Introduction to Binary and Hexadecimal



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Module Goals



Introduce the need for binary
Review – Primary School Math
Counting in Binary
Converting Binary to Decimal
Converting Decimal to Binary
Hexadecimal



Binary 101



Base 10







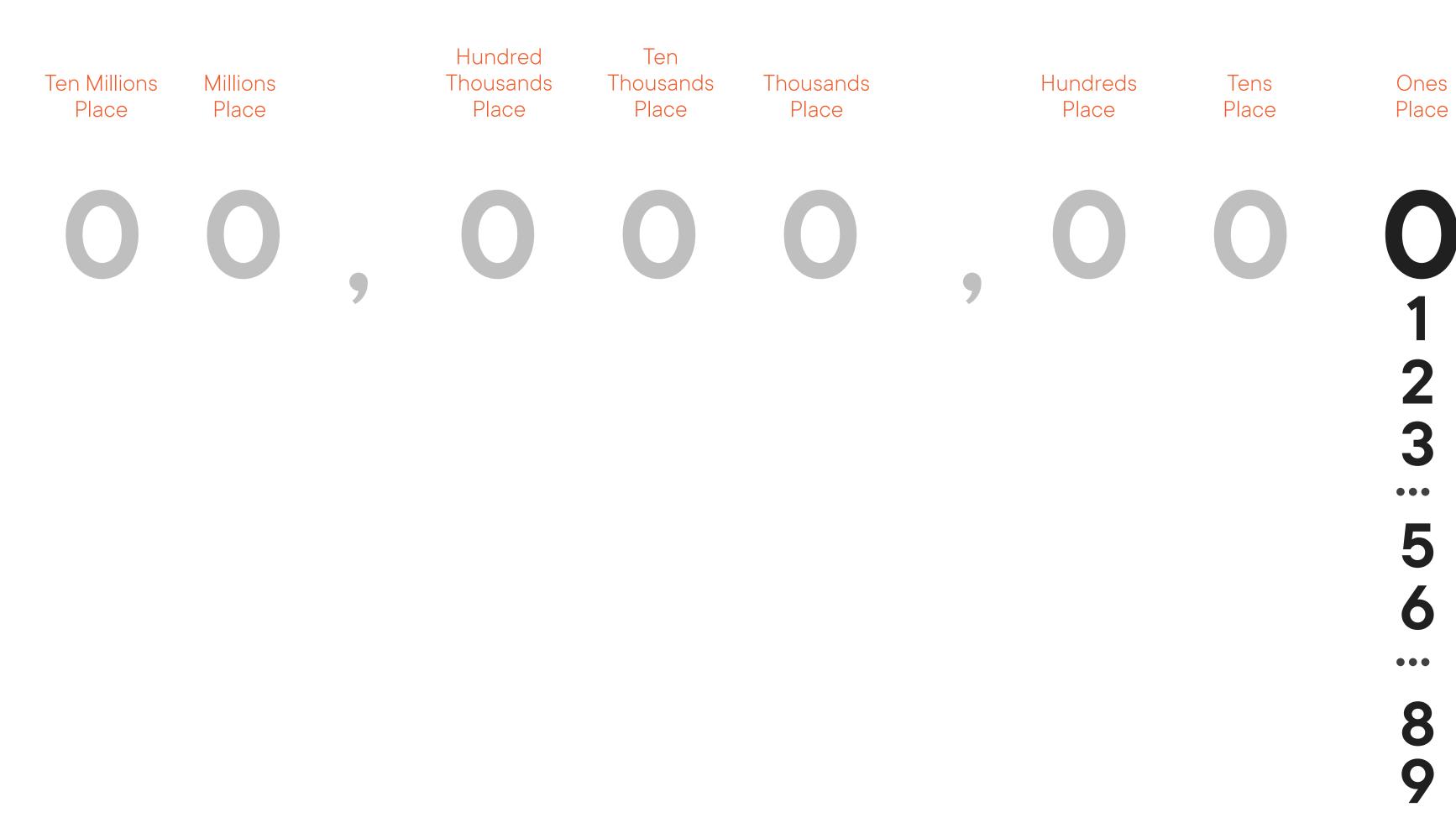
Binary

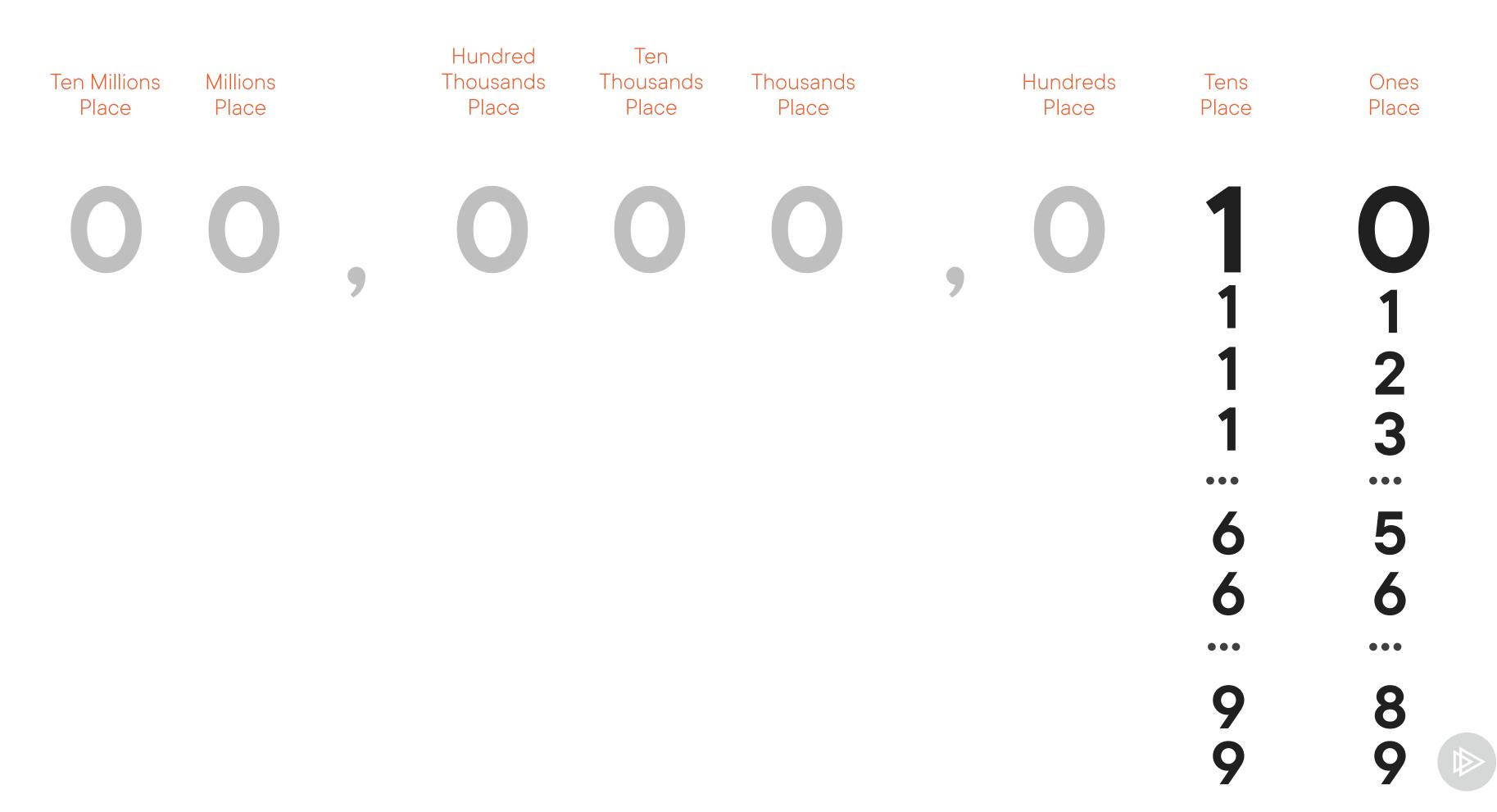


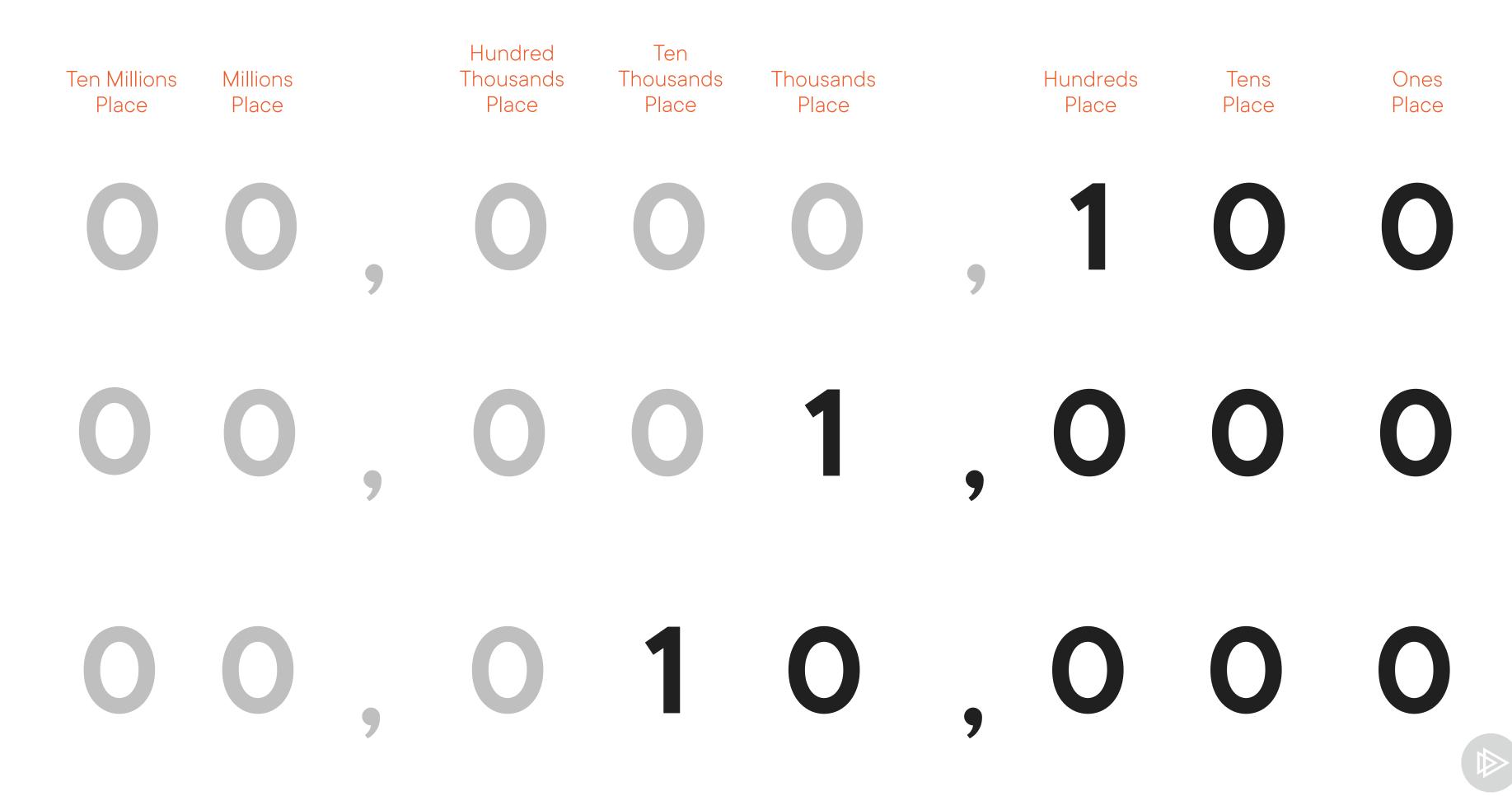


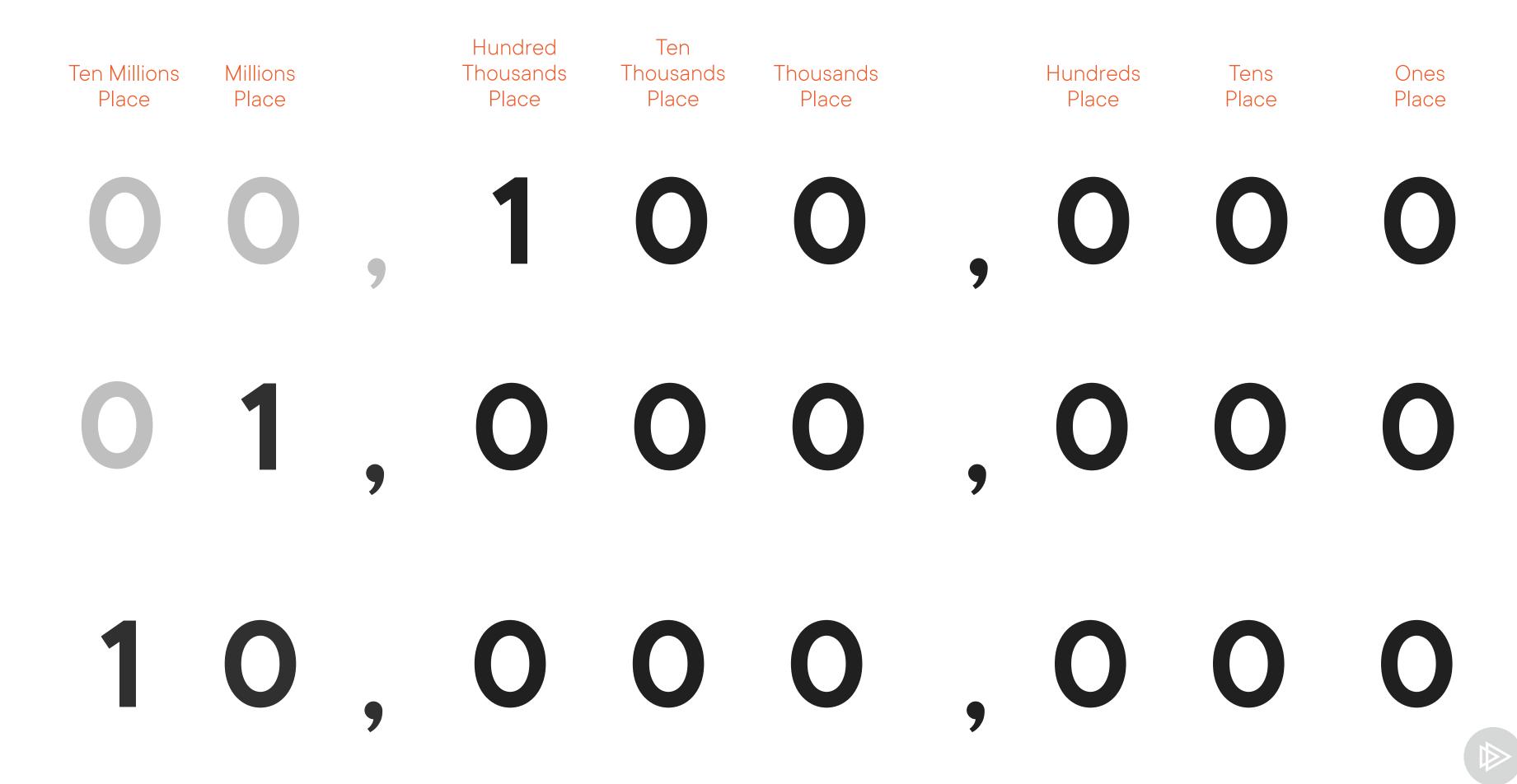
EXAMPLE

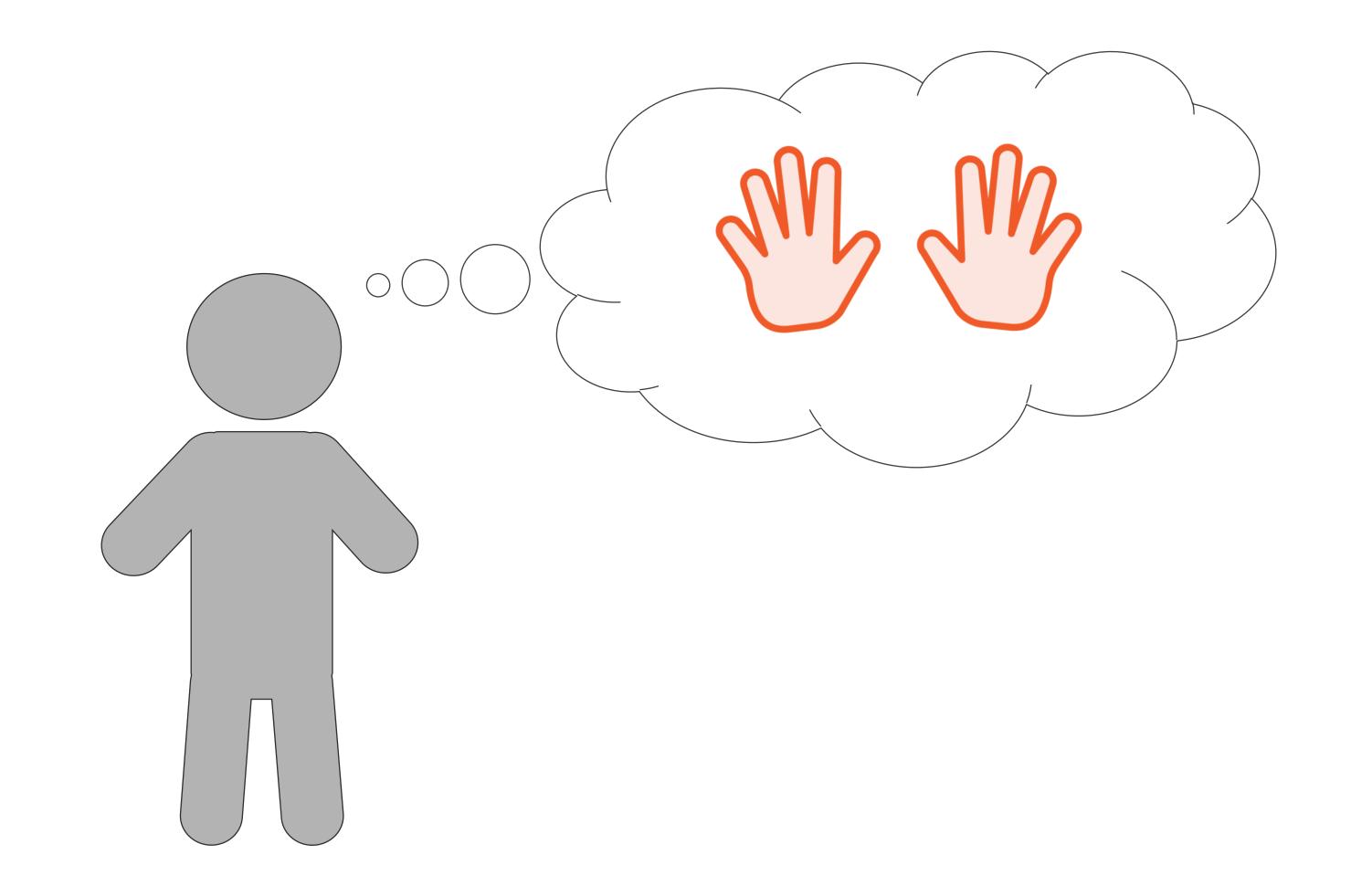


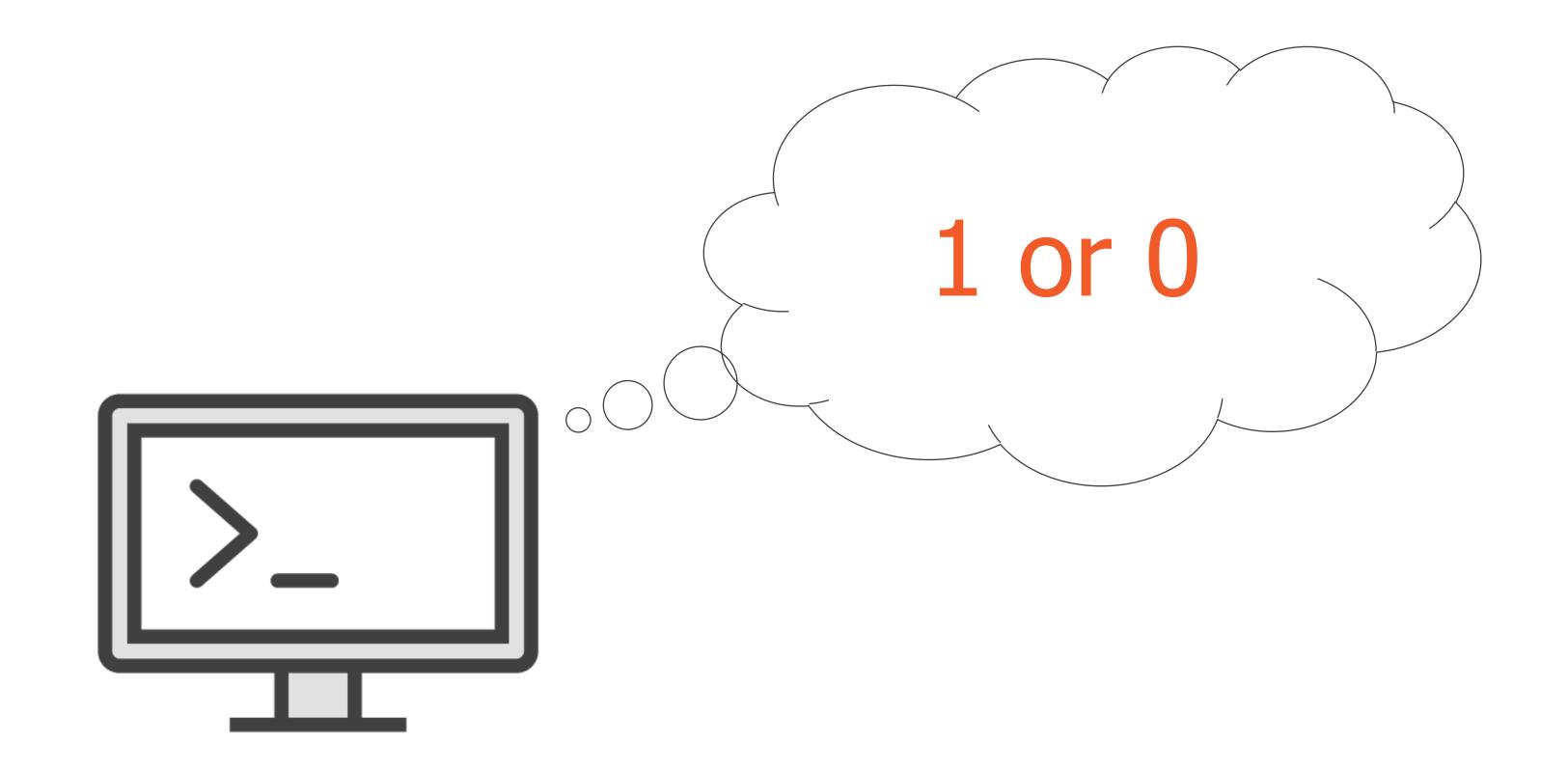












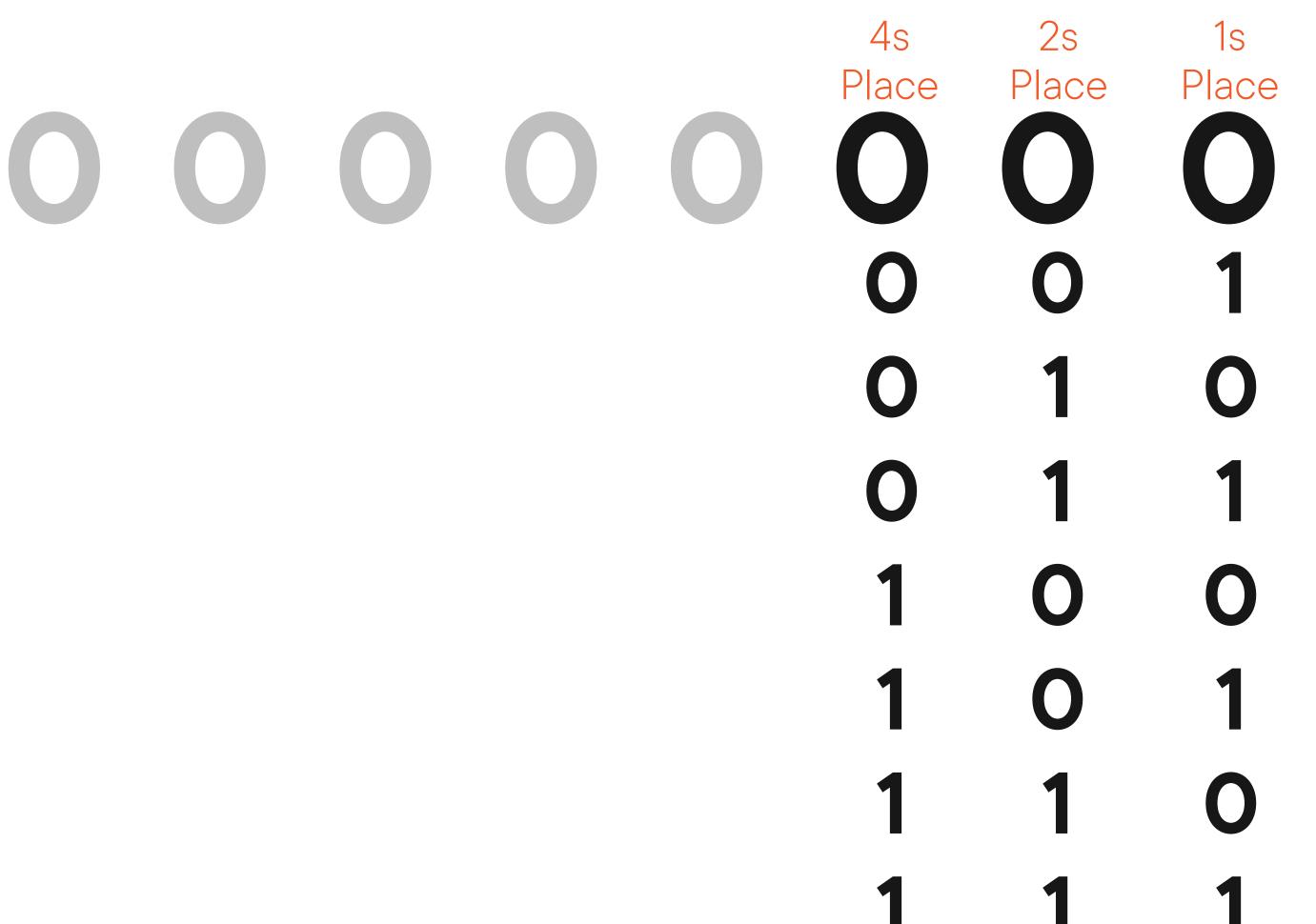




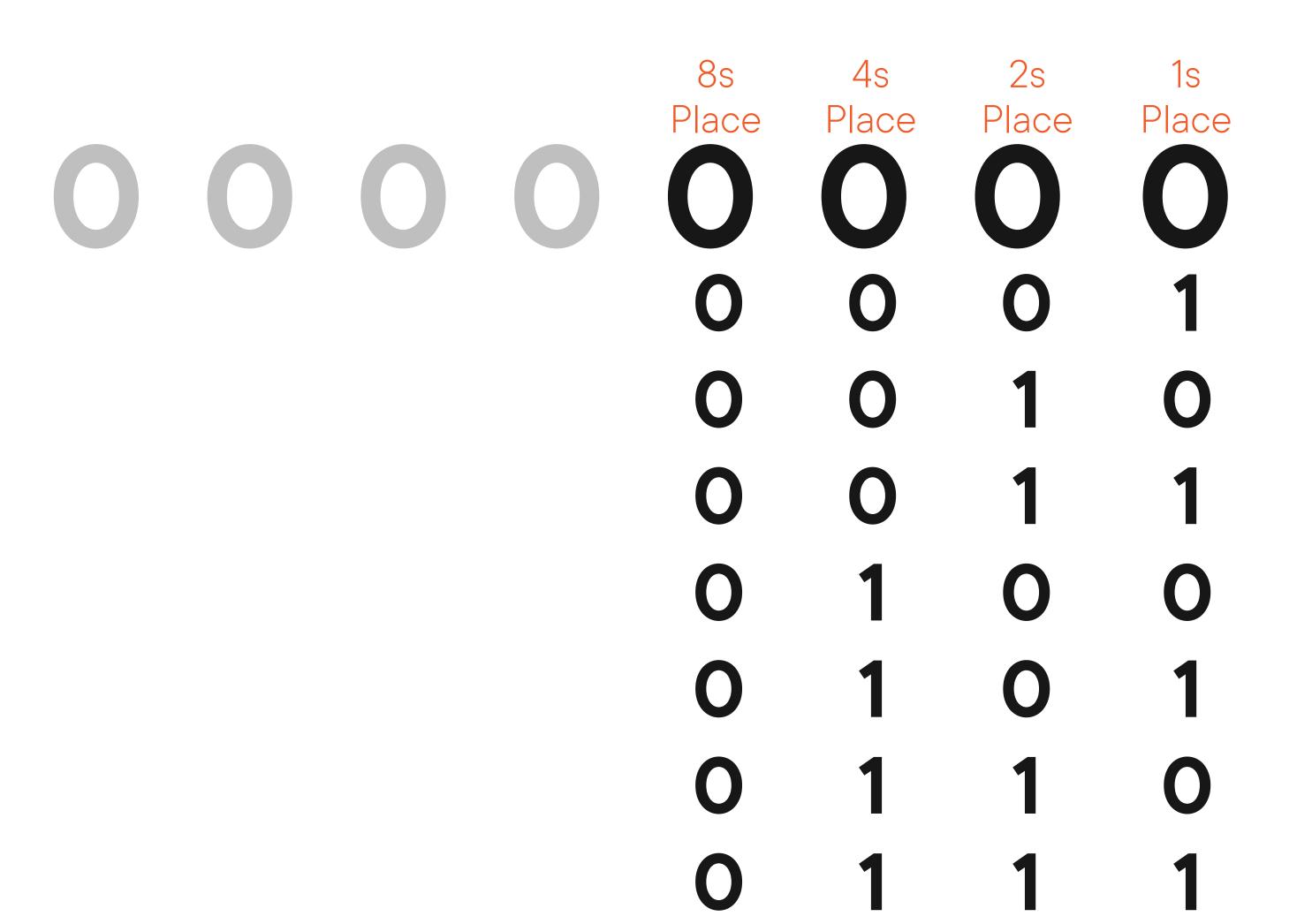
1s



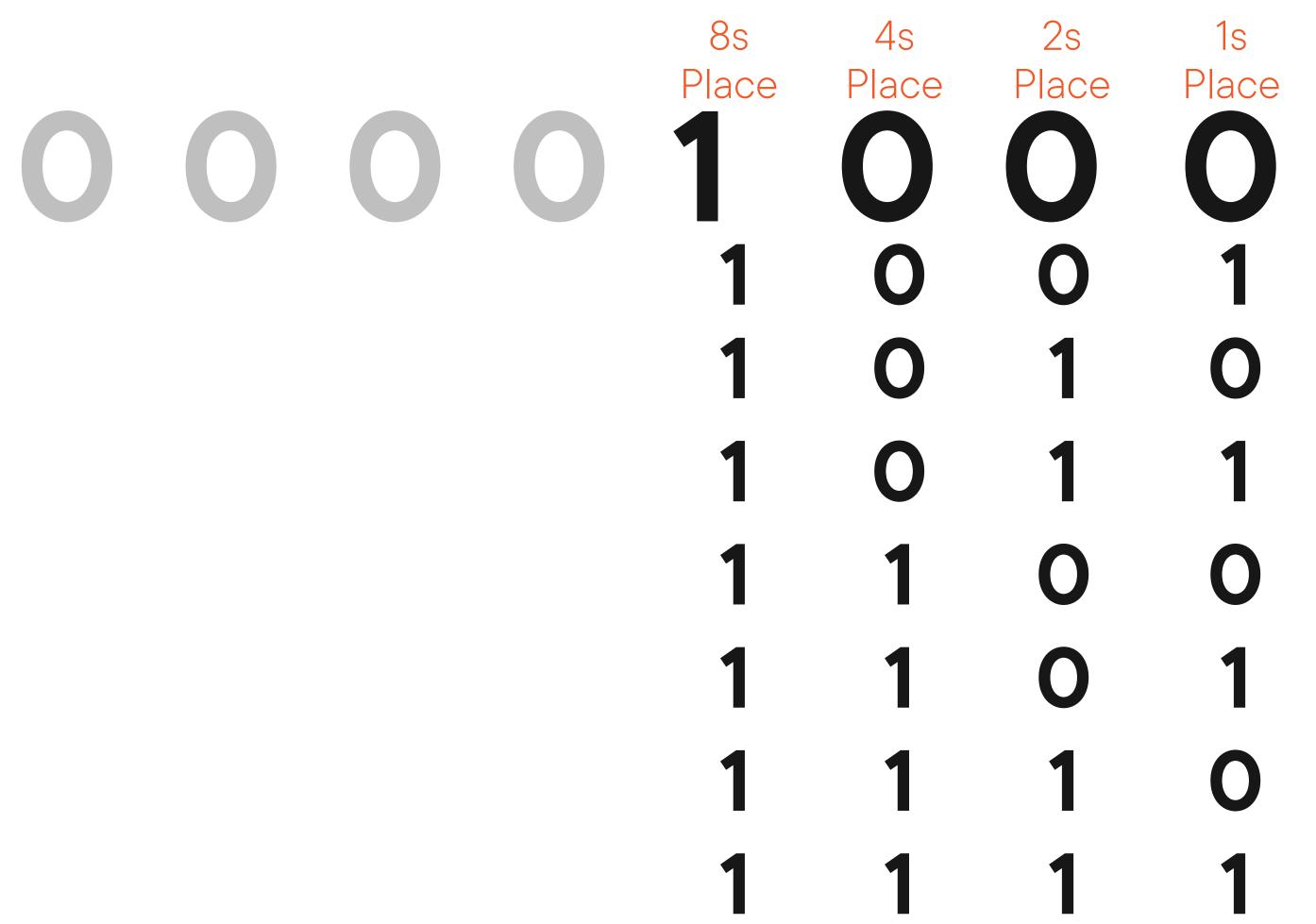
















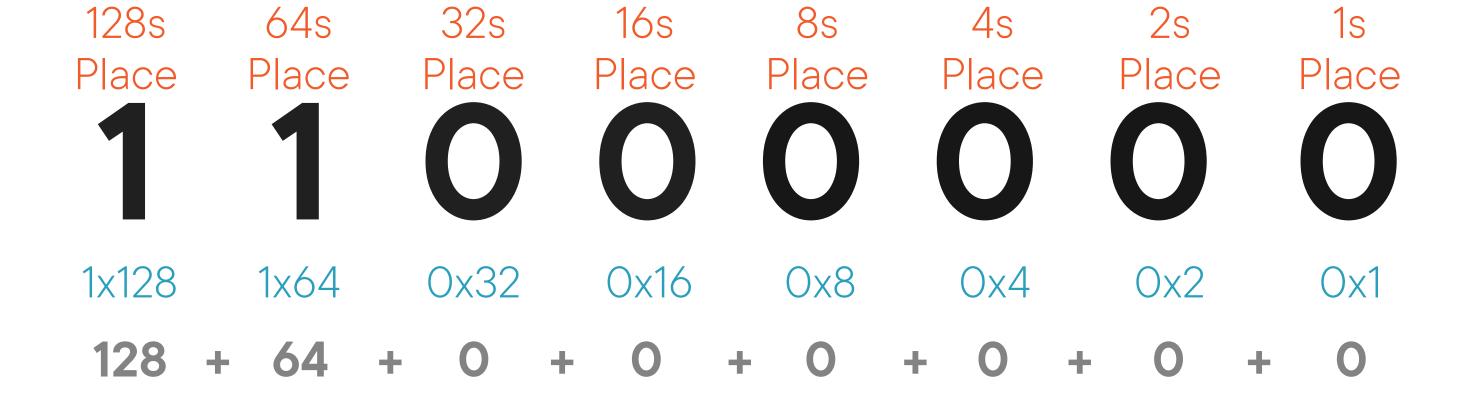






Converting Binary to Decimal









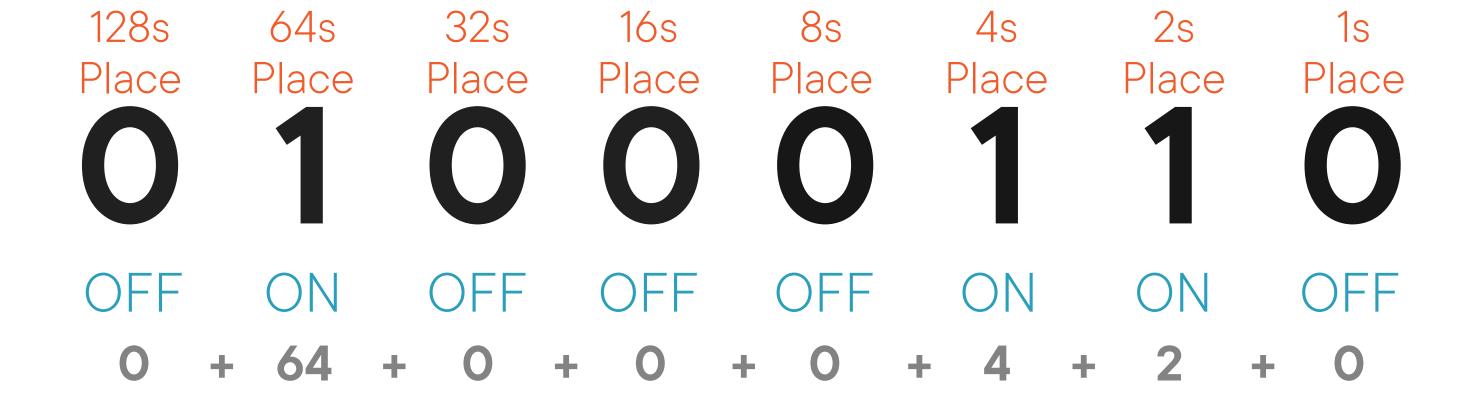




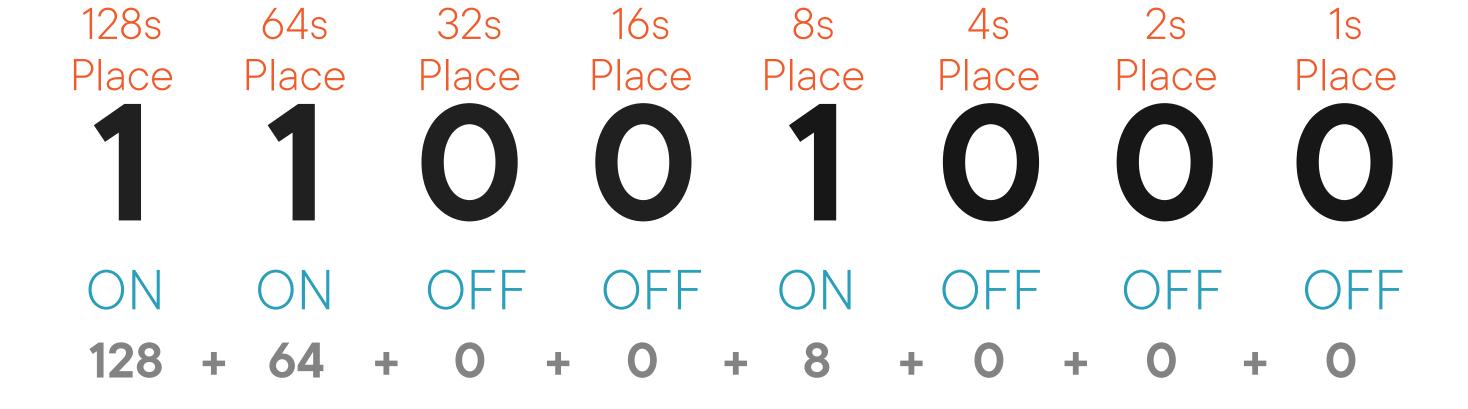


Let's try a few more...







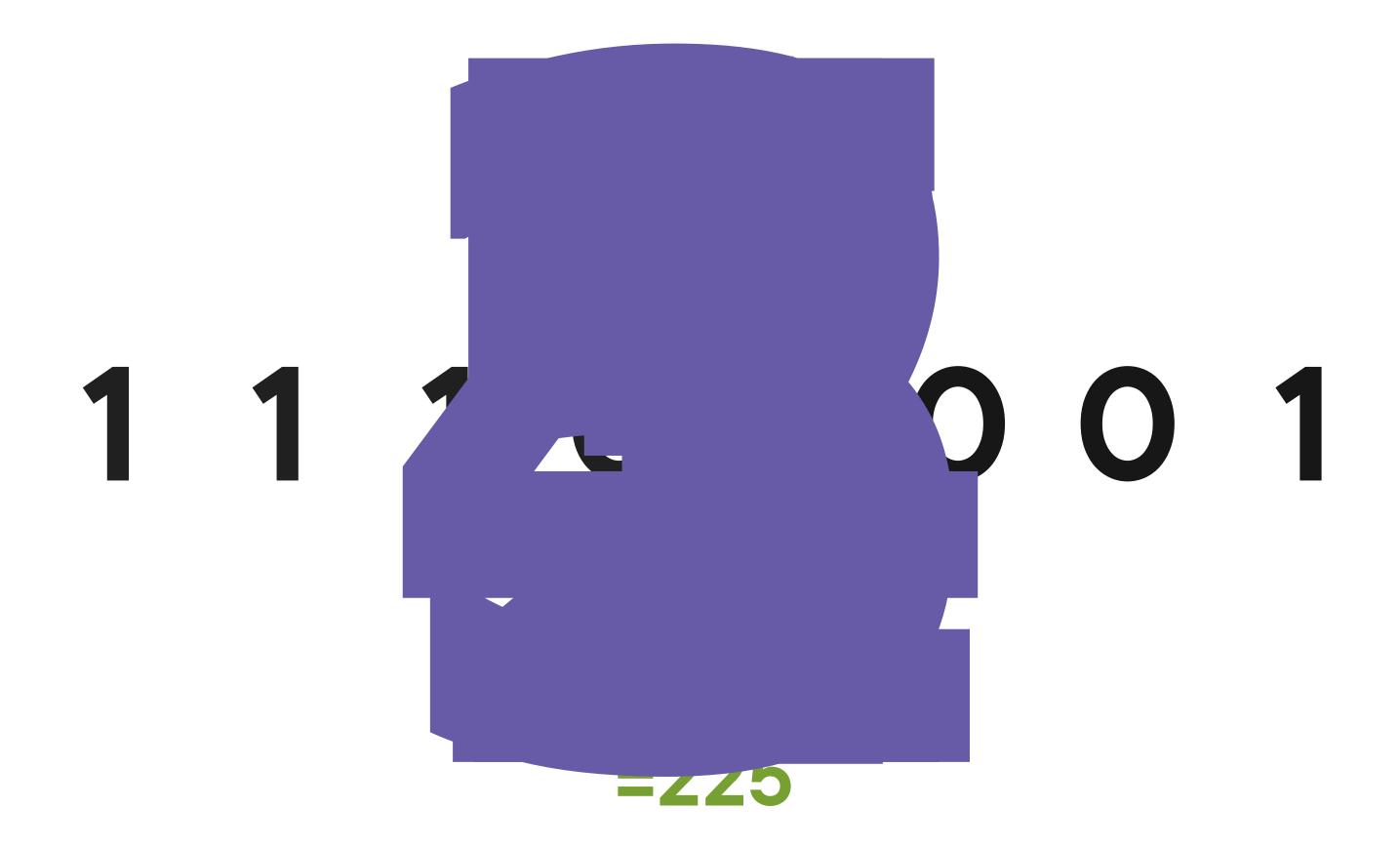






No help this time...







Converting Decimal to Binary

210

= 82	= 18		= 2			= O	
210 -128	82 -64		18 -16			2 -2	
YES	YES	NO	YES	NO	NO	YES	NO
Can we subtract 128 from 210?	Can we subtract 64 from 82?	Can we subtract 32 from 18?	Can we subtract 16 from 18?	Can we subtract 8 from 2?	Can we subtract 4 from 2?	Can we subtract 2 from 2?	Can we subtract 1 from 0 ?
Place	Place	Place	Place	Place	Place	Place	Place
128s	64s	32s	16s	8s	4s	2s	1s

210



Would you like to see that again?



47

		47 -32 = 15		15 -8 = 7	7 -4 = 3	3 -2 = 1	1 -1 = 0
NO	NO	YES	NO	YES	YES	YES	YES
Can we subtract 128 from 47?	Can we subtract 64 from 47?	Can we subtract 32 from 47?	Can we subtract 16 from 15?	Can we subtract 8 from 15?	Can we subtract 4 from 7?	Can we subtract 2 from 3?	Can we subtract 1 from 1?
Place	Place	Place	Place	Place	Place	Place	Place
128s	64s	32s	16s	8s	4s	2s	1s



47



Hexadecimal



Binary	Decimal	Hexadecimal
	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	

Decimal	Hexadecimal
0	
1	
2	
3	A
4	
5	
6	
7	
8	
	 0 1 2 3 4 5

Binary		Decimal	
	0000	0	0
		1	
		2	

0000	O	O
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	

Binary		Decimal		Hexadecimal
	0000	0	0	
		1		
		2		
0001		3		1
0001		4		
		5		
		6		
		7		
		8		

Binary		Decimal		Hexadecimal
	0000	0	0	
		1		
		2		
0001		3		1
		4		
		5		
		6		
		7		
		8		

Binary		Decimal		
	0000	0	0	
	0001	1	1	
		2		
		3		
		4		
		5		
		6		
		7		

Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
		2		
0010		3		2
		4		
		5		
		6		
		7		
		8		

Binary	Decimal					
	0000	0	0			
	0001	1	1			
	0010	2	2			
		3				
		4				
		5				
		6				
		7				
		8				

Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
0011		3		3
		4		
		5		
		6		
		7		
		8		

Binary	Decimal				
	0000	0	0		
	0001	1	1		
	0010	2	2		
	0011	3	3		
		4			
		5			
		6			
		7			
		8			

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Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
0100	0011	3	3	1
010		4		4
		5		
		6		
		7		
		8		

Binary		Decimal	
	0000	0	0
	0001	1	1
	0010	2	2
	0011	3	3
	0100	4	4
		5	
		6	
		7	
		8	

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HENGL	4 C CIIIIai

Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
0101	0011	3	3	5
	0100	4	4	5
		5		
		6		
		7		
		8		

Binary		Decimal	
	0000	0	0
	0001	1	1
	0010	2	2
	0011	3	3
	0100	4	4
	0101	5	5
		6	
		7	
		8	

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HOVOG	OCIM 3	
пехац	ecimal	
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Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
0110	0011	3	3	6
	0100	4	4	O
	0101	5	5	
		6		
		7		
		8		

Binary		Decimal	
	0000	0	0
	0001	1	1
	0010	2	2
	0011	3	3
	0100	4	4
	0101	5	5
	0110	6	6
		7	
		8	

Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
0111	0011	3	3	7
	0100	4	4	
	0101	5	5	
	0110	6	6	
		7		
		8		

Binary	Decimal				
	0000	0	0		
	0001	1	1		
	0010	2	2		
	0011	3	3		
	0100	4	4		
	0101	5	5		
	0110	6	6		
	0111	7	7		
		8			

Binary		Decimal		Hexadecimal
	0000	0	0	
	0001	1	1	
	0010	2	2	
1000	0011	3	3	8
	0100	4	4	O
	0101	5	5	
	0110	6	6	
	9111	7	7	
		8		

Binary		Decimal	
	0000	0	0
	0001	1	1
	0010	2	2
	0011	3	3
	0100	4	4
	0101	5	5
	0110	6	6
	0111	7	7
	1000	8	8

Binary		Decimal	Hexadecimal	
	0000	0	0	
	0001	1	1	
	0010	2	2	
	0011	3	3	
	0100	4	4	
	0101	5	5	
	0110	6	6	
	0111	7	7	
	1000	8	8	
		0		

Binary	Decimal	Hexadecimal
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	

Binary	Decimal	Hexadecimal
1001	9	
	10	
	11	
	12	
	13	9
	14	
	15	
	16	



Binary		Decimal		Hexadecimal
	1001	9	9	
		10		
		11		
		12		
		13		
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
		10		
		11		
1010		12		^
		13		A
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
		11		
		12		
		13		
		14		
		15		
		16		

Binary	Decimal		Hexadecimal	
	1001	9	9	
	1010	10	Α	
		11		
1011		12		B
		13		D
		14		
		15		
		16		

Binary	Decimal Hexadecimal			Hexadecimal
	1001	9	9	
	1010	10	A	
	1011	11	В	
		12		
		13		
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	A	
	1011	11	В	
1100		12		C
		13		
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	
		13		
		14		
		15		
		16		

Binary	Decimal		Hexadecimal	
	1001	9	9	
	1010	10	Α	
	1011	11	В	
1101	1100	12	С	
1101		13		D
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	
	1101	13	D	
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
1110	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	E
	1101	13	D	
		14		
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	
	1101	13	D	
	1110	14	Ε	
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
1111	1100	12	С	F
	1101	13	D	
	1110	14	Ε	
		15		
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	
	1101	13	D	
	1110	14	Е	
	1111	15	F	
		16		

Binary		Decimal		Hexadecimal
10000	1001	9	9	
	1010	10	Α	
	1011	11	В	10
	1100	12	С	
	1101	13	D	
	1110	14	Ε	
	1111	15	F	
		16		

Binary	Decimal			Hexadecimal
1000	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	10
	1101	13	D	10
	1110	14	Ε	
	1111	15	F	
		16		

Binary		Decimal		Hexadecimal
	1001	9	9	
	1010	10	Α	
	1011	11	В	
	1100	12	С	
	1101	13	D	
	1110	14	Ε	
	1111	15	F	
	10000	16	10	

Summary



Introduce the need for binary
Review – Primary School Math
Counting in Binary
Converting Binary to Decimal
Converting Decimal to Binary
Hexadecimal

