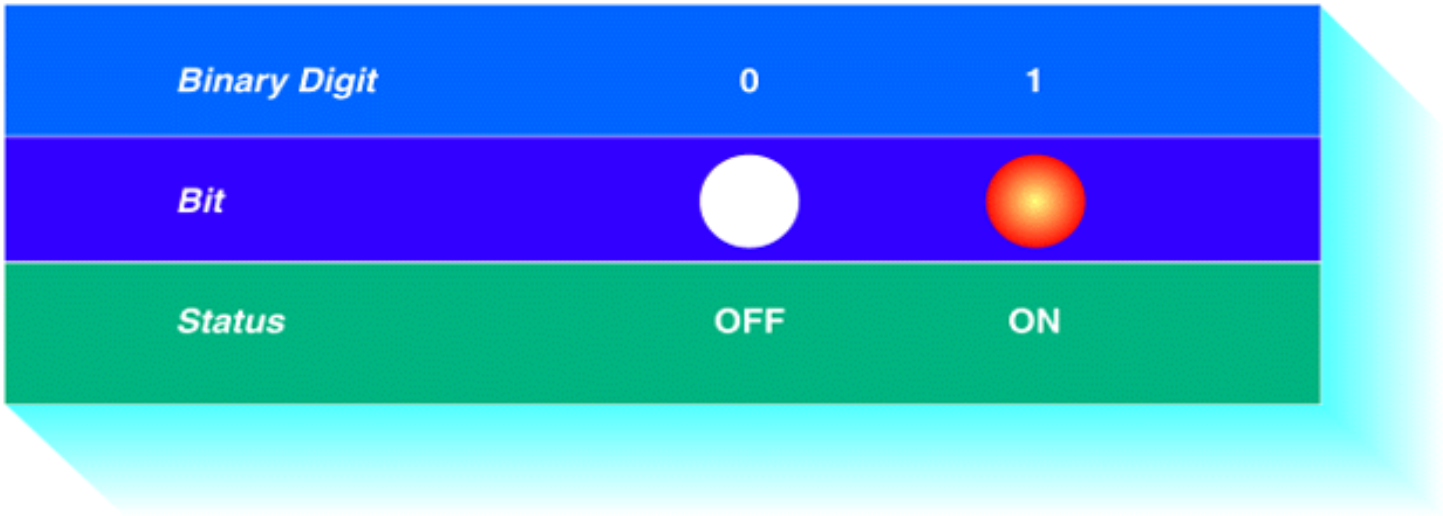
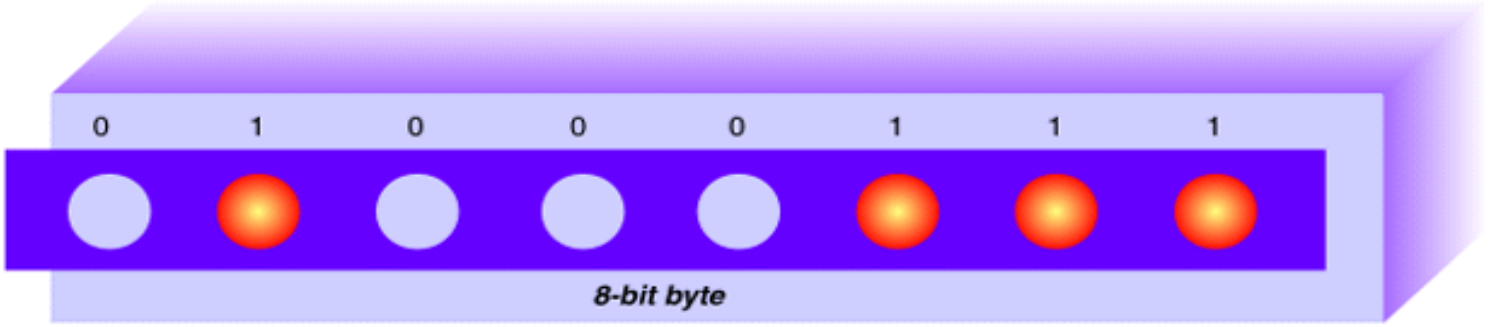
How Data is Represented in a Computer



How Data is Represented in a Computer (con't)



How Data is Represented in a Computer (con't)

- Bit - the smallest unit of data handled by a computer (short for binary digit).
- Byte - a group of 8 bits.

Number Systems

- Computers use three types of number systems:
  - Decimal number system
  - Binary number system
  - Hexadecimal number system

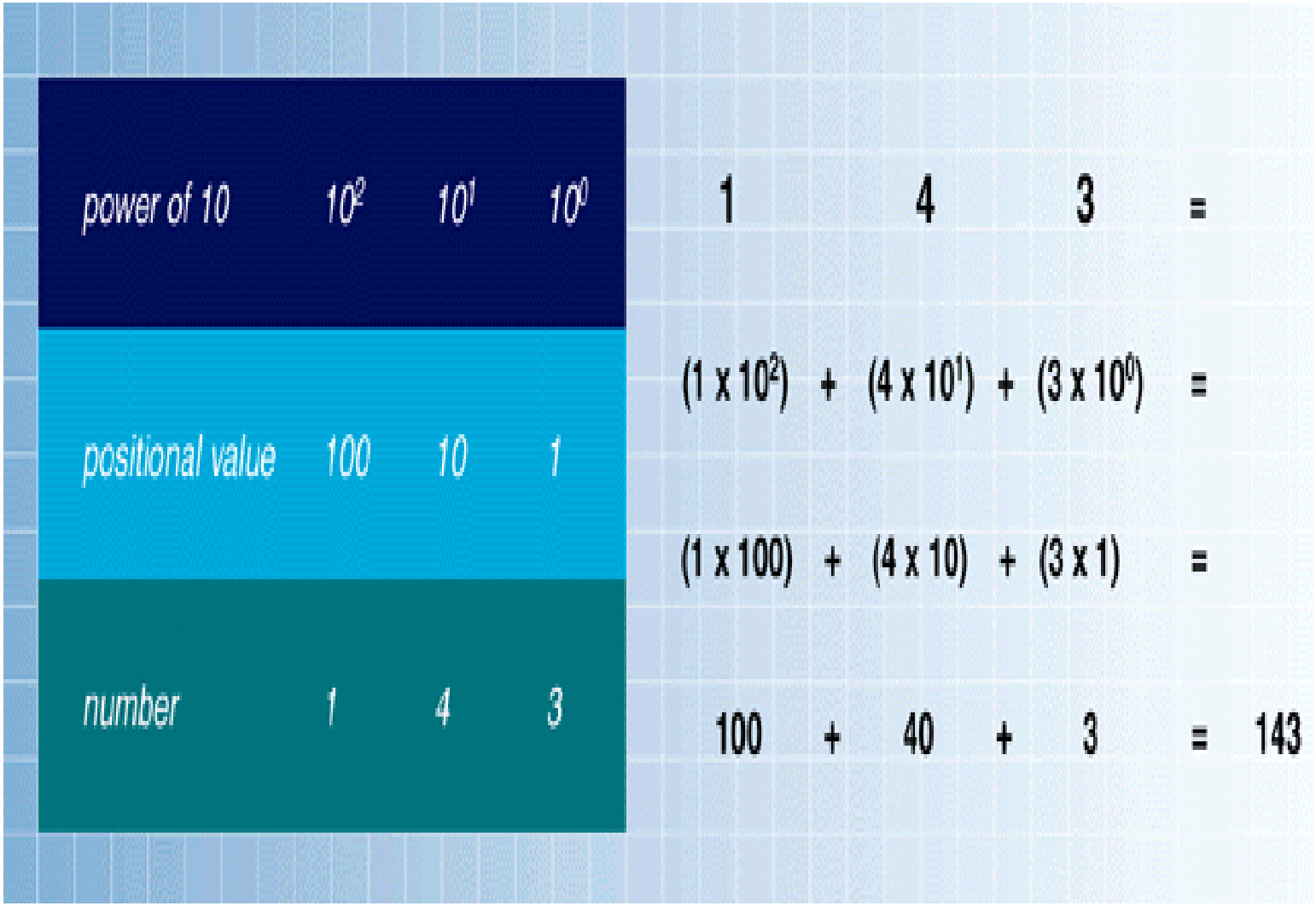
Number Systems (con't)

DECIMAL	BINARY	HEXADECIMAL
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

Decimal Number System

- We (humans) use the decimal number system
- Base 10 number system
- *deci* means ten
- 10 symbols are used - 0 thru 9

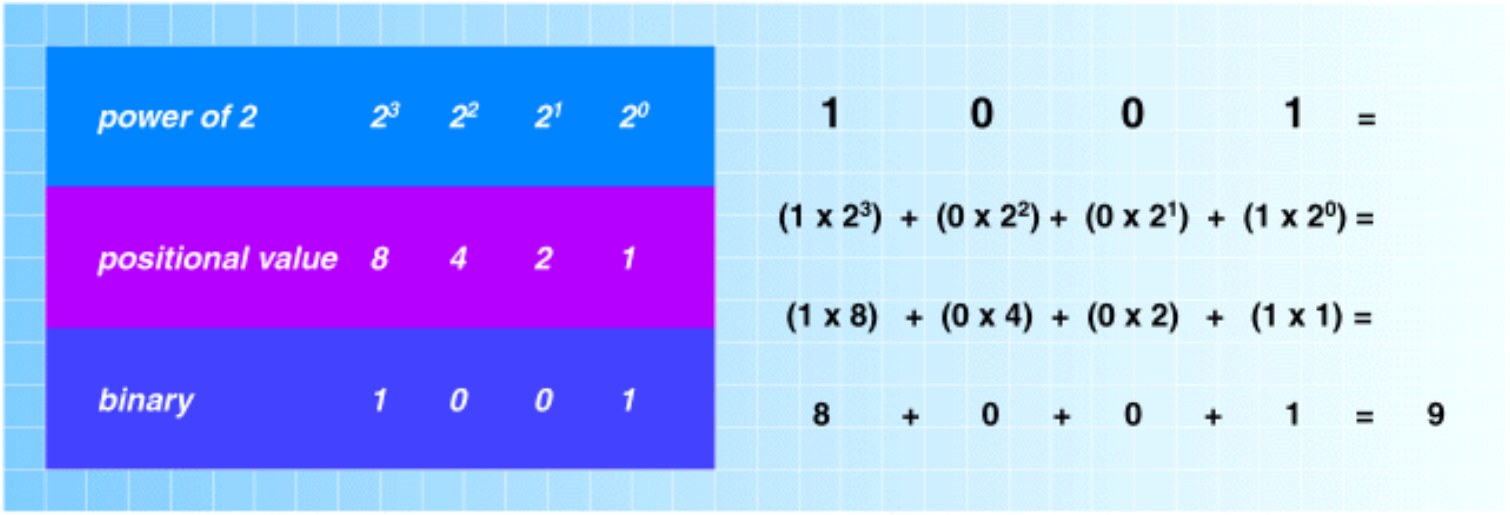
Decimal Number System (con't)



Binary Number System

- Computers use binary in calculations, storage and data transmission.
- Base 2 number system
- *Bi* means two
- Two symbols are used - 0 and 1

Binary Number System



Number Systems

- Conversion of decimal to binary
  - Reverse the process.
  - 59 is 00111011 in binary.
  - Start with position that is less than the original #.
  - 59 is less than 64, so start with 32.
  - Continue to the right accumulating and placing a “1” at those positions until total = 59.

128	64	32	16	8	4	2	1
0	0	1	1	1	0	1	1

Hexadecimal Number System

- Computers use hexadecimal because it represents binary values in a compact form.
- Base 16 number system
- *Hex* means six, *Deci* means ten
- 16 symbols are used - 0 thru 9, A, B, C, D, E, F
  - 0-9 = 0-9
  - A = 10 D = 13
  - B = 11 E = 14
  - C = 12 F = 15

Hexadecimal Number System (con't)

power of 16	16^1	16^0
positional value	16	1
hexadecimal	A	5

A	5	=		
(10×16^1)	+	(5×16^0)	=	
(10×16)	+	(5×1)	=	
160	+	5	=	165

Hexadecimal Number System (con't)

- Conversion of decimal to hexadecimal
  - Reverse the process
  - 59 is 3B in hexadecimal
  - 16 goes into 59 three times
  - It will take "11" or "B" to get to 59 (59 = 3*16+11)

4096	256	16	1
		3	B (11)