

DAY # 13.

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int a = 10 ;

↑ ↑ ↖ ↗

Data variable Assignment operator

Number semi colon

$(10)_{10}$ (Base 10)

NUMBER SYSTEM

A number system is a way of writing, representing & working with numbers.

#13.2

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10 → number
1 0

NUMBER SYSTEMS

Example

$$(1111111111111111)_2 \rightarrow 1 \times 2^{15} + 1 \times 2^{14} + 1 \times 2^{13} + 1 \times 2^{12} + 1 \times 2^{11} + 1 \times 2^{10} + 1 \times 2^9 + 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 11 \text{ (decimal)}$$

$$(1011)_2$$

$$(102)_3$$

$$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 1 \times 8 + 0 \times 4 + 1 \times 2 + 1 \times 1 = 8 + 0 + 2 + 1 = 11_{10}$$

$$1 \times 3^2 + 0 \times 3^1 + 2 \times 3^0 = 1 \times 9 + 0 \times 3 + 2 \times 1 = 9 + 0 + 2 = 11_{10}$$

$$1 \times 8^1 + 3 \times 8^0 = 1 \times 8 + 3 \times 1 = 8 + 3 = 11_{10}$$

$$1 \times 10^1 + 1 \times 10^0 = 1 \times 10 + 1 \times 1 = 10 + 1 = 11_{10}$$

$$(B)_{16} \Rightarrow 11 \times 16^0 \Rightarrow 11 \times 1 = 11_{10}$$

Base	Name	Digits used
1	Unary	1
2	Binary	0, 1
3	Ternary	0, 1, 2
4	Quaternary	0, 1, 2, 3
8	Octal	0, 1, 2, 3, 4, 5, 6, 7
10	Decimal	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
16	Hexadecimal	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

0 - F
0 - 9 A - F

BINARY NUMBER ~~SYSTEM~~

$(13)_{10}$ 13 is decimal no

How to convert Decimal to Binary?

1. Division by 2

Division	Quotient	Remainder
$13/2$	6	1
$6/2$	3	0
$3/2$	1	1
$1/2$	0	1

$(13)_{10} \Rightarrow (1101)_2$

$15/2$	7	1
$7/2$	3	1
$3/2$	1	1
$1/2$	0	1
$(13)_{10} \Rightarrow$		$(1111)_2$

2. Weight Method

	128	64	32	16	8	4	2	1
$(13)_{10} \Rightarrow$	0	0	0	0	1	1	0	1
$(15)_{10} \Rightarrow$					1	1	1	1

DAY #13.4

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Bitwise operators

& → AND

| → OR

^ → XOR

~ → NOT

<< → Left Shift

>> → Right

10 & 5

1010.
4 0101
0000

if (10 & 5) == 0
printf("Hello");
else
printf("Bye");

BINARY OPERATORS WITH BINARY NUMBER OR DECIMAL NUMBER

if (10 | 5) == 15
printf("Hello");
else
printf("Bye");

1010
1 0101
1111 == 15

Bitwise AND TRUTH TABLE

0	0	0
0	1	0
1	0	0
1	1	1

BITWISE OR TRUTH TABLE

0	0	0
0	1	1
1	0	1
1	1	1

000101
16 8 4 2 1
1 0 1 0
1 1 1 1

#13.5

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$\wedge$ XOR (Output is 1 when bits are different)

0	0	0
0	1	1
1	0	1
1	1	0

if $(10 \wedge 5) \Rightarrow 15$
✓ printf("Hello");
else
printf("Bye")

$$\begin{array}{r} 1010 \\ \wedge 0101 \\ \hline 1111 \Rightarrow 15 \end{array}$$

16	8	4	2	1
	1	0	1	0
	0	1	0	1

#13.6

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$$\begin{array}{r} 5 \times 2 = 10 \\ \downarrow \\ x \end{array}$$

<< Left shift (Bitwise operator)

>> Shift (Bitwise operator)

$$5 \ll 1$$

$$5 \gg 1$$

$$5 \gg 2 \Rightarrow 1$$

$$101 \ll 1$$

$$5 \gg 3 \Rightarrow 0$$

$$\begin{array}{r} 00000101 \ll 1 \\ \downarrow \end{array}$$

$$00000101 =$$

$$\begin{array}{r} 00000010 \\ \downarrow \end{array}$$

$$\begin{array}{r} 00001010 \\ \downarrow \\ 10 \end{array}$$

$$\begin{array}{r} 00000001 \\ \downarrow \end{array}$$

$$\begin{array}{r} 00000000 \\ \downarrow \\ 0 \end{array}$$

$$\begin{array}{cccc} & 10 & & \\ \text{---} & & & \\ 1 & 0 & 1 & 0 \\ 8 & 4 & 2 & 1 \\ 0 & 1 & 0 & 1 \end{array}$$

#DAY #13.7

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```
# int a = 10;
```

```
if (a > 3) ⇒ 1
```

```
✓ printf("Hello");
```

```
else  
    printf("Bye");
```

