

Data Types

int	:	4 byte
float	:	4 byte
char	:	1 byte
bool	:	<u>1 byte</u>

size (memory) → CS

1 byte = 8 bits

1 MB → 1 megabyte
1 kilobyte

1 byte = 8 bit

5 digits
0-9
 0-9
10 symbols 2 digits
00-99

Binary System (0,1)

5 bits
5 digits → 0-1111
 in binary system

are called bits

more the no.
 of bits, larger
 values we can store!!

1 byte \rightarrow can store 2^8 values
 \downarrow
256 values

2 bits \rightarrow

0	0
0	1
1	0
1	1

 4 values

3 bits

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

1 byte of storage available

$\{1-256\}$, 257, 258, 0, -1, -2

2x times

8 values

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

represent?

int \rightarrow -ve, 0, +ve

10 digit decimal value

int: 4 bytes

$\left\{ \begin{array}{l} -ve, \\ 0, \\ +ve \end{array} \right\}$

\rightarrow $4 \times 8 \text{ bits} = 32 \text{ bits}$ = 2^{32} values

32 bits {0,1}

negative values, 0, positive values

$$\frac{2^{32}}{2} = \frac{2^{32}}{2^1} = 2^{32-1}$$

$$2^{32} = 2^{31} + 2^{31} = 2^{31}(1+1) = 2^{31} \cdot 2^1 = 2^{32}$$

negative
0, pos

$$2^{31} = 2147483648 \approx 2 \times 10^9$$

$$\left. \begin{aligned} 2^1 &= 2 + 2 \\ 2^2 &= 2^1 + 2^1 \\ 2^3 &= 2^2 + 2^2 \end{aligned} \right\}$$

$$\left\{ \begin{aligned} \text{negative values} &= -1 \text{ to } -2147483648 \\ 0 + \text{pos} &= 2^{31} \\ 0 &\text{ to } 2147483647 \end{aligned} \right\}$$

↓

$$-2147483648 \text{ to } 2147483647$$

INT_MIN

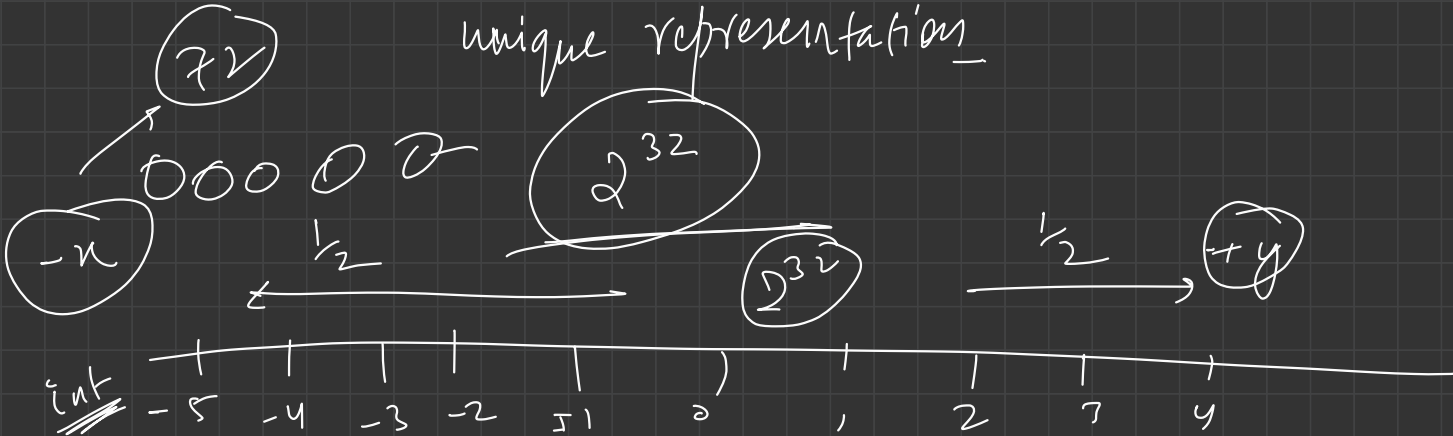
INT_MAX

int \rightarrow 4 bytes

01010101... 32

32 bits \rightarrow 0x10x1 -----

unique representation



$2^2 \rightarrow$

0	0
0	1
1	0
1	1

3 bits
0

	<u>2 bits</u>	
0	0	0
0	0	1
0	1	0
0	1	1
<hr/>		
1	0	0
1	0	1
1	1	0
1	1	1
	<u>2 bits</u>	

32 bits

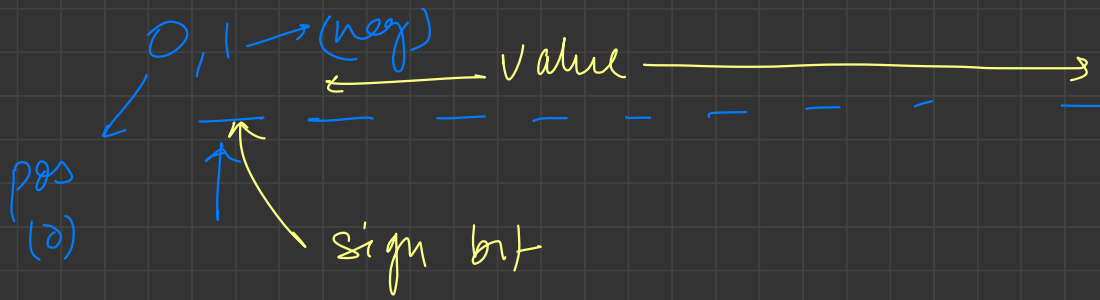
all 31 bit
1

2, pos
values with 0

all 31 bit values with 1
neg
 $= 2^{32}$

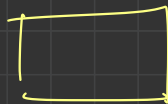
32 bit representation integer

Whether it is negative or positive (0) ??



float 48.5642 \Rightarrow values after decimal

float \rightarrow 5 digits after decimal.
double \rightarrow 15 digits after decimal.



Type Modifier

int, bool, char, float, double

① long \rightarrow $\overset{-10^9}{\text{int}} \rightarrow \overset{+10^9}{\text{4 byte}}$; $\overset{-10^{18}}{\text{long int}} \rightarrow \overset{+10^{18}}{\text{8 byte}}$

② short : $\text{int} : \text{4 byte}$; $\text{short int} : \text{2 byte}$ $\xrightarrow{32,000 \text{ to } 320,000}$

③ signed : $\text{int} : \text{4 byte} : \text{32 bits}$: 1-bit \rightarrow sign { + }
31-bit \rightarrow value { - }

④ unsigned : \rightarrow values only ≥ 0

int : 32 bit \rightarrow 1-bit ~~sign~~

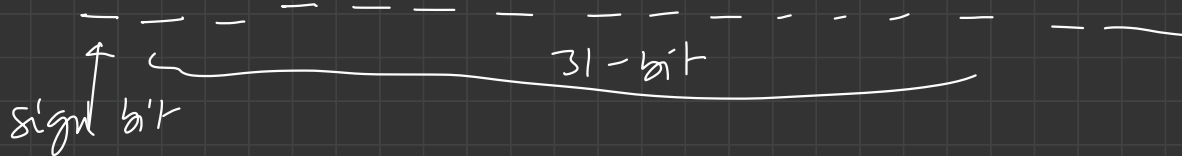
\rightarrow (positive values)

exactly double

int , signed int

signed int
int

0/1 \Rightarrow positive, negative



unsigned int

4 bytes = 32 bit \rightarrow (+) ve inc. 0

\rightarrow 2^{32} \rightarrow values

$0 \rightarrow (2^{32} - 1)$

next iteration → for () {
 → continue;
 } skip

for (i=1; i<=10; i++) {
 if (i==7) {
 → continue;
 }
 → cout << i << endl;
 }

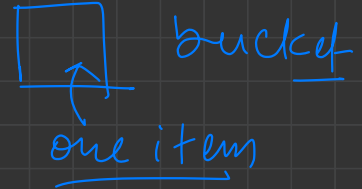
1 → 10, 7
 1, 2, 3, 4, 5, 6, 7
8, 9, 10

for (i=1; i<=100; i++) {
 if (i==50) {
 → break;
 }
 cout << i << endl;
 }

1, 2, 3, ..., 49
 → loop execution
 → end at that point

Arrays

variable



relation

Q: If I give you a value N , and then N integers;
Find sum of all the values.

5 -
1, 2, 0, 5

$$1 \ 1 \ 2 \ 0 \ 5 = 12 \quad \boxed{N}$$

$N=5$

$$2 \ 2 \ 2 \ 2 \ 4 = 12$$

$$7 \ 0 \ 0 \ 3 \ 2 = 12$$

loop (repeat N times) {

→ taking input one value at a time \square

adding it to sum \square
variable

}

$$\begin{array}{r} 0 \ 1 \ 4 \ 5 \ 2 \\ 2 \ 0 \ 5 \ 4 \ 1 \\ \hline \end{array}$$

min, max

Q. Take N as input, and then N values.

Print them in reverse order.

input
→ a, b, c, d, e, f, g, h, i, j
↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
1 2 3 4 5 6 7 8 9 10

output
→ j i h g f e d c b a

solve ?!

N = 7

4 → 2 → 0 → 1 → 6 → 5 → 3

□

□

4 ← 2 ← 0 ← 1 ← 6 ← 5 ← 3

□

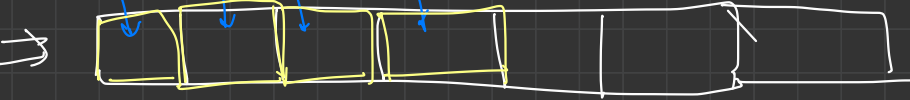
□

variable



item

array



→ common name

An array is a container, which stores
related data, of same type in continuous
memory locations.

(array) 10 int ⇒ 40 Bytes

→ all these data are referred using same name
(with a sub-script).

int \rightarrow 4 Bytes

10 int \rightarrow 4 Bytes \times 10
40 Bytes