HEADS UP

The Bonnie Situation, Pulp Fiction (1994), Quentin Tarantino

- Blackboard is unavailable every weekdays (Monday to Friday) from 5 AM to 6 AM for regular maintenance!
- Change of classroom and labrooms
- Assignments
  - For marking and any related issue, foremost reach out to your lab instructor, not the marker. Then me!
  - For opening another submissions
  - Pay attention to naming of files!
  - Some topics are not covered in the lecture, but in labs or lecture assignments
  - Lab may have dependencies.
  - No key to the labs!
  - Key to the assignments based on highest selected assignments
  - Questions about the lab or lec in discussion board.
    - Subscribe to the forums to receive emails when somebody put sth
  - Academic Integrity (plagiarism)

- Keys to the exams (midterm and final)

- Blackboard is unavailable every weekdays (Monday to Friday) from 5 AM to 6 AM for regular maintenance!
- Change of classroom and labrooms
- Assignments
  - For marking and any related issue, foremost reach out to your lab instructor, not the marker. Then me!
  - For opening another submissions
  - Pay attention to naming of files!

SLIDES ARE NOT LIKE THIS

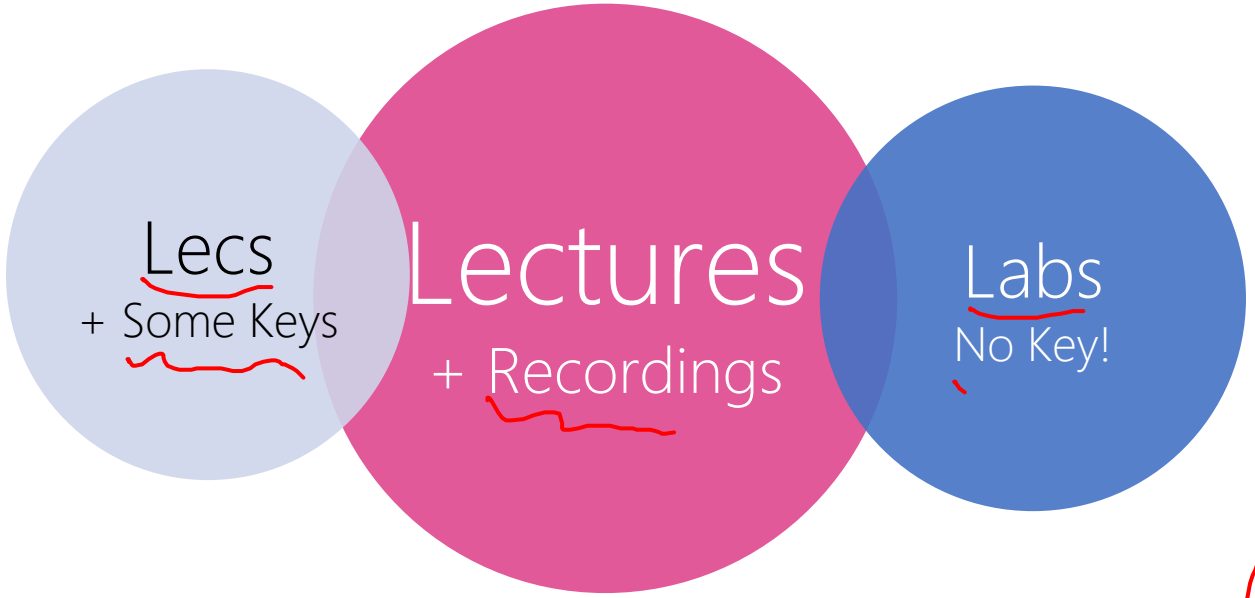
  - No key to the labs!
  - Key to the assignments based on highest selected assignments
  - Questions about the lab or lec in discussion board.
    - Subscribe to the forums to receive emails when somebody put sth

- Keys to the exams (midterm and final)


Pink Floyd - Another Brick In The Wall
Are robots becoming more human or humans becoming more robotic?

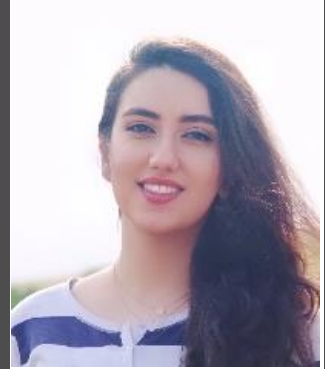
Slides are not books, summaries, …
Slides are not for last night before exam
Slides are to be presented! Lecture = Slide + Talk

SOME TOPICS ARE NOT COVERED IN THE LECTURE, BUT IN LABS OR LECTURE ASSIGNMENTS



NEXT WEEK

Zahra Taherikhonakdar (taherik@uwindsor.ca)
Morning Labs
Section 51, Tuesdays 11:30 AM - 12:50 PM
Section 52, Thursdays 11:30 AM - 12:50 PM



Roonak Moasses (moasses@uwindsor.ca)
Afternoon Labs
Section 53, Tuesdays 01:00 PM - 02:20 PM
Section 54, Thursdays 01:00 PM - 02:20 PM

Discussion Board

Discussions are a good way to encourage students to think critically about your coursework and interact with each others' ideas. You can create discussions around individual course lessons or for your course in general. More Help

Create Forum | Search | Discover Content

Delete

FORUM	DESCRIPTION	TOTAL POSTS	UNREAD POSTS	UNREAD REPLIES TO ME	TOTAL PARTICIPANTS
Lectures		126	0	0	25
Laboratories		199	0	0	35
Midterm Exam		31	0	0	16
Final Exam		60	0	0	27
Miscellaneous		35	0	0	14

Delete

Displaying **1** to **5** of **5** items | Show All | Edit Paging...

THERE MIGHT BE A CHANGE TO CLASSROOM AND LABROOM

Personalize | View All | First 1-12 of 12 Last

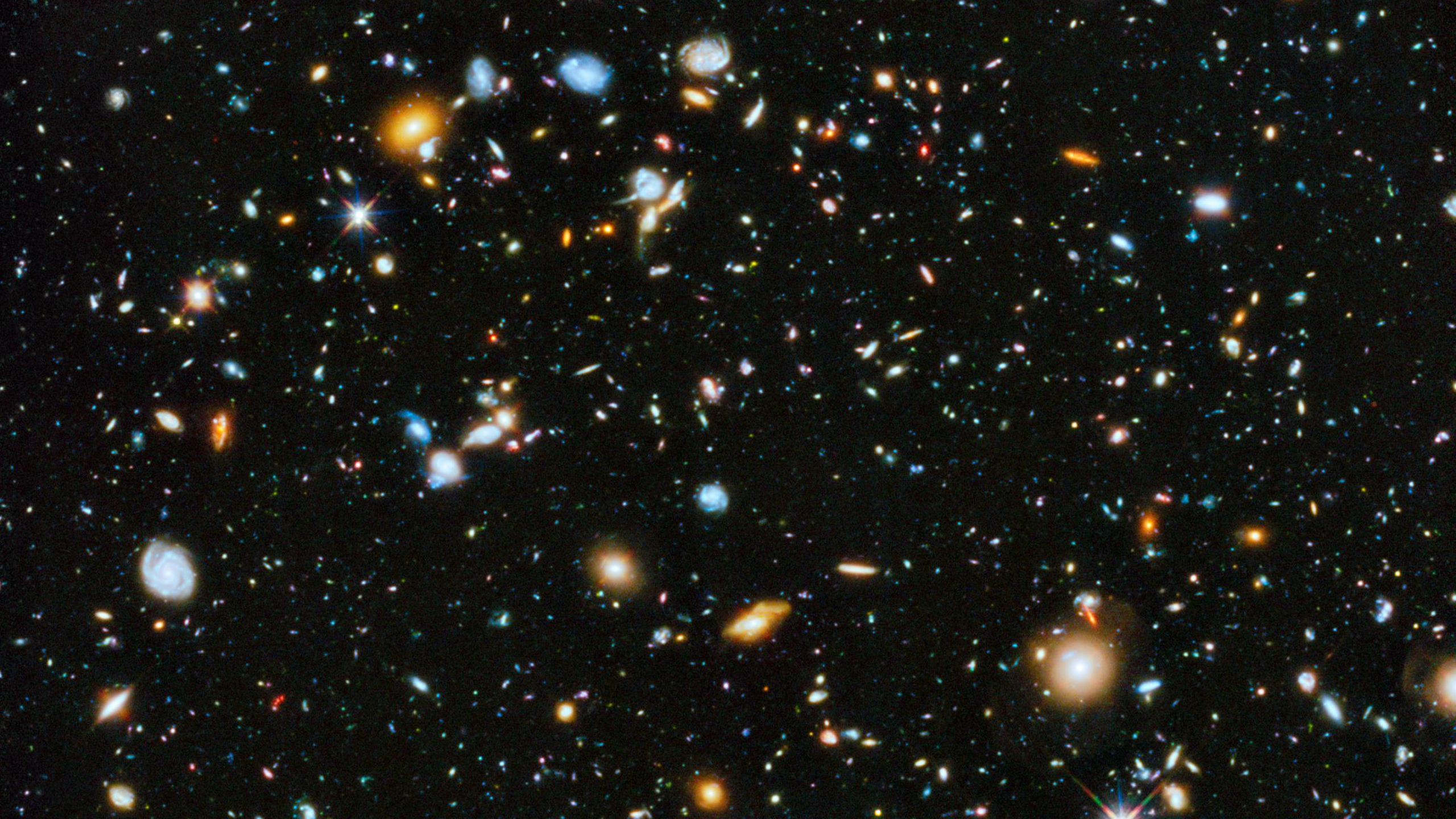
Class	Class Title	Enrolled	Days & Times	Room	Class Dates
COMP 2650-1A (5115)	Comp Architre I:Digital Design (Lecture)	62	TuTh 10:00AM - 11:20AM	Erie Hall 3123	Jan 17, 2022-Apr 18, 2022
COMP 2650-1O (6123)	Comp Architre I:Digital Design (Lecture)	72	TuTh 10:00AM - 11:20AM	Livestream (Hyflex)	Jan 17, 2022-Apr 18, 2022
COMP 2650-51A (5116)	Comp Architre I:Digital Design (Laboratory)	19	Tu 11:30AM - 12:50PM	Erie Hall 2125	Jan 17, 2022-Apr 18, 2022
COMP 2650-51O (6124)	Comp Architre I:Digital Design (Laboratory)	20	Tu 11:30AM - 12:50PM	Livestream (Hyflex)	Jan 17, 2022-Apr 18, 2022
COMP 2650-52A (5117)	Comp Architre I:Digital Design (Laboratory)	19	Th 11:30AM - 12:50PM	Erie Hall 2125	Jan 17, 2022-Apr 18, 2022
COMP 2650-52O (6125)	Comp Architre I:Digital Design (Laboratory)	14	Th 11:30AM - 12:50PM	Livestream (Hyflex)	Jan 17, 2022-Apr 18, 2022
COMP 2650-53A (5118)	Comp Architre I:Digital Design (Laboratory)	17	Tu 1:00PM - 2:20PM	Erie Hall 2125	Jan 17, 2022-Apr 18, 2022
COMP 2650-53O (6126)	Comp Architre I:Digital Design (Laboratory)	14	Tu 1:00PM - 2:20PM	Livestream (Hyflex)	Jan 17, 2022-Apr 18, 2022
COMP 2650-54A (5119)	Comp Architre I:Digital Design (Laboratory)	18	Th 1:00PM - 2:20PM	Dillon Hall 256	Jan 17, 2022-Apr 18, 2022
COMP 2650-54O (6127)	Comp Architre I:Digital Design (Laboratory)	13	Th 1:00PM - 2:20PM	Livestream (Hyflex)	Jan 17, 2022-Apr 18, 2022

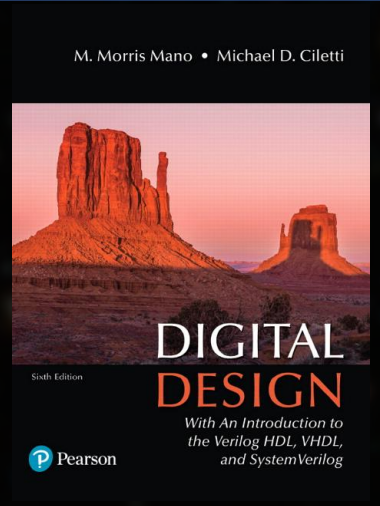
4 AM

Blackboard will return to service at 6 am EST.

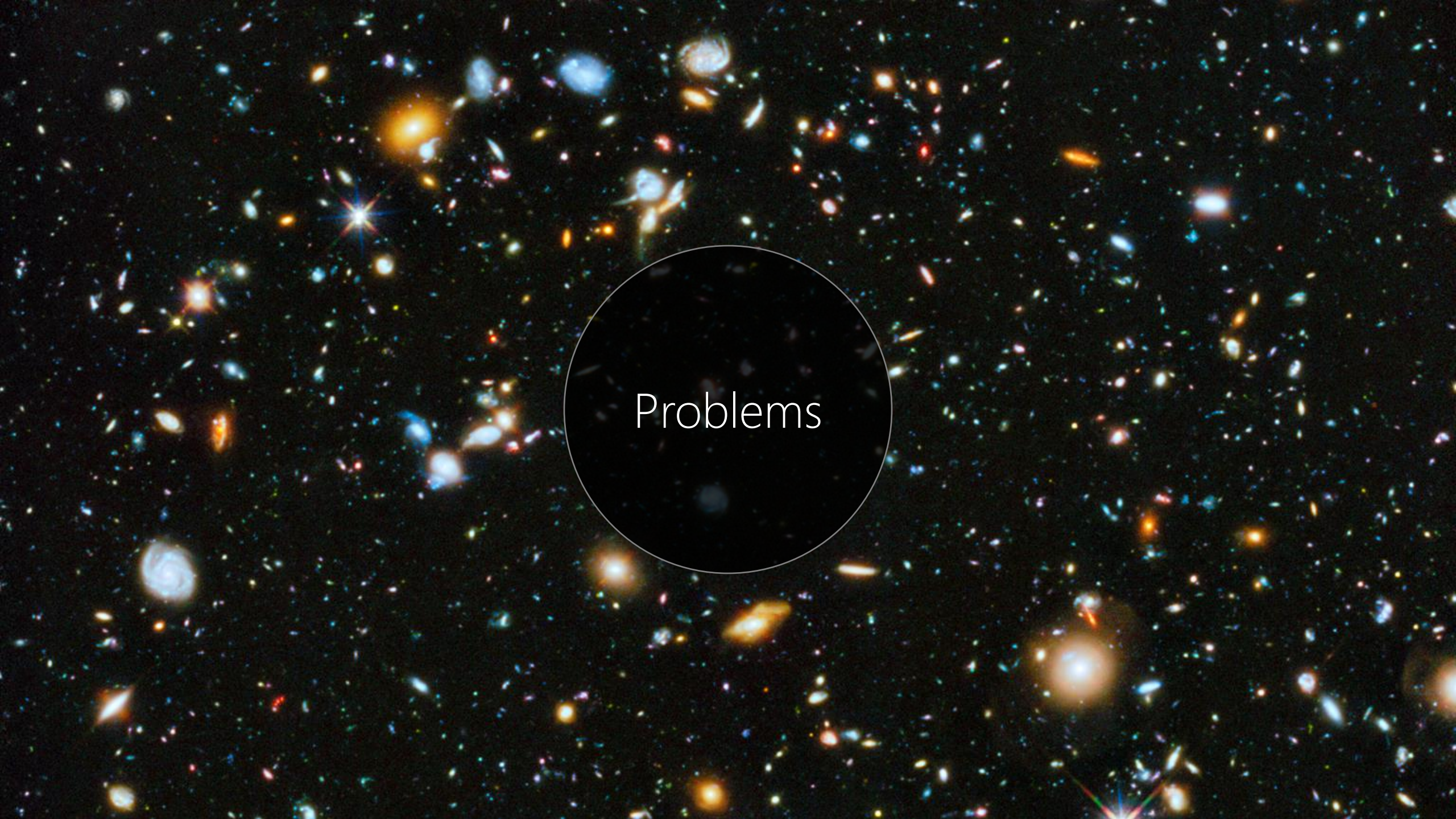
Blackboard is unavailable every weekday (Monday to Friday) from 5 am to 6 am EST for regular maintenance.

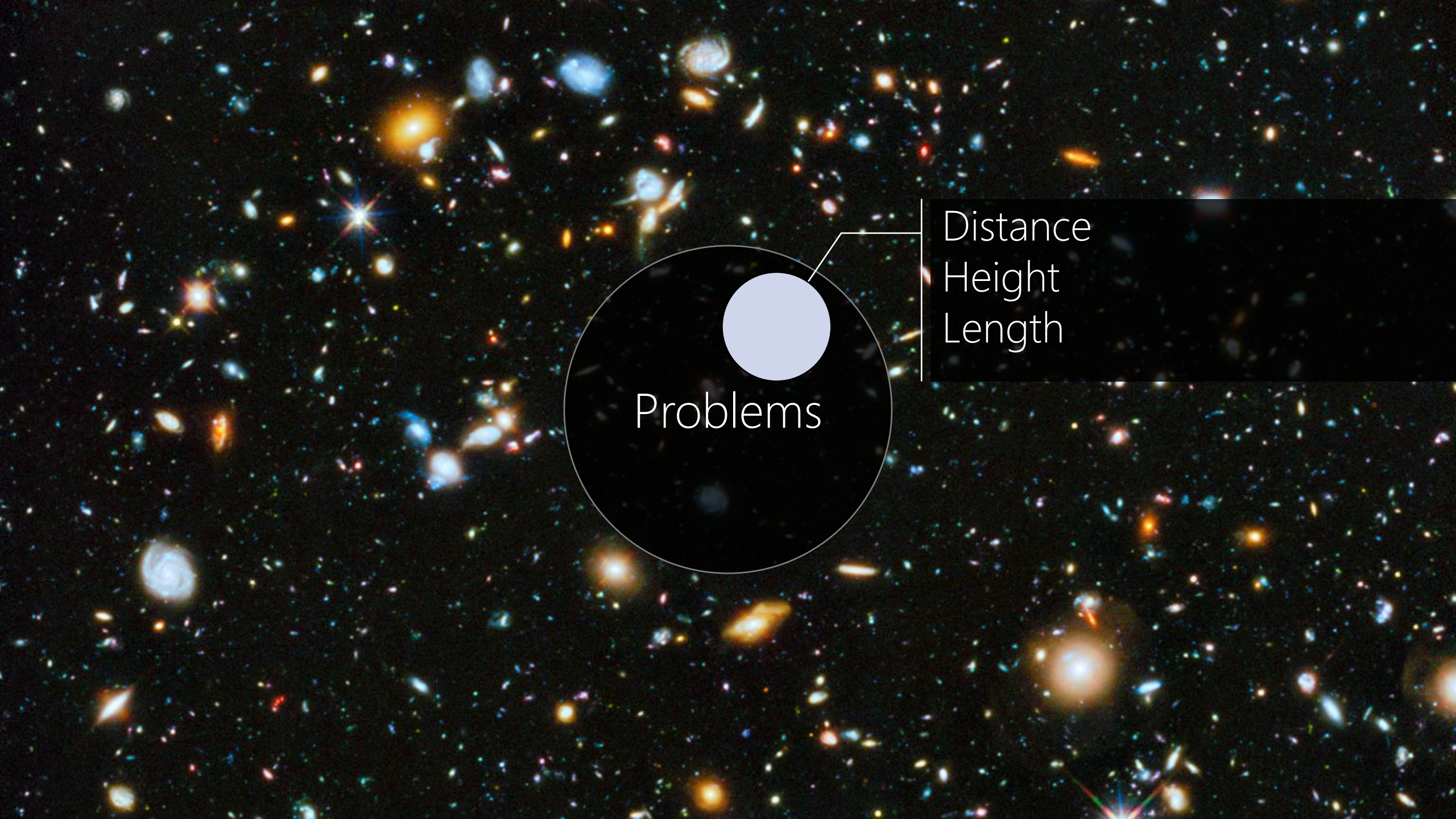
At 6 am you can reload this page to access Blackboard.

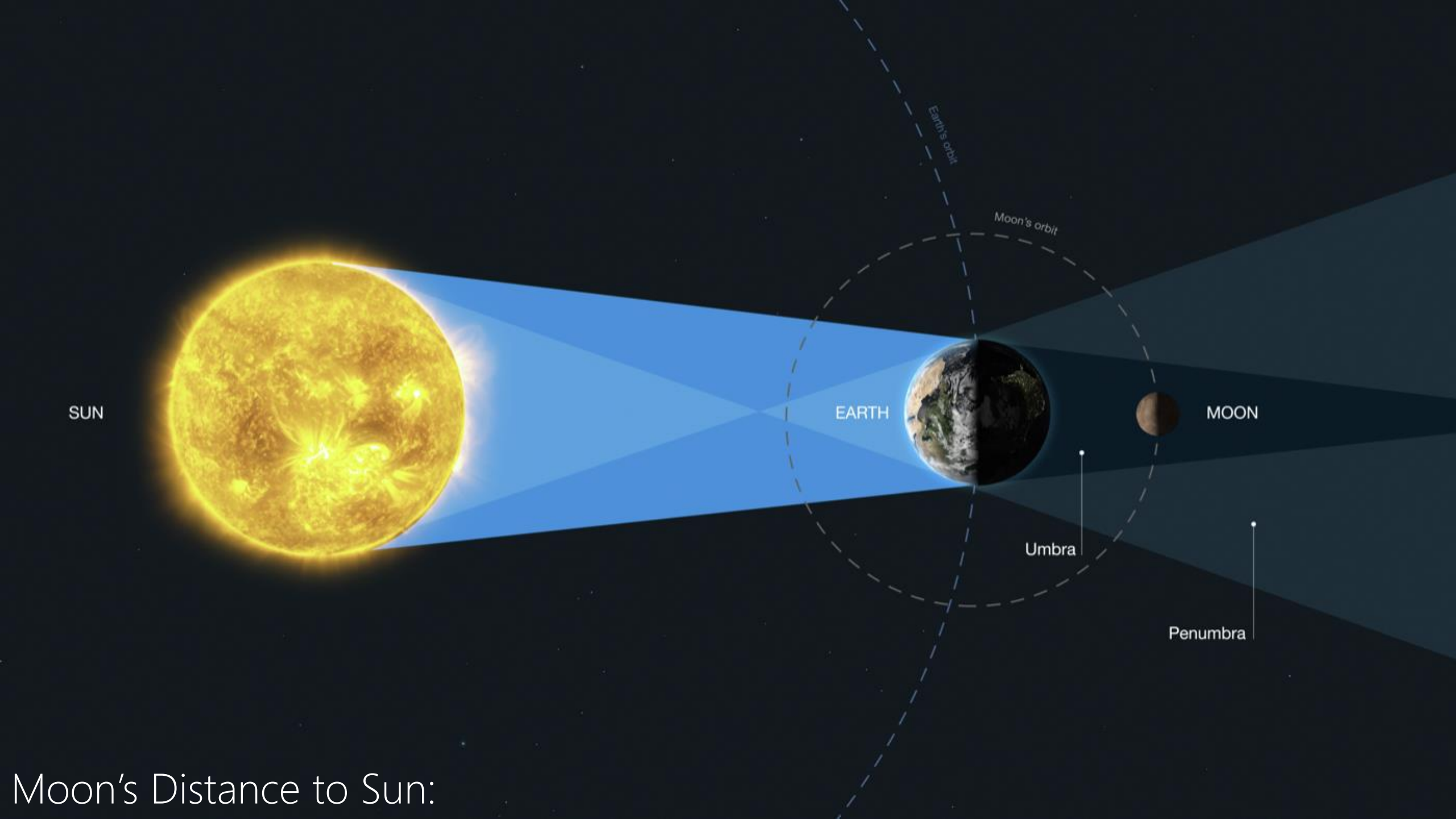




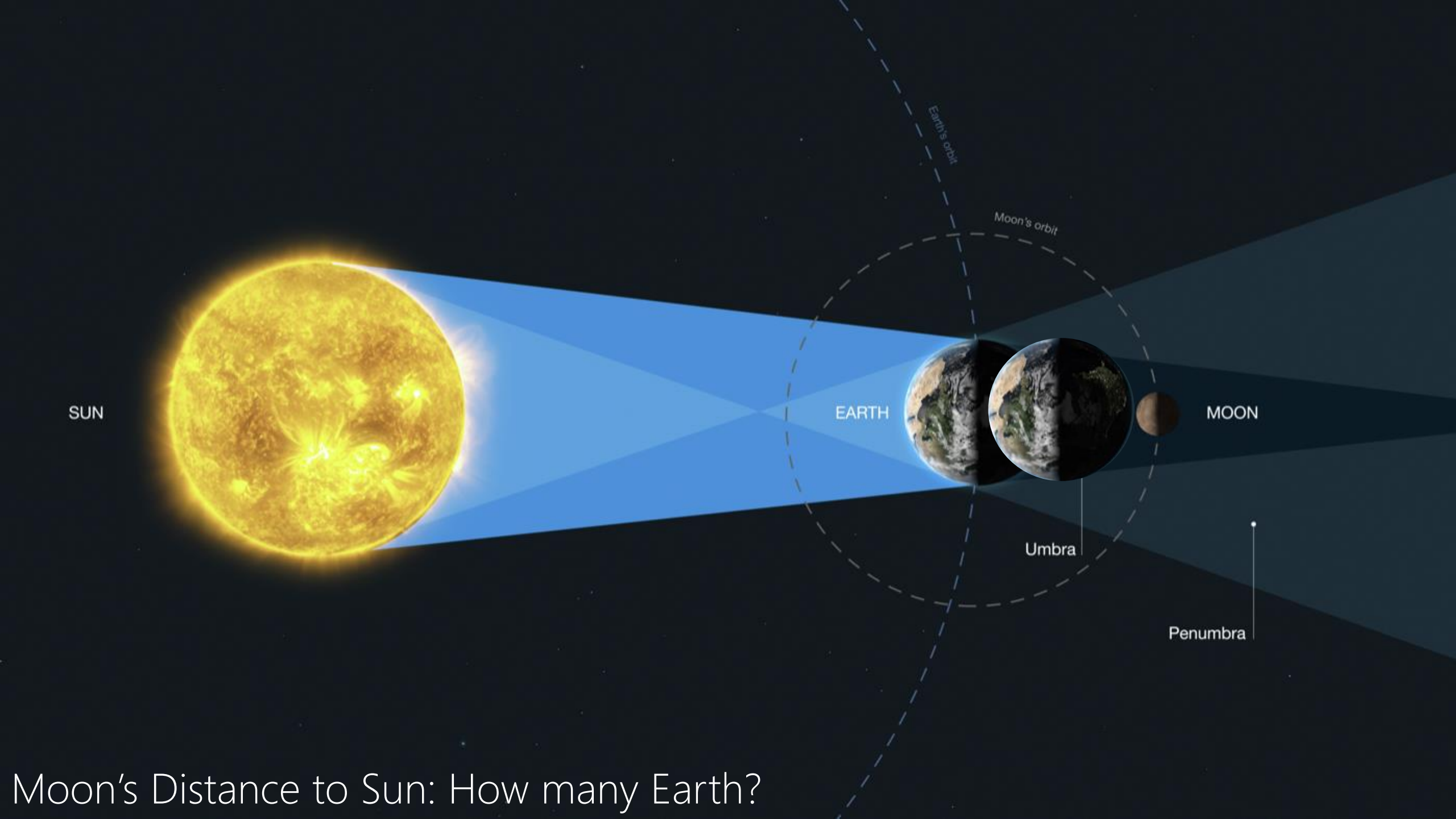
Chapter 1
Digital Systems and Binary Numbers


Problems

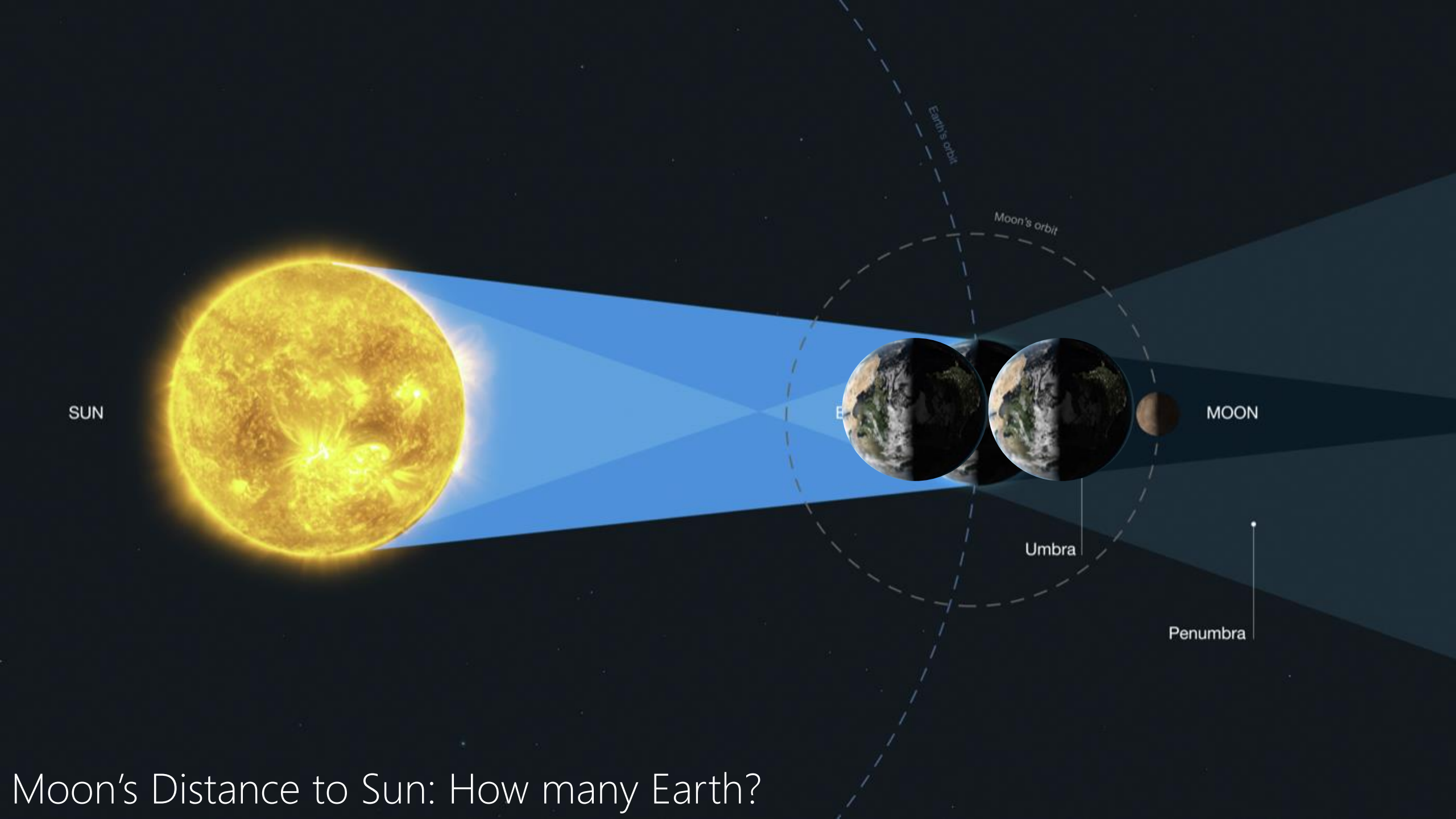

Problems
Distance
Height
Length



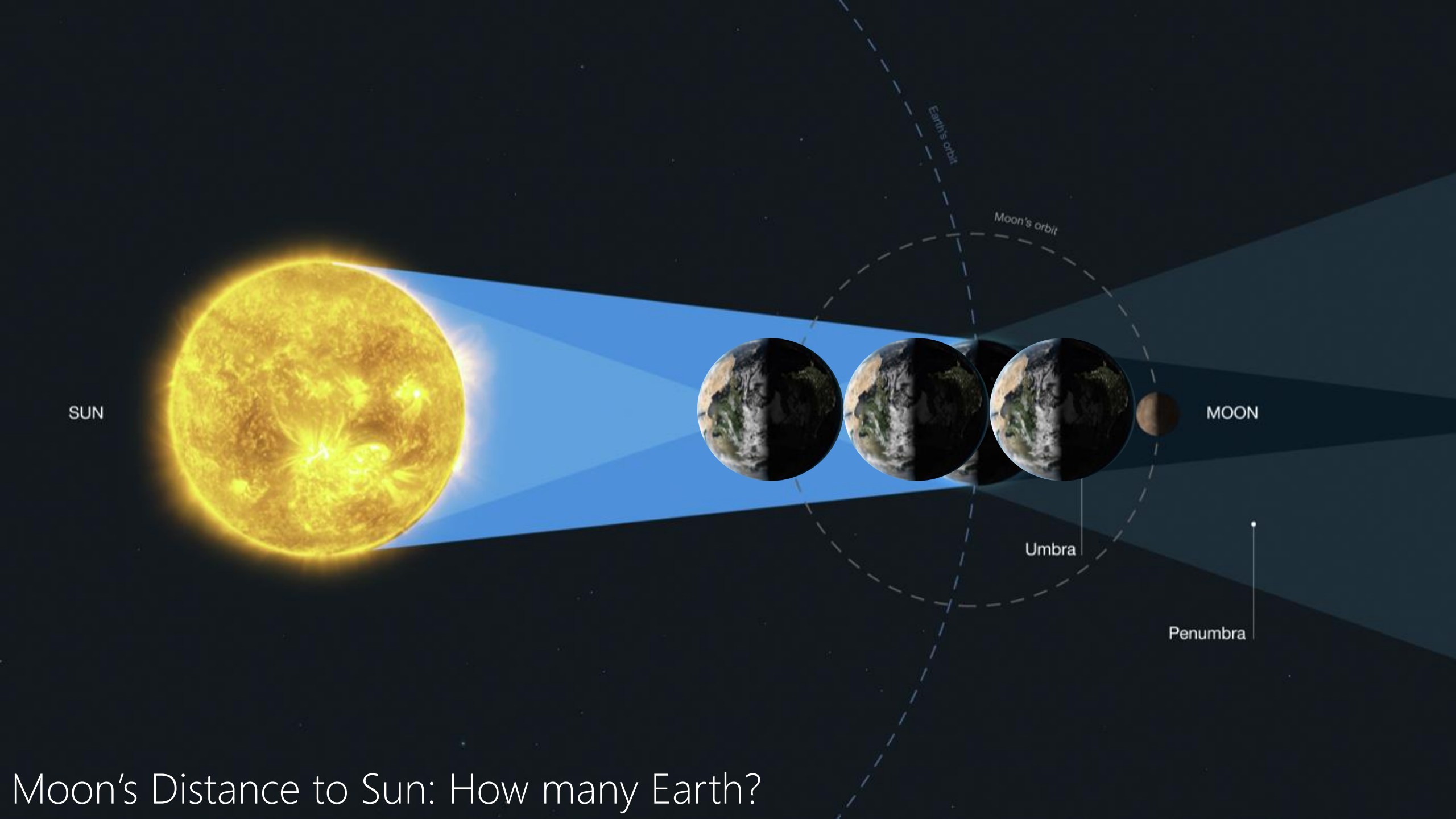
Moon's Distance to Sun:



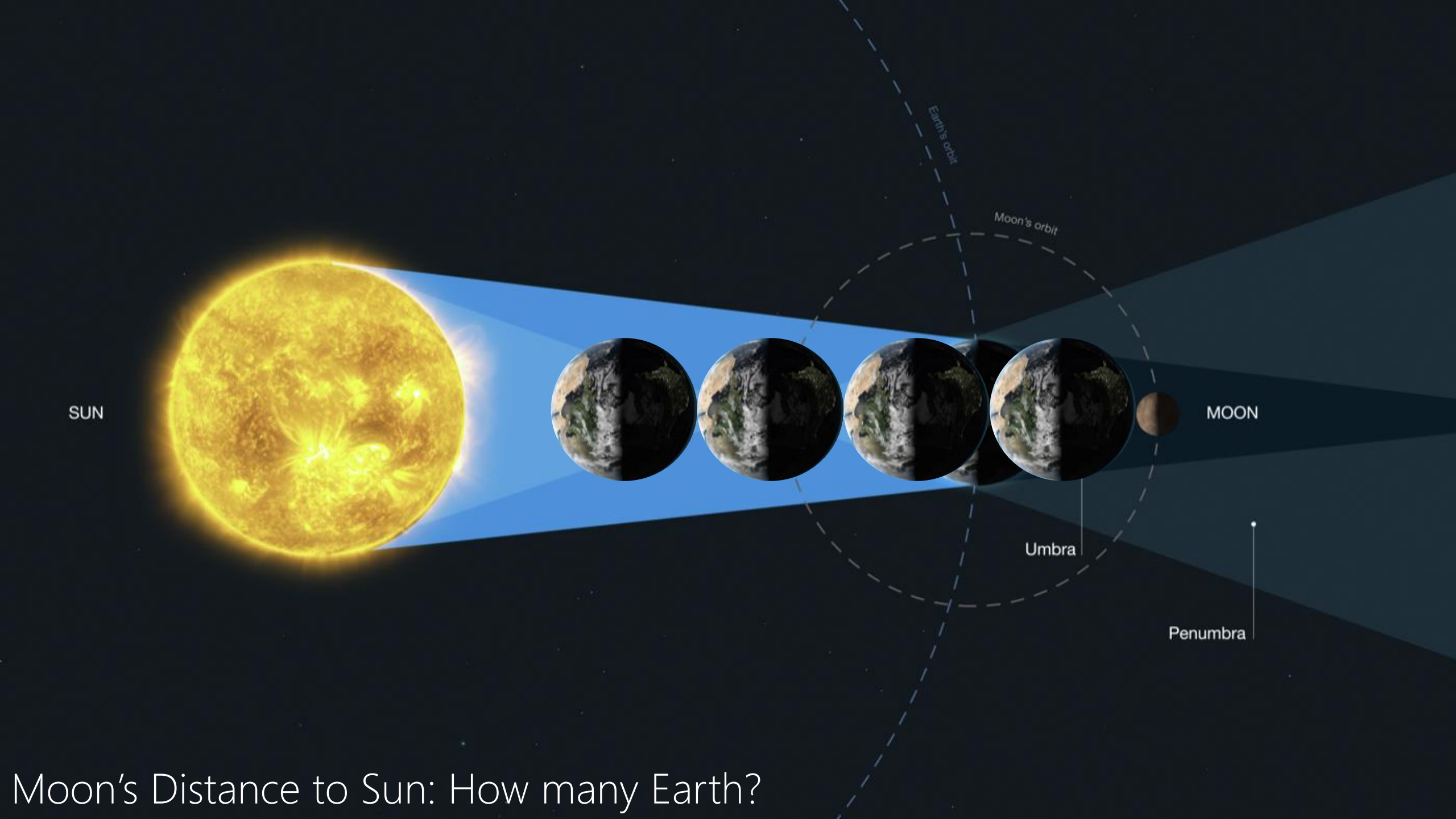
Moon's Distance to Sun: How many Earth?



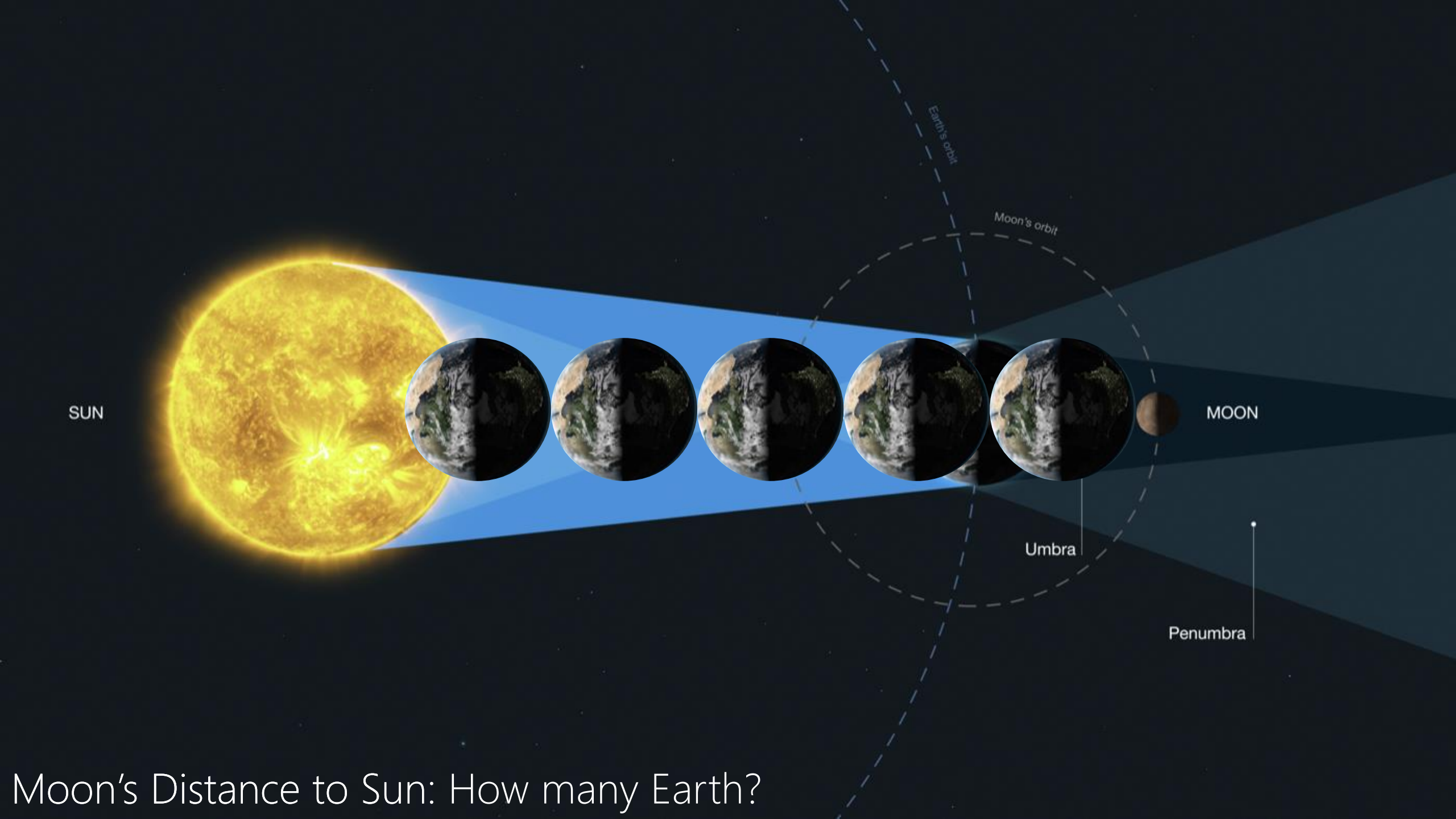
Moon's Distance to Sun: How many Earth?



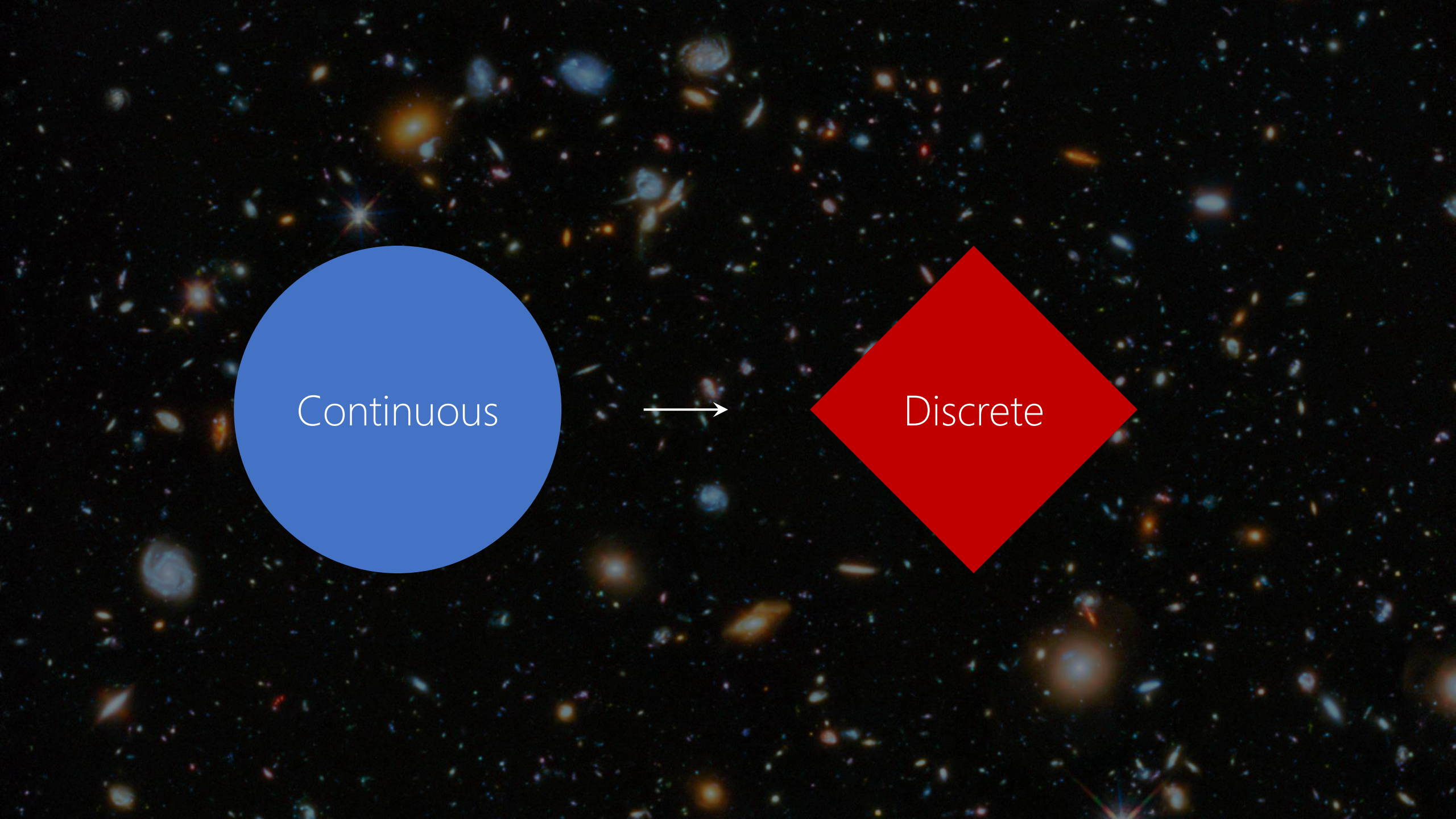
Moon's Distance to Sun: How many Earth?



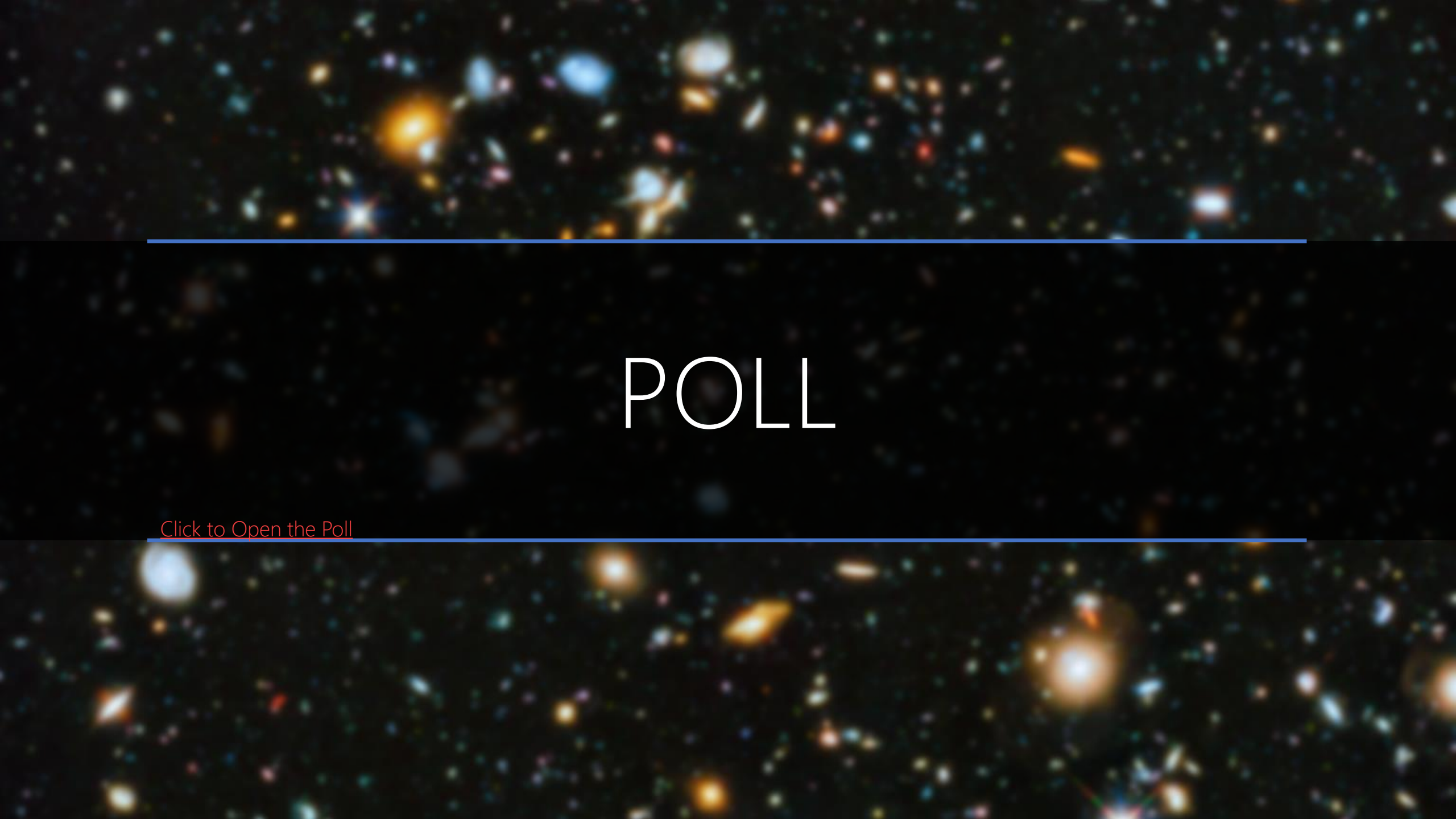
Moon's Distance to Sun: How many Earth?



Moon's Distance to Sun: How many Earth?


Continuous
Discrete

DISCRETE SYSTEMS



POLL

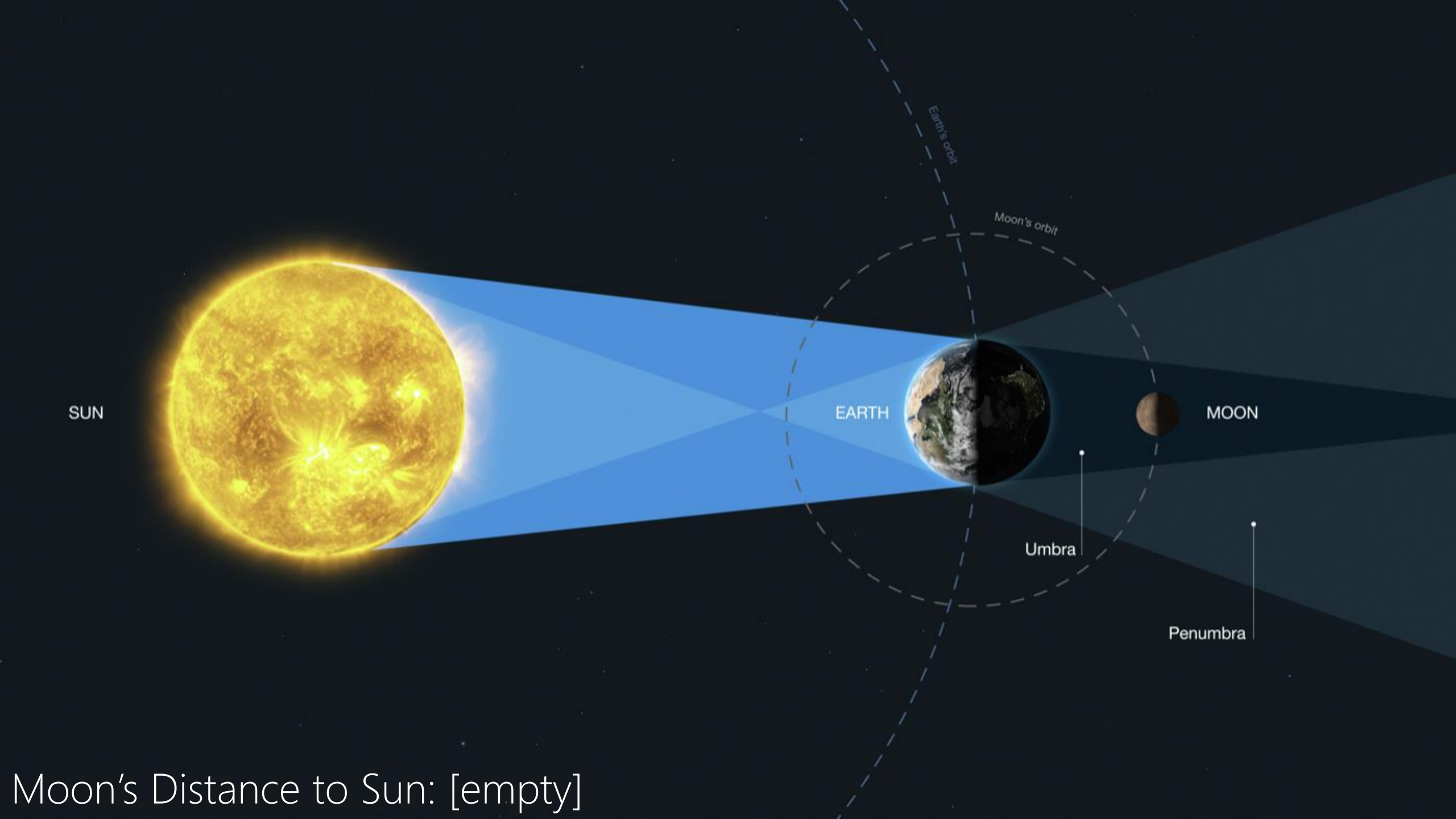
Click to Open the Poll

STAR	CONTINUOUS	DISCRETE
TEMPERATURE	CONTINUOUS	DISCRETE
ELECTRON	CONTINUOUS	DISCRETE
TIME	CONTINUOUS	DISCRETE
WEIGHT	CONTINUOUS	DISCRETE
SPEED	CONTINUOUS	DISCRETE
STUDENT	CONTINUOUS	DISCRETE
SOUND	CONTINUOUS	DISCRETE
IMAGE	CONTINUOUS	DISCRETE
PAIN	CONTINUOUS	DISCRETE
LIGHT	CONTINUOUS	DISCRETE
WAVE	CONTINUOUS	DISCRETE

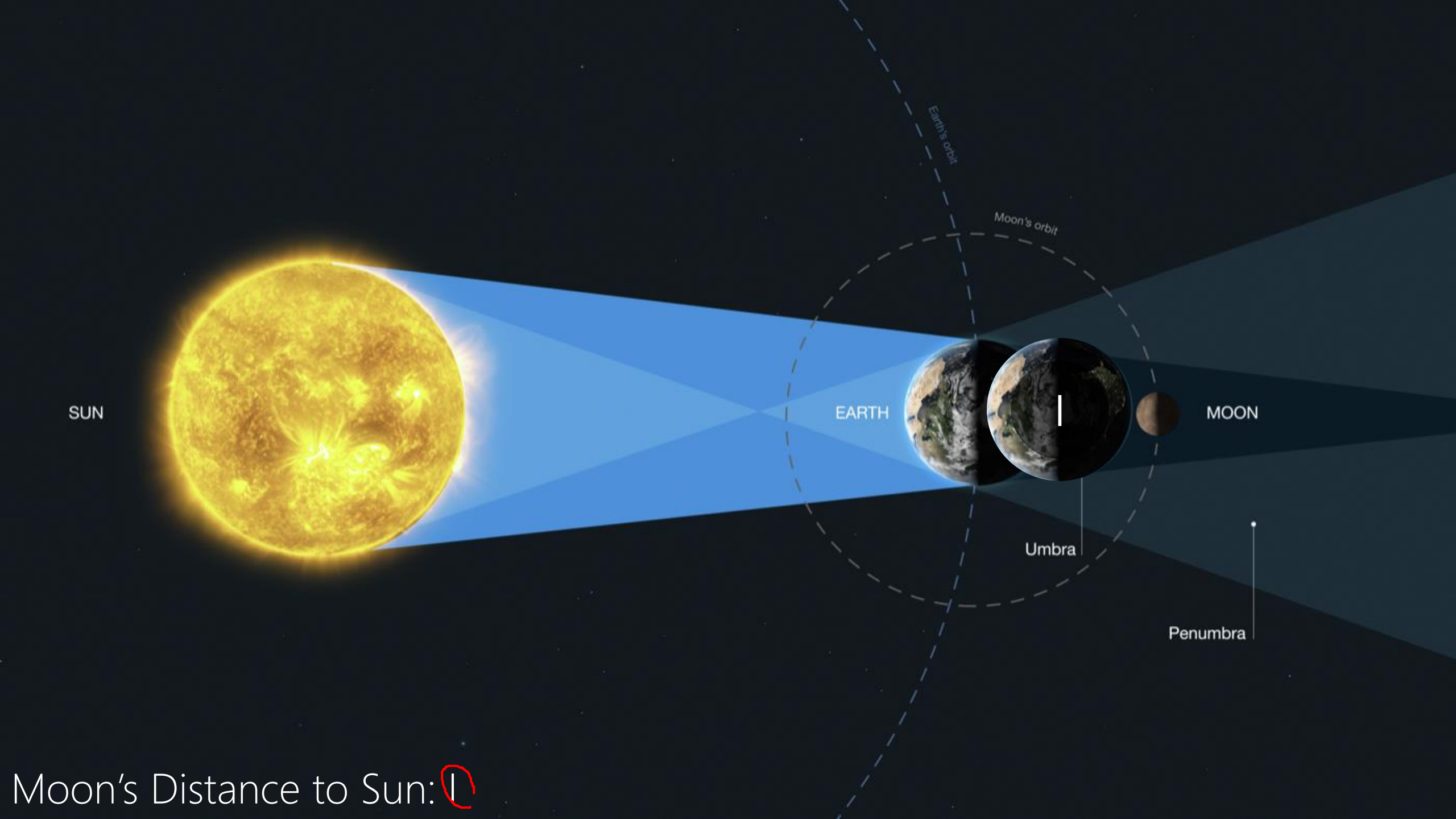
STAR		DISCRETE
TEMPERATURE	CONTINUOUS	
ELECTRON		DISCRETE
TIME	CONTINUOUS	
WEIGHT	CONTINUOUS	
SPEED	CONTINUOUS	
STUDENT		DISCRETE
SOUND	CONTINUOUS	
IMAGE	CONTINUOUS	DISCRETE
PAIN	CONTINUOUS	DISCRETE
LIGHT	CONTINUOUS	DISCRETE
WAVE	CONTINUOUS	

“The world's first photograph—or at least the oldest surviving photo—was taken by Joseph Nicéphore Niépce in 1826 or 1827. Captured using a technique known as heliography, the shot was taken from an upstairs window at Niépce's estate in Burgundy. As heliography produces one-of-a-kind images, there are no duplicates of the piece, which is now part of the permanent collection at the University of Texas-Austin.” 18 Famous First Photographs in History: From the Oldest Photo Ever to the World’s First Instagram

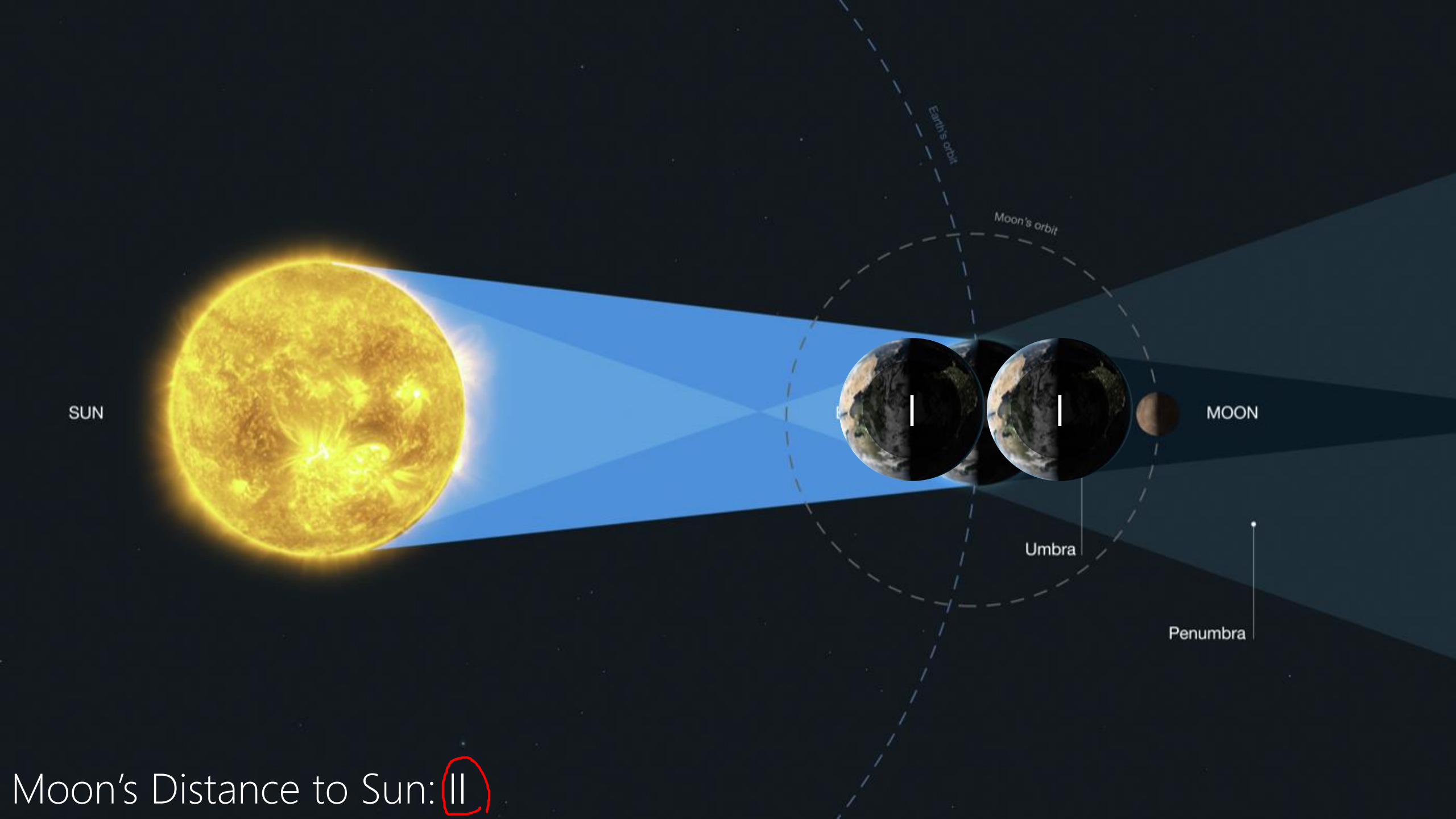
“We may be used to selfies now, but it's Robert Cornelius's 1839 image that lays claim to the first self-portrait. Taken in Philadelphia, Cornelius sat for a little over one minute before covering the lens.” 18 Famous First Photographs in History: From the Oldest Photo Ever to the World’s First Instagram



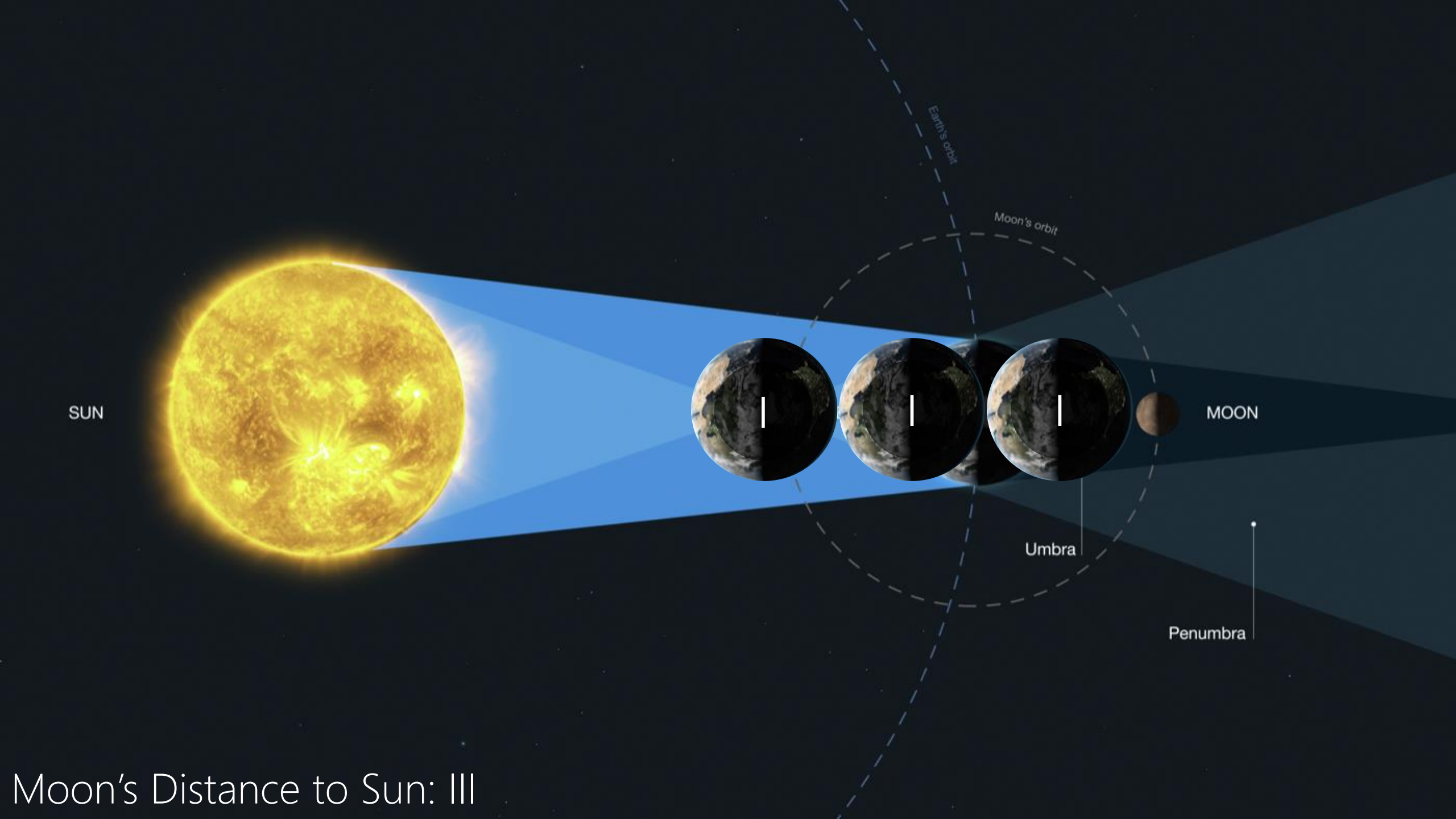
Moon’s Distance to Sun: [empty]



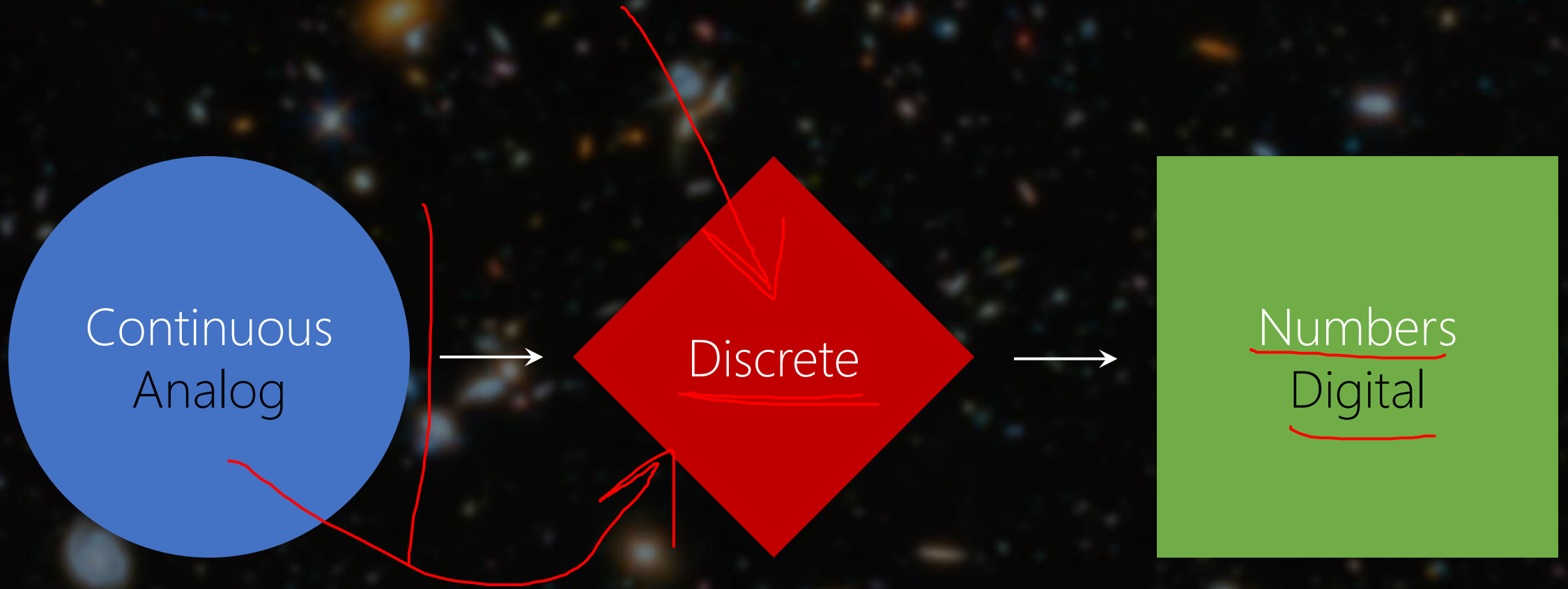
Moon's Distance to Sun: 1



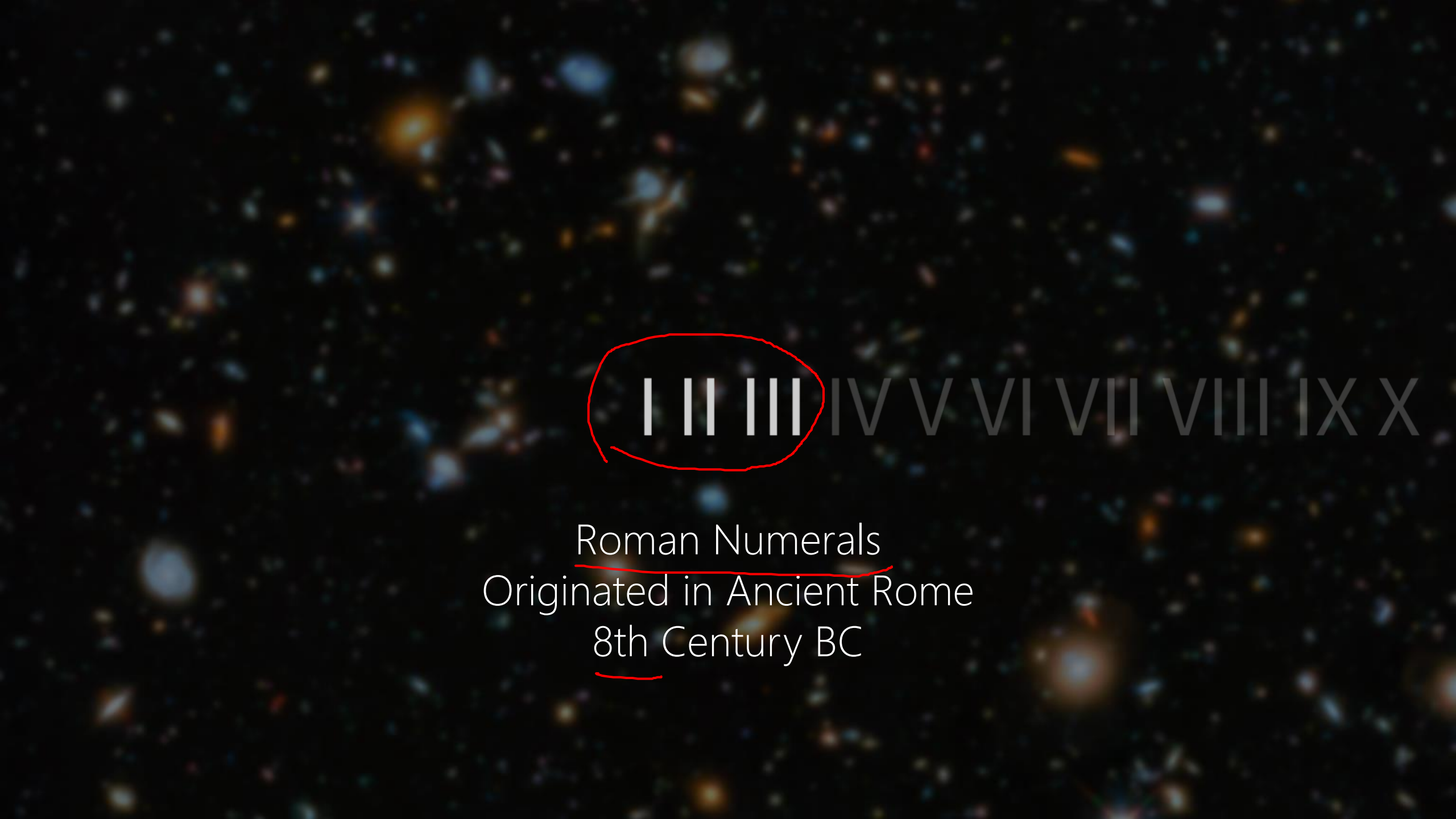
Moon's Distance to Sun: II



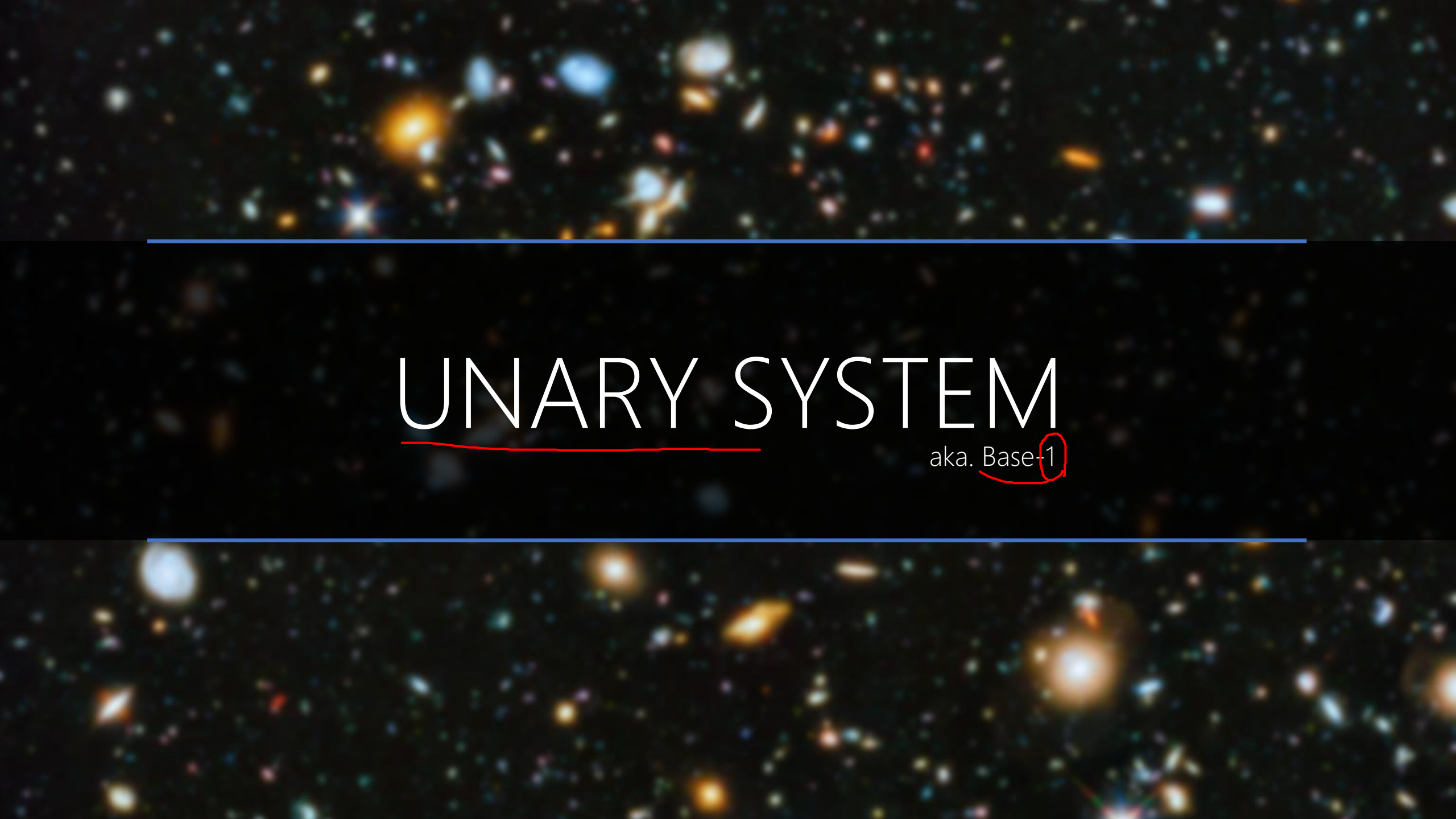
Moon's Distance to Sun: III



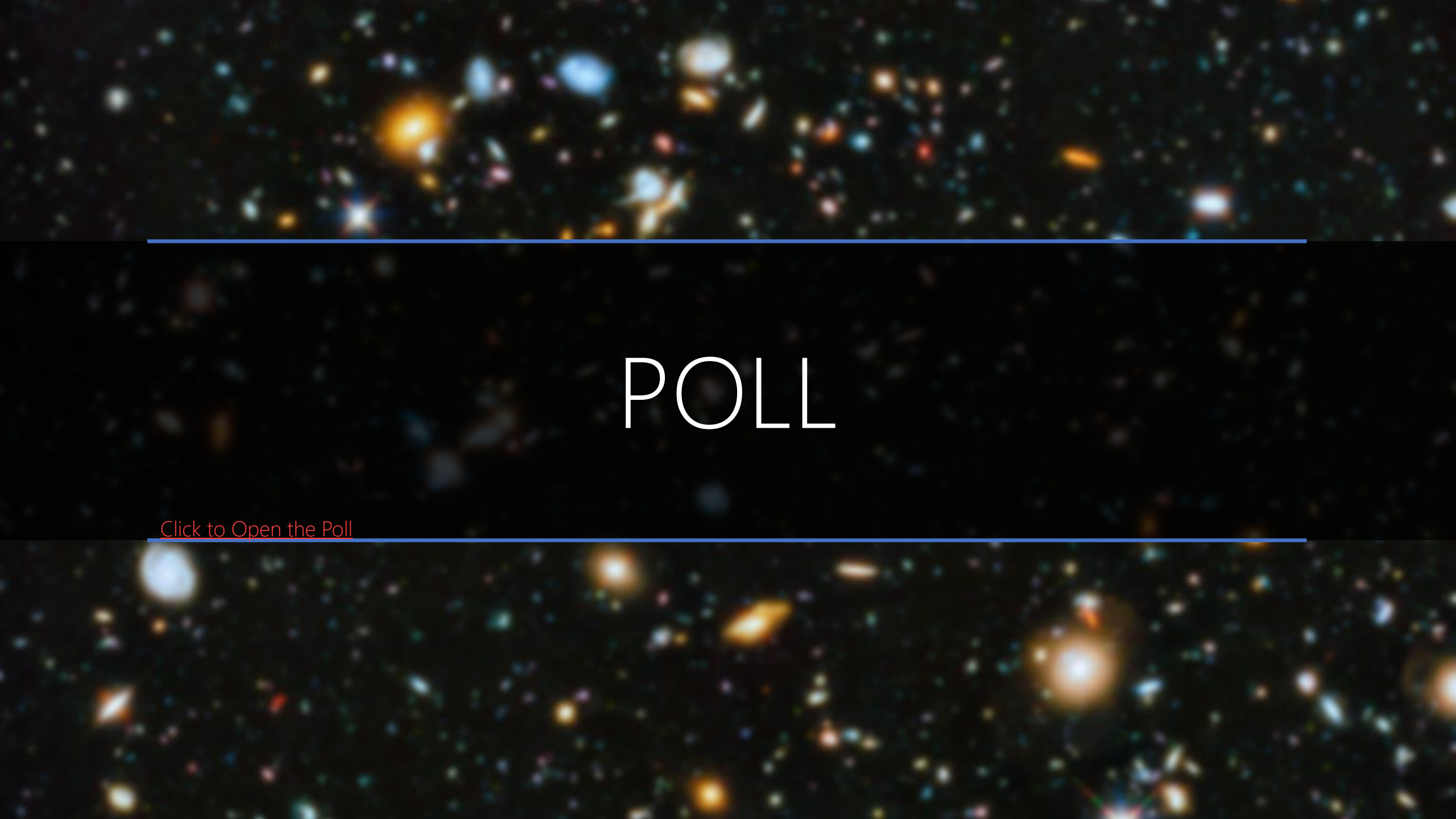
Quantization



Roman Numerals
Originated in Ancient Rome
8th Century BC


UNARY SYSTEM
aka. Base-1

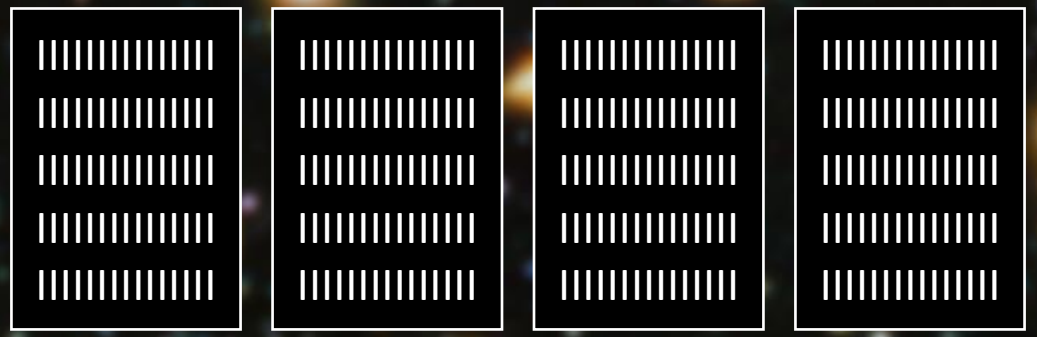
how many positions to represent the moon's distance to the sun if an Oracle said it is ~150 million km and earth's diameter is ~13,000 km?



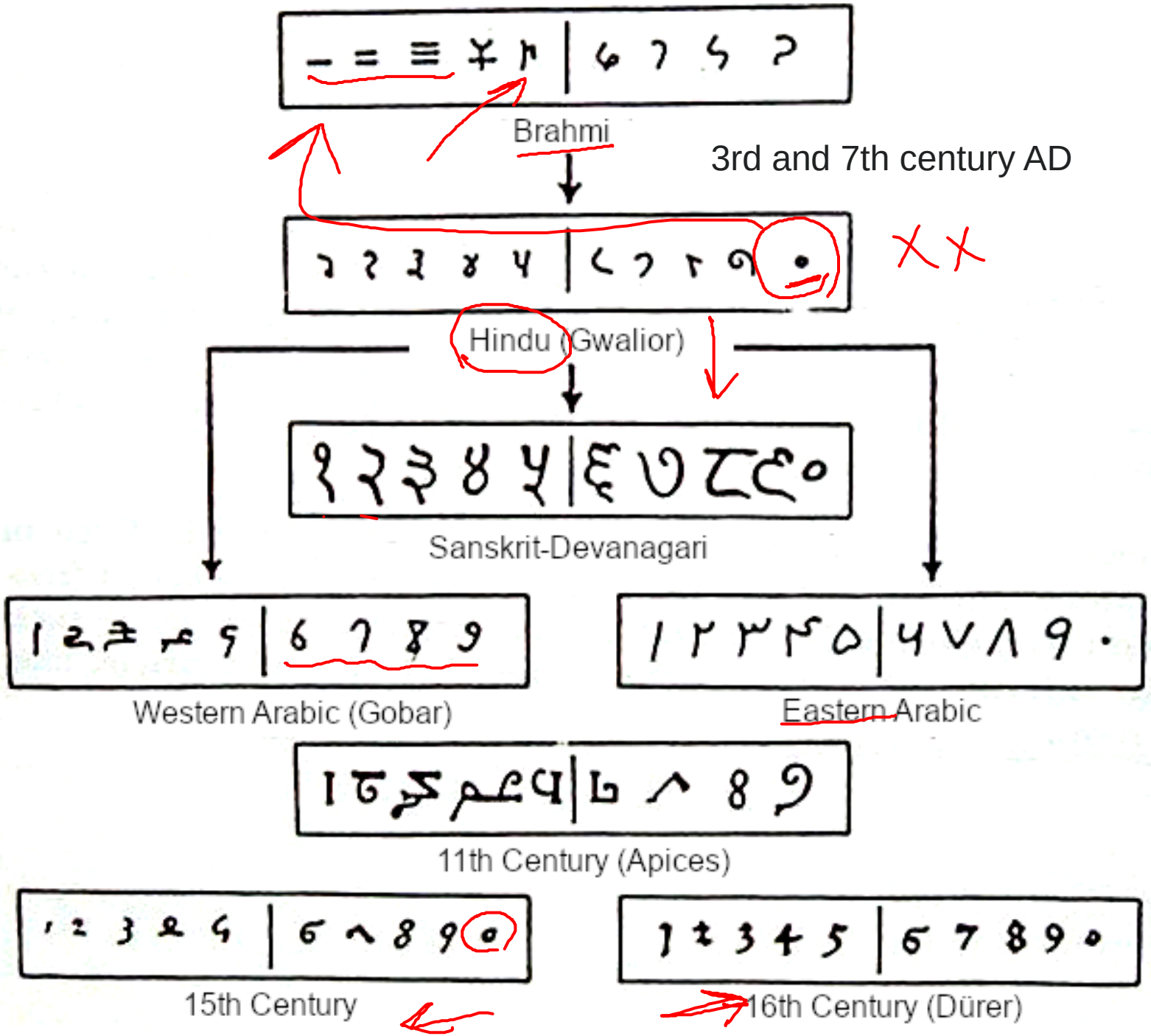
POLL

Click to Open the Poll

~150 million km ÷ ~13,000 km = ~12,000 Earth paper = ~3,000 positions
12,000 ÷ 3,000 = 4 pages!

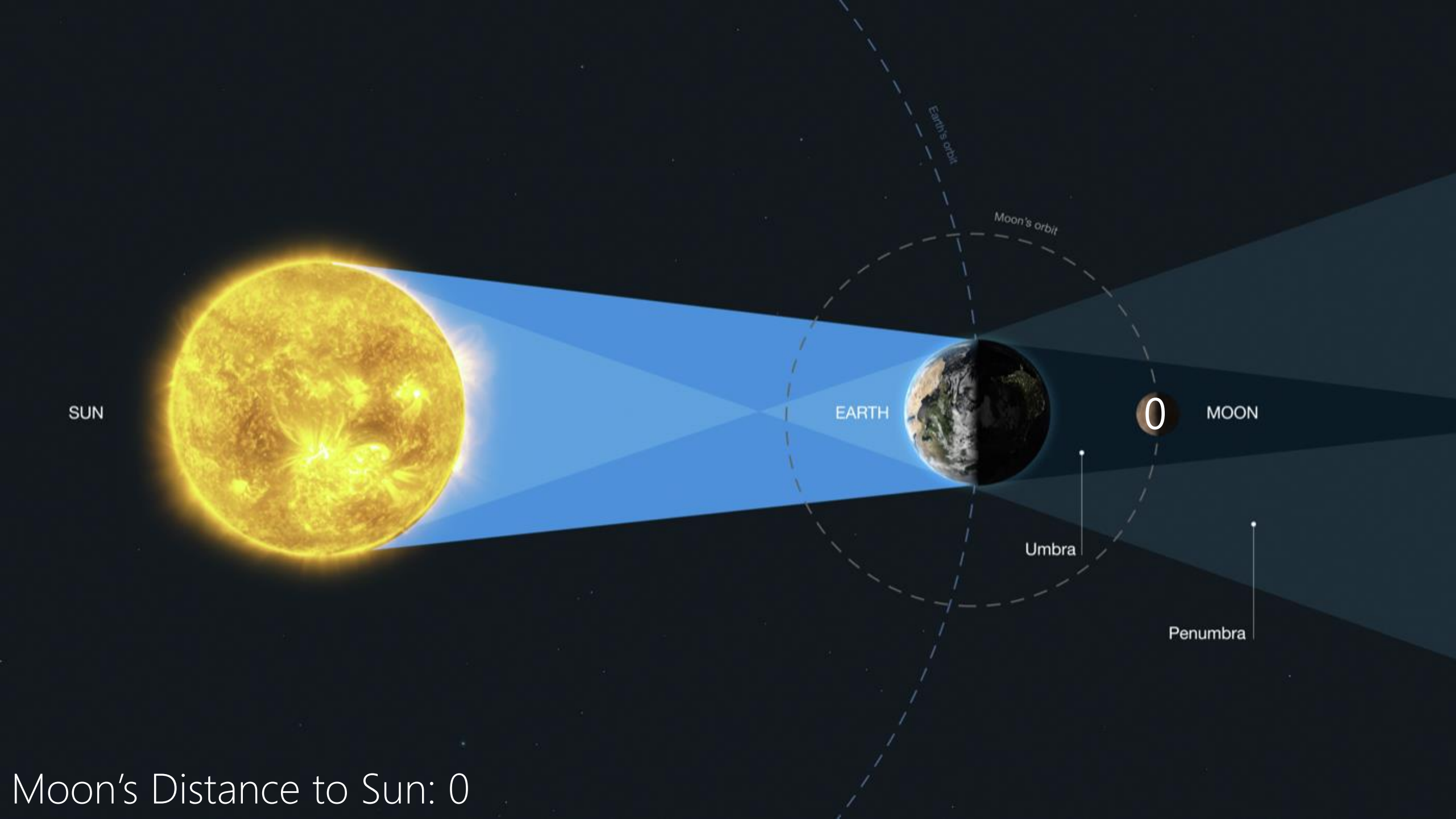


NUMBER SYSTEMS

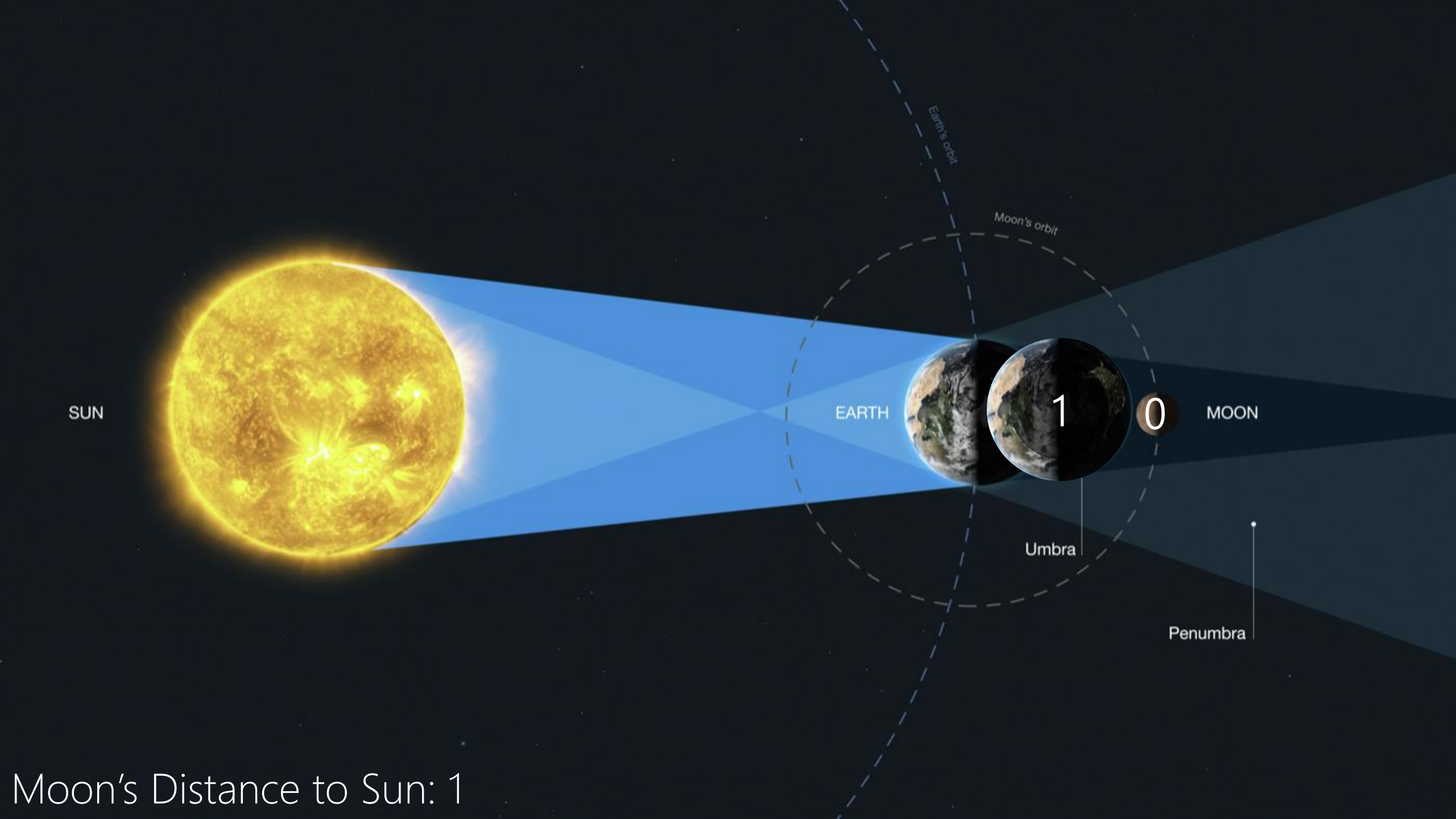

Brahmi
3rd and 7th century AD
Hindu (Gwalior)
Sanskrit-Devanagari
Western Arabic (Gobar)
Eastern Arabic
11th Century (Apices)
15th Century
16th Century (Dürer)

0123456789

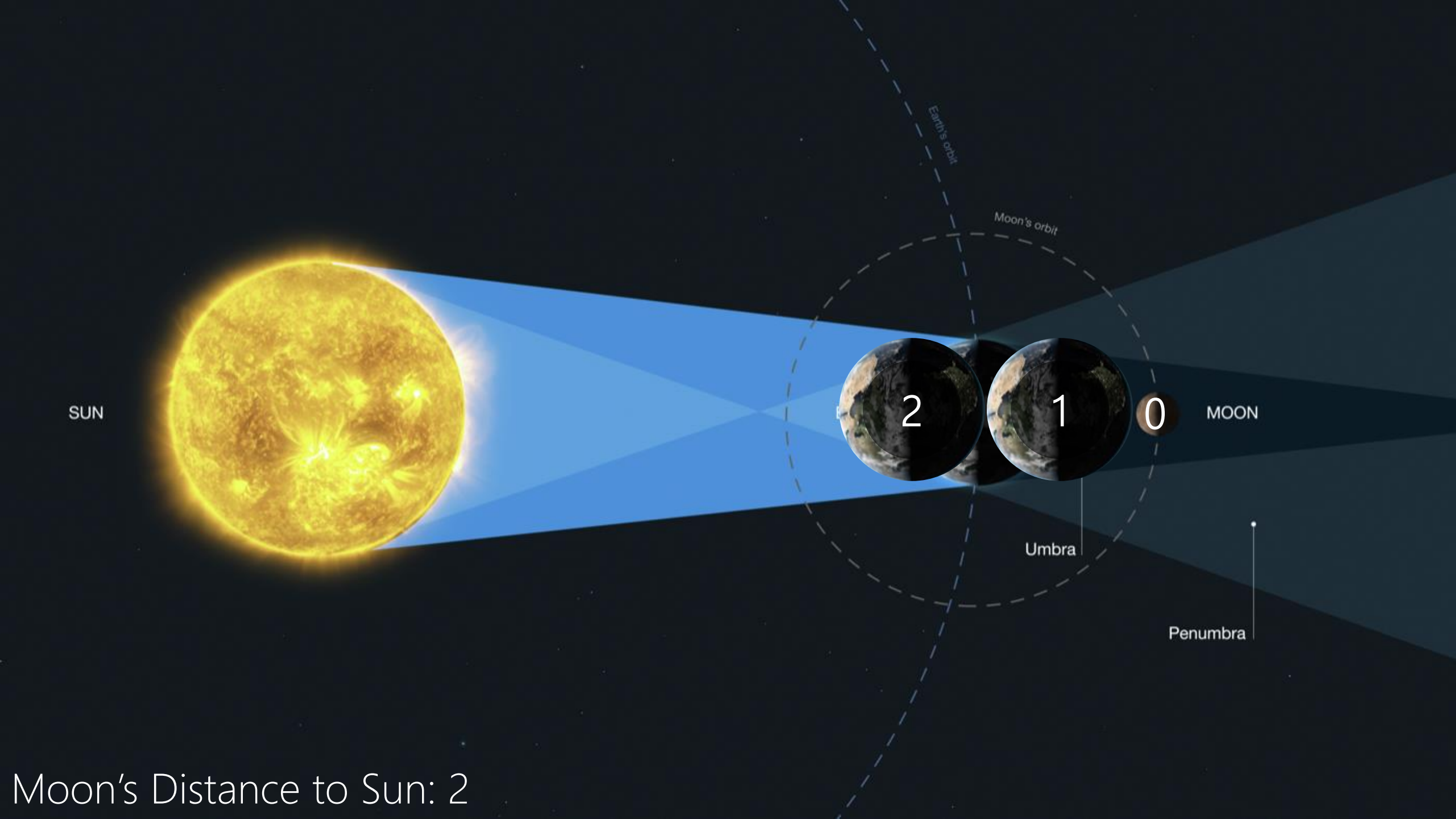
Hossein's Number System



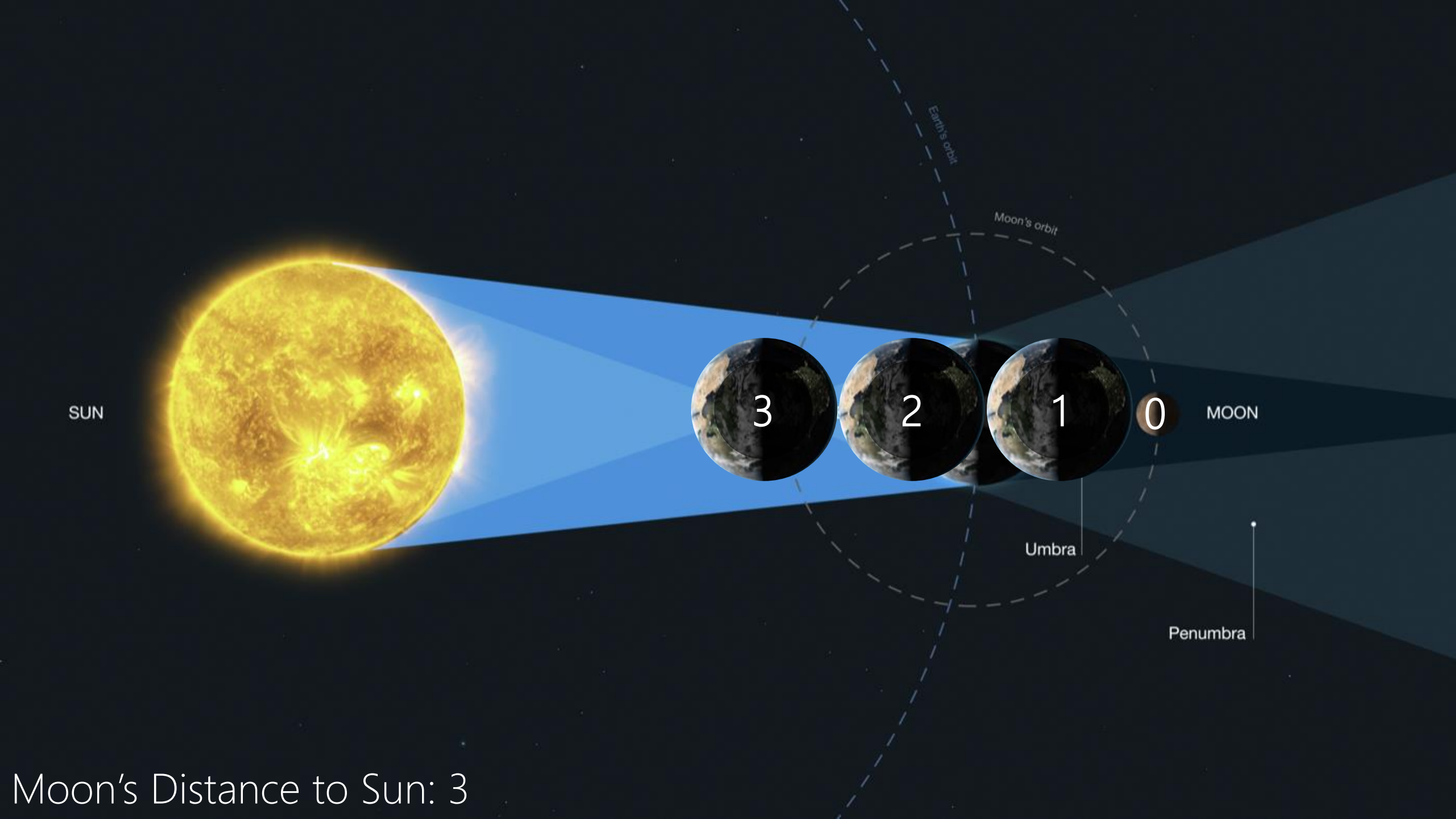
Moon’s Distance to Sun: 0



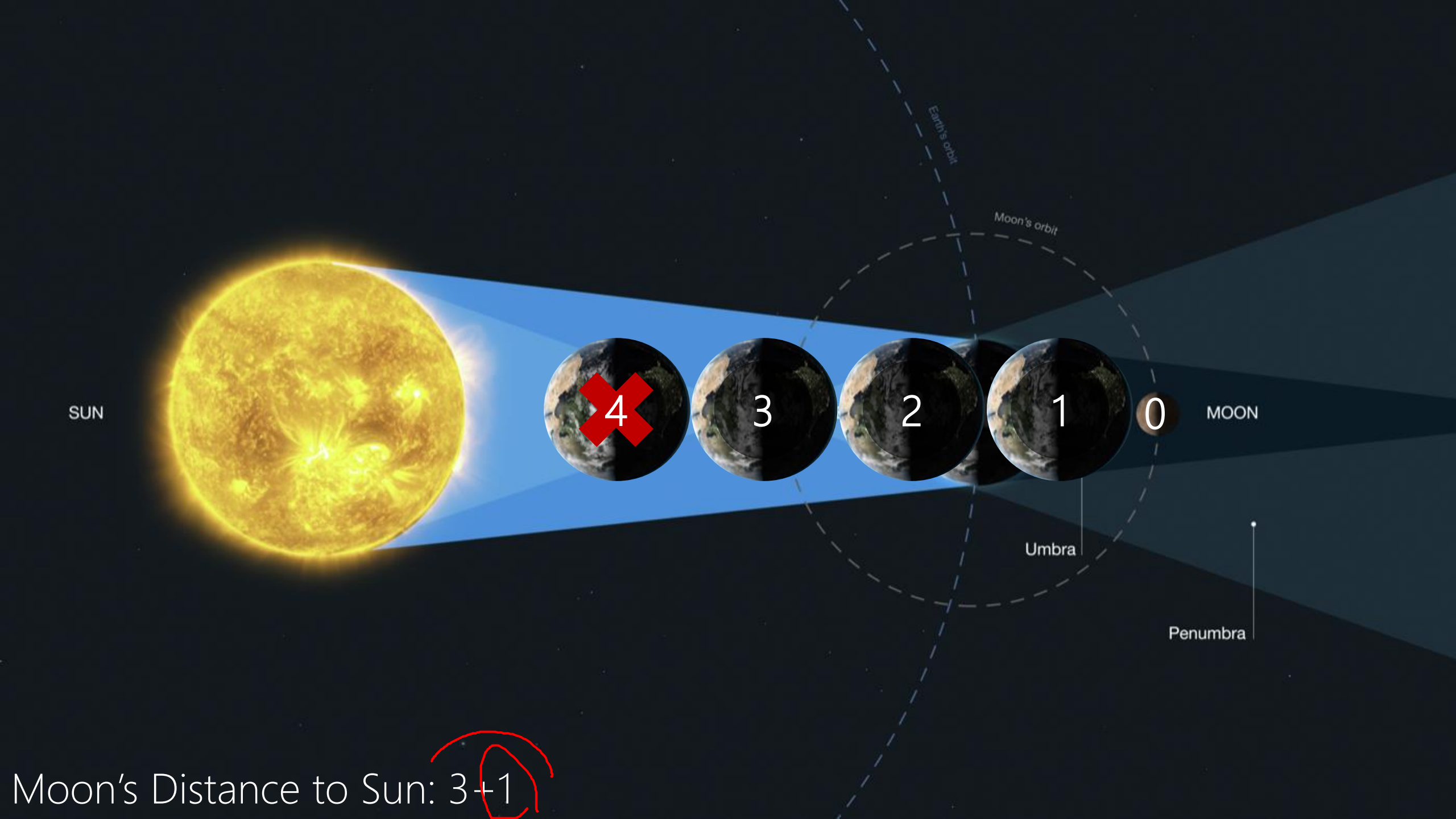
Moon’s Distance to Sun: 1



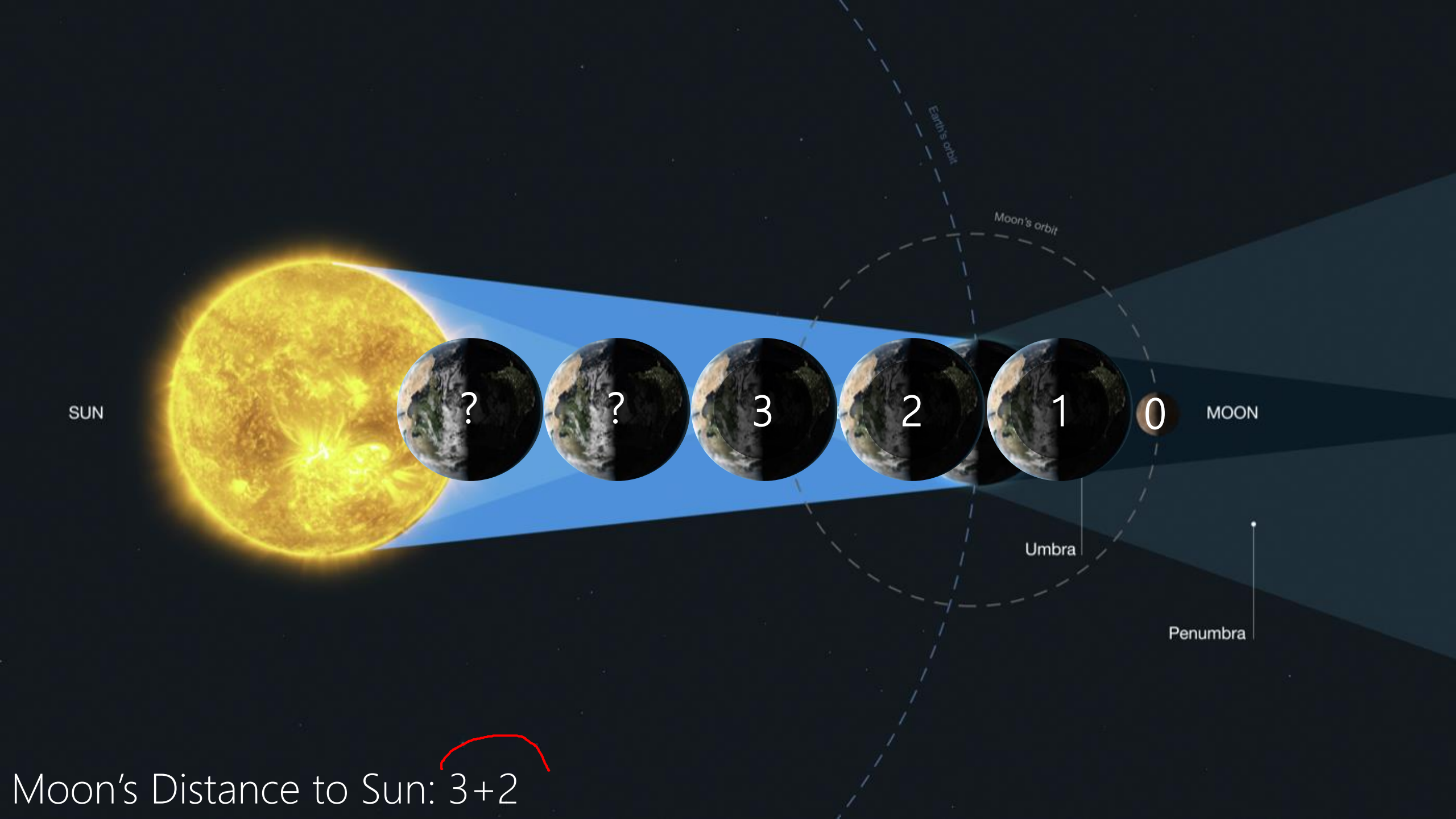
Moon’s Distance to Sun: 2



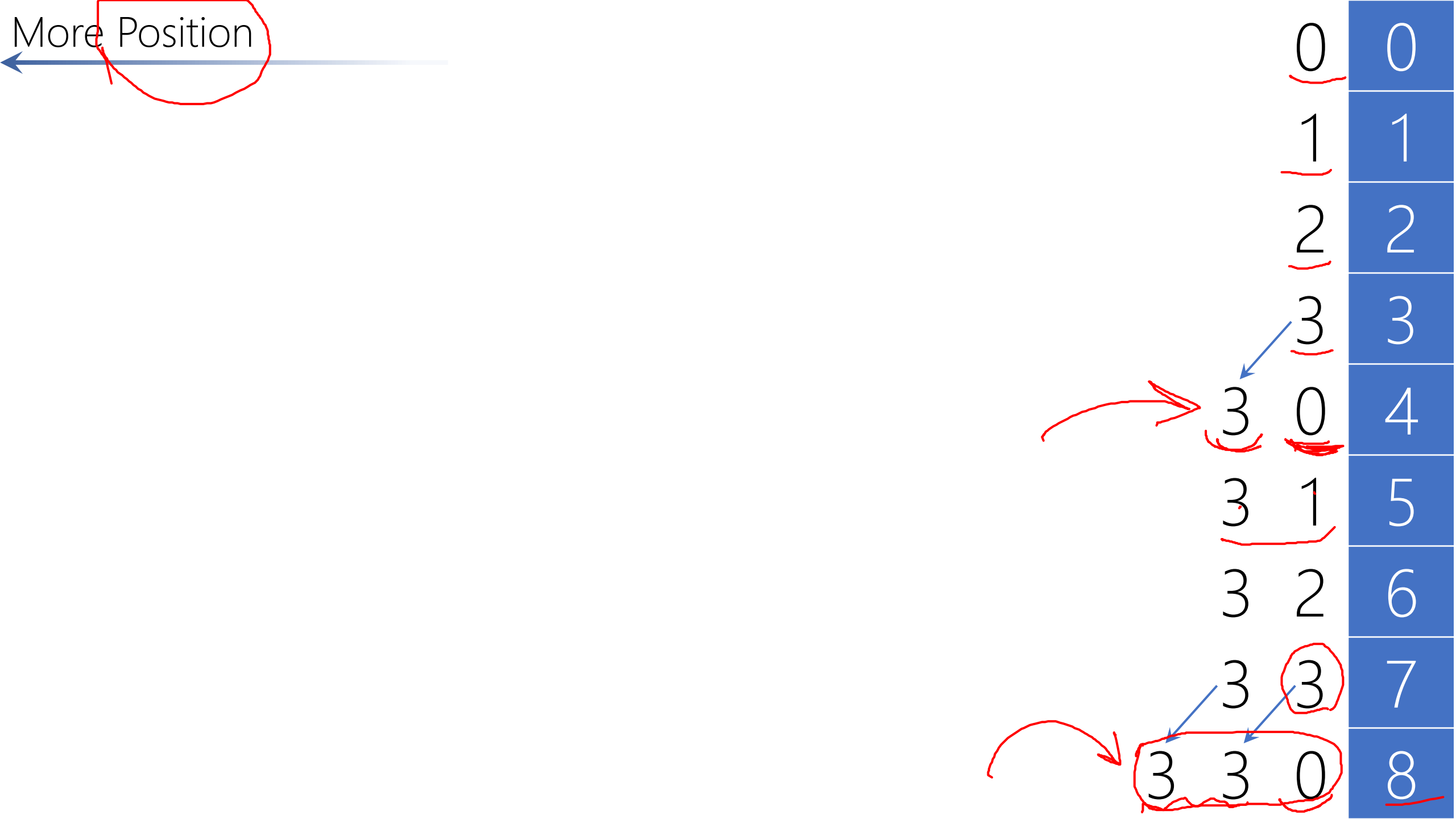
Moon’s Distance to Sun: 3



Moon's Distance to Sun: 3+1

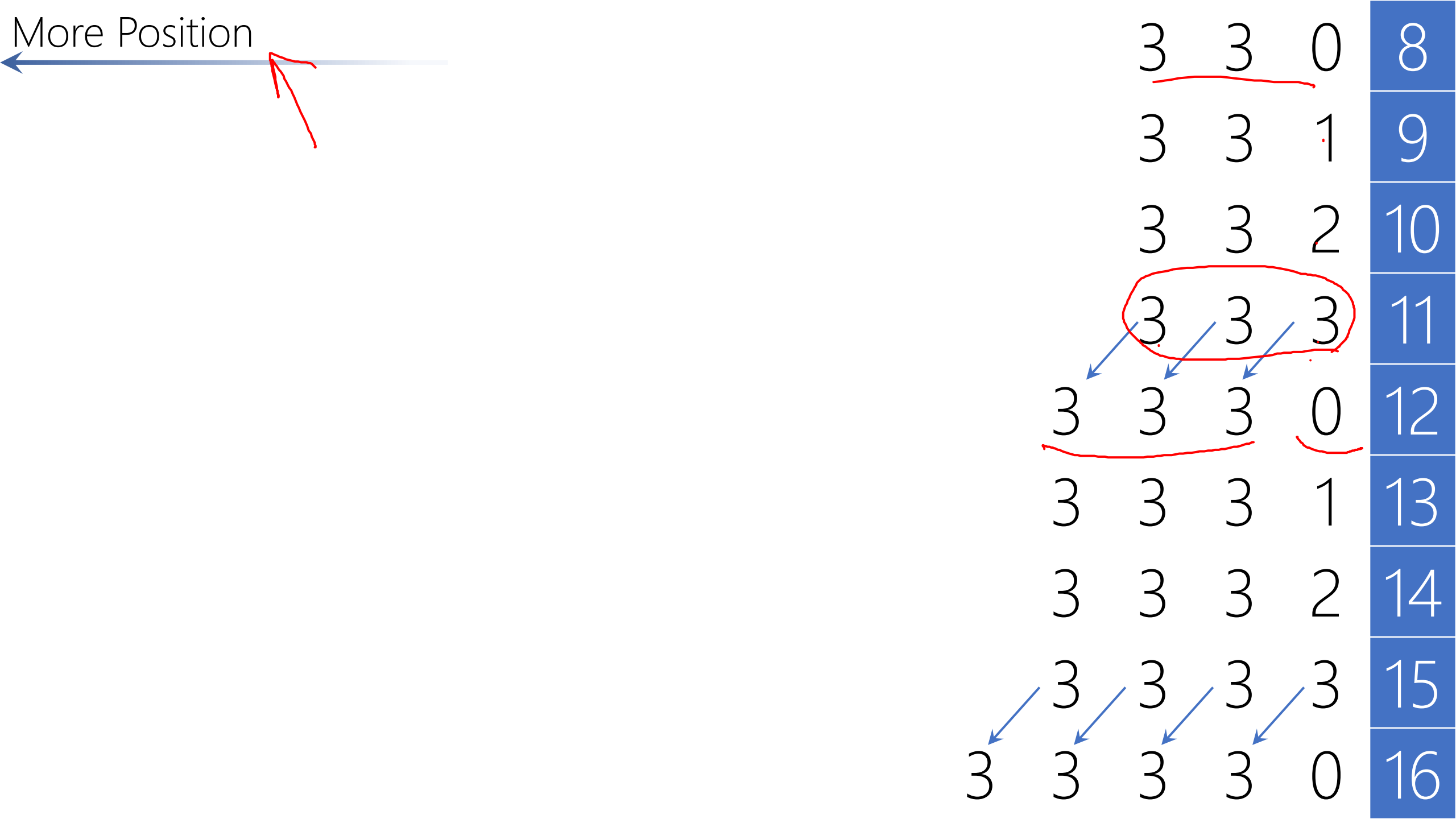


Moon's Distance to Sun: 3+2


More Position
0
1
2
3
3 0
3 1
3 2
3 3
3 3 0
0
1
2
3
4
5
6
7
8


More Position
0
1
2
3
4
5
6
7
8
0
0 3
1 3
2 3
3 3
0 3 3

More Position



More Position

		0	(1-1)=0
		1	1+(1-1)=1
		2	2+(1-1)=2
		3	3+(1-1)=3
	3	0	3+0+(2-1)=4
	3	1	3+1+(2-1)=5
	3	2	3+2+(2-1)=6
	3	3	3+3+(2-1)=7
3	3	0	3+3+(3-1)=8

More Position

		3	3	0
		3	3	1
		3	3	2
		3	3	3
	3	3	3	0
	3	3	3	1
	3	3	3	2
	3	3	3	3
3	3	3	3	0

$3+3+0+(3-1)=8$

$3+3+1+(3-1)=9$

$3+3+2+(3-1)=10$

$3+3+3+(3-1)=11$

$3+3+3+0+(4-1)=12$

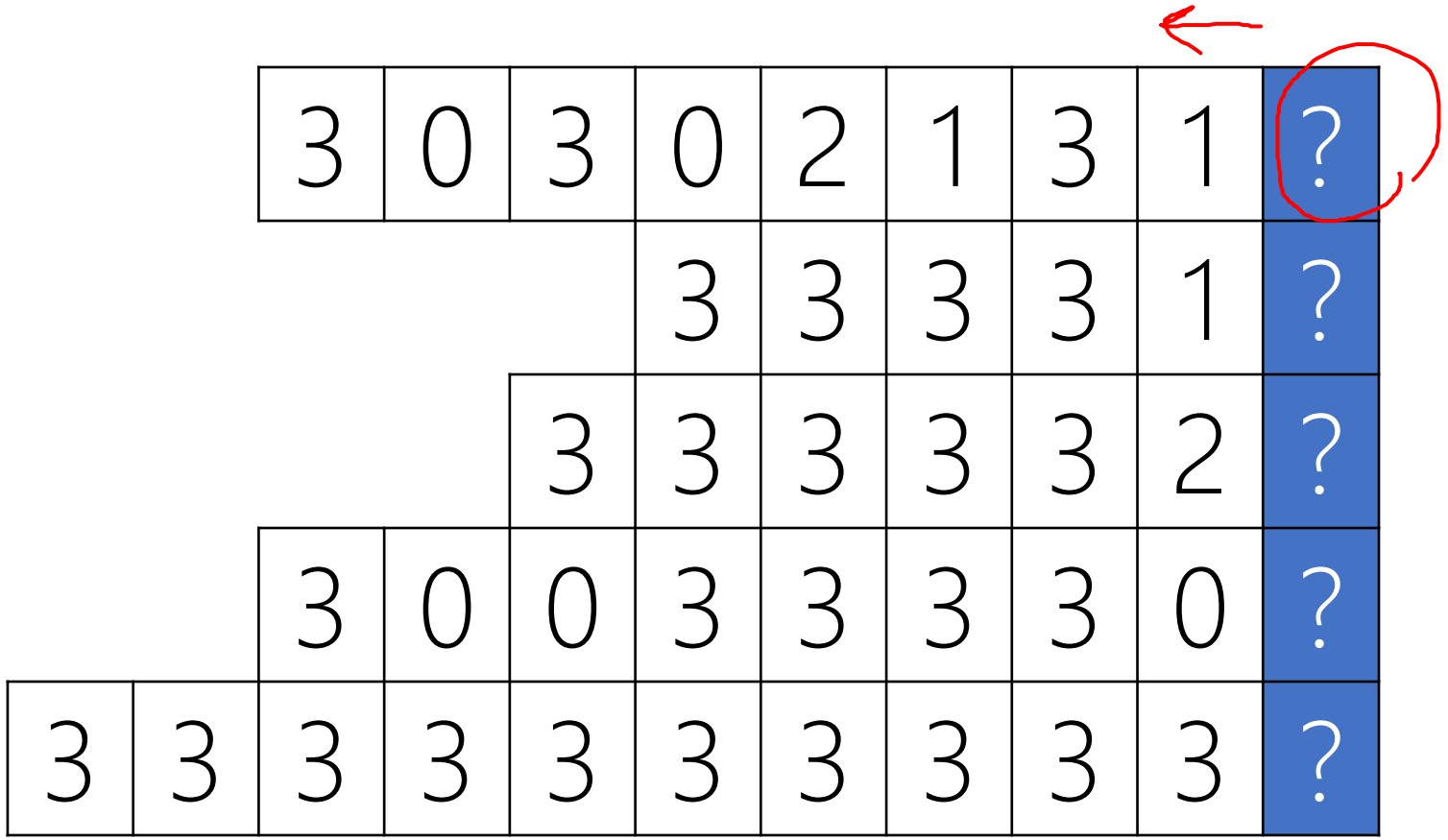
$3+3+3+1+(4-1)=13$

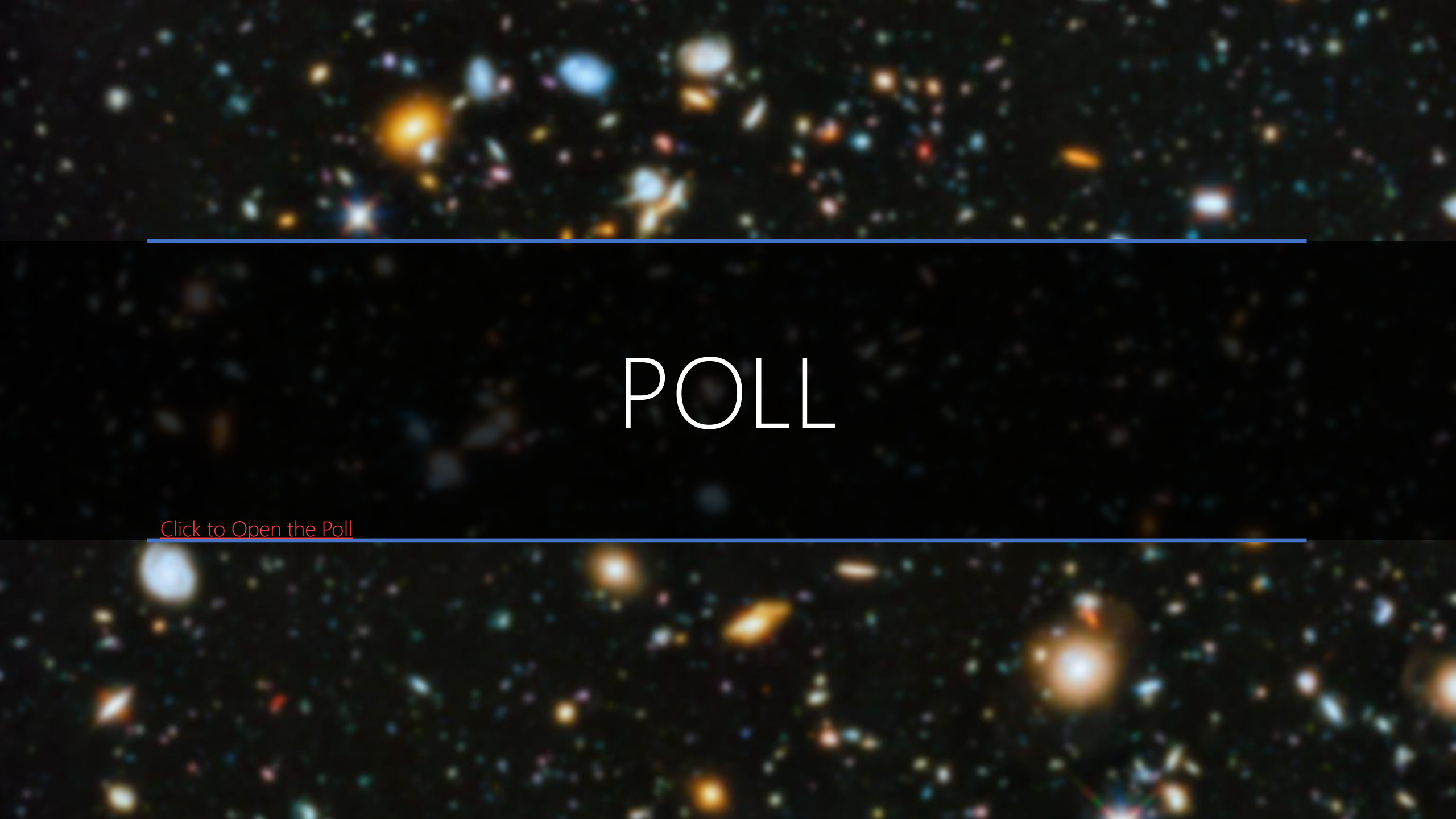
$3+3+3+2+(4-1)=14$

$3+3+3+3+(4-1)=15$

$3+3+3+3+(5-1)=16$

More Position

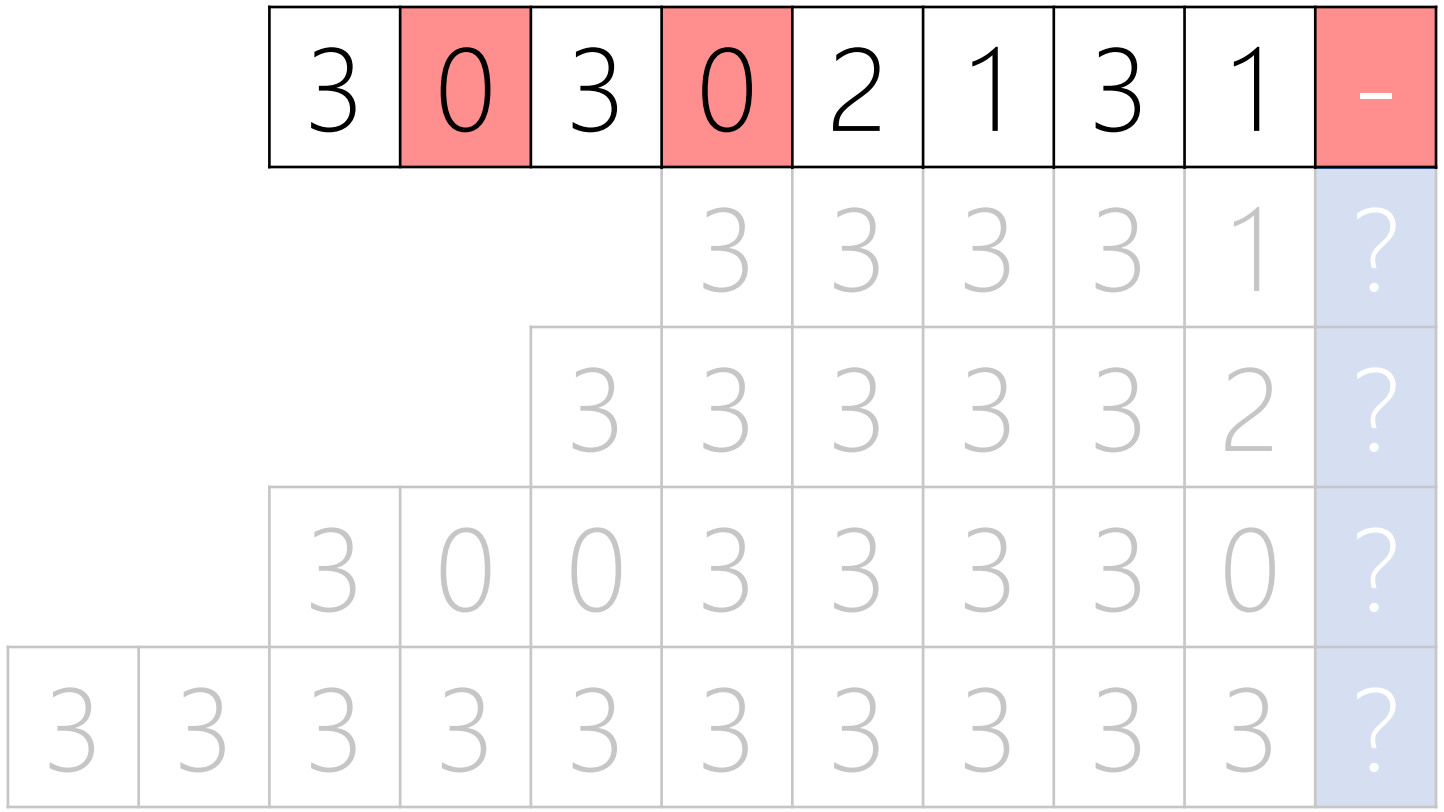




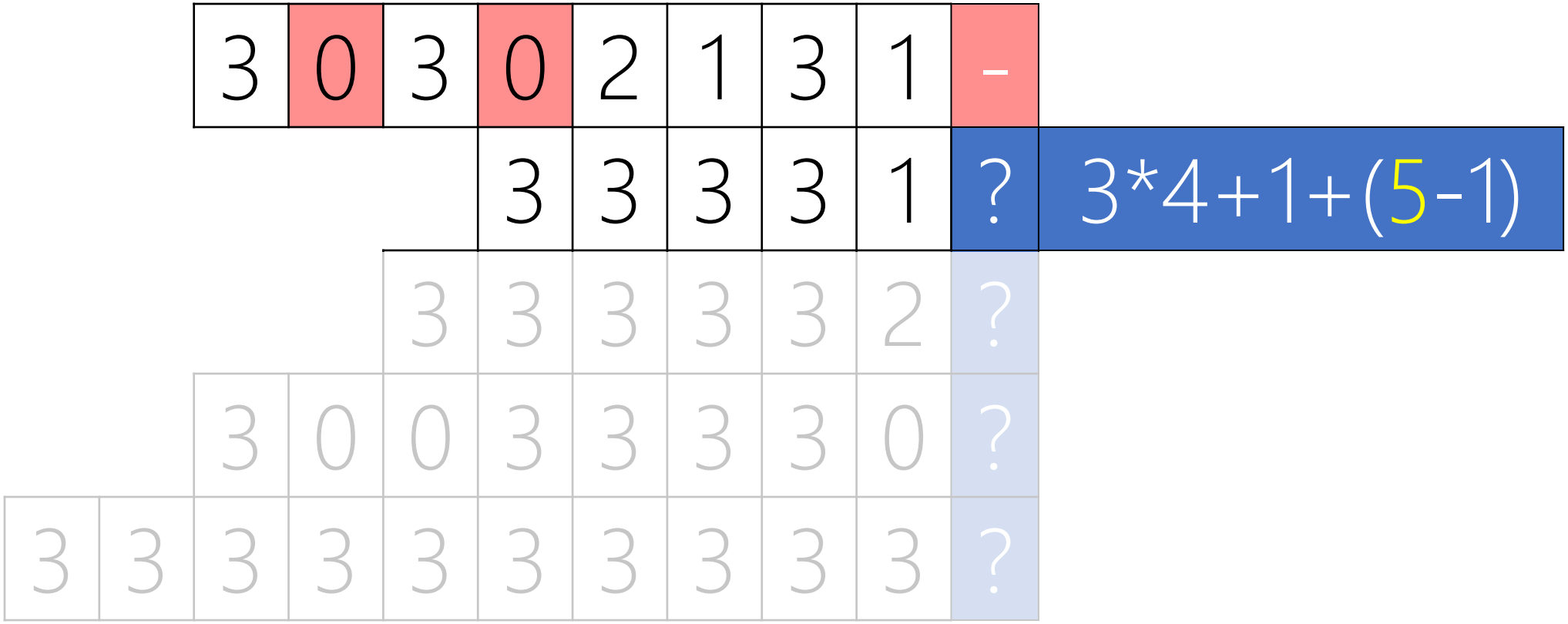
POLL

Click to Open the Poll

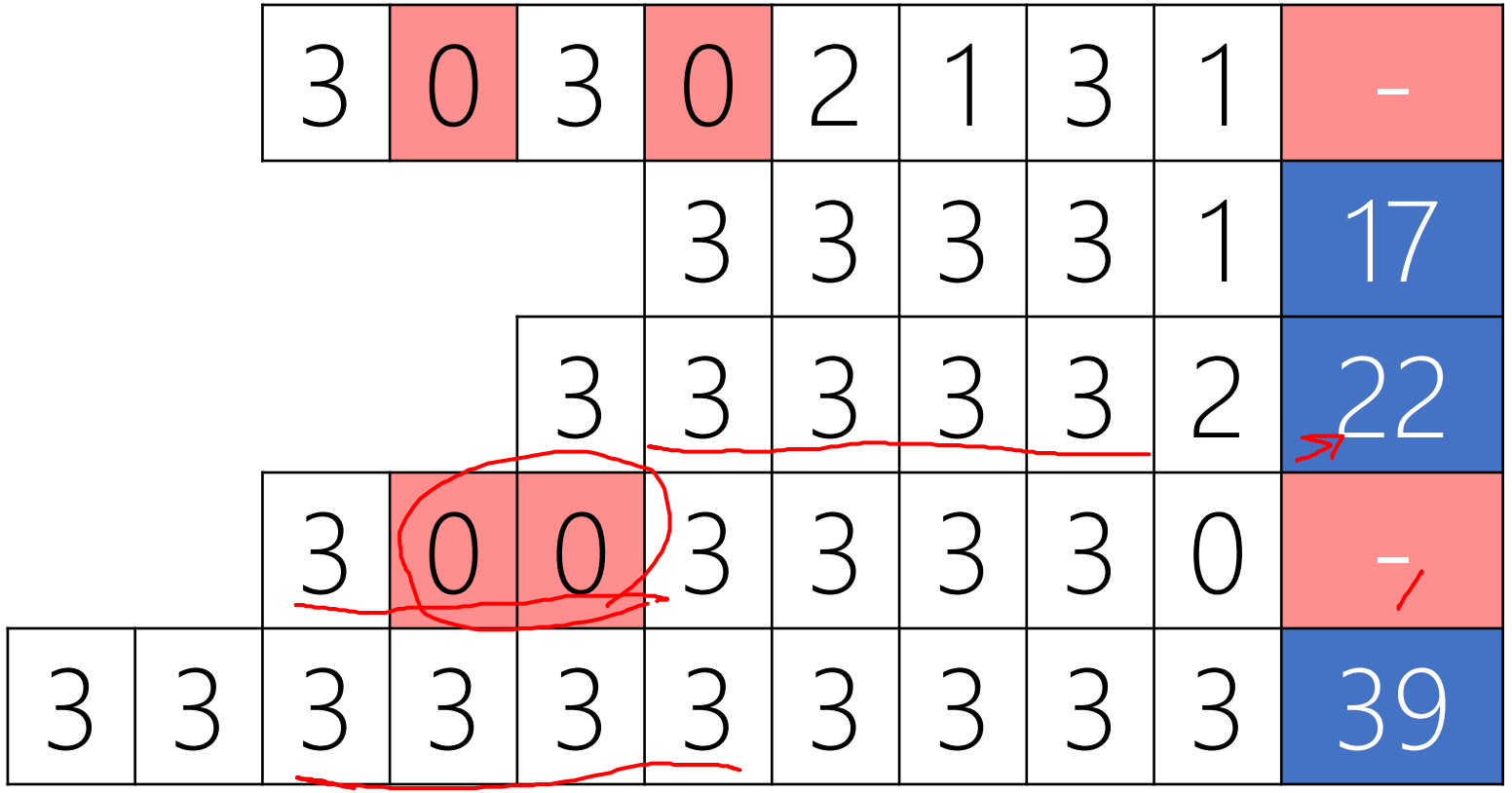
More Position

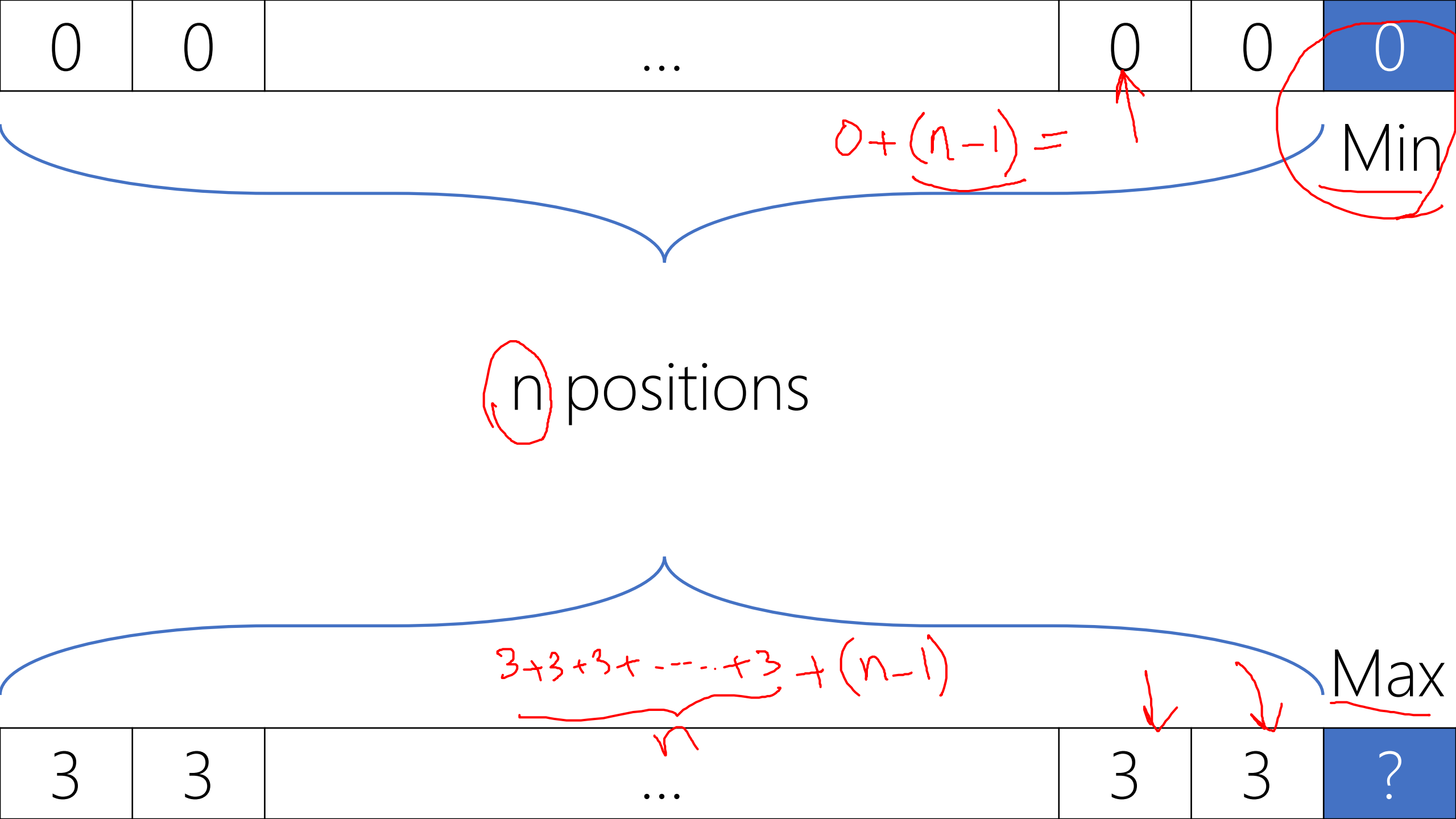


More Position



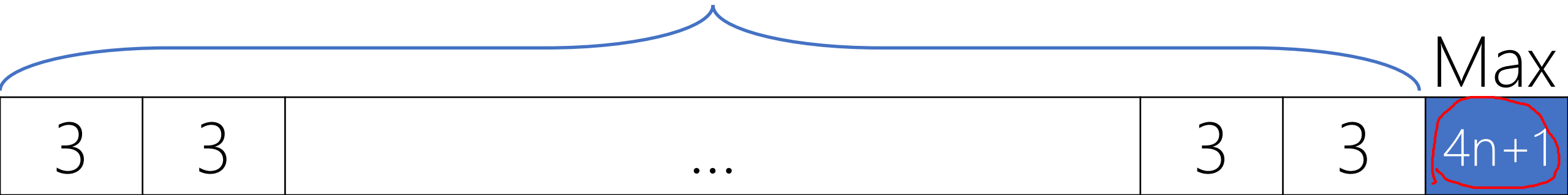
More Position




0
0
...
0
0
0
Min
0+(n-1)=
n positions
3+3+3+ ---- +3 +(n-1)
n
Max
3
3
...
3
3
?

$$3+3+3+\cdots+3+(n-1) = 3\times n+(n-1)=4n-1$$

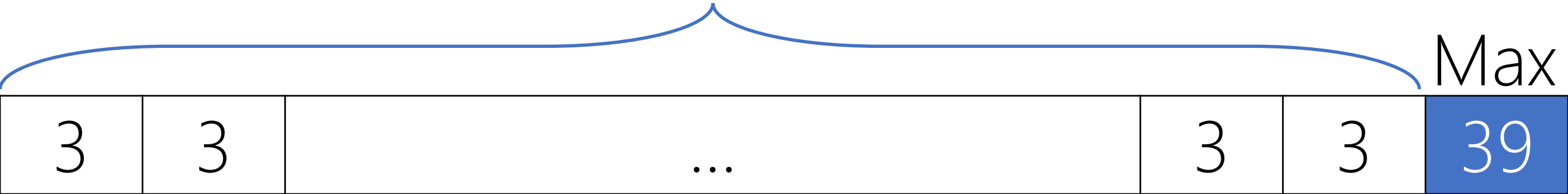
n positions



$$\text{Max} = 4n - 1$$

$$n = 10 \Rightarrow (4 \times 10) - 1 = 39$$

10 positions

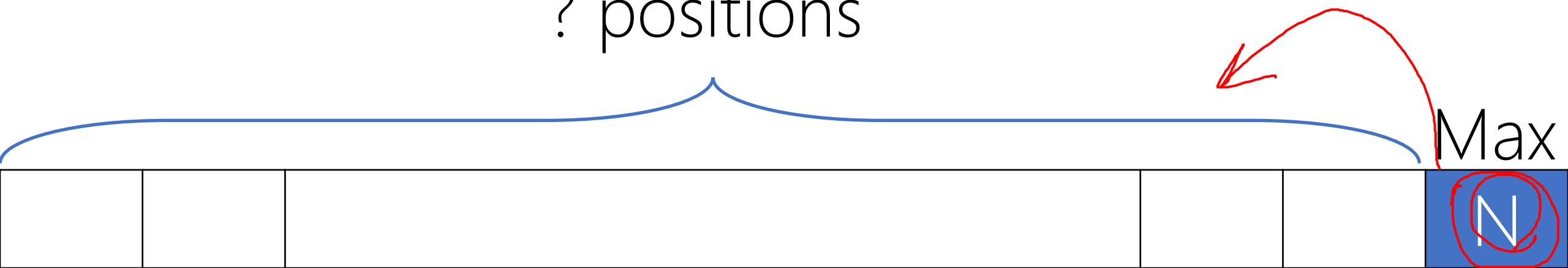


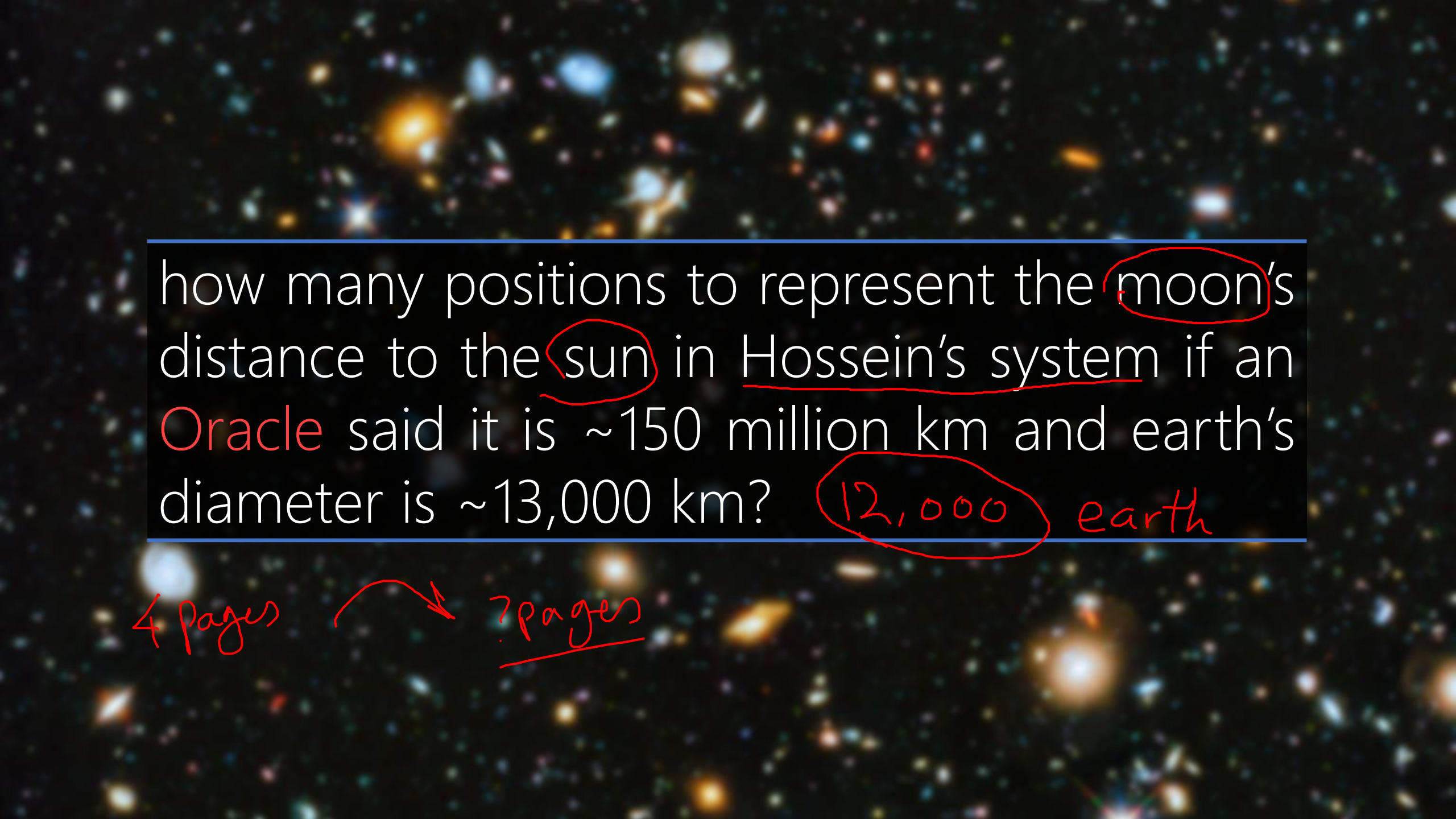
$$Max = N = 4n - 1$$

$$N + 1 = 4n$$

$$(N + 1) \div 4 = n$$

? positions




how many positions to represent the moon's distance to the sun in Hossein's system if an Oracle said it is ~150 million km and earth's diameter is ~13,000 km?
12,000
earth
4 pages
7 pages

~150 million km ÷ ~13,000 km = ~12,000 Earth

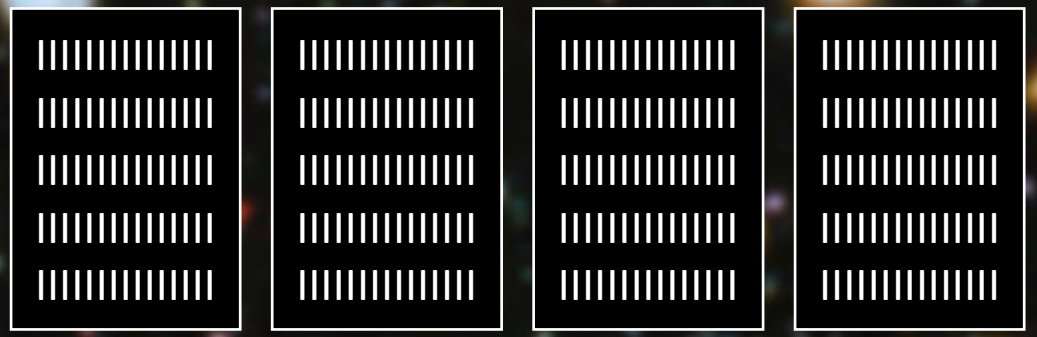
N = 12,000

n = (N+1)÷4 = (12,000+1)÷4 = ~3,000 positions

paper = ~3,000 positions

3,000 ÷ 3,000 = 1 pages

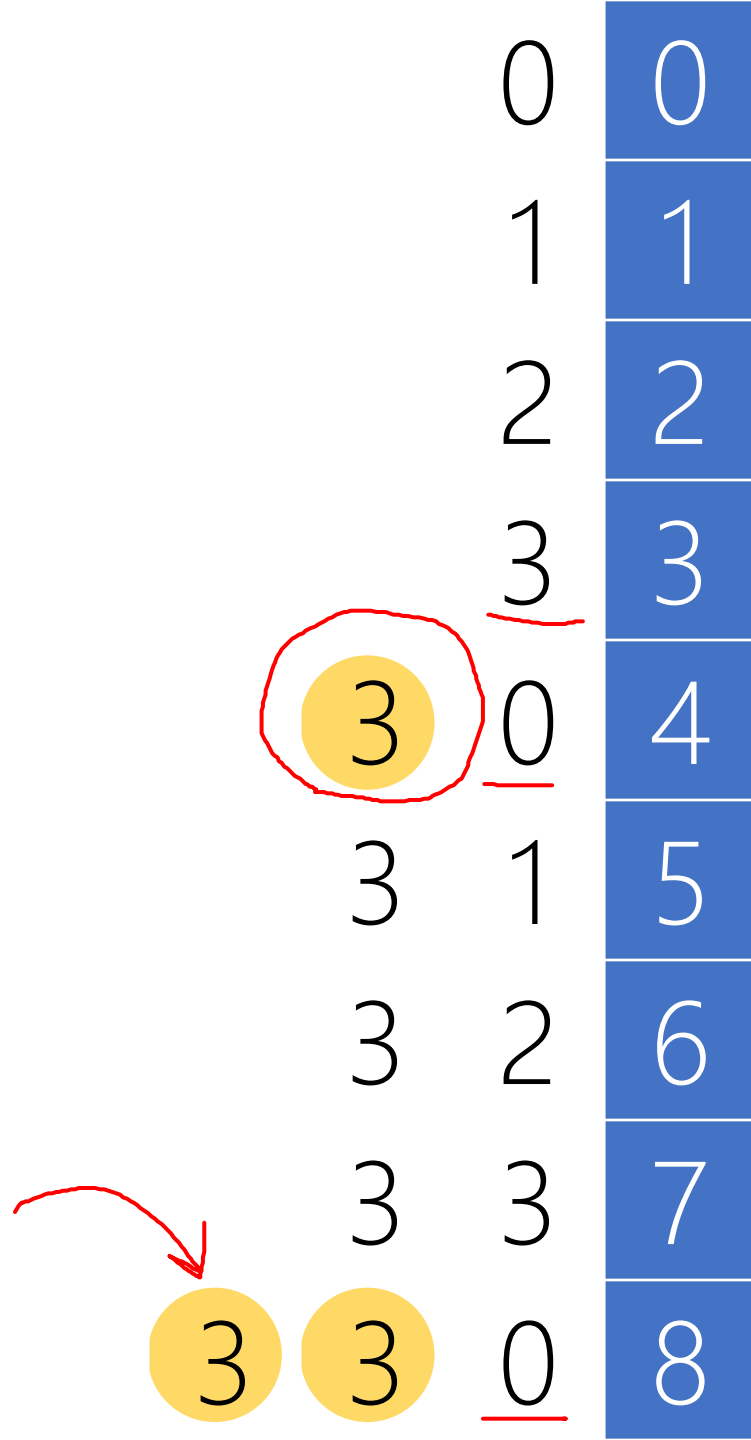
0, 2, 3



More Position

1 rounds of all (4) symbols: 1 × 4

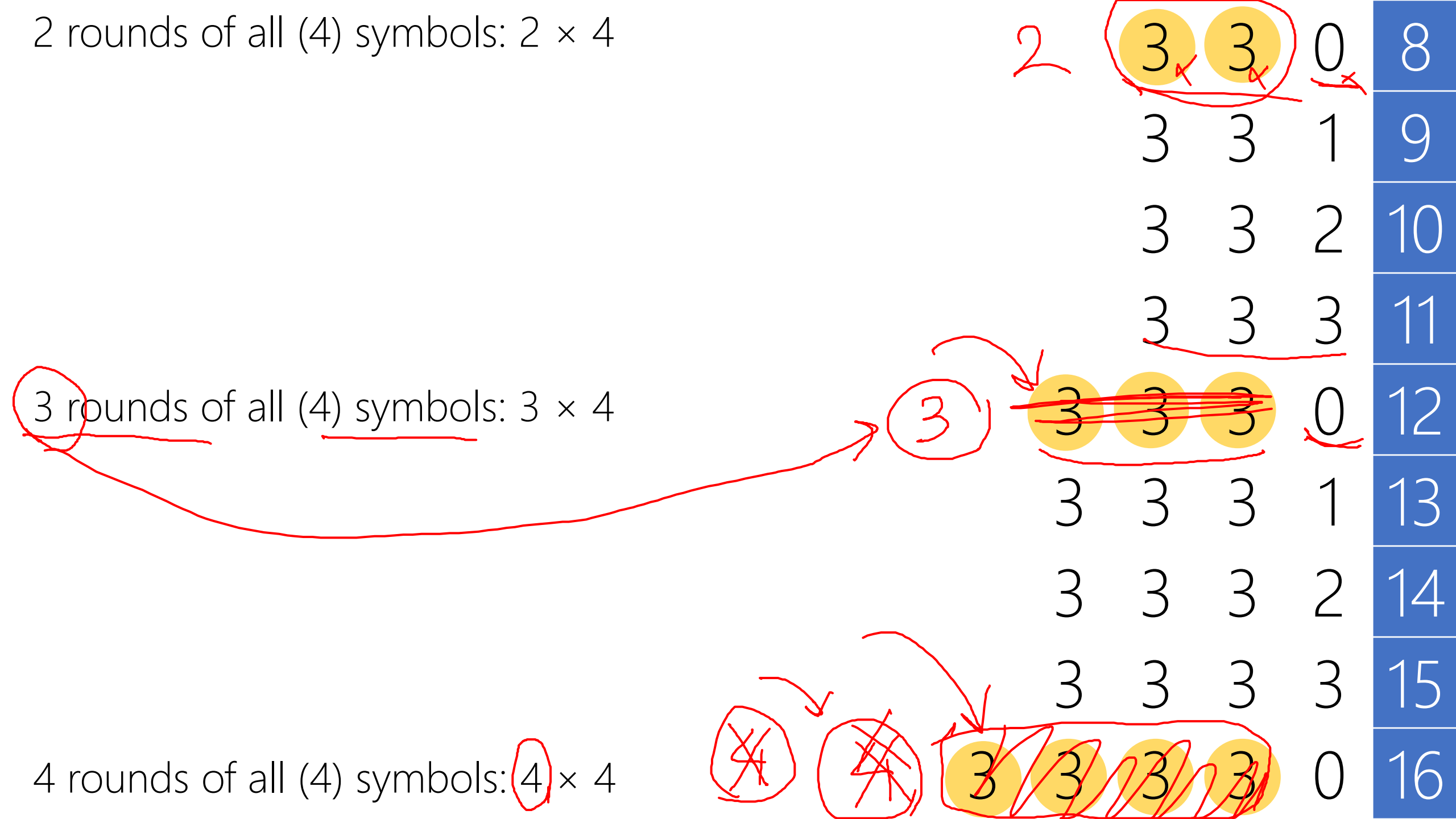
2 rounds of all (4) symbols: 2 × 4



2 rounds of all (4) symbols: 2 × 4

3 rounds of all (4) symbols: 3 × 4

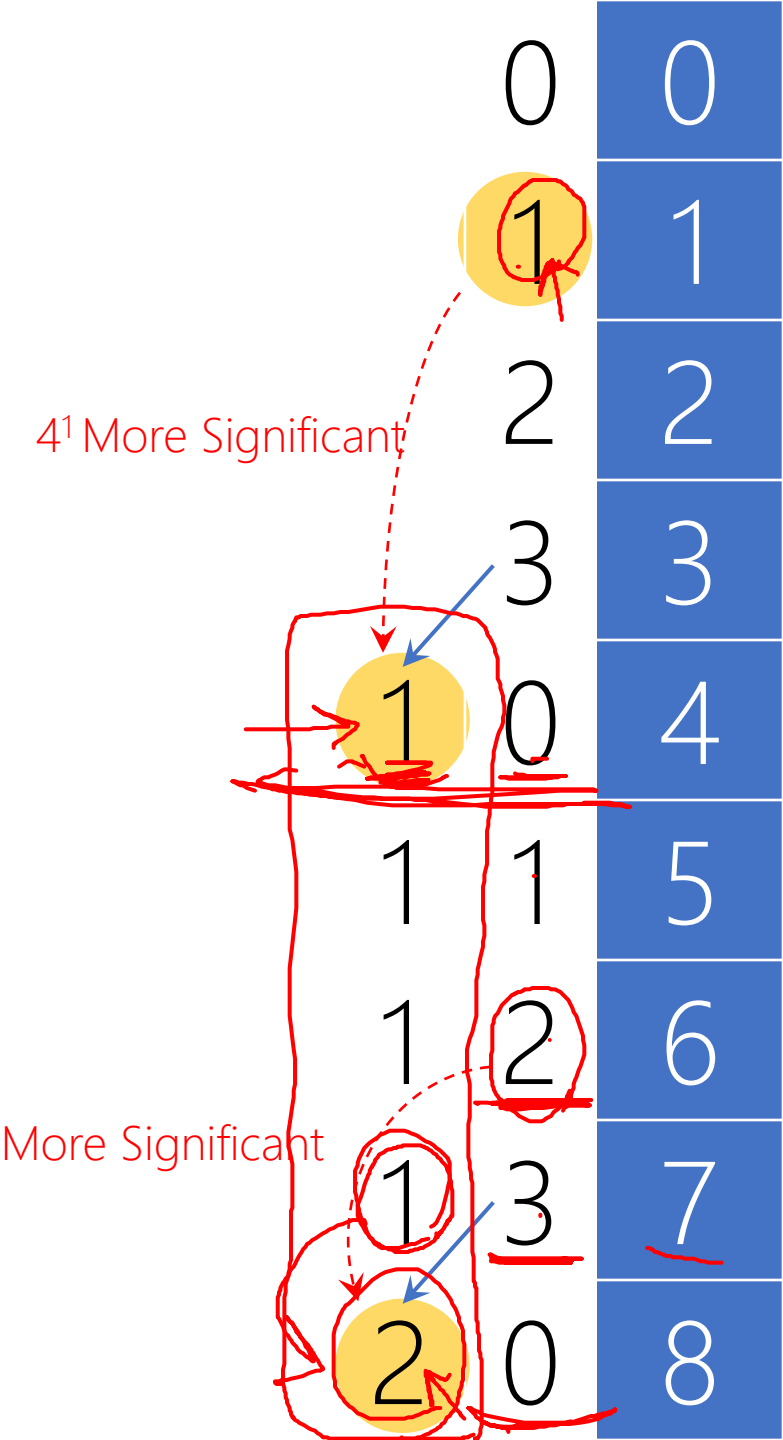
4 rounds of all (4) symbols: 4 × 4



More Significant Position

1 round of all (4) symbols = 1×4^1

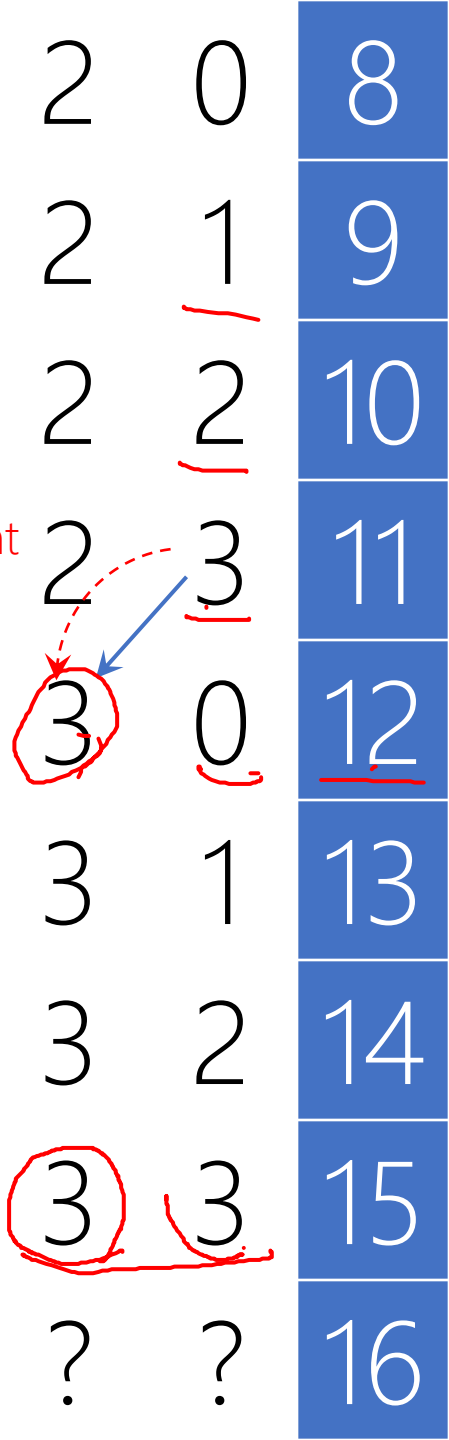
2 rounds of all (4) symbols = 2×4^1



2 rounds of all (4) symbols = 2×4^1

4^1 More Significant

3 rounds of all (4) symbols = 3×4^1

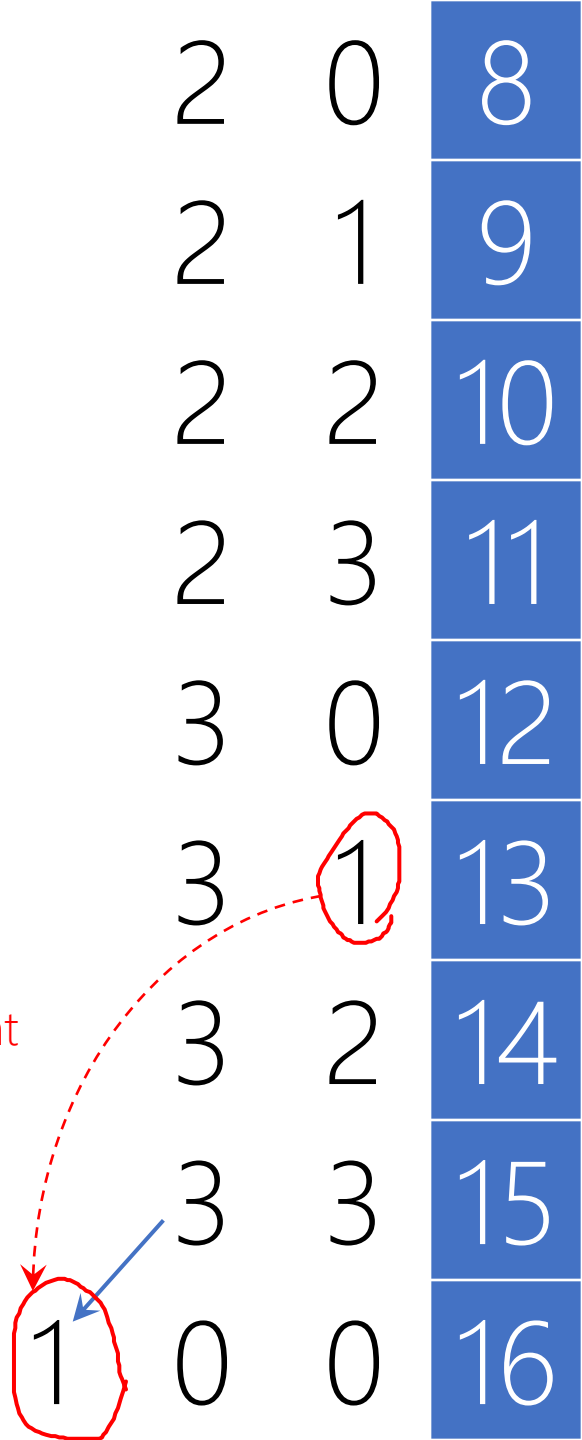


2	0	8
2	1	9
2	2	10
2	3	11
3	0	12
3	1	13
3	2	14
3	3	15
1 0	0	16

4x4
16

1 rounds of all (4) symbols in the 2nd significant position

$= 4 \times 4^1 = 1 \times 4^2$



1 rounds of all (4) symbols in the more significant position

$= 4 \times 4^1 = 1 \times 4^2$

QUATERNARY SYSTEM

/kwaa·tur·neh·ree/

aka. Base-4, Radix-4

$(0,1,2,3)_4$

Hindu-Arabic Numerals
Originated in India
7th Century AD

More Significant Position

#Symbols=4
Radix-4
Base-4

4^0	× 1
0	$0\times4^0=0$
1	$1\times4^0=1$
2	$2\times4^0=2$
3	$3\times4^0=3$

More Significant Position

#Symbols=4
Radix-4
Base-4

4^1	4^0	
	0	$0\times4^0=0$
	1	$1\times4^0=1$
	2	$2\times4^0=2$
	3	$3\times4^0=3$
1	0	$1\times4^1+0\times4^0=4$
1	1	$1\times4^1+1\times4^0=5$
1	2	$1\times4^1+2\times4^0=6$
1	3	$1\times4^1+3\times4^0=7$
2	0	$2\times4^1+0\times4^0=8$

More Significant Position

#Symbols=4
Radix-4
Base-4

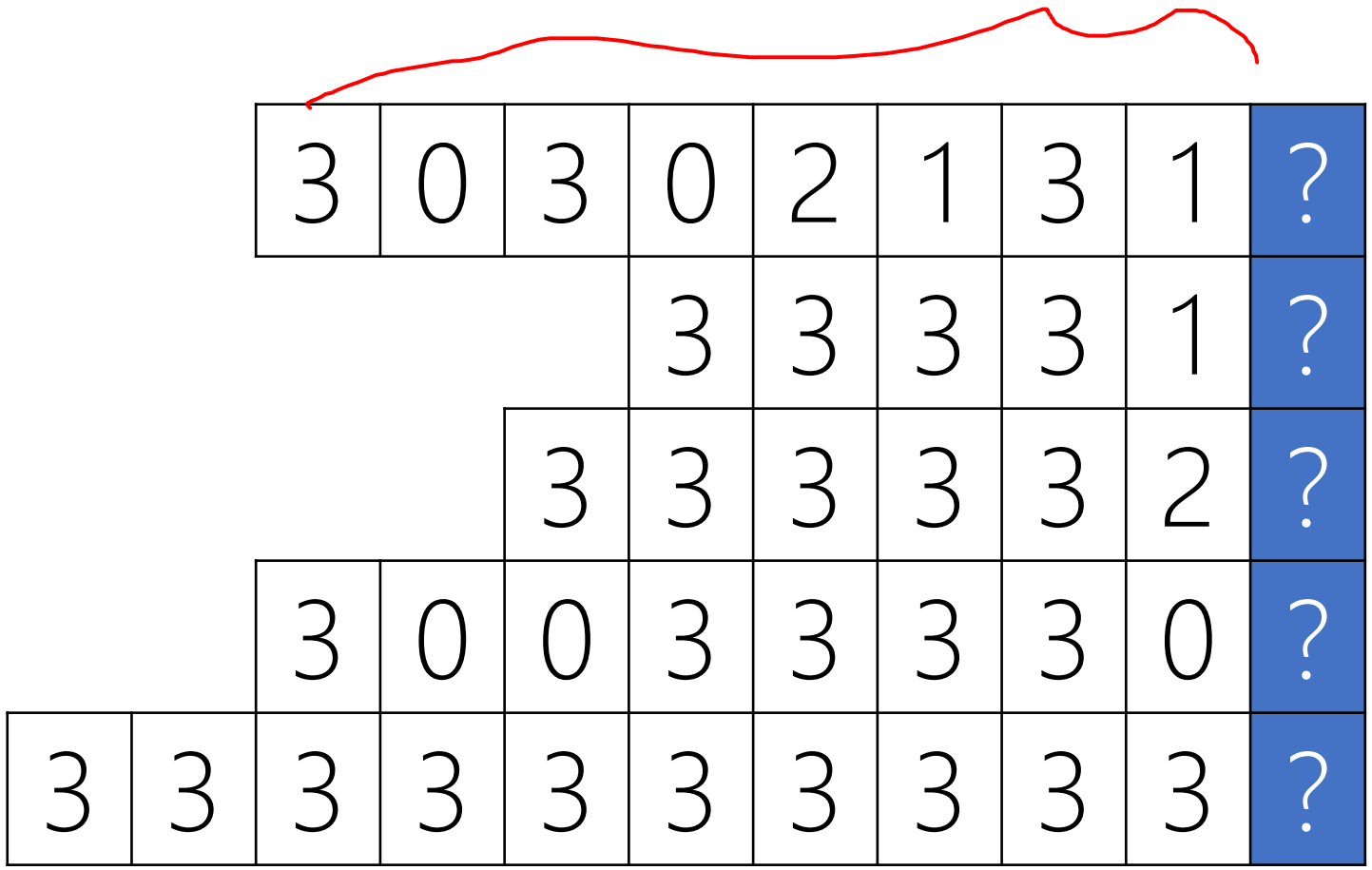
4^2	4^1	4^0	
	2	0	$2\times4^1+0\times4^0=8$
	2	1	$2\times4^1+1\times4^0=9$
	2	2	$2\times4^1+2\times4^0=10$
	2	3	$2\times4^1+3\times4^0=11$
	3	0	$3\times4^1+0\times4^0=12$
	3	1	$3\times4^1+1\times4^0=13$
	3	2	$3\times4^1+2\times4^0=14$
	3	3	$3\times4^1+3\times4^0=15$
1	0	0	$1\times4^2+0\times4^1+0\times4^0=16$

More Significant Position

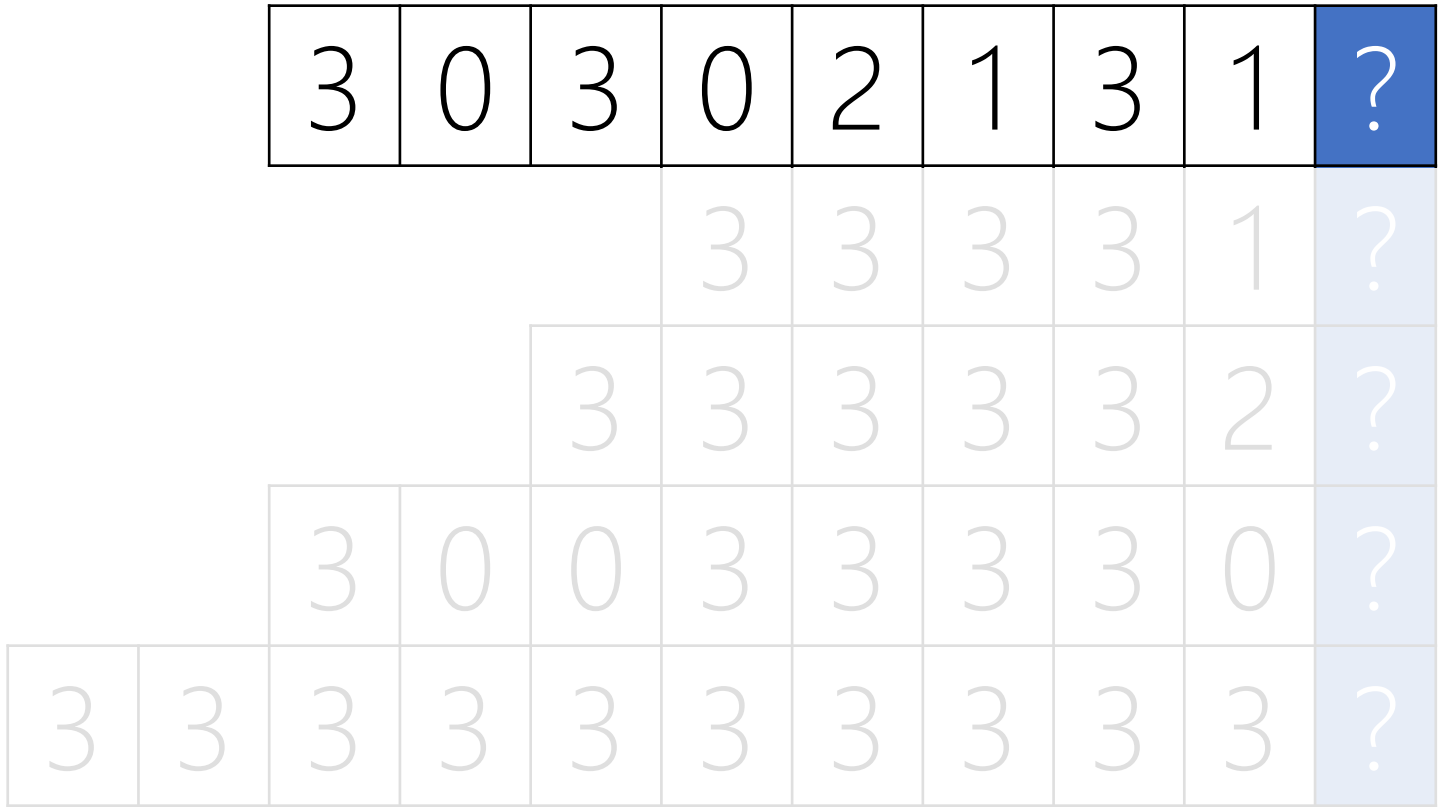
#Symbols=4
Radix-4
Base-4

4^3	4^2	4^1	4^0	
		2	0	$2\times4^1+0\times4^0=8$
		2	1	$2\times4^1+1\times4^0=9$
		2	2	$2\times4^1+2\times4^0=10$
		2	3	$2\times4^1+3\times4^0=11$
		3	0	$3\times4^1+0\times4^0=12$
		3	1	$3\times4^1+1\times4^0=13$
		3	2	$3\times4^1+2\times4^0=14$
		3	3	$3\times4^1+3\times4^0=15$
	1	0	0	$1\times4^2+0\times4^1+0\times4^0=16$

More Significant Position



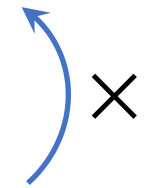
More Significant Position



More Significant Position

4^7	4^6	4^5	4^4	4^3	4^2	4^1	4^0	
3	0	3	0	2	1	3	1	

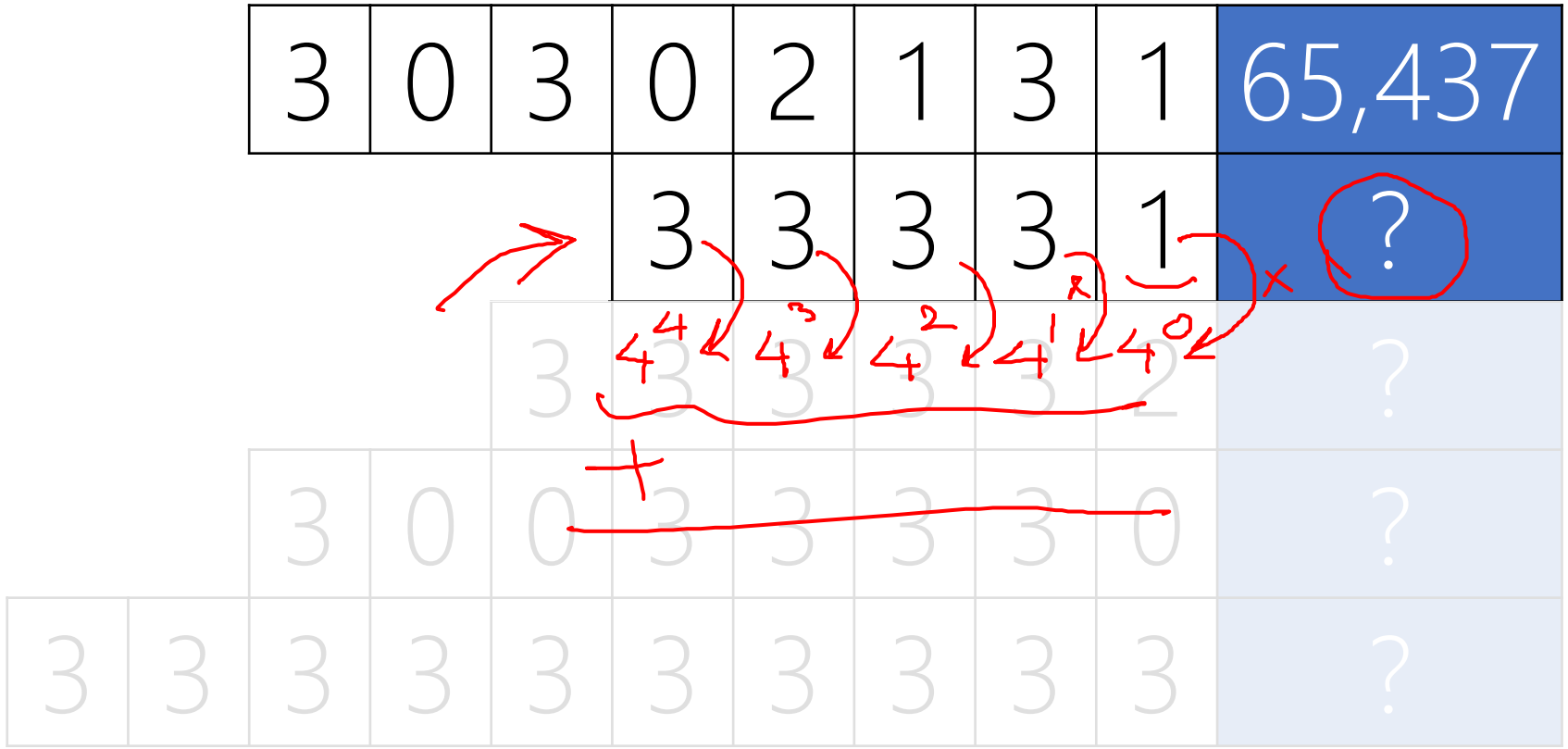
More Significant Position

4^7	4^6	4^5	4^4	4^3	4^2	4^1	4^0	
3	0	3	0	2	1	3	1	
3×4^7	0×4^6	3×4^5	0×4^4	2×4^3	1×4^2	3×4^1	1×4^0	

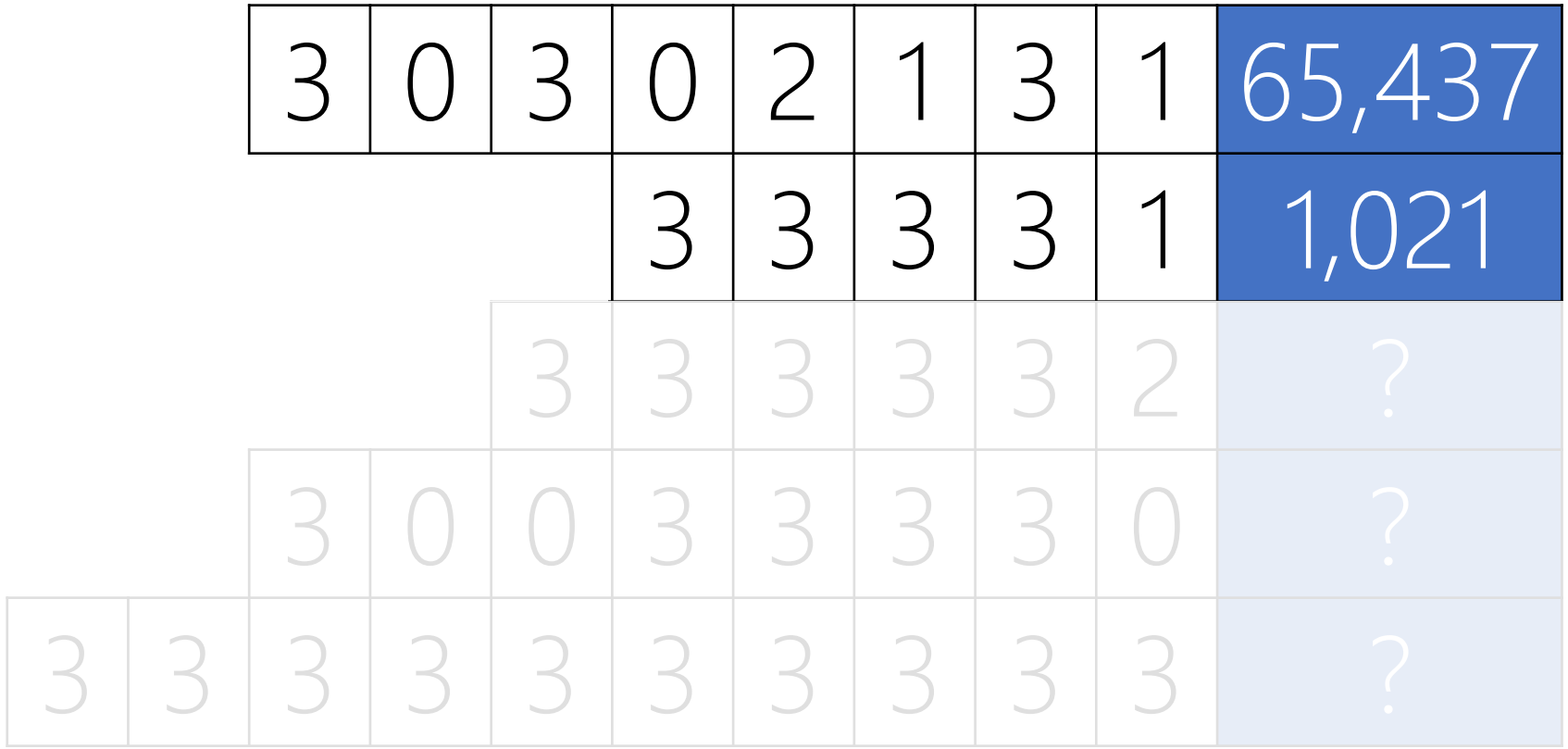
More Significant Position

4^7	4^6	4^5	4^4	4^3	4^2	4^1	4^0	
3	0	3	0	2	1	3	1	×
3×4^7	0×4^6	3×4^5	0×4^4	2×4^3	1×4^2	3×4^1	1×4^0	$\sum$
								65,437

More Significant Position



More Significant Position



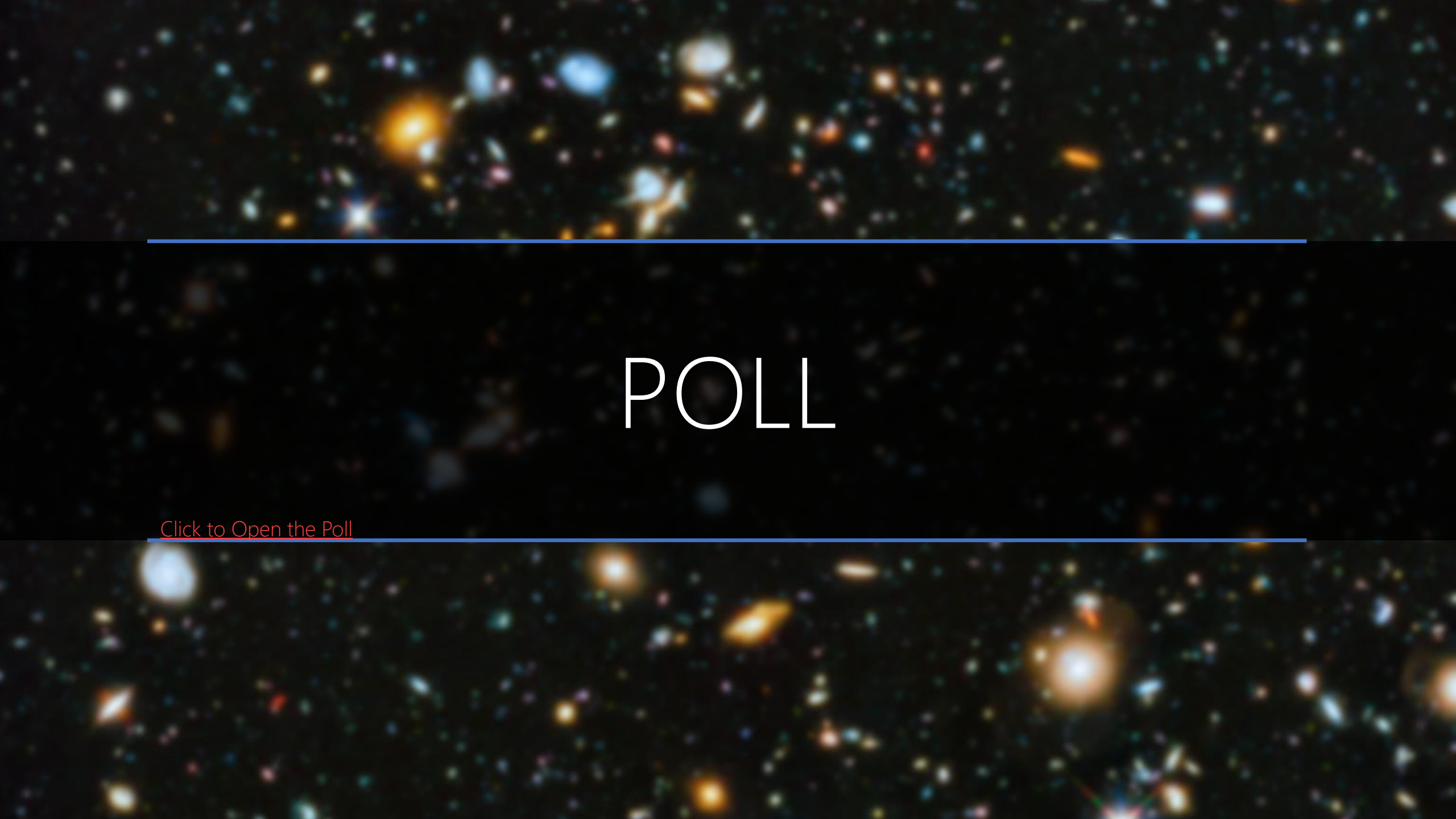
More Significant Position

		3	0	3	0	2	1	3	1	65,437
					3	3	3	3	1	1,021
				3	3	3	3	3	2	4,094
		3	0	0	3	3	3	3	0	50,172
3	3	3	3	3	3	3	3	3	3	1,048,575

More Significant Position

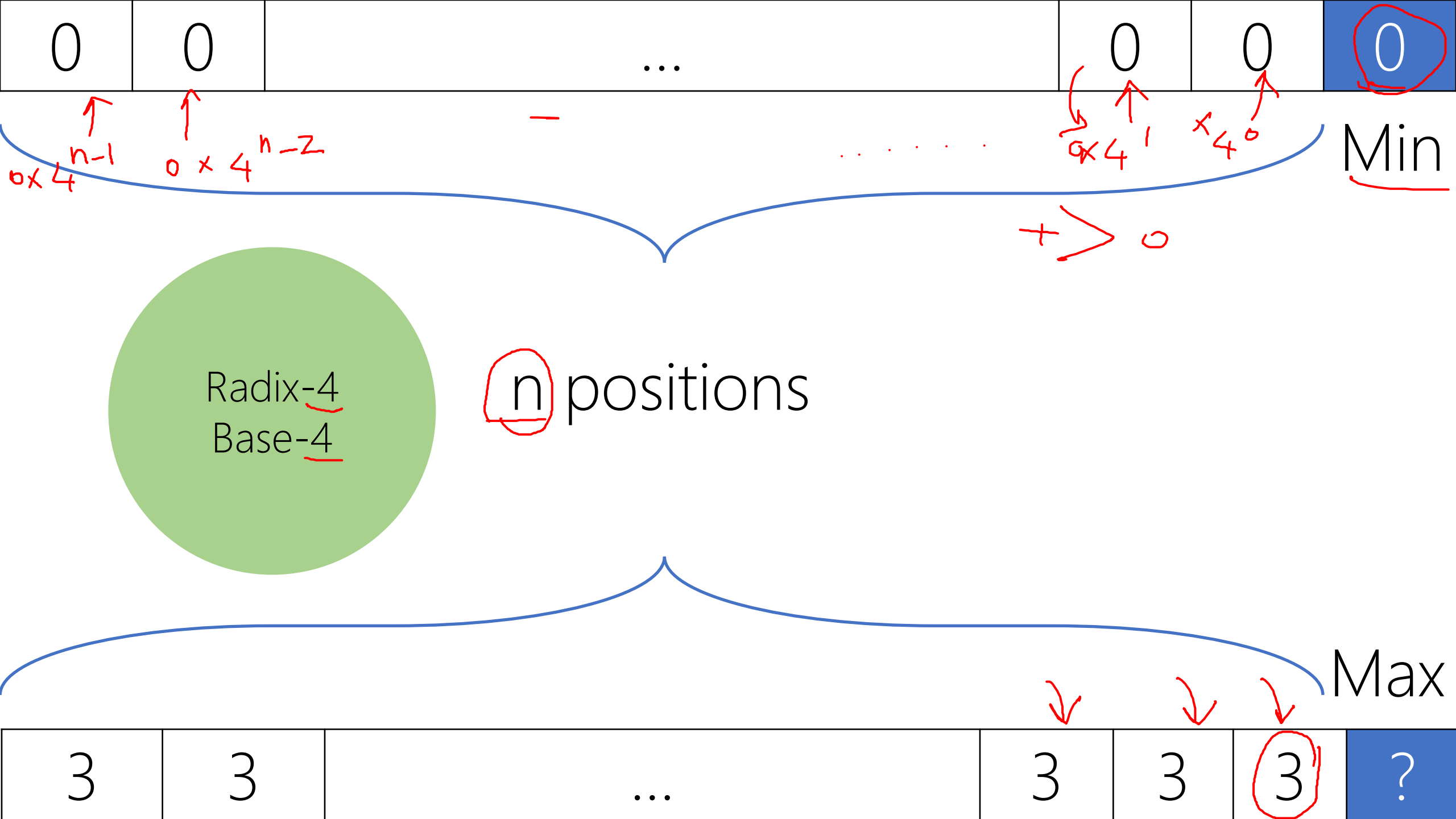
								Base-4	Hossein's Number System
3	0	3	0	2	1	3	1	65,437	-
			3	3	3	3	1	1,021	17
		3	3	3	3	3	2	4,094	22
	3	0	0	3	3	3	0	50,172	-
3	3	3	3	3	3	3	3	1,048,575	39

10



POLL

Click to Open the Poll


0
0
...
0
0
0
Min
Radix-4
Base-4
n positions
Max
3
3
...
3
3
3
?

$$N = 3 \times 4^{n-1} + 3 \times 4^{n-2} + \cdots + 3 \times 4^2 + 3 \times 4^1 + 3 \times 4^0$$

$$N = 3 \times (4^{n-1} + 4^{n-2} + \cdots + 4^2 + 4^1 + 4^0) \rightarrow \text{geometric series}$$

$$N = 3 \times \left(\frac{4^n - 1}{4 - 1}\right)$$

$$N = 4^n - 1$$

$$r^0 + r^1 + r^2 + \cdots + r^{n-1} = \frac{r^n - 1}{r - 1}$$

$4^n - 1$ Hossein's System

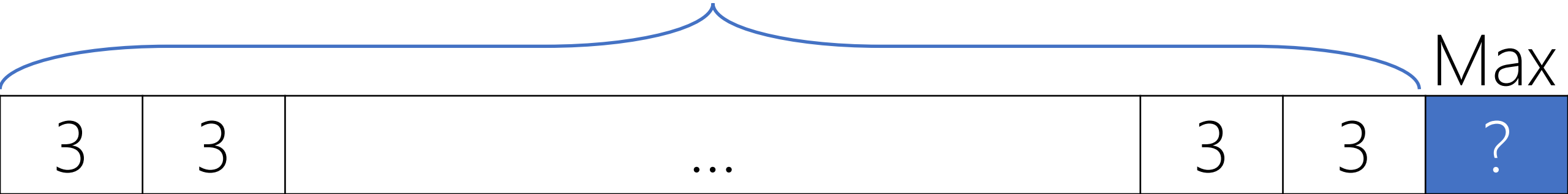
n positions

Max

4^{n-1}	4^{n-2}		4^2	4^1	4^0	
3	3	…	3	3	3	N

$$n = 10 \Rightarrow 4^{10} - 1 = 1{,}048{,}575$$

10 positions



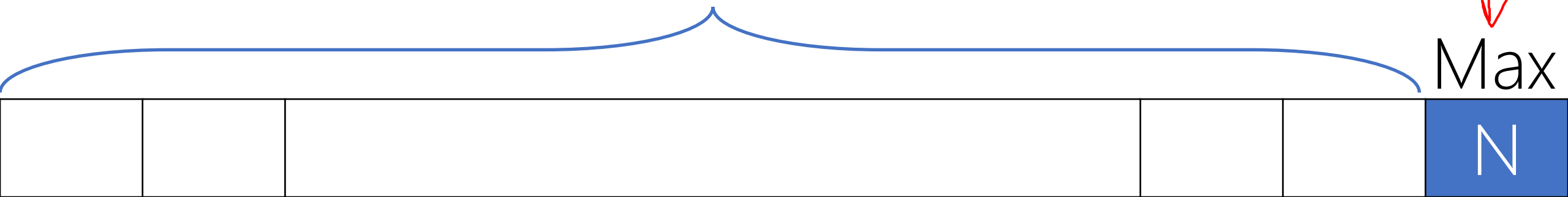
$$4^n - 1 = N$$

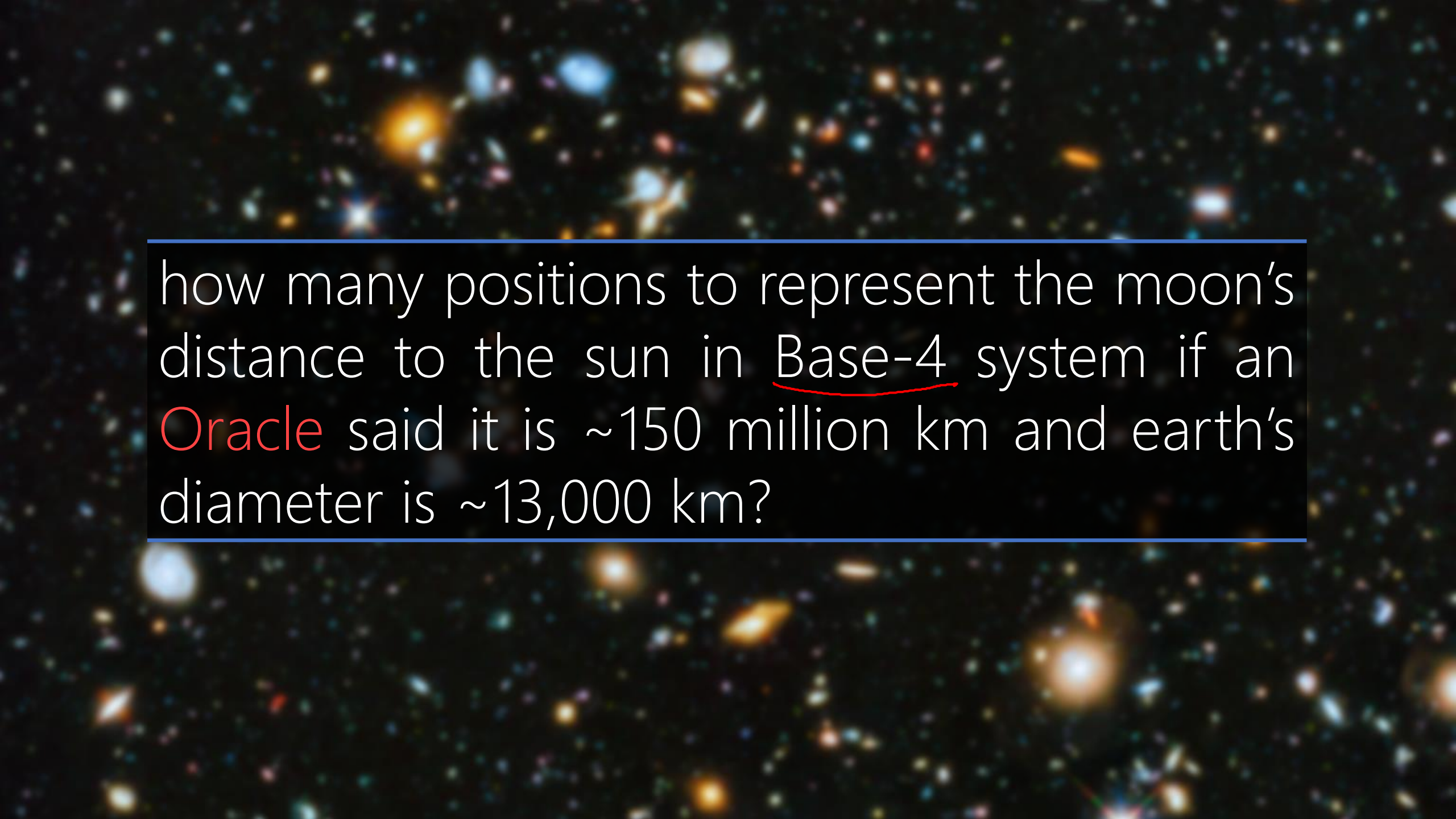
$$4^n = N + 1$$

$$\log_4 4^n = \log(N + 1)$$

$$n = \log_4(N + 1)$$

? positions



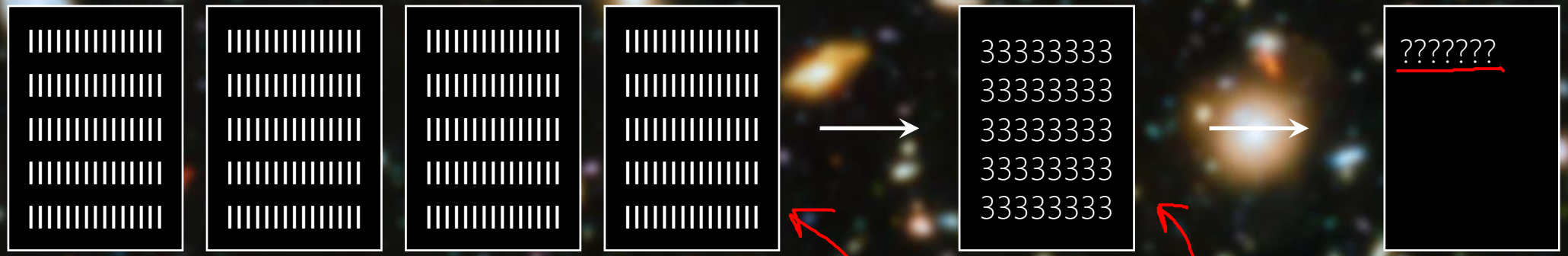

how many positions to represent the moon's distance to the sun in Base-4 system if an Oracle said it is ~150 million km and earth's diameter is ~13,000 km?

~150 million km ÷ ~13,000 km = ~12,000 Earth

N = 12,000

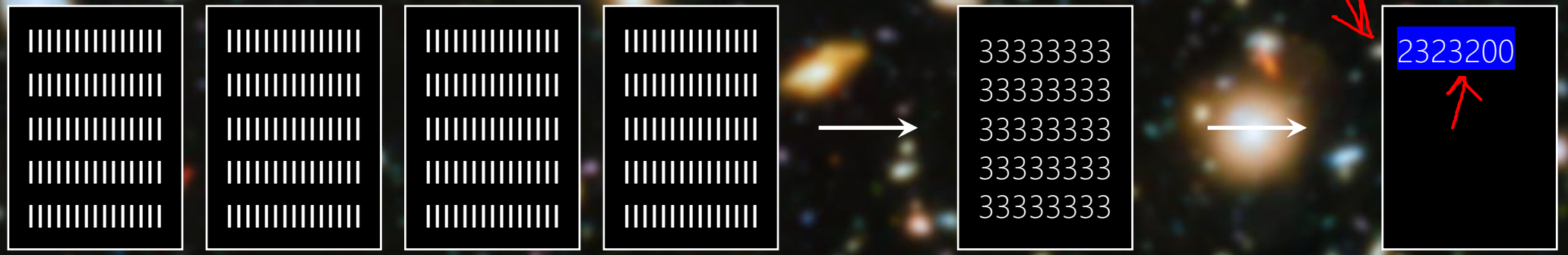
$n = \text{Log}_4 (12{,}000+1) = \text{Log}_{10}\ 12{,}001 \div \text{Log}_{10}\ 4 = 4 \div 0.6 = 6.79$

~ 7 positions



$$N = 12{,}000 \longrightarrow (2323200)_4$$

We'll see how to convert from decimal to base-4 or any other number systems later. Stay tuned!




QUESTION