

A cosmic background image featuring a dense field of galaxies in various colors (yellow, orange, blue, red) against a black space. Two horizontal blue lines are positioned above and below the central text.

CONVERSION

From Base-r to Base-r'

A diagram illustrating a transformation. On the left, a point cloud of white squares is enclosed in large white parentheses, with a subscript r below it. An arrow points to the right, where a point cloud of blue squares is enclosed in large blue parentheses, with a subscript r' below it.

we already knew that: sum of the powers of r

we already knew that: sum of the powers of r

Let $(N)_r$ be a radix- r (base- r) number in a positional weighting number system, then

$$(N)_r = (d_{n-1} r^{n-1} + \dots + d_0 r^0 . d_{-1} r^{-1} + d_{-2} r^{-2} + \dots + d_{-m} r^{-m})_{10}$$

where:

r = radix (base)

d_i = digit at position i , $0 \leq d_i \leq r - 1$

r^i = weight of position i

n = number of digits in integer part of N

m = number of digits in fraction part of N



Fraction Point

A diagram illustrating a mapping from a 10x10 grid of blue dots to a 5x5 grid of white dots. The 10x10 grid is labeled with a subscript 10, and the 5x5 grid is labeled with a subscript r. An arrow points from the 10x10 grid to the 5x5 grid, indicating a reduction or mapping process.

The background of the slide is a Cosmic Microwave Background (CMB) fluctuation map, showing a dense field of small, multi-colored spots (yellow, orange, blue, and red) against a black background, representing temperature variations in the early universe. A thin blue horizontal line is positioned above and below the central equation.
$$\left(\begin{smallmatrix} \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \end{smallmatrix} \right)_{10} \leftarrow \left(\begin{smallmatrix} \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \end{smallmatrix} \right)_{10}$$

What is the digit in the position with significance of 10^0 ?

(3 0 3 0 2 1 3 1)₁₀

What is the digit in the position with significance of 10^1 ?

(3 0 3 0 2 1 3 1)₁₀

What is the digit in the position with significance of 10^2 ?

(3 0 3 0 2 1 3 1)₁₀

What is the digit in the position with significance of 10^i ?

$$(30302131)_{10} \rightarrow 10^0 \rightarrow 1$$

$$(30302131)_{10} \rightarrow 10^1 \rightarrow 3$$

$$(30302131)_{10} \rightarrow 10^2 \rightarrow 1$$

$$(30302131)_{10} \rightarrow 10^3 \rightarrow 2$$

$$(30302131)_{10} \rightarrow 10^4 \rightarrow 0$$

$$(30302131)_{10} \rightarrow 10^5 \rightarrow 3$$

$$(30302131)_{10} \rightarrow 10^6 \rightarrow 0$$

$$(30302131)_{10} \rightarrow 10^7 \rightarrow 3$$

What is the digit in the position with significance of 10^i ?

$$(30302131)_{10} \rightarrow 10^0 \rightarrow 1$$

$$(3030213)_{10} \rightarrow 10^0 \rightarrow 3$$

$$(303021)_{10} \rightarrow 10^0 \rightarrow 1$$

$$(30302)_{10} \rightarrow 10^0 \rightarrow 2$$

$$(3030)_{10} \rightarrow 10^0 \rightarrow 0$$

$$(303)_{10} \rightarrow 10^0 \rightarrow 3$$

$$(30)_{10} \rightarrow 10^0 \rightarrow 0$$

$$(3)_{10} \rightarrow 10^0 \rightarrow 3$$

Divide by 10?

(3 0 3 0 2 1 3 1)₁₀

$$30,302,131 \div 10 = 3,030,213$$

$$30,302,131 \% 10 = 1$$

$$\frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1$$

Divide by 10?

(3 0 3 0 2 1 3 1)₁₀

$$3,030,213 \div 10 = 303,021$$

$$3,030,213 \% 10 = 3$$

$$\frac{3,030,213}{10} = 303,021 \text{ } r \text{ } 3$$

Divide by 10?

(3 0 3 0 2 1 3 1)₁₀

$$303,021 \div 10 = 30,302$$

$$303,021 \% 10 = 1$$

$$\frac{303,021}{10} = 30,302 \text{ } r \text{ } 1$$

What is the digit in the position with significance of 10^0 ?

$$\frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1$$

Remainder of the 0+1 division by 10!

What is the digit in the position with significance of 10^1 ?

$$\frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1$$
$$\frac{3,030,213}{10} = 303,021 \text{ } r \text{ } 3$$

Remainder of the $1+1$ division by 10 !

What is the digit in the position with significance of 10^2 ?

$$\begin{array}{r} 30,302,131 \\ \hline 10 \end{array} = 3,030,213 \text{ } r \text{ } 1$$

$$\begin{array}{r} 3,030,213 \\ \hline 10 \end{array} = 303,021 \text{ } r \text{ } 3$$

$$\begin{array}{r} 303,021 \\ \hline 10 \end{array} = 30,302 \text{ } r \text{ } 1$$

Remainder of the $2+1$ division by 10!

What is the digit in the position with significance of 10^3 ?

$$\begin{array}{l} \frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1 \\ \quad \frac{\quad}{10} = 303,021 \text{ } r \text{ } 3 \\ \qquad \frac{\quad}{10} = 30,302 \text{ } r \text{ } 1 \\ \qquad \qquad \frac{\quad}{10} = 3,030 \text{ } r \text{ } 2 \end{array}$$

Remainder of the 3+1 division by 10!

What is the digit in the position with significance of 10^4 ?

$$\begin{array}{l} \frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1 \\ \quad \frac{\quad}{10} = 303,021 \text{ } r \text{ } 3 \\ \qquad \frac{\quad}{10} = 30,302 \text{ } r \text{ } 1 \\ \qquad \qquad \frac{\quad}{10} = 3,030 \text{ } r \text{ } 2 \\ \qquad \qquad \qquad \frac{\quad}{10} = 303 \text{ } r \text{ } 0 \end{array}$$

Remainder of the $4+1$ division by $10!$

What is the digit in the position with significance of 10^5 ?

$$\begin{array}{l} \frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1 \\ \quad \frac{\quad}{10} = 303,021 \text{ } r \text{ } 3 \\ \qquad \frac{\quad}{10} = 30,302 \text{ } r \text{ } 1 \\ \qquad \qquad \frac{\quad}{10} = 3,030 \text{ } r \text{ } 2 \\ \qquad \qquad \qquad \frac{\quad}{10} = 303 \text{ } r \text{ } 0 \\ \qquad \qquad \qquad \qquad \frac{\quad}{10} = 30 \text{ } r \text{ } 3 \end{array}$$

Remainder of the $5+1$ division by $10!$

What is the digit in the position with significance of 10^6 ?

$$\begin{array}{l} \frac{30,302,131}{10} = 3,030,213 \text{ } r \text{ } 1 \\ \quad \frac{\quad}{10} = 303,021 \text{ } r \text{ } 3 \\ \qquad \frac{\quad}{10} = 30,302 \text{ } r \text{ } 1 \\ \qquad \qquad \frac{\quad}{10} = 3,030 \text{ } r \text{ } 2 \\ \qquad \qquad \qquad \frac{\quad}{10} = 303 \text{ } r \text{ } 0 \\ \qquad \qquad \qquad \qquad \frac{\quad}{10} = 30 \text{ } r \text{ } 3 \\ \qquad \qquad \qquad \qquad \qquad \frac{\quad}{10} = 3 \text{ } r \text{ } 0 \end{array}$$

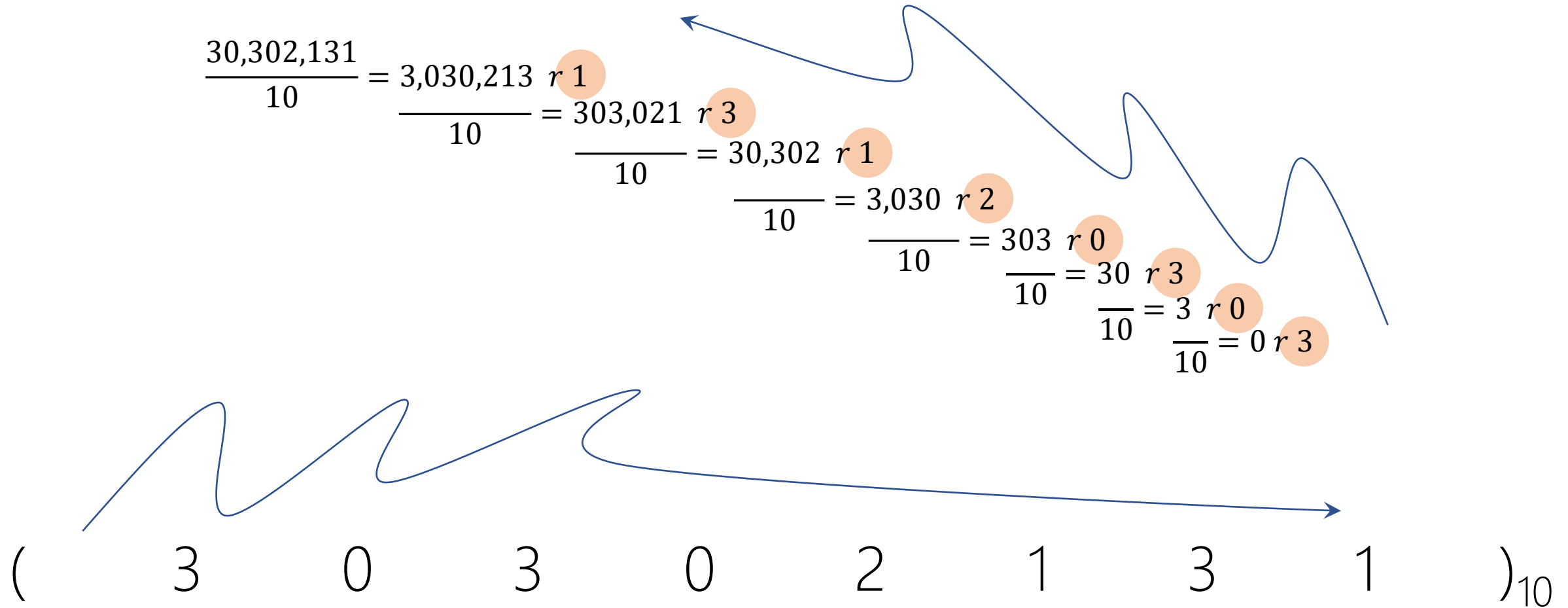
Remainder of the $6+1$ division by 10!

What is the digit in the position with significance of 10^7 ?

$$\begin{aligned}\frac{30,302,131}{10} &= 3,030,213 \text{ } r \text{ } 1 \\ \frac{3,030,213}{10} &= 303,021 \text{ } r \text{ } 3 \\ \frac{303,021}{10} &= 30,302 \text{ } r \text{ } 1 \\ \frac{30,302}{10} &= 3,030 \text{ } r \text{ } 2 \\ \frac{3,030}{10} &= 303 \text{ } r \text{ } 0 \\ \frac{303}{10} &= 30 \text{ } r \text{ } 3 \\ \frac{30}{10} &= 3 \text{ } r \text{ } 0 \\ \frac{3}{10} &= 0 \text{ } r \text{ } 3\end{aligned}$$

Remainder of the $7+1$ division by 10 !

What is the digit in the position with significance of 10^i ?



What is the digit in the position with significance of 16^0 ?

$$\frac{30,302,131}{16} = 1,893,883 \text{ } r \text{ } 3$$

Remainder of the 0+1 division by 16!

What is the digit in the position with significance of 16^1 ?

$$\frac{30,302,131}{16} = 1,893,883 \text{ r } 3$$
$$\frac{\quad}{16} = 118,367 \text{ r } 11$$

Remainder of the $1+1$ division by 16!

What is the digit in the position with significance of 16^2 ?

$$\begin{array}{l} \frac{30,302,131}{16} = 1,893,883 \text{ r } 3 \\ \quad \frac{\quad}{16} = 118,367 \text{ r } 11 \\ \qquad \frac{\quad}{16} = 7,397 \text{ r } 15 \end{array}$$

Remainder of the $2+1$ division by 16!

What is the digit in the position with significance of 16^3 ?

$$\begin{array}{l} \frac{30,302,131}{16} = 1,893,883 \text{ r } 3 \\ \quad \frac{\quad}{16} = 118,367 \text{ r } 11 \\ \qquad \frac{\quad}{16} = 7,397 \text{ r } 15 \\ \qquad \qquad \frac{\quad}{16} = 462 \text{ r } 5 \end{array}$$

Remainder of the 3+1 division by 16!

What is the digit in the position with significance of 16^4 ?

$$\begin{array}{l} \frac{30,302,131}{16} = 1,893,883 \text{ r } 3 \\ \quad \frac{1,893,883}{16} = 118,367 \text{ r } 11 \\ \qquad \frac{118,367}{16} = 7,397 \text{ r } 15 \\ \qquad \qquad \frac{7,397}{16} = 462 \text{ r } 5 \\ \qquad \qquad \qquad \frac{462}{16} = 28 \text{ r } 14 \end{array}$$

Remainder of the $4+1$ division by 16!

What is the digit in the position with significance of 16^5 ?

$$\begin{array}{l} \frac{30,302,131}{16} = 1,893,883 \text{ r } 3 \\ \quad \frac{}{16} = 118,367 \text{ r } 11 \\ \qquad \frac{}{16} = 7,397 \text{ r } 15 \\ \qquad \qquad \frac{}{16} = 462 \text{ r } 5 \\ \qquad \qquad \qquad \frac{}{16} = 28 \text{ r } 14 \\ \qquad \qquad \qquad \qquad \frac{}{16} = 1 \text{ r } 12 \end{array}$$

Remainder of the $5+1$ division by 16!

What is the digit in the position with significance of 16^6 ?

$$\begin{aligned}\frac{30,302,131}{16} &= 1,893,883 \text{ r } 3 \\ \frac{1,893,883}{16} &= 118,367 \text{ r } 11 \\ \frac{118,367}{16} &= 7,397 \text{ r } 15 \\ \frac{7,397}{16} &= 462 \text{ r } 5 \\ \frac{462}{16} &= 28 \text{ r } 14 \\ \frac{28}{16} &= 1 \text{ r } 12 \\ \frac{1}{16} &= 0 \text{ r } 1\end{aligned}$$

Remainder of the $6+1$ division by 16!

What is the digit in the position with significance of 16^6 ?

$$\begin{aligned} \frac{30,302,131}{16} &= 1,893,883 \text{ } r \text{ } 3 \\ \frac{1,893,883}{16} &= 118,367 \text{ } r \text{ } 11 \\ \frac{118,367}{16} &= 7,397 \text{ } r \text{ } 15 \\ \frac{7,397}{16} &= 462 \text{ } r \text{ } 5 \\ \frac{462}{16} &= 28 \text{ } r \text{ } 14 \\ \frac{28}{16} &= 1 \text{ } r \text{ } 12 \\ \frac{1}{16} &= 0 \text{ } r \text{ } 1 \end{aligned}$$

(1 12 14 5 15 11 3)₁₆

What is the digit in the position with significance of 16^6 ?

$$\begin{aligned}\frac{30,302,131}{16} &= 1,893,883 \text{ r } 1 \\ \frac{1,893,883}{16} &= 118,367 \text{ r } 11 \\ \frac{118,367}{16} &= 7,397 \text{ r } 0 \\ \frac{7,397}{16} &= 462 \text{ r } 5 \\ \frac{462}{16} &= 28 \text{ r } 14 \\ \frac{28}{16} &= 1 \text{ r } 12 \\ \frac{1}{16} &= 0 \text{ r } 1\end{aligned}$$

(1 12 14 5 15 11 3)₁₆

$$1, 2, 3, 4, 5, 6, 7, 8, 9, A = 9 + 1 = (10)_{10}$$

$$B = A + 1 = (11)_{10}$$

$$C = B + 1 = (12)_{10}$$

$$D = C + 1 = (13)_{10}$$

$$E = D + 1 = (14)_{10}$$

$$F = E + 1 = (15)_{10}$$

What is the digit in the position with significance of 16^6 ?

$$\begin{aligned}\frac{30,302,131}{16} &= 1,893,883 \text{ r } 1 \\ \frac{1,893,883}{16} &= 118,367 \text{ r } 11 \\ \frac{118,367}{16} &= 7,397 \text{ r } 0 \\ \frac{7,397}{16} &= 462 \text{ r } 5 \\ \frac{462}{16} &= 28 \text{ r } 14 \\ \frac{28}{16} &= 1 \text{ r } 12 \\ \frac{1}{16} &= 0 \text{ r } 1\end{aligned}$$

(1 C E 5 F B 3)₁₆

What is the digit in the position with significance of 8^i ?

Quotient	Remainder
$30,302,131 \div 8$	3
$3787766 \div 8$	6
$473470 \div 8$	6
$59183 \div 8$	7
$7397 \div 8$	5
$924 \div 8$	4
$115 \div 8$	3
$14 \div 8$	6
$1 \div 8$	1
0	



$(1CE5FB3)_{16}$
 $(30,302,131)_{10}$
 $(163457663)_8$

Diagram illustrating a mapping from a 10x10 grid of blue squares to a 4x4 grid of white squares. The mapping is indicated by a large white arrow pointing from the 10x10 grid to the 4x4 grid. The 10x10 grid is labeled with a subscript 10, and the 4x4 grid is labeled with a subscript 4.

What is the digit in the position with significance of 4^i ?

Quotient	Remainder
$30,302,131 \div 4$	3
$7575532 \div 4$	0
$1893883 \div 4$	3
$473470 \div 4$	2
$118367 \div 4$	3
$29591 \div 4$	3
$7397 \div 4$	1
$1849 \div 4$	1
$462 \div 4$	2
$115 \div 4$	3
$28 \div 4$	0
$7 \div 4$	3
$1 \div 4$	1
0	



$(1CE5FB3)_{16}$

$(30,302,131)_{10}$

$(163457663)_8$

$(1303211332303)_4$

What is the digit in the position with significance of 2^i ?

Quotient	Remainder
30,302,131 ÷ 2	1
15151065 ÷ 2	1
7575532 ÷ 2	0
3787766 ÷ 2	0
1893883 ÷ 2	1
946941 ÷ 2	1
473470 ÷ 2	0
236735 ÷ 2	1
118367 ÷ 2	1
59183 ÷ 2	1
29591 ÷ 2	1
14795 ÷ 2	1
7397 ÷ 2	1
3698 ÷ 2	0
1849 ÷ 2	1
924 ÷ 2	0
462 ÷ 2	0
231 ÷ 2	1
115 ÷ 2	1
57 ÷ 2	1
28 ÷ 2	0
14 ÷ 2	0
7 ÷ 2	1
3 ÷ 2	1
1 ÷ 2	1
0	



$(1CE5FB3)_{16}$

$(30,302,131)_{10}$

$(163457663)_8$

$(1303211332303)_4$

$(111001110010111110110011)_2$

[illegible]

A diagram illustrating a transformation. On the left, a white point cloud is enclosed in large parentheses with a subscript r . An arrow points to the right, where a blue point cloud is enclosed in large parentheses with a subscript r' . The point clouds are arranged in a roughly circular pattern.



$$\begin{aligned}
 (1CE5FB3)_{16} &\rightarrow 1 \times 16^6 + C \times 16^5 + E \times 16^4 + 5 \times 16^3 + F \times 16^2 + B \times 16^1 + 3 \times 16^0 \\
 &\rightarrow 1 \times 16^6 + 12 \times 16^5 + 14 \times 16^4 + 5 \times 16^3 + 15 \times 16^2 + 11 \times 16^1 + 3 \times 16^0 \\
 &\rightarrow (30,302,131)_{10}
 \end{aligned}$$

Quotient	Remainder
$30,302,131 \div 8$	3
$3787766 \div 8$	6
$473470 \div 8$	6
$59183 \div 8$	7
$7397 \div 8$	5
$924 \div 8$	4
$115 \div 8$	3
$14 \div 8$	6
$1 \div 8$	1
0	



$$\rightarrow (163457663)_8$$

The background of the slide is a deep space image showing a vast field of galaxies. These galaxies appear as bright, colorful spots in various shapes and sizes, including spirals, ellipticals, and irregular forms, scattered across a dark, star-filled sky. Two thin, horizontal blue lines are positioned above and below the central text.

FRACTION CONVERSION

What is the digit in the position with significance of 10^{-i} ?

$$(0.26501)_{10} \rightarrow 10^{-1} \rightarrow 2$$

$$(0.26501)_{10} \rightarrow 10^{-2} \rightarrow 6$$

$$(0.26501)_{10} \rightarrow 10^{-3} \rightarrow 5$$

$$(0.26501)_{10} \rightarrow 10^{-4} \rightarrow 0$$

$$(0.26501)_{10} \rightarrow 10^{-5} \rightarrow 1$$

What is the digit in the position with significance of 10^{-i} ?

$$(0.26501)_{10} \rightarrow 10^{-1} \rightarrow 2$$

$$(0.6501)_{10} \rightarrow 10^{-1} \rightarrow 6$$

$$(0.501)_{10} \rightarrow 10^{-1} \rightarrow 5$$

$$(0.01)_{10} \rightarrow 10^{-1} \rightarrow 0$$

$$(0.1)_{10} \rightarrow 10^{-1} \rightarrow 1$$

Multiply by 10?

(0 . 2 6 5 0 1)₁₀

$$0.26501 \times 10 = 2.6501$$

Multiply by 10?

(0 . 2 6 5 0 1)₁₀

$$0.6501 \times 10 = 6.501$$

Fraction	Result	Integer Part
0.26501×10	2.6501	2
0.6501×10	6.501	6
0.501×10	5.01	5
0.01×10	0.1	0
0.1×10	1.0	1
0		

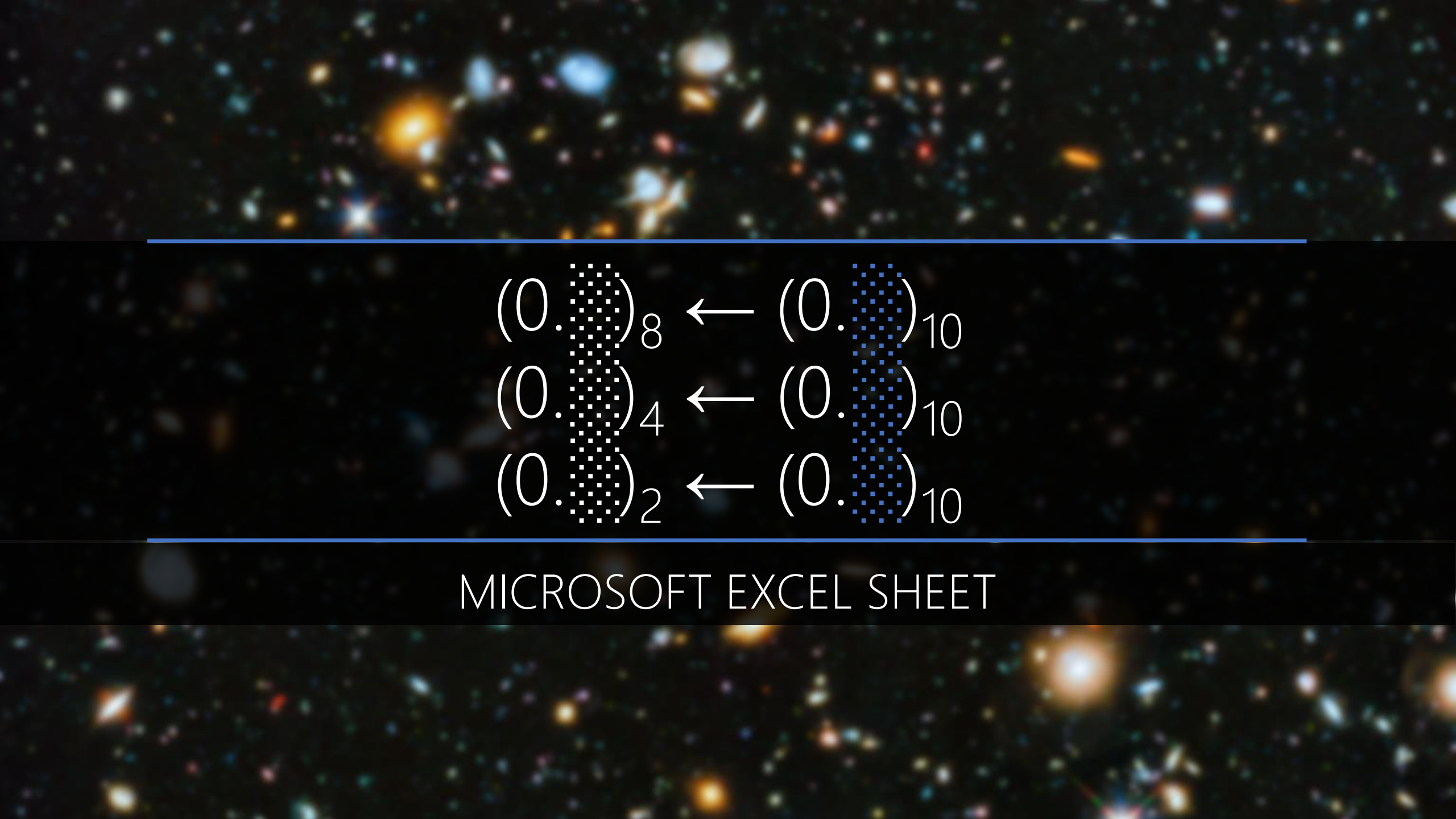


$$(0.\overset{\text{white}}{\underset{\text{white}}{\square}}_{\text{white}})_{16} \leftarrow (0.\overset{\text{blue}}{\underset{\text{blue}}{\square}}_{\text{blue}})_{10}$$

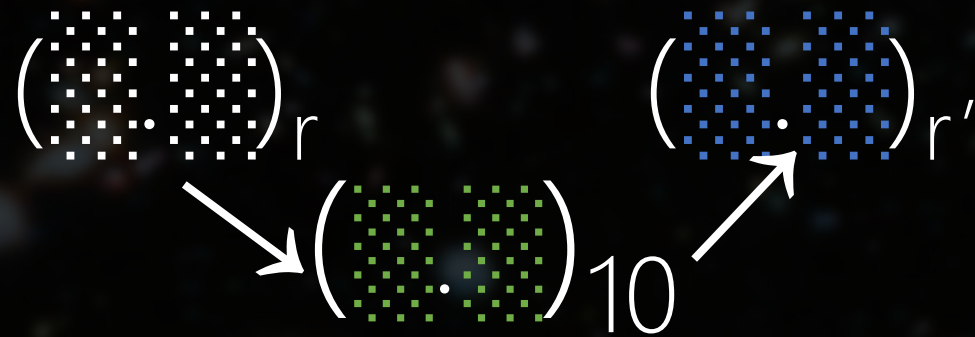
Fraction	Result	Integer Part
0.26501×16	4.24016	4
0.24016×16	3.84256	3
0.84256×16	13.48096	13 = D
0.48096×16	7.69536	7
0.69536×16	11.12576	11 = B
0.12576×16	2.01216	2
0.01216×16	0.19456	0
0.194560006×16	3.11296	3
0.1129601×16	1.807362	1
0.807361603×16	12.91779	12 = C
0.917785645×16	14.68457	14 = E
0.684570313×16	10.95313	10 = A
0.953125×16	15.25	15 = F
0.25×16	4	4
0	0	0



$$(0.26501)_{10} \rightarrow (0.43D7B2031CEAF40)_{16}$$


$$\begin{aligned} (0.\text{[white dots]})_8 &\leftarrow (0.\text{[blue dots]})_{10} \\ (0.\text{[white dots]})_4 &\leftarrow (0.\text{[blue dots]})_{10} \\ (0.\text{[white dots]})_2 &\leftarrow (0.\text{[blue dots]})_{10} \end{aligned}$$

MICROSOFT EXCEL SHEET



Integer Part independent of Fraction Part!



Integer Part

$$\left(\cdot \begin{array}{c} \text{white dotted square} \end{array} \right)_r \rightarrow \left(\cdot \begin{array}{c} \text{green dotted square} \end{array} \right)_{10} \rightarrow \left(\cdot \begin{array}{c} \text{blue dotted square} \end{array} \right)_{r'}$$

Fraction Part

$(30,302,131.26501)_{10}$

$(163457663.20753....)_8$

Quotient	Remainder
$30,302,131 \div 8$	3
$3787766 \div 8$	6
$473470 \div 8$	6
$59183 \div 8$	7
$7397 \div 8$	5
$924 \div 8$	4
$115 \div 8$	3
$14 \div 8$	6
$1 \div 8$	1
0	

Fraction	Result	Integer Part
0.26501×8	2.12008	2
0.12008×8	0.96064	0
0.96064×8	7.68512	7
0.68512×8	5.48096	5
0.48096×8	3.84768	3
0.84768×8	6.78144	6
0.78144×8	6.25152	6
0.25152×8	2.01216	2
0.01216×8	0.09728	0
...

A cosmic background image featuring a dense field of galaxies in various colors (yellow, orange, blue, red) against a dark space. Two horizontal blue lines are positioned above and below the main text.

BASE-2 \rightarrow BASE-[$2^2, 2^3, 2^4, 2^n$]

LECTURE ASSIGNMENT

A cosmic background image featuring a dense field of galaxies in various colors (yellow, orange, blue, red) against a dark space. Two horizontal blue lines are positioned above and below the main text.

BASE-2 \leftarrow BASE-[$2^2, 2^3, 2^4, 2^n$]

LECTURE ASSIGNMENT



<https://planetcalc.com/862/>

A deep-field astronomical image showing a vast field of galaxies in various colors (yellow, orange, blue, red) against a black background. Two horizontal blue lines are positioned above and below the central text.

ARITHMETIC

A cosmic background image featuring a dense field of galaxies in various colors (yellow, orange, blue, and red) against a black space. Two horizontal blue lines are positioned above and below the central text.

ADDITION

+ Base-16		2	A	.	E	5	4
	4	B	F	.	2	B	
				.			

PADDING

+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.			

+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.			4

+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B=11	0
				.		16	4

$$\frac{16}{16} = 1 \text{ } r \text{ } 0$$

					1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.		0	4

$$\frac{16}{16} = 1 \text{ } r \text{ } 0$$

					1		
+ Base-16	0	2	A	.	E=14	5	4
	4	B	F	.	2	B	0
				.	17	0	4

$$\frac{17}{16} = 1 \text{ r } 1$$

			1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.	1	0	4

$$\frac{17}{16} = 1 \text{ r } 1$$

			1		1		
+ Base-16	0	2	A=10	.	E	5	4
	4	B	F=15	.	2	B	0
			26	.	1	0	4

$$\frac{26}{16} = 1 \text{ } r \text{ } 10$$

		1	1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
			10	.	1	0	4

$$\frac{26}{16} = 1 \text{ } r \text{ } 10$$

		1	1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
			A	.	1	0	4

		1	1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B=11	F	.	2	B	0
		14	A	.	1	0	4

		1	1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
		E	A	.	1	0	4

		1	1		1		
+ Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
	4	E	A	.	1	0	4



MULTIPLY

The background of the slide is a deep space image showing a dense field of galaxies and stars. The galaxies are in various stages of evolution, with some appearing as bright, smooth ellipsoids and others as more complex, irregular shapes. The stars are small, point-like sources of light, scattered across the dark background. The overall color palette is dominated by the blues and oranges of the galaxies, with the white and yellow of the stars providing contrast.

SUBTRACTION

— Base-16		2	A	.	E	5	4
	4	B	F	.	2	B	
				.			

PADDING

— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.			

— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
				.			4

— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B=11	0
				.			4

BORROW					-1 → +16		
— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B=11	0
				.		= 5+16-11 = 10 = A	4

					-1	+16		
— Base-16	0	2	A	.	E	5	4	
	4	B	F	.	2	B	0	
				.		A	4	

					-1	+16		
— Base-16	0	2	A	.	E=14	5	4	
	4	B	F	.	2	B	0	
				.	B=11	A	4	

					-1	+16		
— Base-16	0	2	A=10	.	E	5	4	
	4	B	F=15	.	2	B	0	
				.	B	A	4	

		-1 → +16			-1	+16	
— Base-16	0	2	A=10	.	E	5	4
	4	B	F=15	.	2	B	0
			B=11	.	B	A	4

		-1	+16		-1	+16	
— Base-16	0	2	A	.	E	5	4
	4	B=11	F	.	2	B	0
			B	.	B	A	4

		+16					
	-1	-1	+16		-1	+16	
— Base-16	0	2	A	.	E	5	4
	4	B=11	F	.	2	B	0
		6	B	.	B	A	4

		+16						
	-1	-1	+16			-1	+16	
— Base-16	0	2	A	.	E	5	4	
	4	B	F	.	2	B	0	
		6	B	.	B	A	4	

	+16	+16					
-1	-1	-1	+16		-1	+16	
— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
	B=11	6	B	.	B	A	4

	+16	+16					
-1	-1	-1	+16		-1	+16	
— Base-16	0	2	A	.	E	5	4
	4	B	F	.	2	B	0
	B	6	B	.	B	A	4

02A.E54 < 4BF.2B0

	+16	+16						
-1	-1	-1	+16			-1	+16	
—	0	2	A	.		E	5	4
Base-16	4	B	F	.		2	B	0
	B	6	B	.		B	A	4

02A.E54 < 4BF.2B0

Last Borrow → Negative Result

	+16	+16	+16		+16	+16	
-1	-1	-1	-1		-1	-1	+16
1	0	0	0	.	0	0	0
—	B ₌₁₁	6	B ₌₁₁	.	B ₌₁₁	A ₌₁₀	4
Base-16	4	9	4	.	4	5	C ₌₁₂

$$= (2A.E54)_{16} - (4BF.2B0)_{16} = (B6B.BA4)_{16} \text{ and last borrow!}$$

$$= (1000.000)_{16} - (B6B.BA4)_{16}$$

$$= (494.45C)_{16}$$

$$= \text{---} (494.45C)_{16}$$

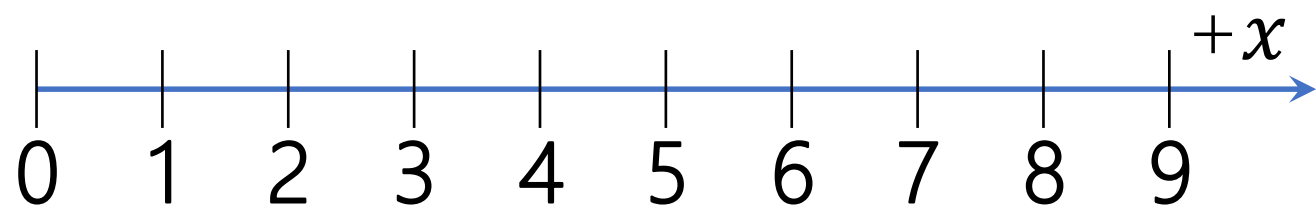
A deep-field astronomical image showing a vast field of galaxies and stars against a black background. The galaxies are of various shapes and sizes, some appearing as bright, diffuse clouds, others as more compact, point-like sources. The colors range from bright yellow and orange to deep blue and purple. Two thin, horizontal blue lines are positioned above and below the central text.

DIVISION

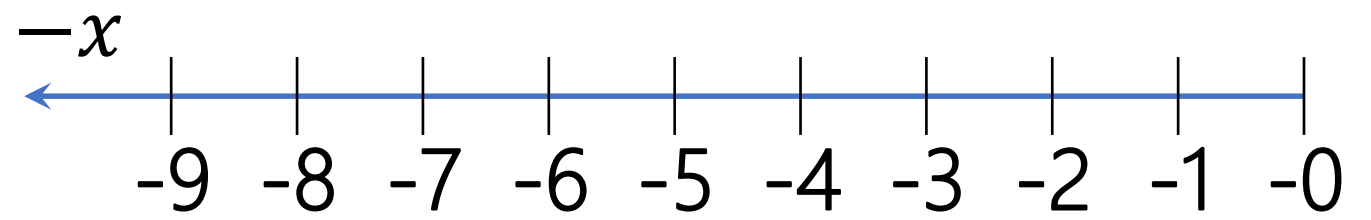
A cosmic background image featuring a dense field of galaxies in various colors (yellow, orange, blue, white) against a black space. Two horizontal blue lines are positioned above and below the central text.

NEGATIVE NUMBERS

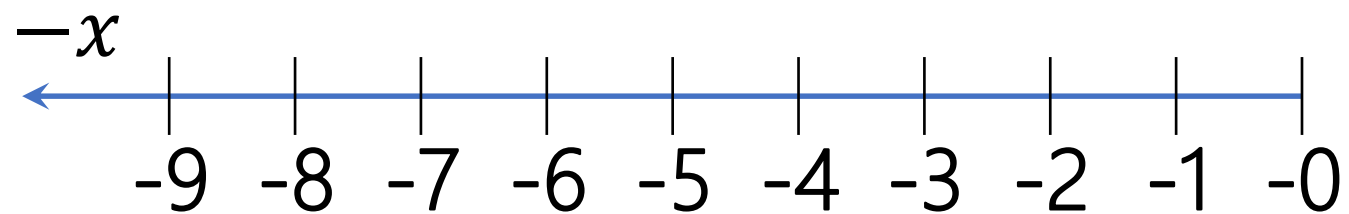
10^0
0
1
2
3
4
5
6
7
8
9



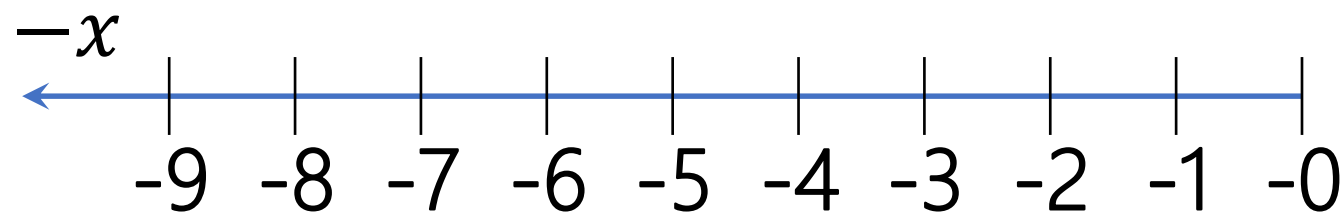
10^1	10^0
—	0
—	1
—	2
—	3
—	4
—	5
—	6
—	7
—	8
—	9



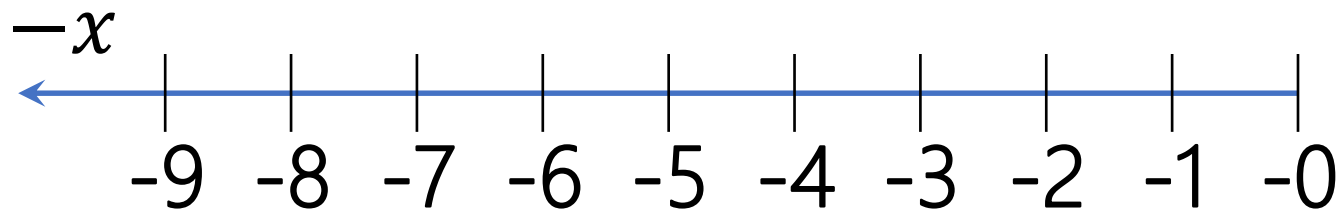
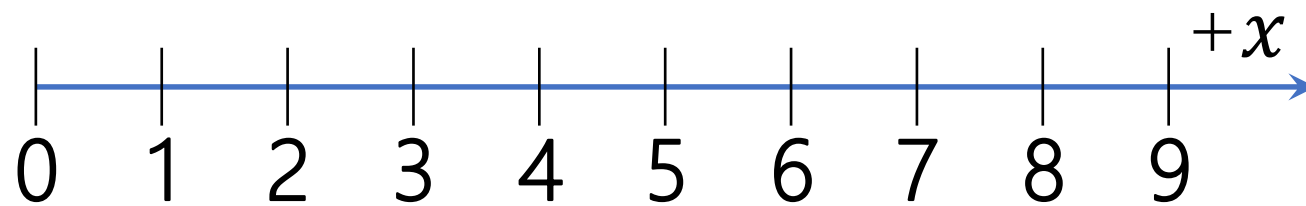
10^1	10^0
1	0
1	1
1	2
1	3
1	4
1	5
1	6
1	7
1	8
1	9



10^1	10^0
Nonzero	0
Nonzero	1
Nonzero	2
Nonzero	3
Nonzero	4
Nonzero	5
Nonzero	6
Nonzero	7
Nonzero	8
Nonzero	9

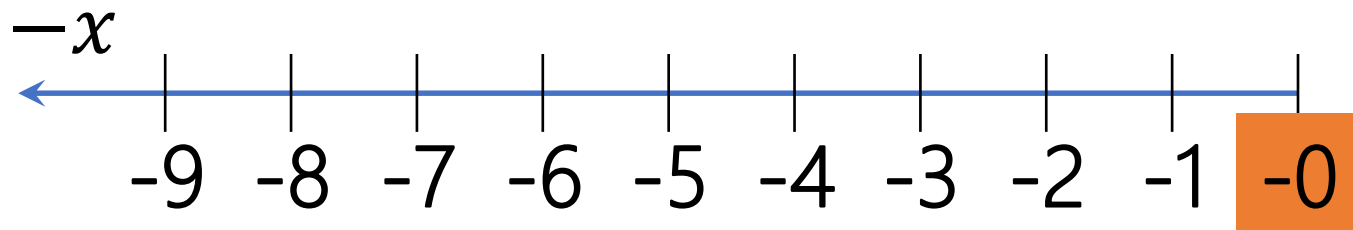
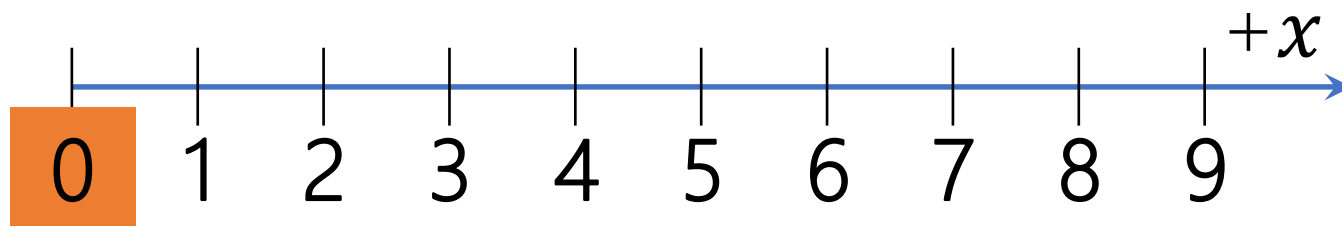


10^1	10^0
1	0
1	1
1	2
1	3
1	4
1	5
1	6
1	7
1	8
1	9



10^1	10^0
0	0
0	1
0	2
0	3
0	4
0	5
0	6
0	7
0	8
0	9

10^1	10^0
1	0
1	1
1	2
1	3
1	4
1	5
1	6
1	7
1	8
1	9



10^1	10^0
0	0
0	1
0	2
0	3
0	4
0	5
0	6
0	7
0	8
0	9

A deep-field astronomical image showing a vast field of galaxies. The galaxies are of various shapes and sizes, including spiral, elliptical, and irregular forms. They are colored in shades of blue, orange, and white, set against a dark, star-filled background. Two horizontal blue lines frame the central text.

SIGNED MAGNITUDE

r^{n-1}	r^{n-2}	r^{n-3}	...	r^2	r^1	r^0
0	Positive Numbers					
Nonzero	Negative Numbers					



Signed

Magnitude

Give up left most position for sign!

r^{n-1}	r^{n-2}	r^{n-3}	...	r^2	r^1	r^0
0	Positive Numbers					
Nonzero	Negative Numbers					

$$\text{Min} = -(r^{n-1} - 1) \leftarrow \cancel{0} \rightarrow \text{Max} = r^{n-1} - 1 = \cancel{r^n - 1}$$