



To what would you compare it in the human body?

What is this?

- A. Shell
- B. Skin
- C. Skull
- D. Hair

Pictures by Jason Clopper



What is this?

To what would you compare it in the human body?

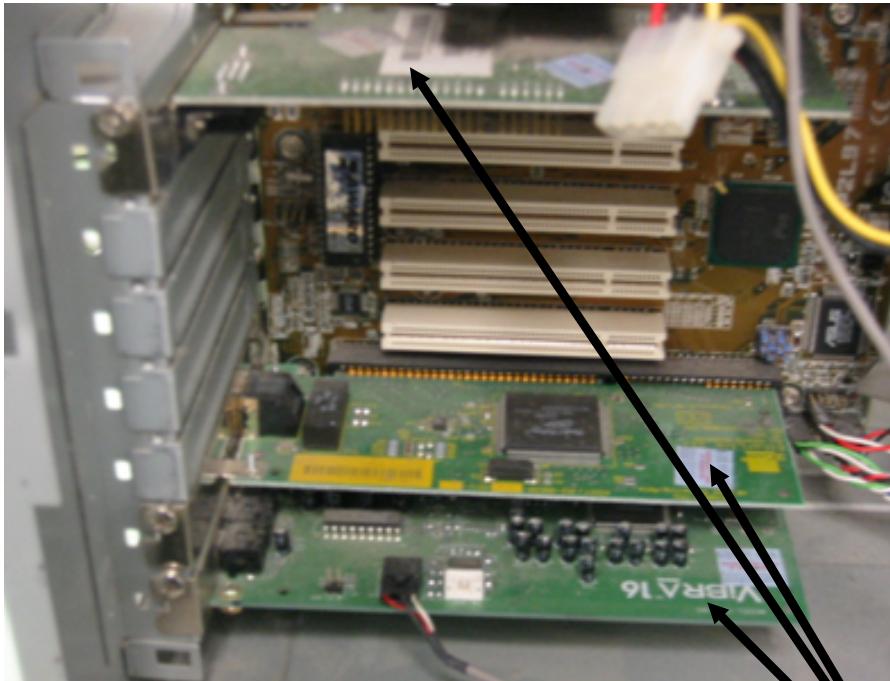
- A. Shell
- B. Skin
- C. Skeleton
- D. Legs



What is this?

To what would you compare it in the human body?

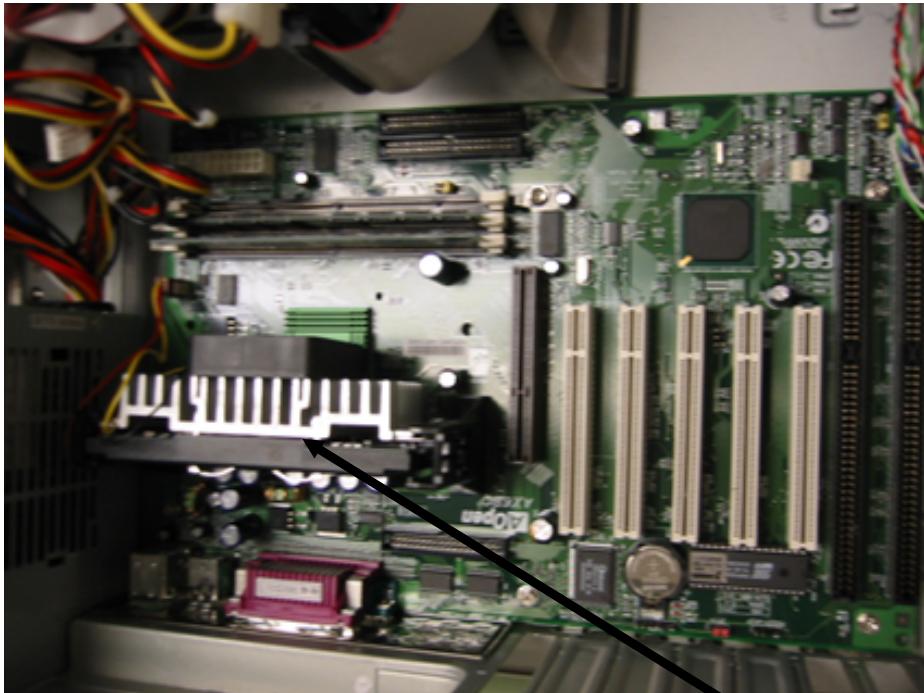
- A. Brain
- B. Heart
- C. Muscles
- D. Arms



What are these?

To what would you compare it in the human body?

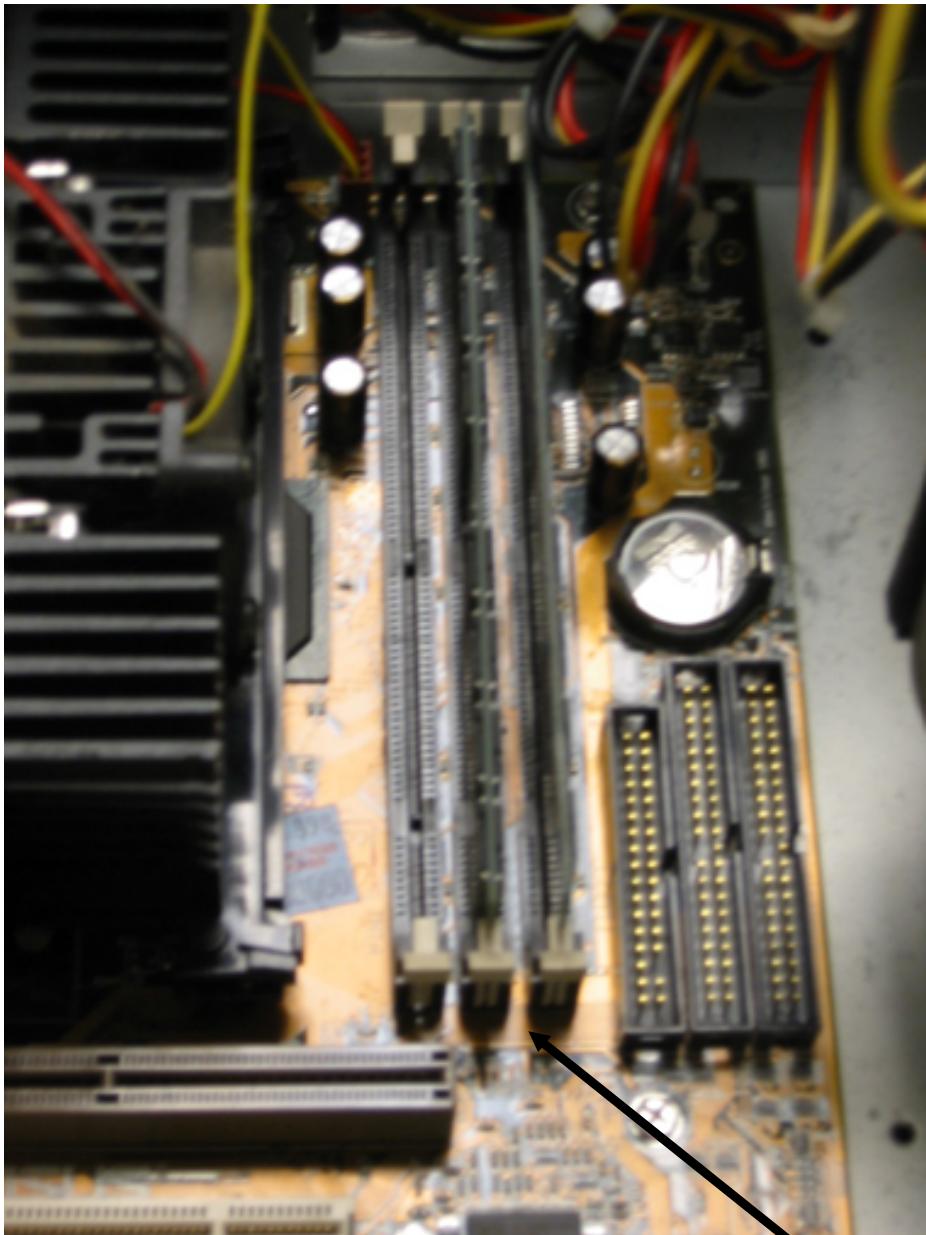
- A. Brain
- B. Heart
- C. Muscles
- D. Arms



What is this?

To what would you compare it in the human body?

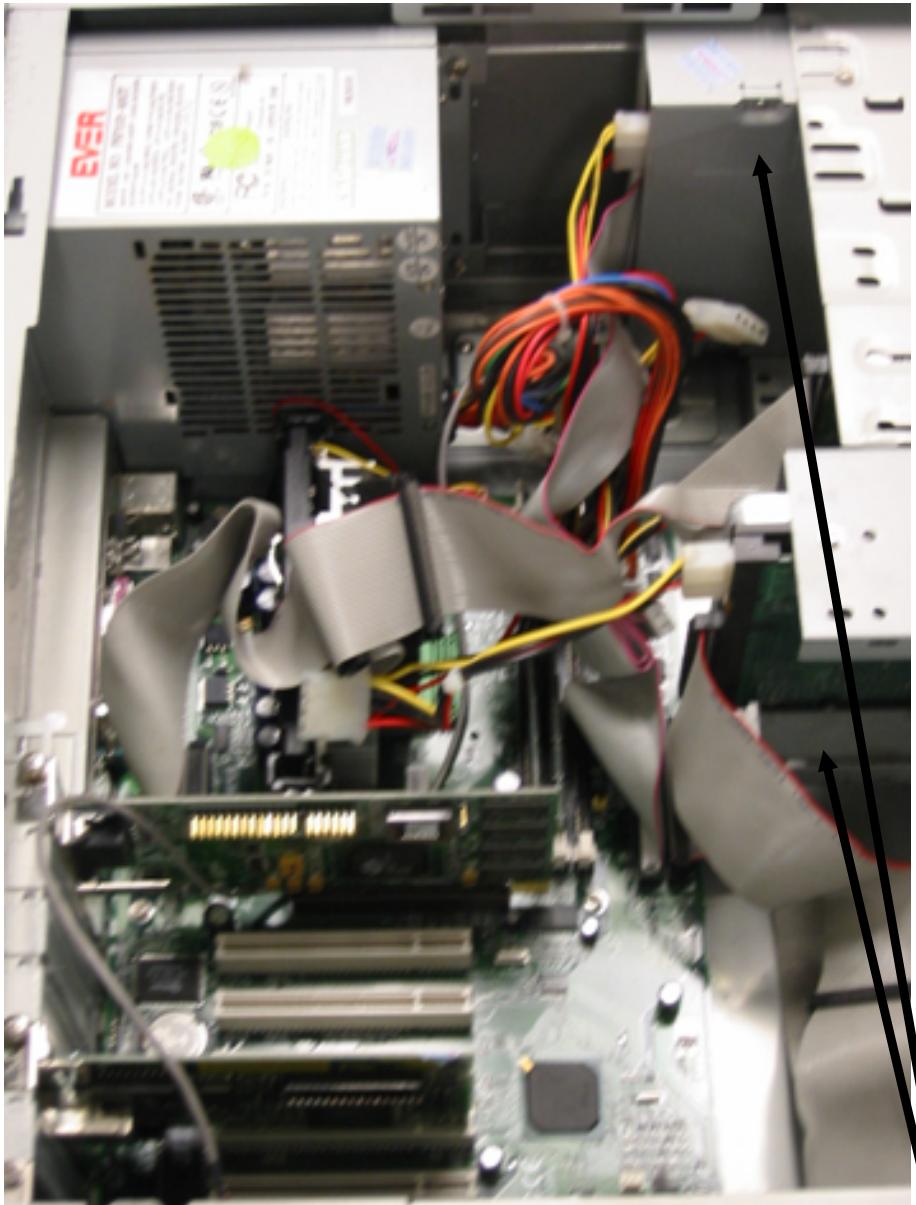
- A. Brain
- B. Heart
- C. Muscles
- D. Arms



What are these?

To what would you compare it in the human body?

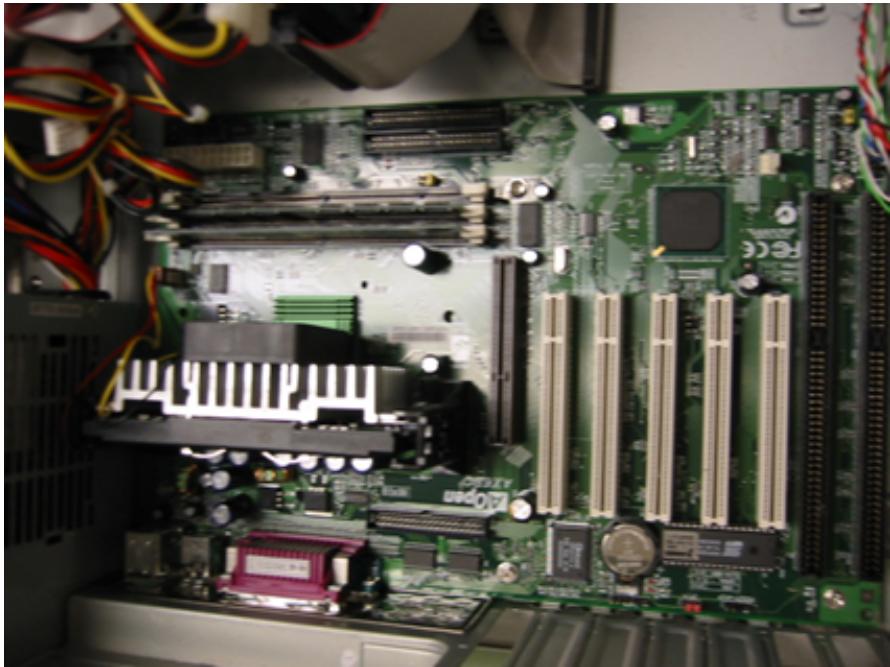
- A. Brain
- B. Short-term memory
- C. Long-term memory
- D. Nose



What are these?

To what would you compare it in the human body?

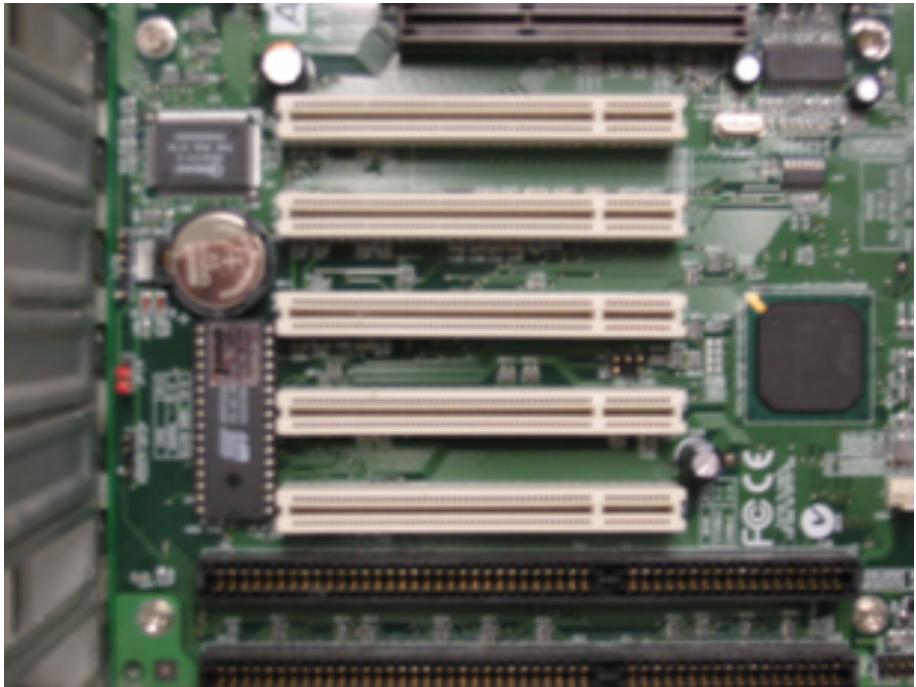
- A. Brain
- B. Short-term memory
- C. Long-term memory
- D. Nose



What is this?

To what would you compare it in the human body?

- A. Brain
- B. Heart
- C. Circulatory System
- D. Nervous System

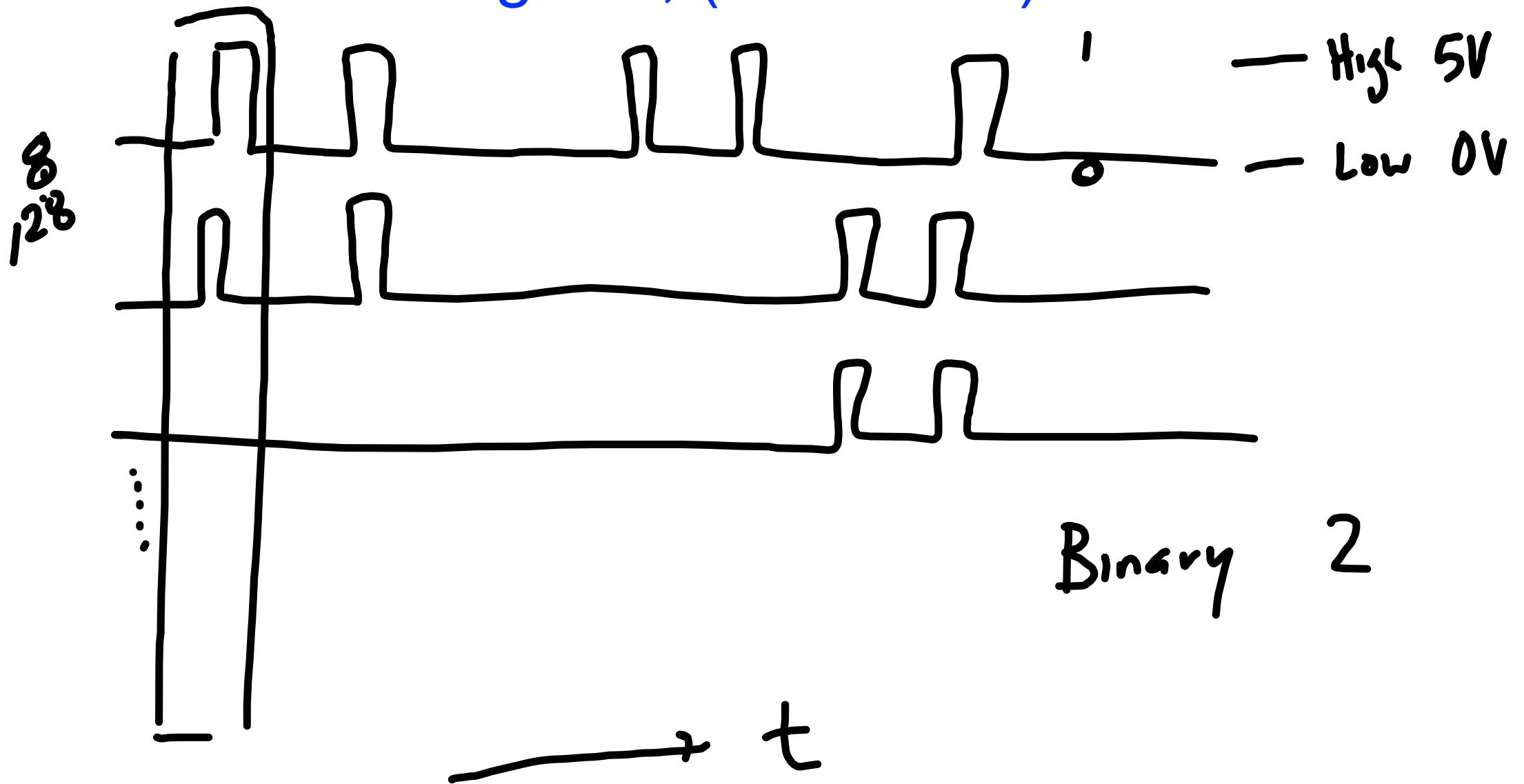


What is this?

To what would you compare it in the human body?

- A. Brain
- B. Bus
- C. Circulatory System
- D. Nervous System

Busses and signals, (1s and 0s)



Binary Numbers

Converting from base 10 to base 2, base 8, base 16

12345

$$\begin{aligned} & 1 \times 10^0 \\ & 2 \times 10^1 \\ & 3 \times 10^2 \\ & 4 \times 10^3 \\ & 5 \times 10^4 \end{aligned}$$

10010100110

12345

↑↑↑↑
Digit

Binary

10

Decimal

MSB $2^{10} 2^9 2^8 2^7 2^6 2^5 2^4 2^3 2^2 2^1$ Bits

10110000101001 LSB

4096

4096

1024

512

32

8

—
5663

$$\begin{array}{rcl} & & 1 \times 1 = 1 \times 2^0 \\ & & 0 \times 2 = 0 \times 2^1 \\ & & 0 \times 4 = 0 \times 2^2 \\ & & 1 \times 8 = 1 \times 2^3 \\ & & 0 \times 16 = 0 \times 2^4 \\ & & 1 \times 32 = 1 \times 2^5 \end{array}$$

65536	
32768	
16384	
8192	1
4096	0
2048	0
1024	0
512	0
256	0
128	0
64	0
32	1
16	1
8	1
4	0
2	0
1	1

Dec to Binary {4 #'s} → Hex Oct
 Subtraction Method
 Look → (Division Method)

$$\begin{array}{r}
 12345 \\
 - 8192 \\
 \hline
 4153 \\
 - 4096 \\
 \hline
 57 \\
 - 32 \\
 \hline
 25 \\
 - 16 \\
 \hline
 9 \\
 - 8 \\
 \hline
 1 \\
 - 1 \\
 \hline
 0
 \end{array}$$

11000000111001_2

3 5 digit dec → Bin, Oct, Hex
 8pt 2pt each

$$\begin{array}{r}
 12345 \\
 \hookrightarrow \\
 \begin{array}{r}
 2 \overline{)1} \\
 2 \overline{)3} \\
 2 \overline{)16} \\
 2 \overline{)12} \\
 2 \overline{)24} \\
 2 \overline{)48} \\
 2 \overline{)96} \\
 2 \overline{)192} \\
 2 \overline{)385} \\
 2 \overline{)771} \\
 2 \overline{)1543} \\
 2 \overline{)3086} \\
 2 \overline{)6172} \\
 2 \overline{)12345}
 \end{array}
 \end{array}$$

$\{4 \text{ #'s}\} \rightarrow \text{Hex Oct}$
 Subtraction Method
 $\log_2 \rightarrow$ (Division Method)
 $\rightarrow 11000000111001_2$

$\begin{array}{r} 1011000000111001 \\ \diagdown \quad \diagup \quad \diagup \quad \diagup \\ 3 \quad 0 \quad 0 \quad 7 \quad 1 \end{array}$ 0011000000111001

12345 =

bin dec/oct

12345 = 30071₈

000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

011000000111001 ^0011000000111001
 ^3 ^0 ^3 ^9

$$12345 = \frac{3039_{16}}{0x3039} = 30071_8$$

Bin	Oct/Dec	DEC	HEX
00000000	0	0000 - 8	0000
00000001	1	0001 - 9	0009
00000010	2	0010 - 10	A
00000011	3	0011 - 11	B
00000100	4	0100 - 12	C
00000101	5	0101 - 13	D
00000110	6	0110 - 14	E
00000111	7	0111 - 15	F

$\begin{array}{r} 011,000000111,001_2 \\ \times 3 \quad 0 \quad 0 \quad 7 \quad 1 \\ \hline \end{array}$ $\begin{array}{r} 0011,000000111,001_2 \\ \times 3 \quad 0 \quad 3 \quad 9 \\ \hline \end{array}$

$$12345 = 30071_8 = 3039_{16} = 0x3039$$

Bin	Oct/Dec	DEC	HEX
000	0	000	8
001	1	001	9
010	2	010	A
011	3	011	B
100	4	100	C
101	5	101	D
110	6	110	E
111	7	111	F