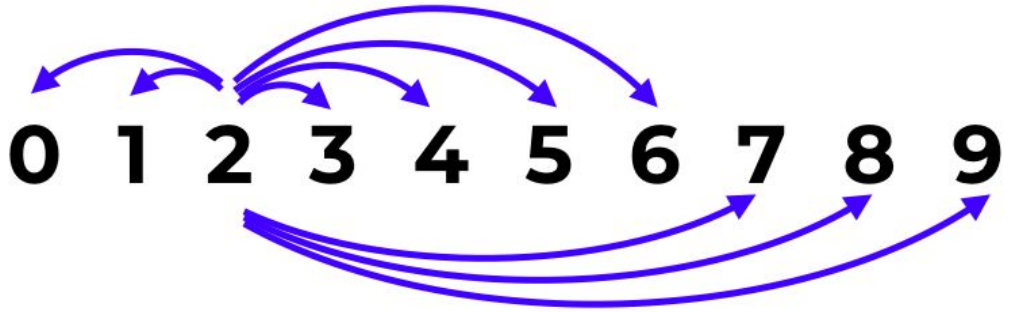
# A GENERAL PATTERN.

**So after the basic 9 symbols, how do we make the next numbers?**



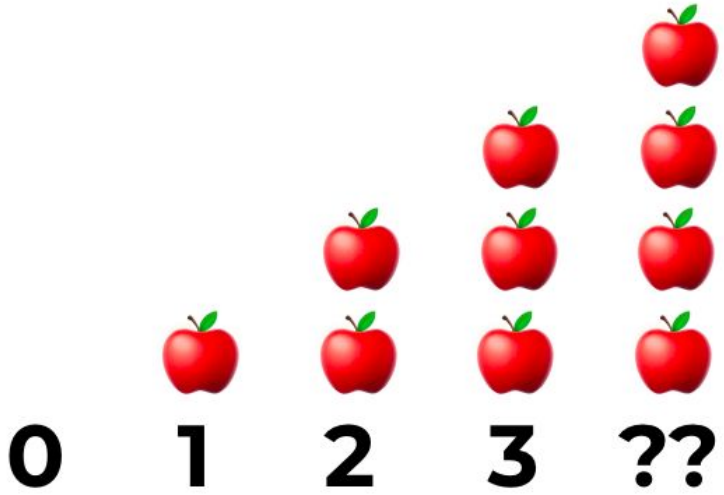
# A GENERAL PATTERN.

**So on and so forth...**



# QUESTION

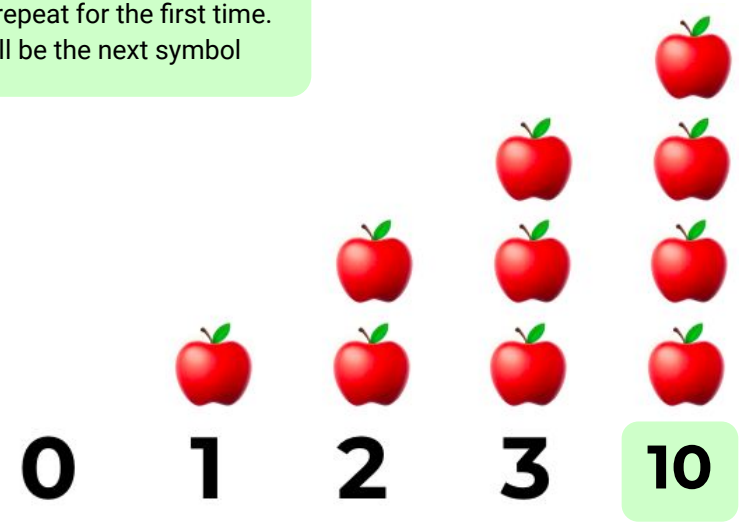
**A number system has only four symbols - 0, 1, 2, & 3. What will be the next number in the sequence?**



# QUESTION

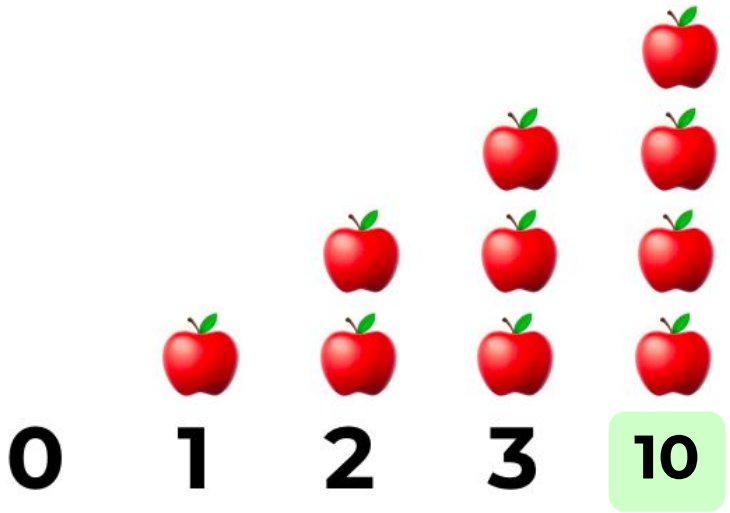
**A number system has only four symbols - 0, 1, 2, & 3. What will be the next number in the sequence?**

Symbol ‘0’ will repeat for the first time.
Hence **10** will be the next symbol



# QUESTION

**Why isn’t ‘4’ the symbol you would put here?**



# QUESTION

**In the same number system, what quantity of apples are shown here?**

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11 apples are shown here.

# GUIDED PRACTICE

**Given a number system that has 5 digits - A, B, C, D, E.**
**Expand this number system to the first 20 numbers**

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**CA stars are shown here.**

# GUIDED PRACTICE

**Given a number system that has 5 digits - A, B, C, D, E.**
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BCA, BCB, _____, BCD, _____.

**Fill in the missing numbers**

# GUIDED PRACTICE

**Given a number system that has 5 digits - A, B, C, D, E.**
**Expand this number system to the first 20 numbers**

BCA, BCB, _____, BCD, _____.

**Fill in the missing numbers**

**BCC, BCE.**

# GUIDED PRACTICE

**A new number system used in a machine understands only 3 digits - ▢, △, ○**

**Which digit represents decimal zero?**

**What will be the next digit in the series?**

**Apoorva has 2 apples. How will he use this number system to show the quantity of apples?**

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| | |
|---|---|
| **Which digit represents decimal zero?** | ▢ |
| **What will be the next digit in the series?** | △▢ |
| **Apoorva has 2 apples. How will he use this number system to show the quantity of apples?** | ○ |

# INDEPENDENT PRACTICE

Design your own number system with any number of digits(try keeping it less than 12) and any types of symbols
(arabic numbers, english letters, hindi letters, shapes).
Write at least the first fifteen numbers in this system.

# CONVERTING TO DECIMAL

**EXPAND THE FOLLOWING NUMBERS - 264, 2867**

# PLACE VALUE

**EXPAND THE FOLLOWING NUMBERS - 264, 2867**

**364 = 3x100 + 6x10 + 4x1**

**2867 = 2x1000 + 8x100 + 6x10 + 7x1**

**What did we do here? Do you notice a pattern?**

# BY THIS LOGIC

**A system has 4 digits - A, B, C, D, then which of the following will be correct for a number BAC?**

(Option 1) $BAC = Bx10^2 + Ax10^1 + Cx10^0$

(Option 2) $BAC = Bx4^2 + Ax4^1 + Cx4^0$

# CONVERT A NUMBER TO DECIMAL

**STEP 1 - Take the symbols and assign a decimal number to each character.**

Example -

A → 0

B → 1

C → 2

D → 3

# CONVERT A NUMBER TO DECIMAL

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**STEP 2 - Now, write the expanded place value form of the symbols**

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BAC = $Bx4^2 + Ax4^1 + Cx4^0$

**STEP 3 - Replace each digit with the corresponding number from step 1.**

Example -

B becomes 1, A becomes 0, C becomes 2

BAC = $1x4^2 + 0x4^1 + 2x4^0$

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Example -

B becomes 1, A becomes 0, C becomes 2

BAC = $1x4^2 + 0x4^1 + 2x4^0$

**STEP 4 - Solve this equation, you'll get the conversion**

Example -

BAC = 18 in decimal

# PRACTICE

STEP 1 - Take the symbols and assign a decimal number to each character.

STEP 2 - Now, write the expanded place value form of the symbols

STEP 3 - Replace each digit with the corresponding number from step 1.

STEP 4 - Solve this equation, you'll get the conversion

**A number system has 5 digits - M, N, O, P, Q. Convert the numbers NNO, QO, OQP into decimal.**

# TRUE OR FALSE

In a number system - X, Y, Z - the next number in the series would be XY

In a number system - X, Y, Z - the number ‘5’ is represented by YZ

The number 623 indicates that the number ‘23’ is repeating for the 6th time.

A symbol such as ‘10’ can represent 🌟🌟🌟🌟🌟🌟🌟🌟🌟🌟 or 🌟🌟🌟🌟🌟 based on the number system.

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