The Secret to Mr C's Success

ESC101: Fundamentals of Computing

Purushottam Kar

Announcement

- Advanced Track group meeting
- This Friday evening – details over email
- Please think carefully about your project and come
- Will discuss tools, tips, techniques during meeting
- Short meeting 10 – 15 minutes only ☺

Number Systems

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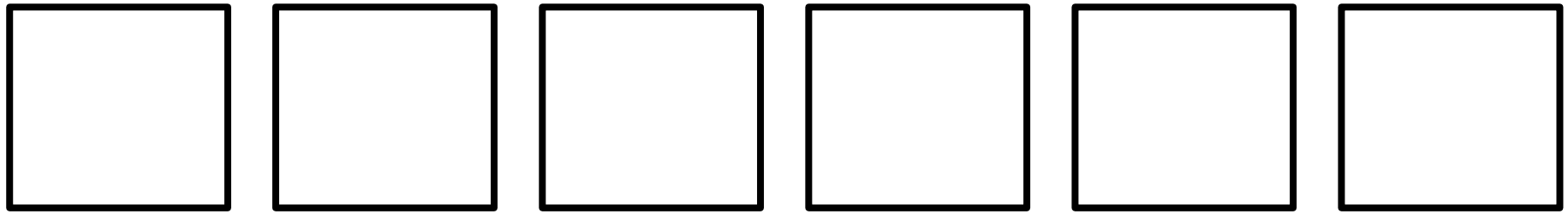

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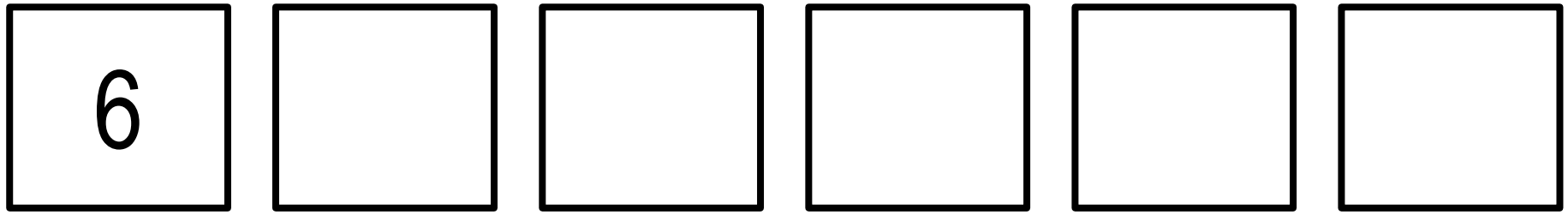

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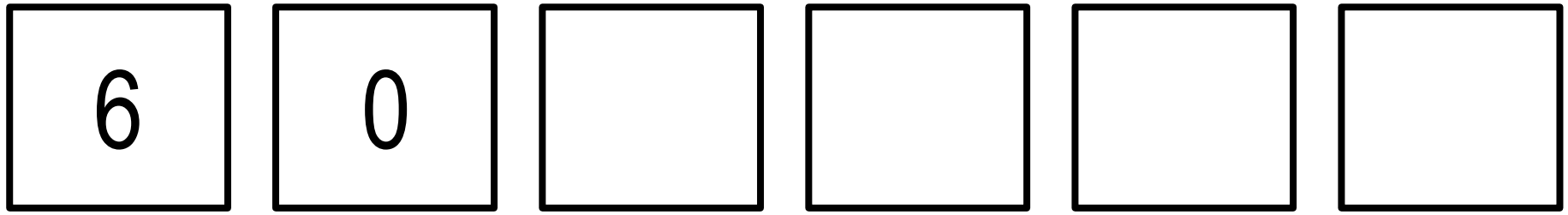

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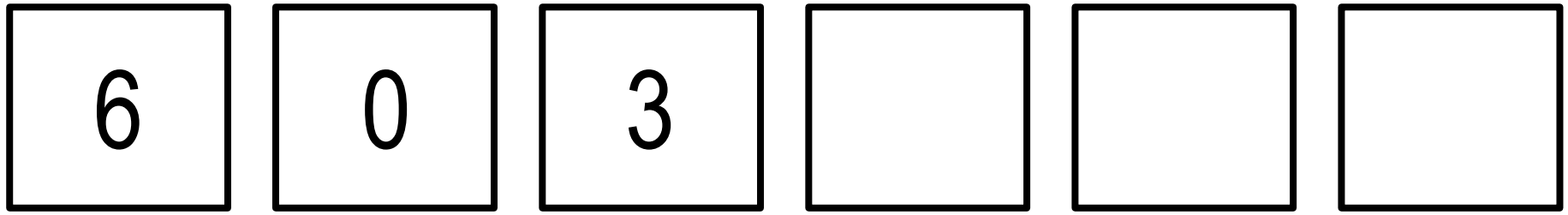

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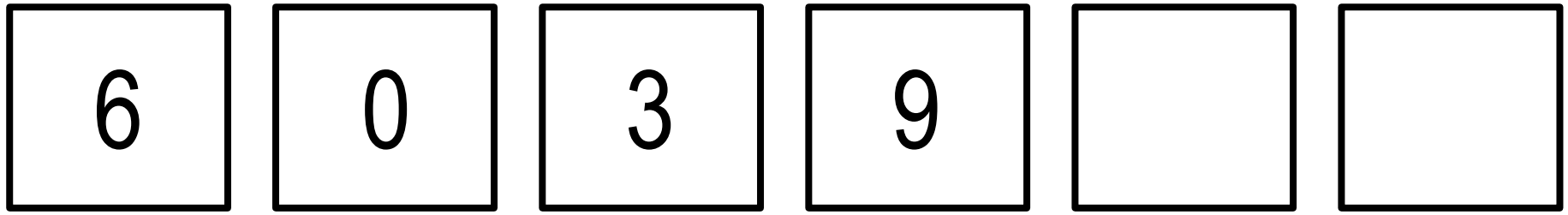

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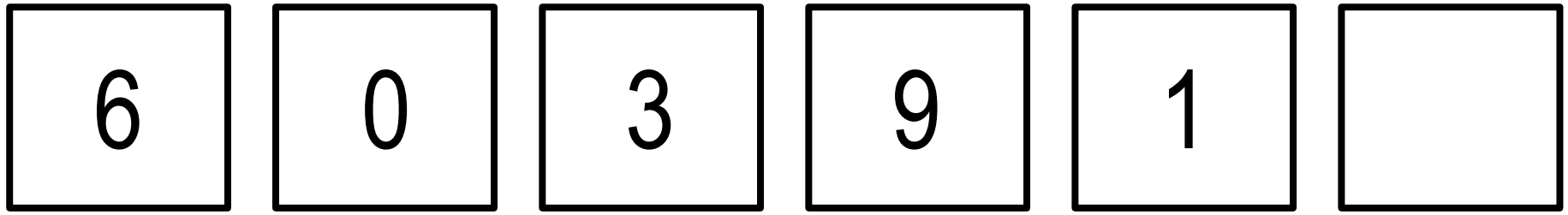

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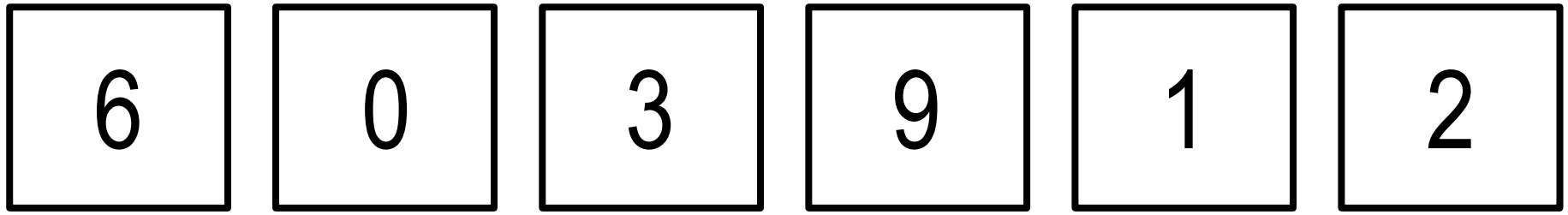

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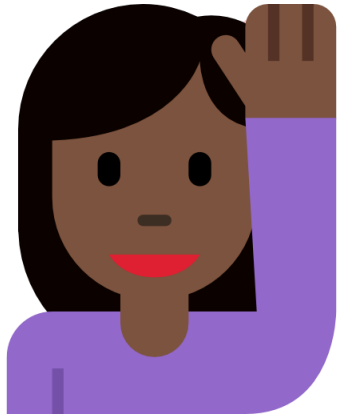

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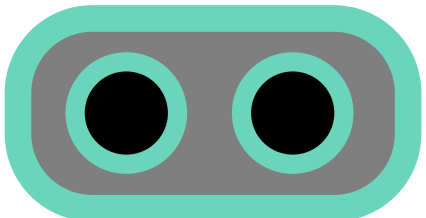

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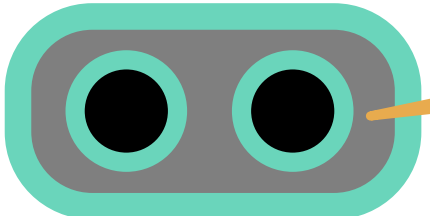

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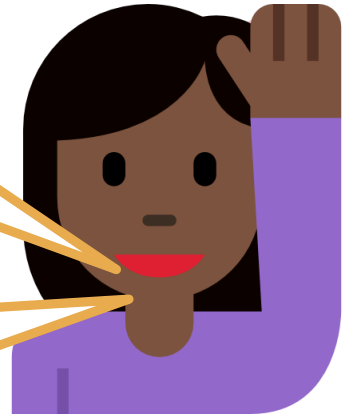

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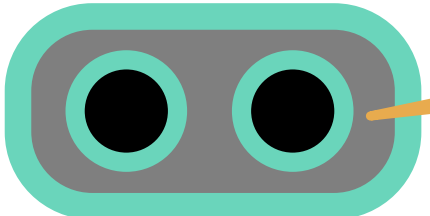

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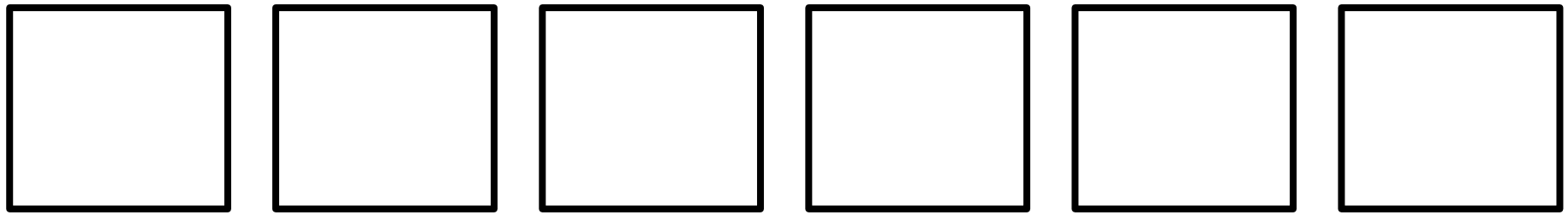

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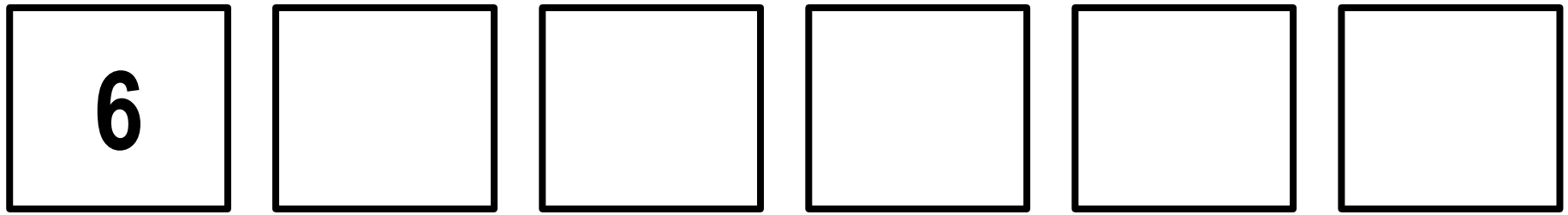

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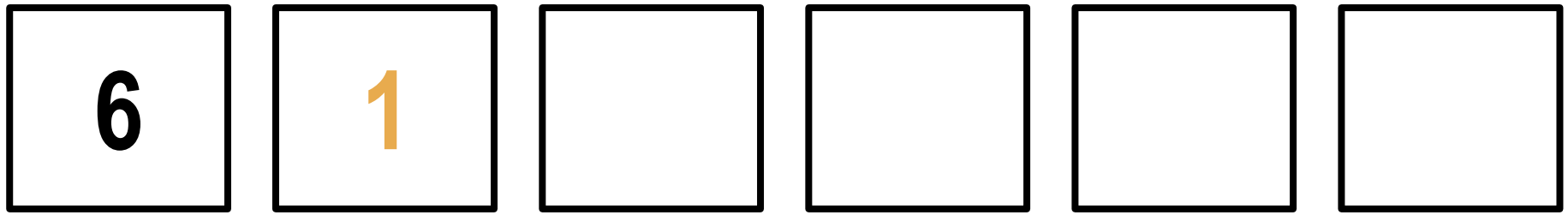

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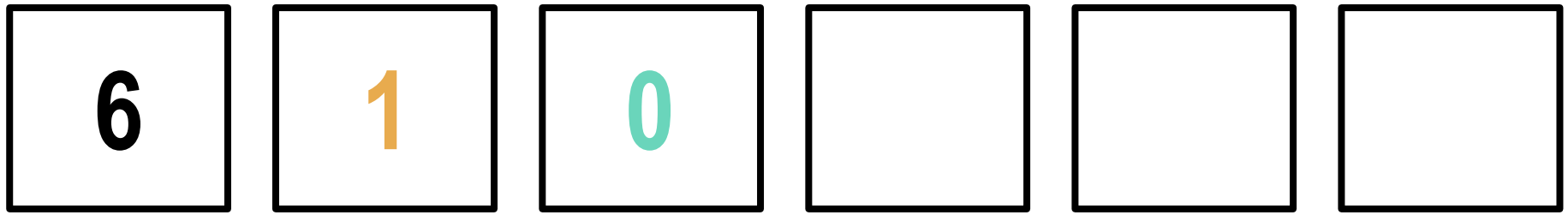

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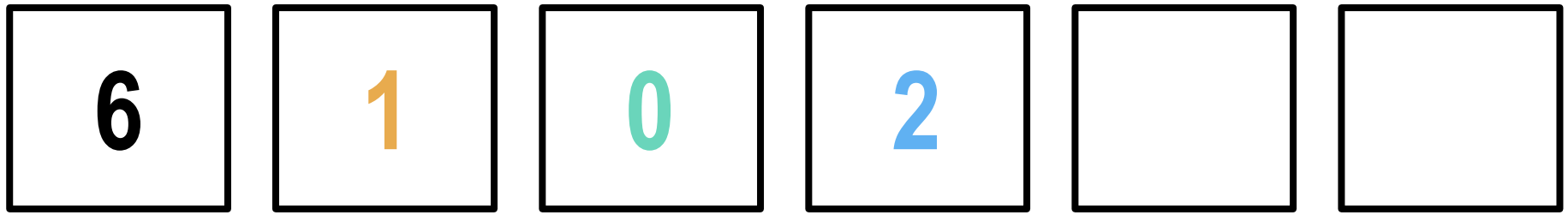

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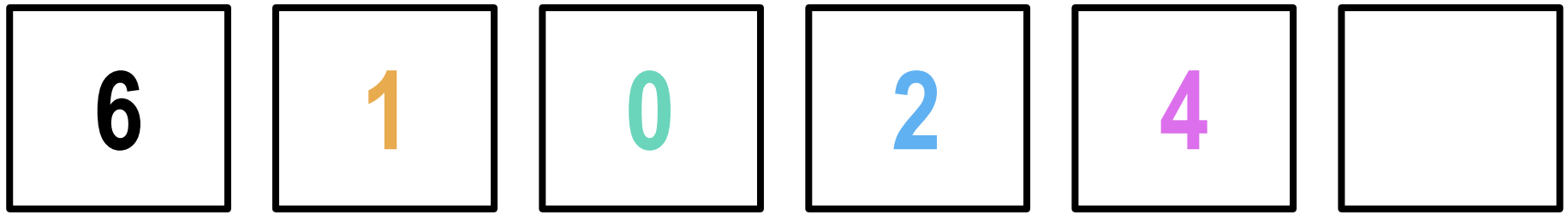

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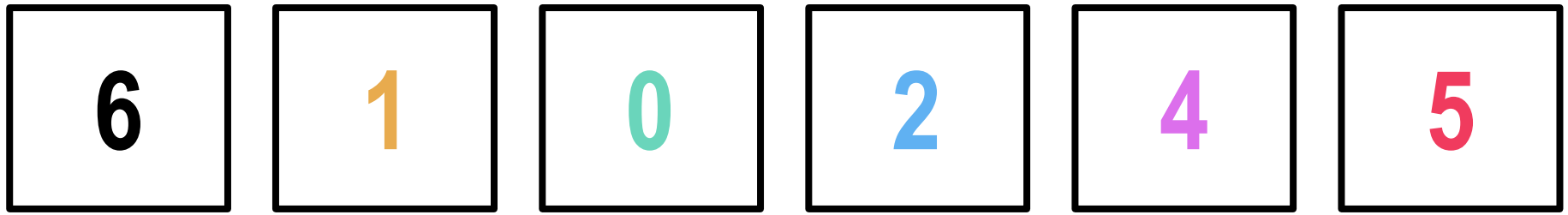

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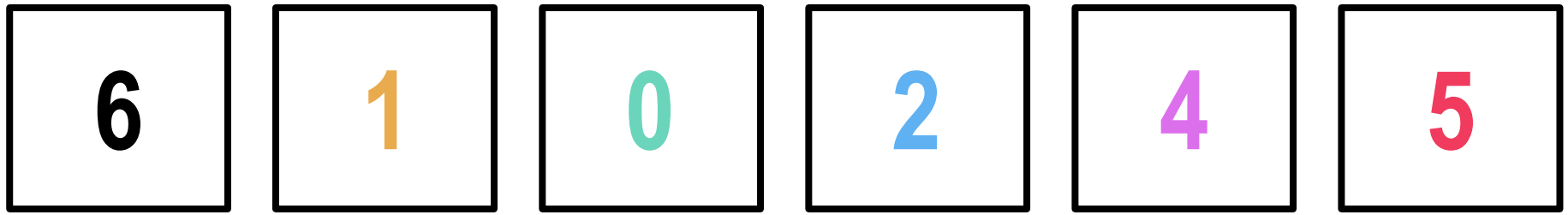

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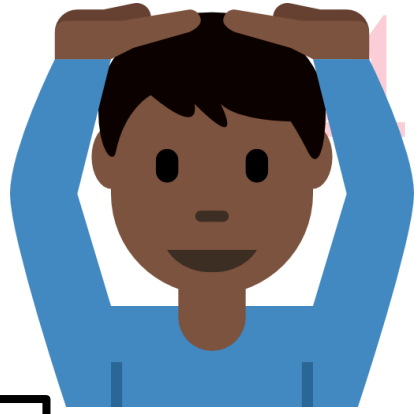

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Aha! That is why we have been using %d for integers so far – d for decimal ☺

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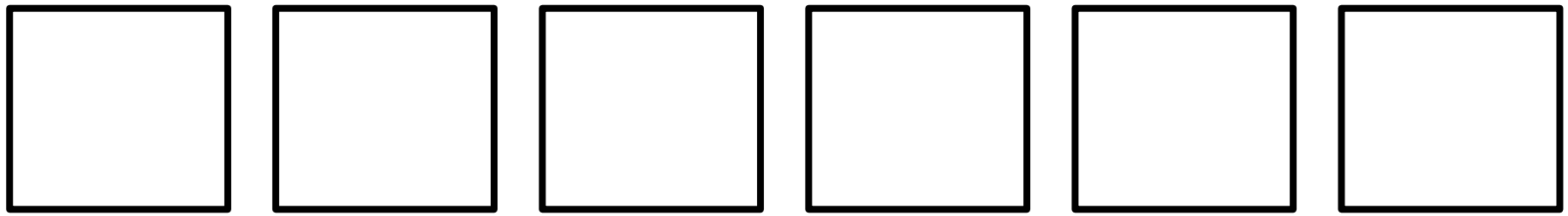

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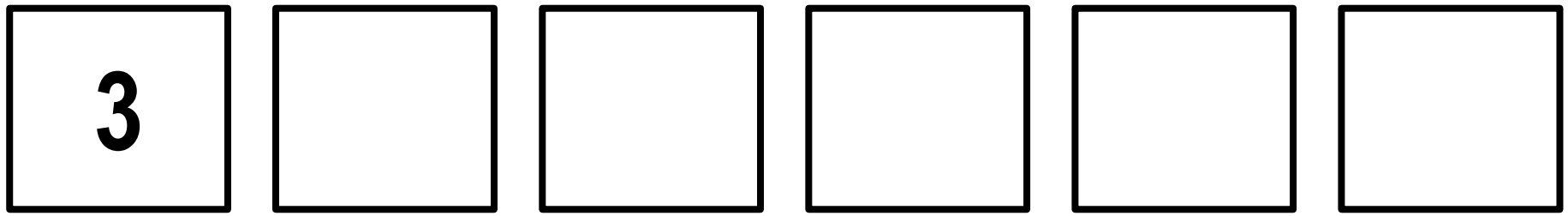

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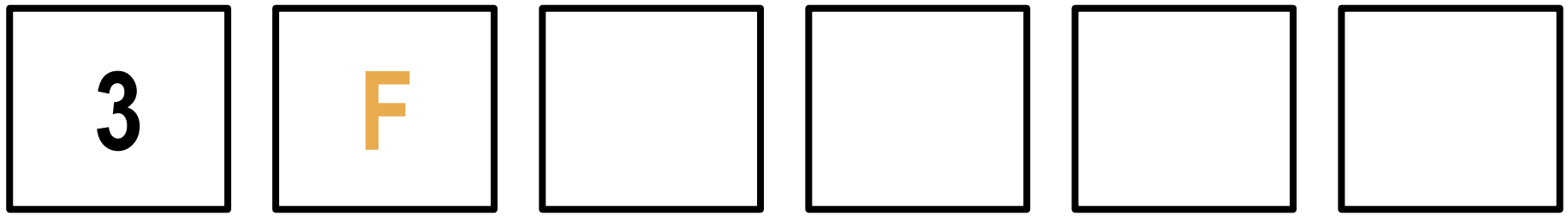

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%X if you want A, B, etc and %x if you want a, b, etc.

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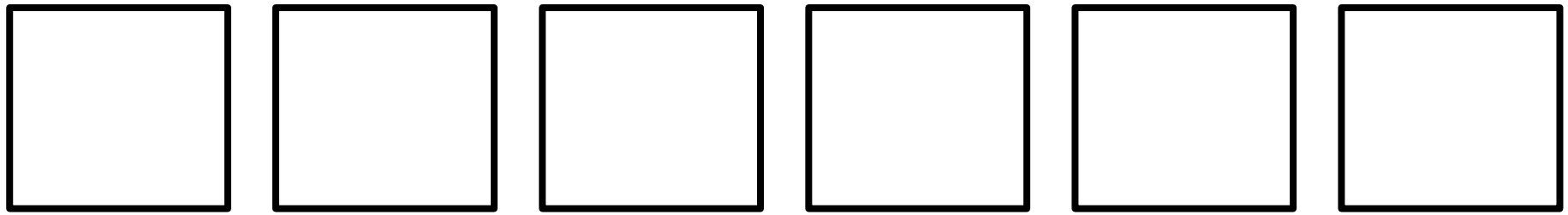

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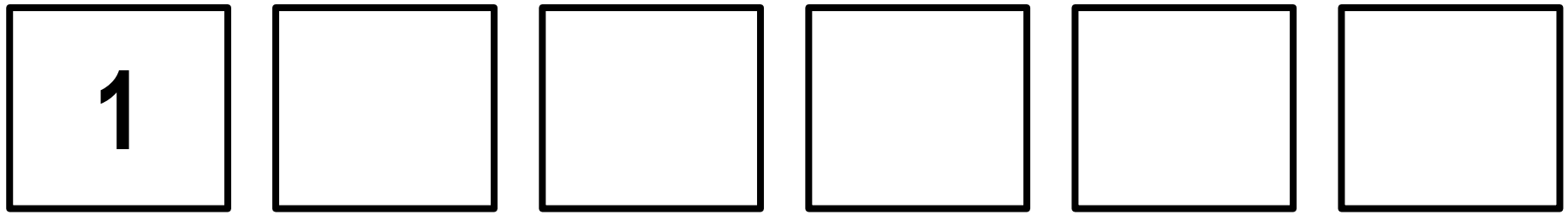

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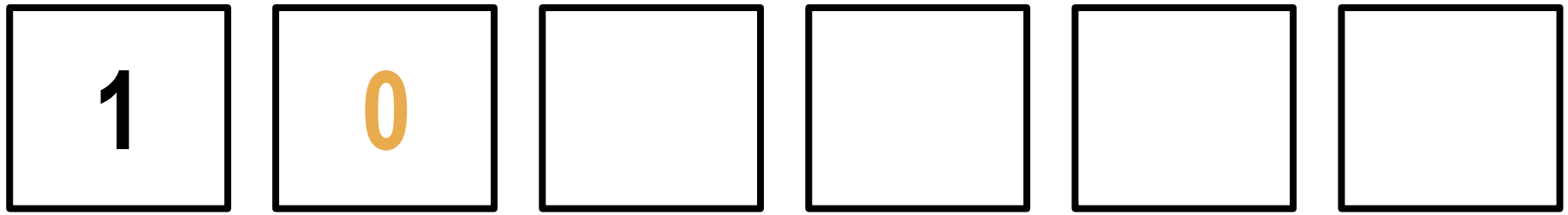

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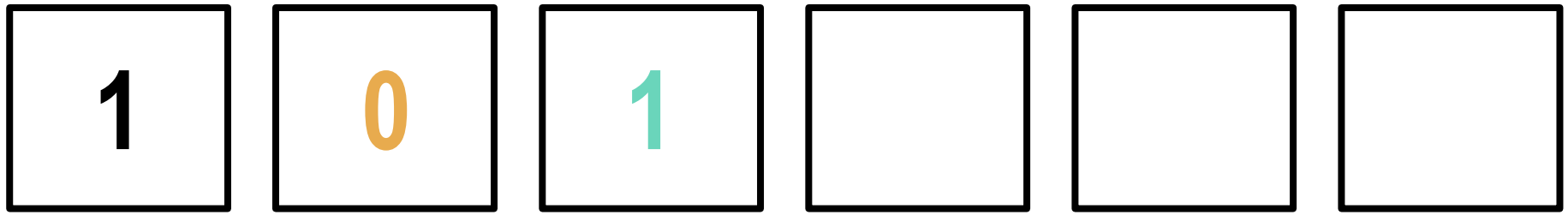

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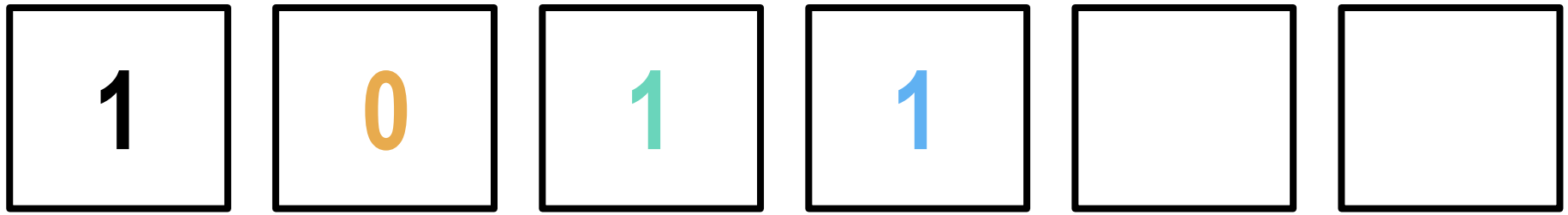

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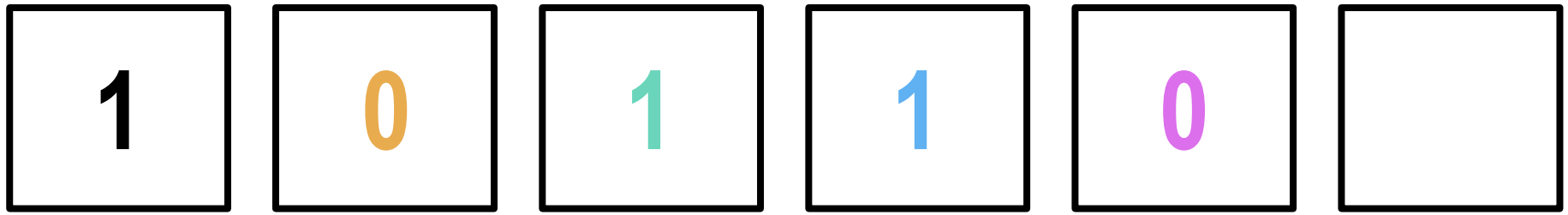

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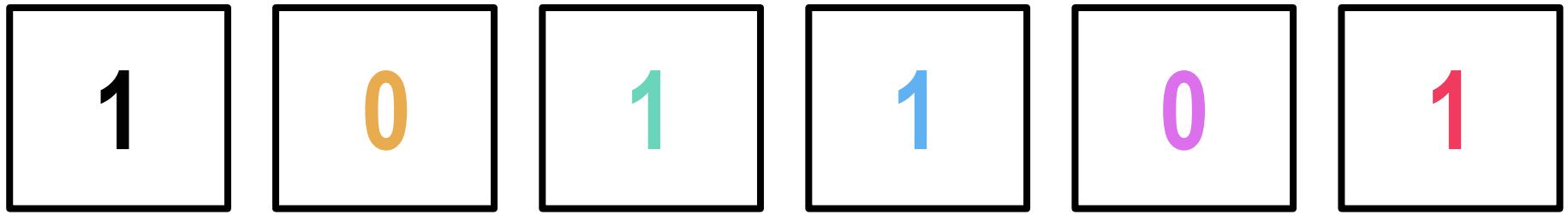

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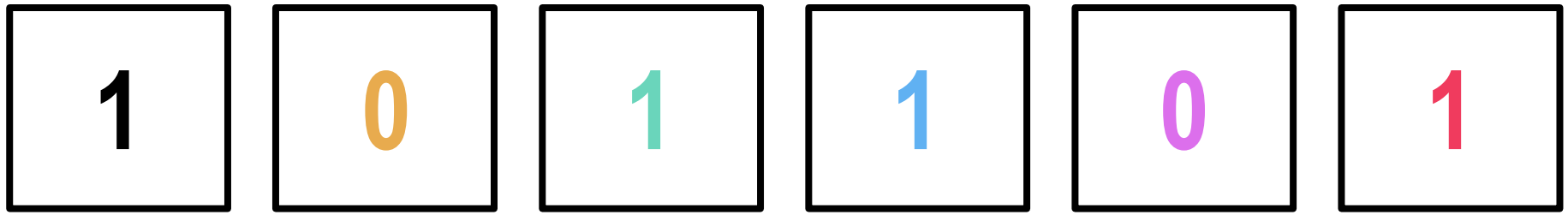

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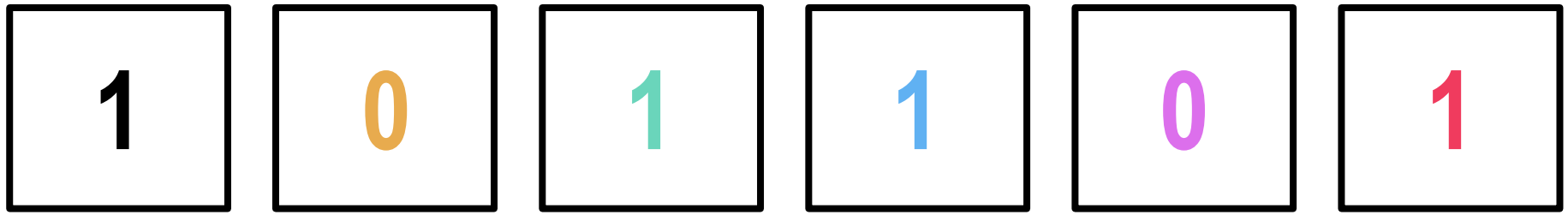

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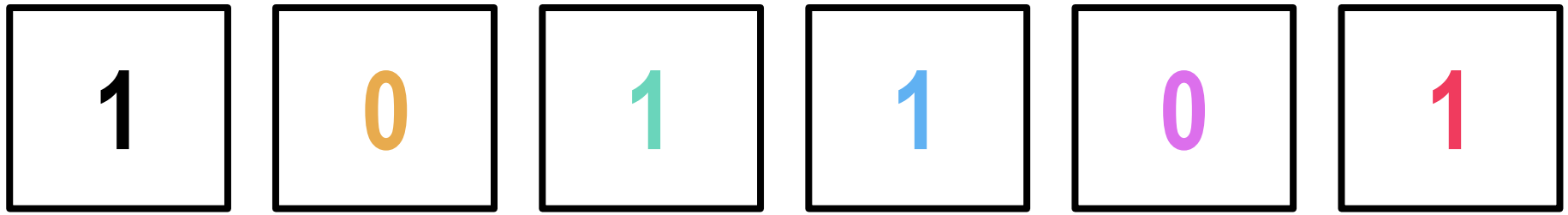

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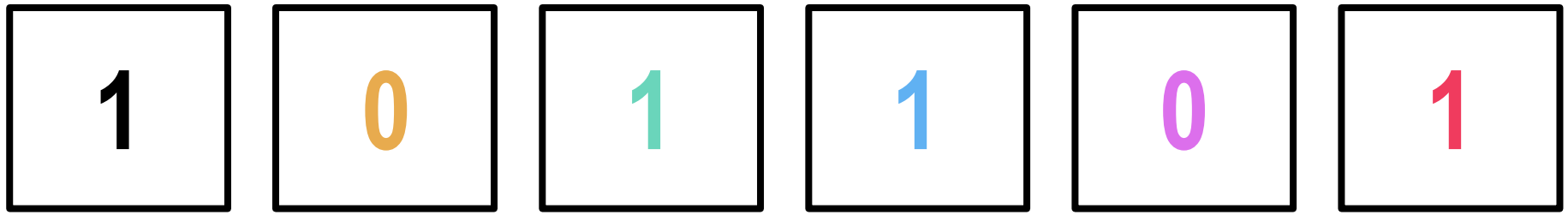

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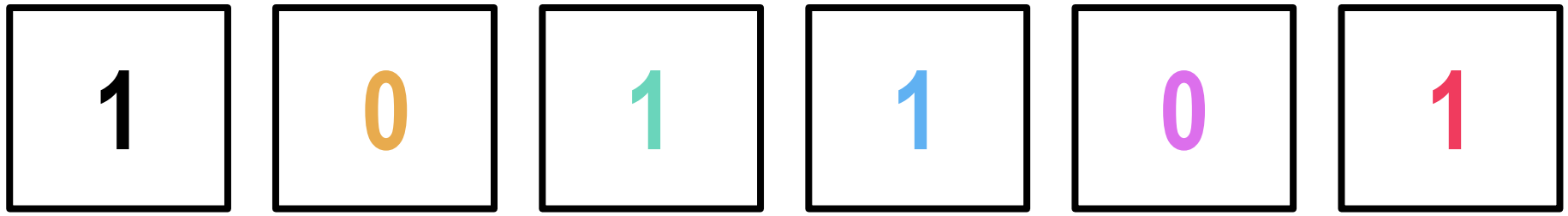

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Write a program to take an integer in decimal system and print its binary representation

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Can represent fractional numbers as well – explore yourself if you are interested

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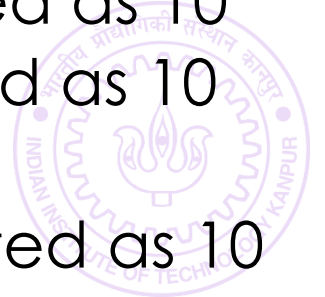

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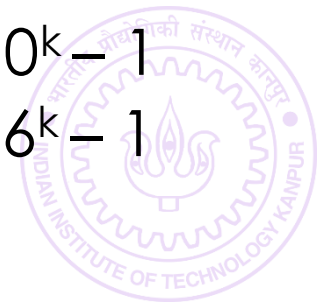

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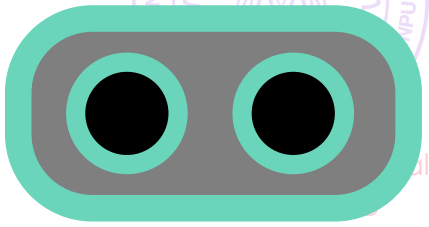

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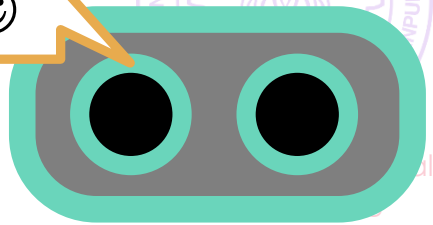

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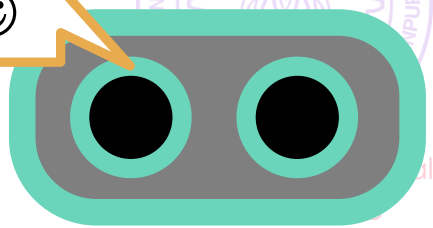

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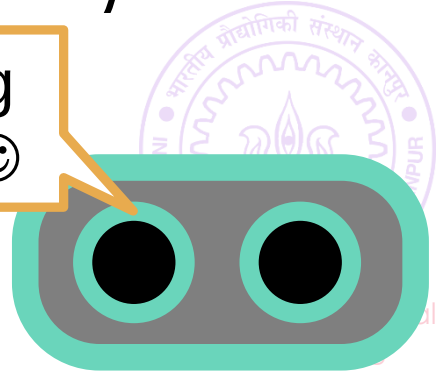

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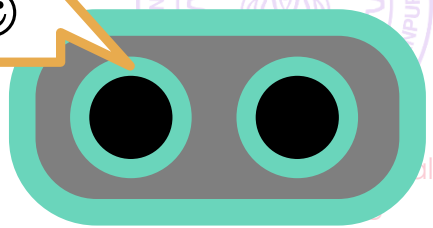

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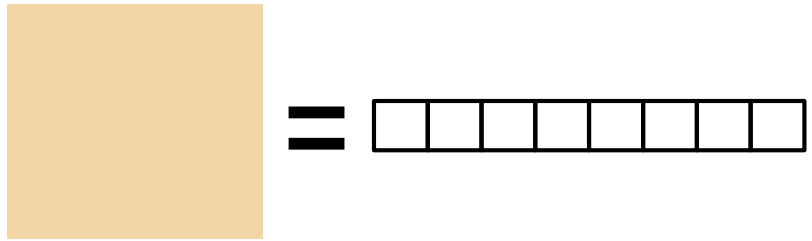

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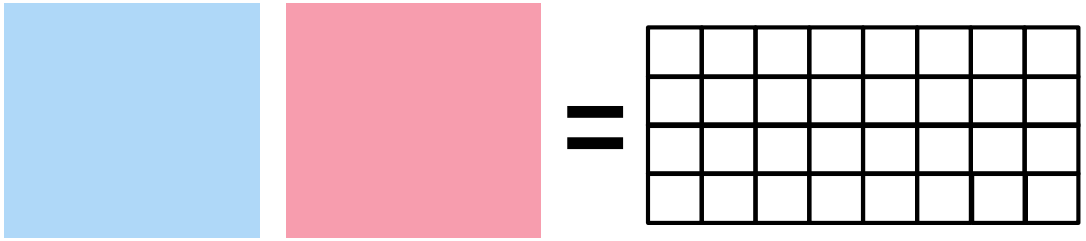

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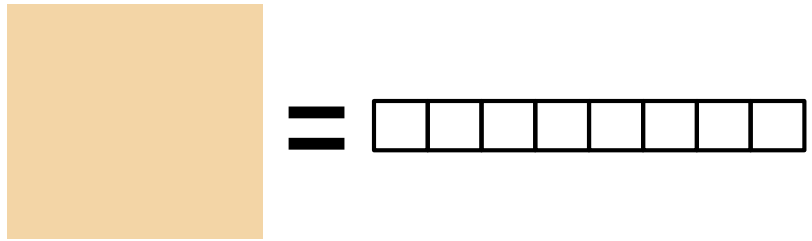

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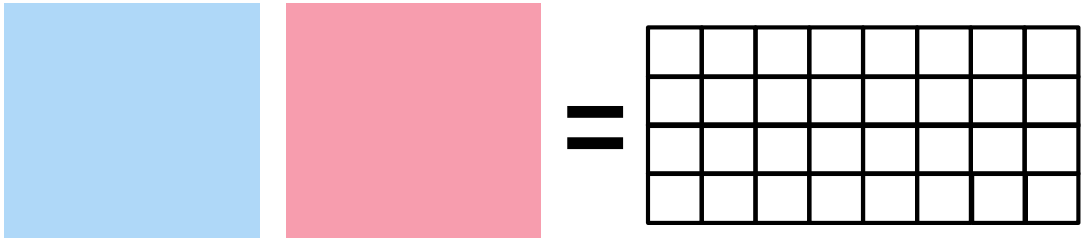

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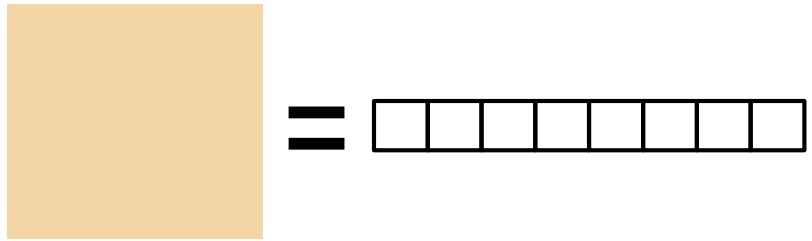

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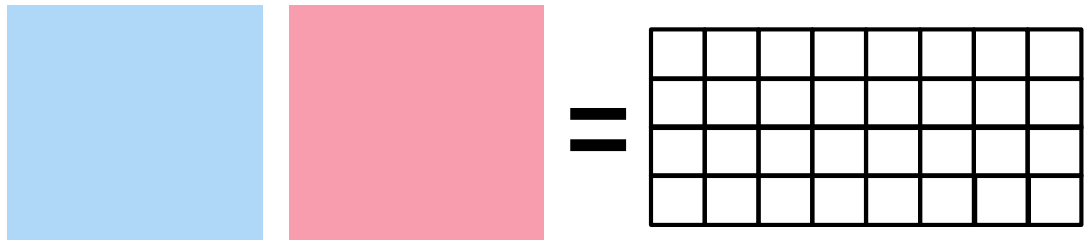

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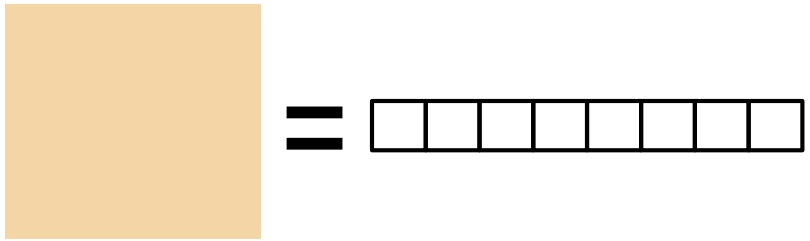

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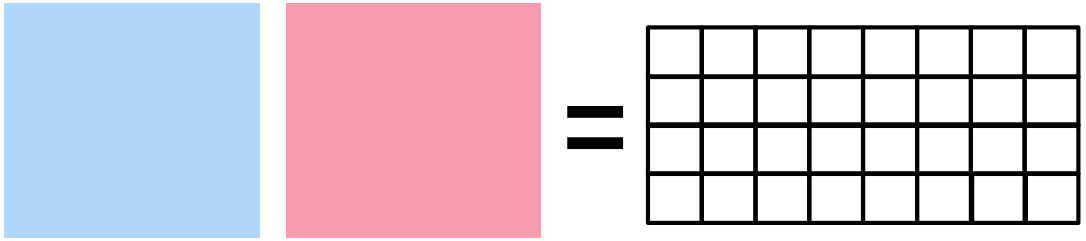

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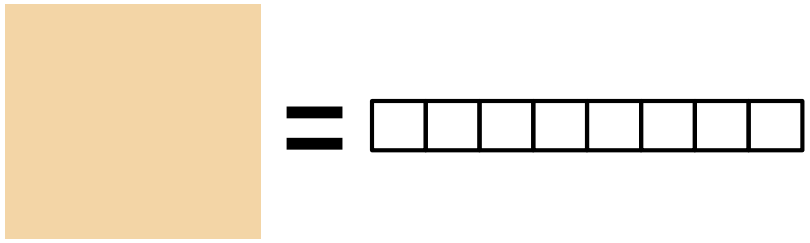

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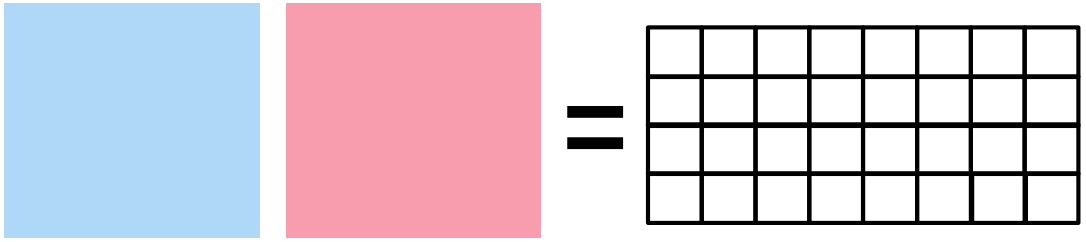

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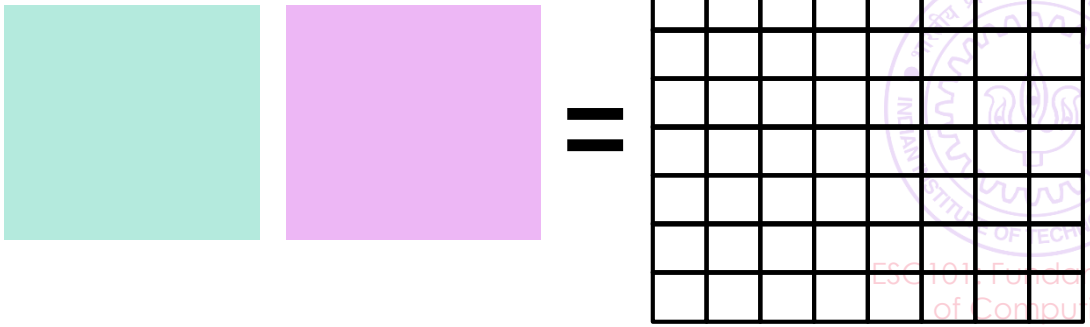

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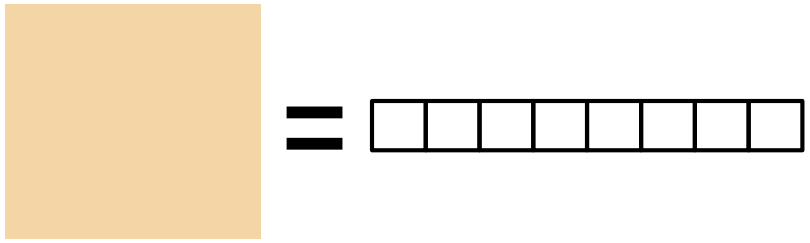

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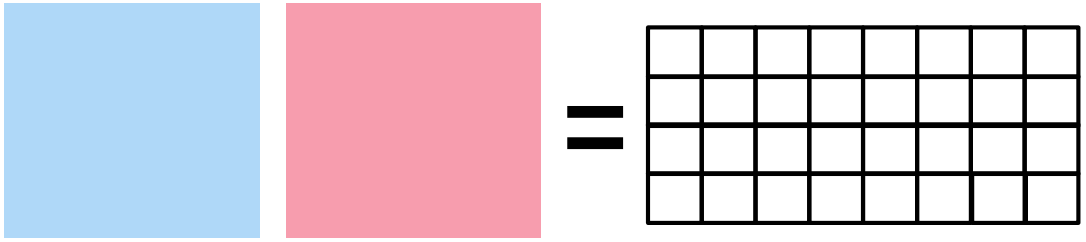
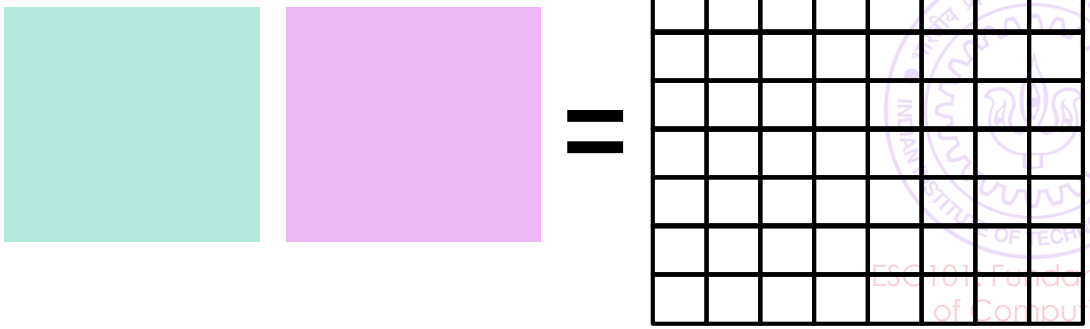


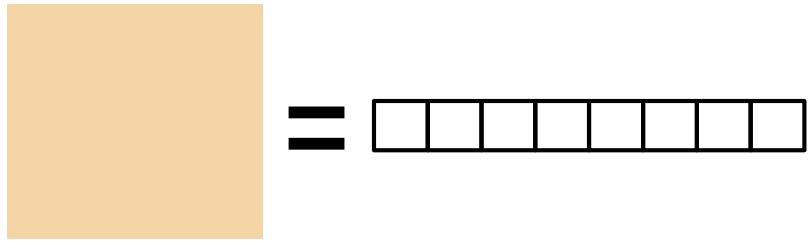
long/double takes 8 bytes = 64 bits

Max value in long is $2^{(64-1)}-1$ – verify



The sizeof various variable types

8 bits □ make a byte □□□□□□□□



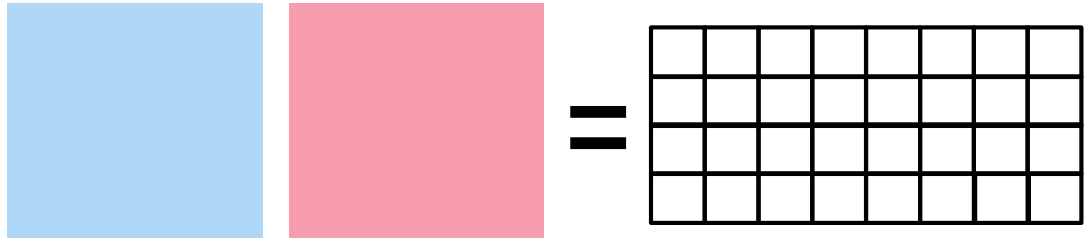
char takes 1 byte = 8 bits

Max value in a char is 127 = $2^{(8-1)}-1$

int/float takes 4 bytes = 32 bits

Max value in int is $2^{(32-1)}-1$ – verify

Max value of float discussed later



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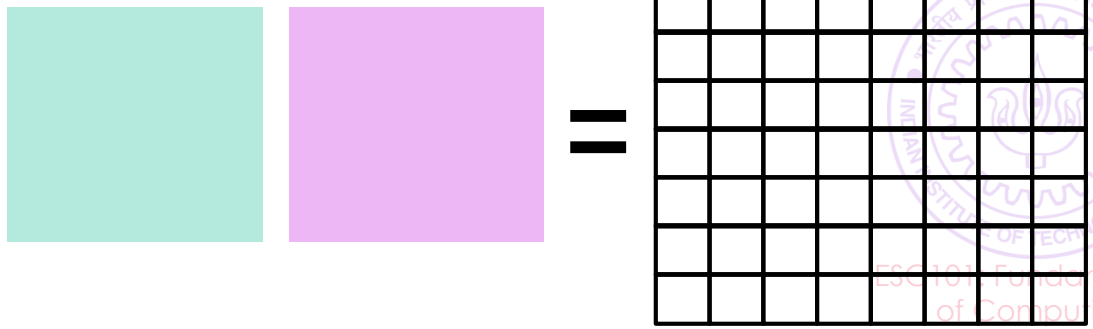

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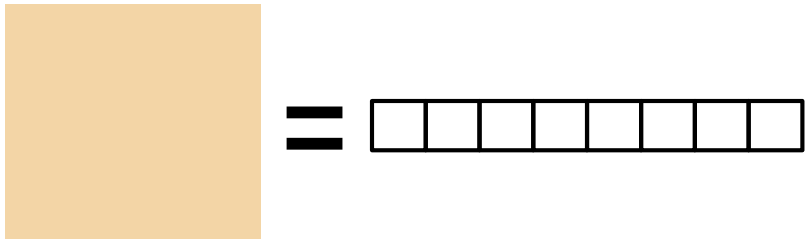

int/float takes 4 bytes = 32 bits

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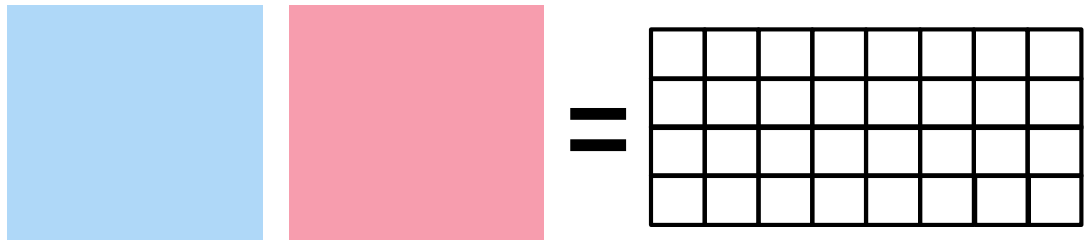
Max value of float discussed later



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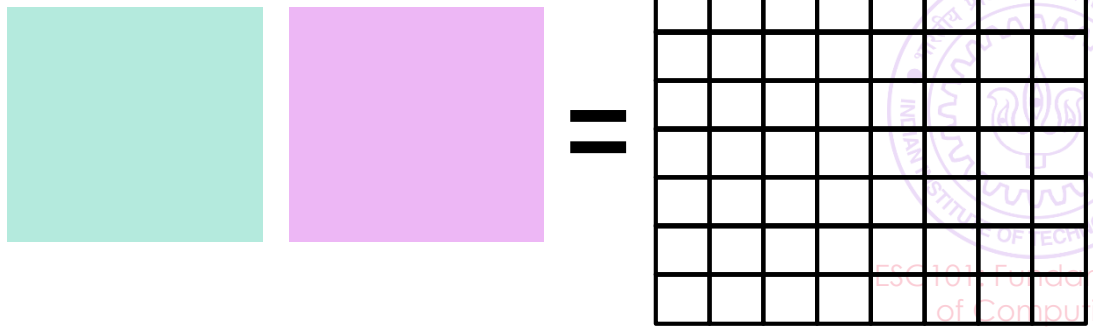

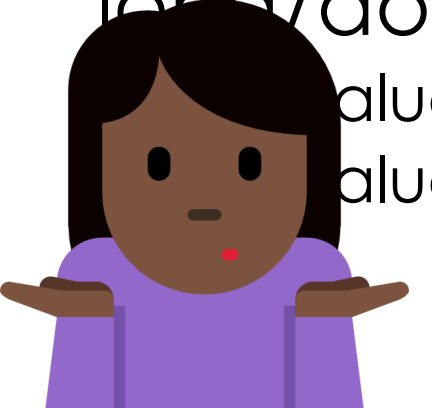

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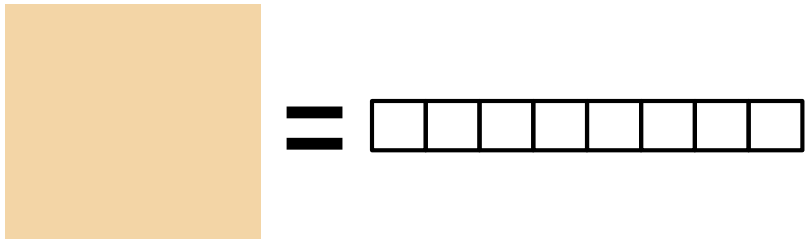

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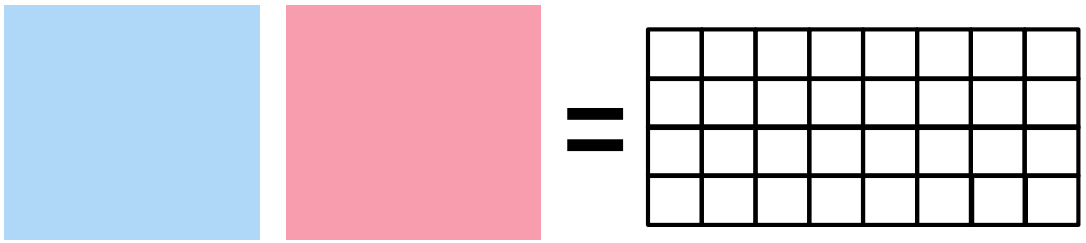

long/d… …s

a…

…alue of double discussed later

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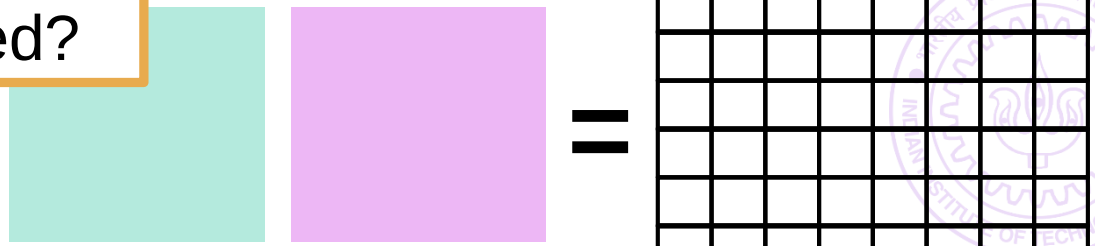

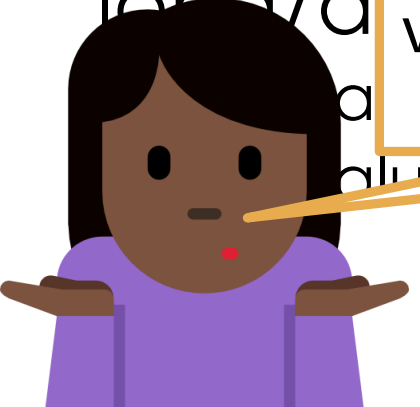

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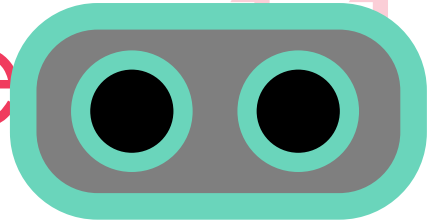

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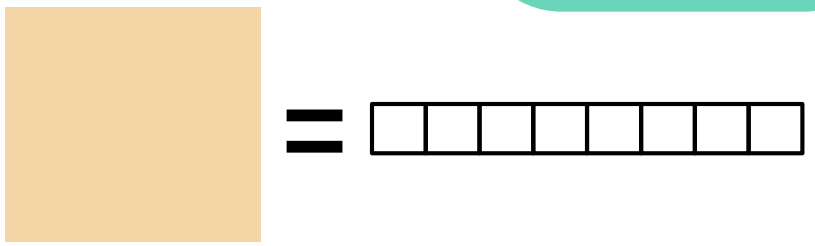

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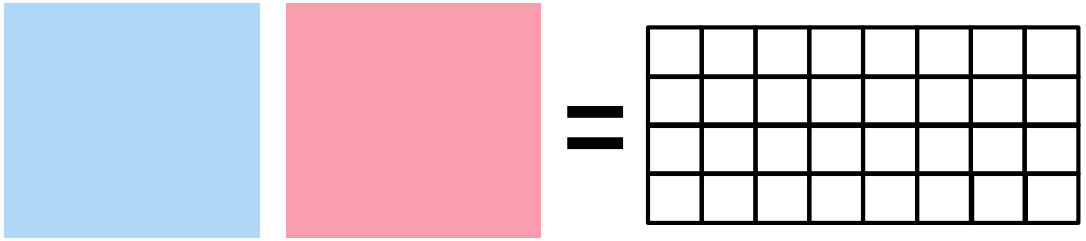

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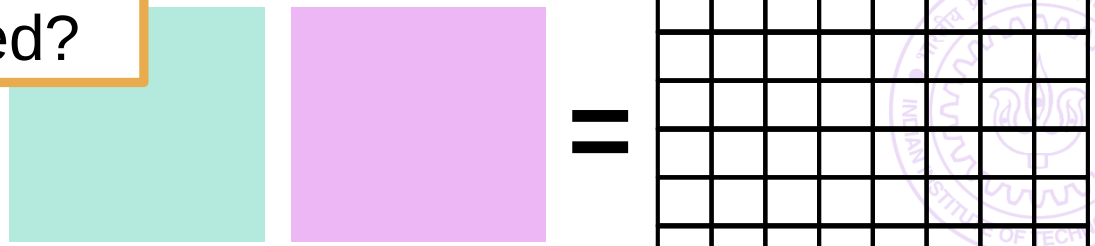
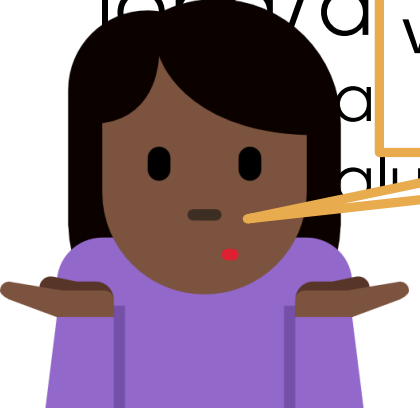
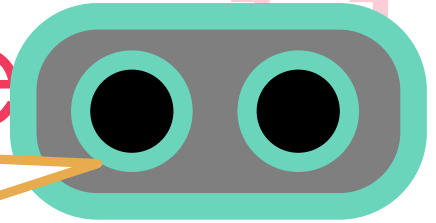




The sizeof various variable type

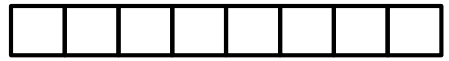


This has to do with the way I store negative numbers. Effectively, one bit gets used up in storing the sign of the number so only k-1 bits left to store the magnitude of the number

8 bits □ make

char takes 1 b

Max value in a char is 127 = $2^{(8-1)}-1$



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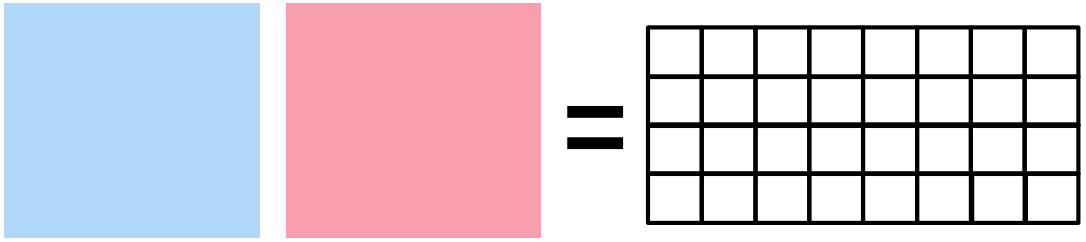
Max value of float discussed later



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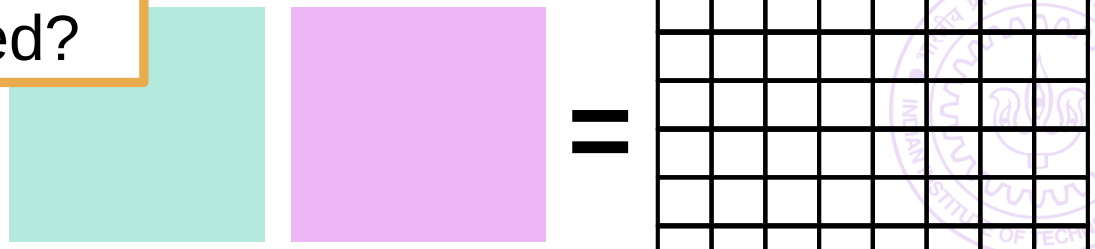

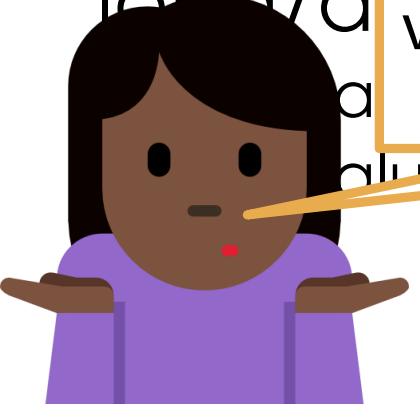

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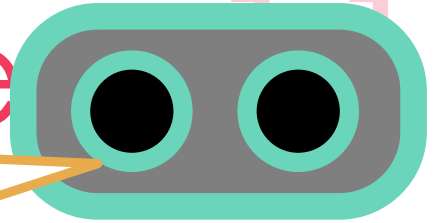

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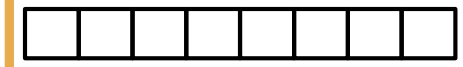

Max value in a char is 127 = $2^{(8-1)}-1$

int/float takes 4 bytes = 32 bits

Max value in int is $2^{(32-1)}-1$ – verify

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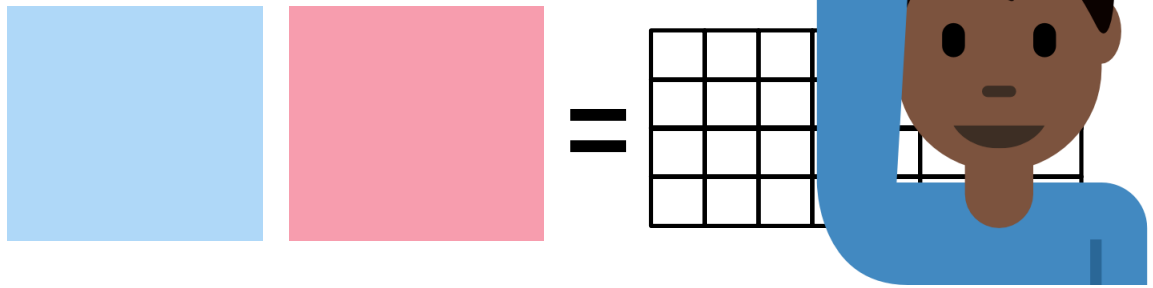

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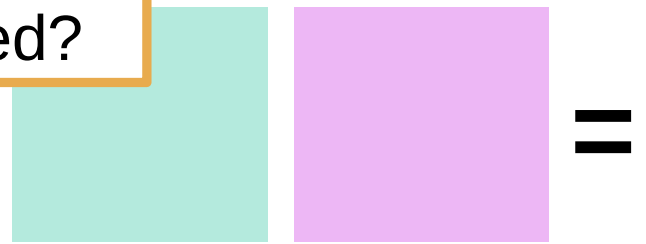

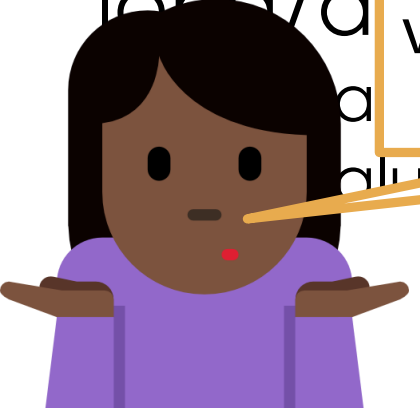

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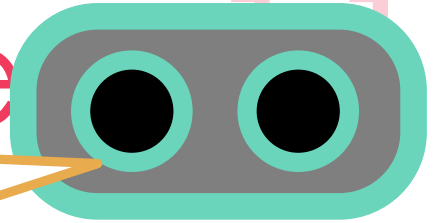

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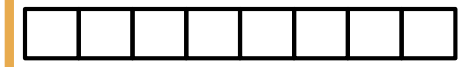


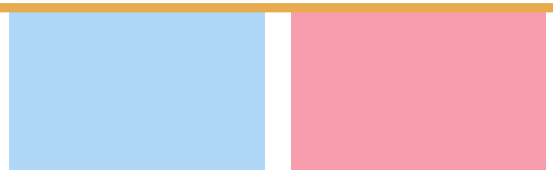
Max value in a char is 127 = $2^{(8-1)}-1$

int/float takes 4 bytes = 32 b

We will wait a few weeks to learn how negative numbers are stored

Max value in int is $2^{(32-1)}-1$ – verify

Max value of float discussed later



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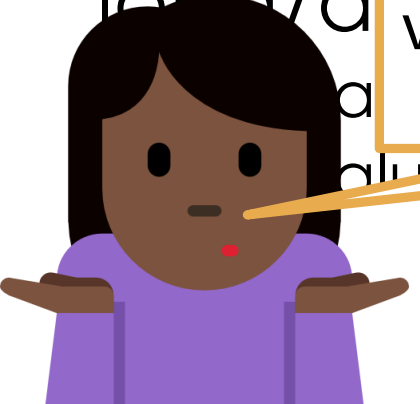

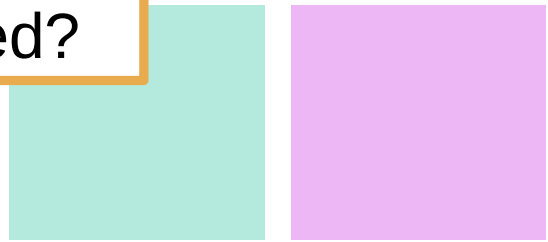

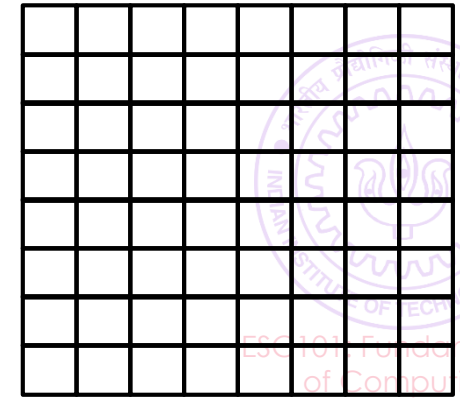

How Mr C stores variables

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He has a very long chain of bytes

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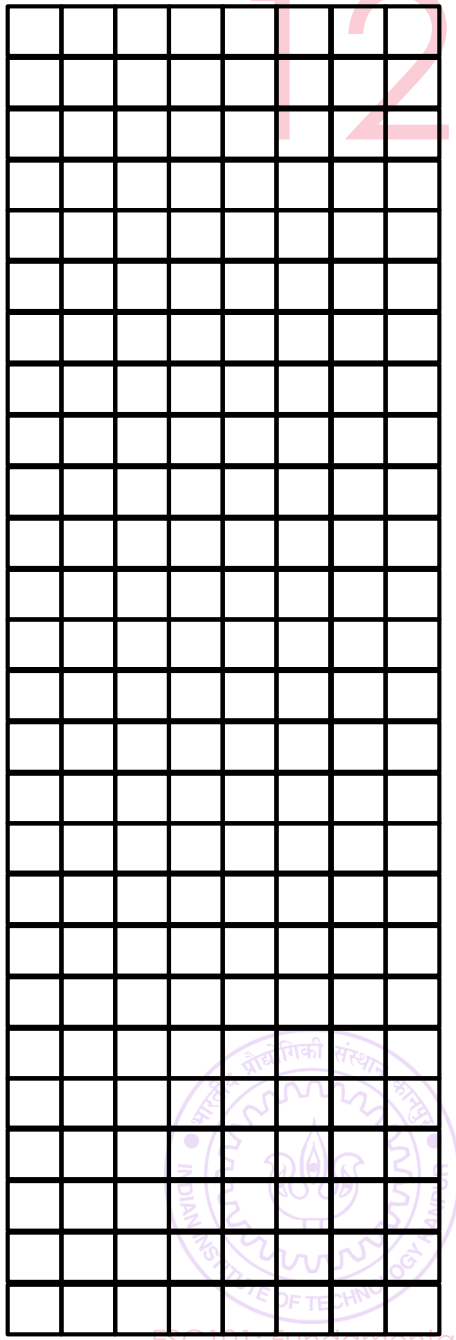

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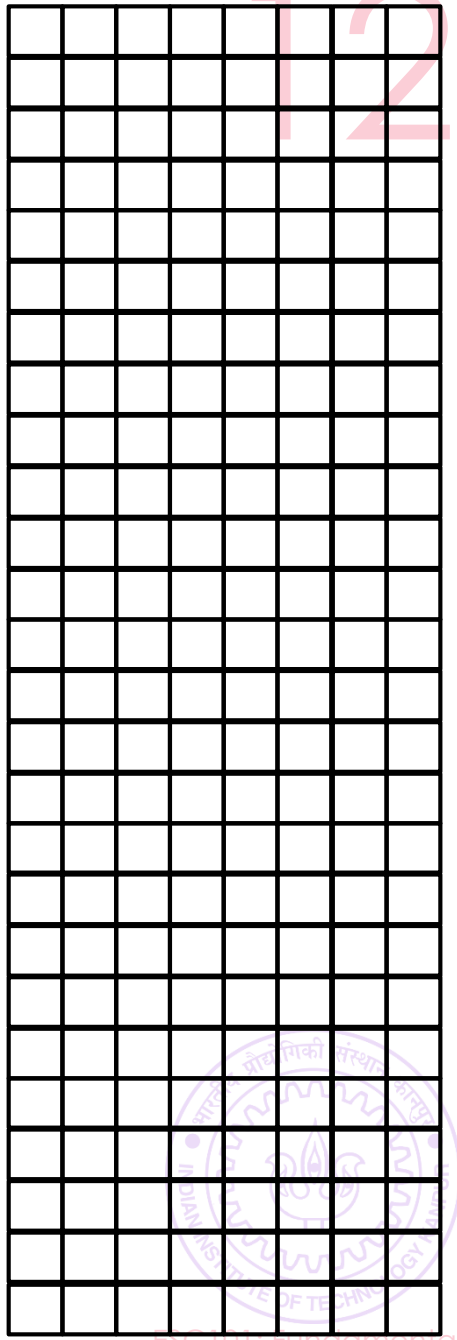
Each byte has an "address“



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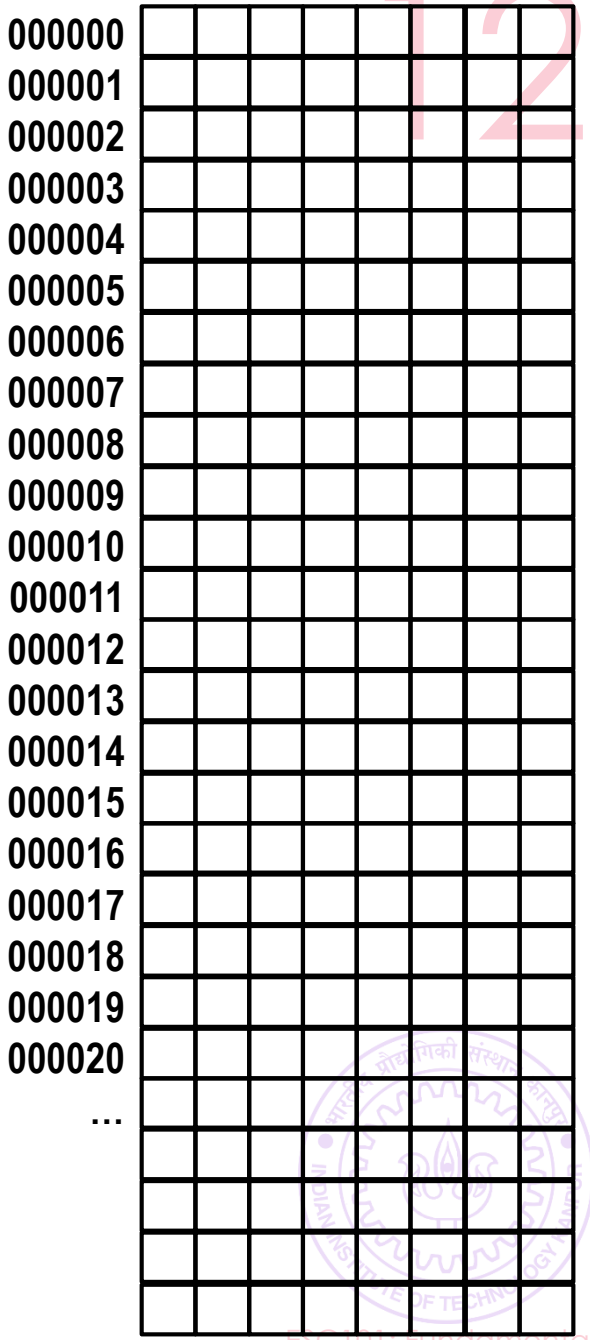

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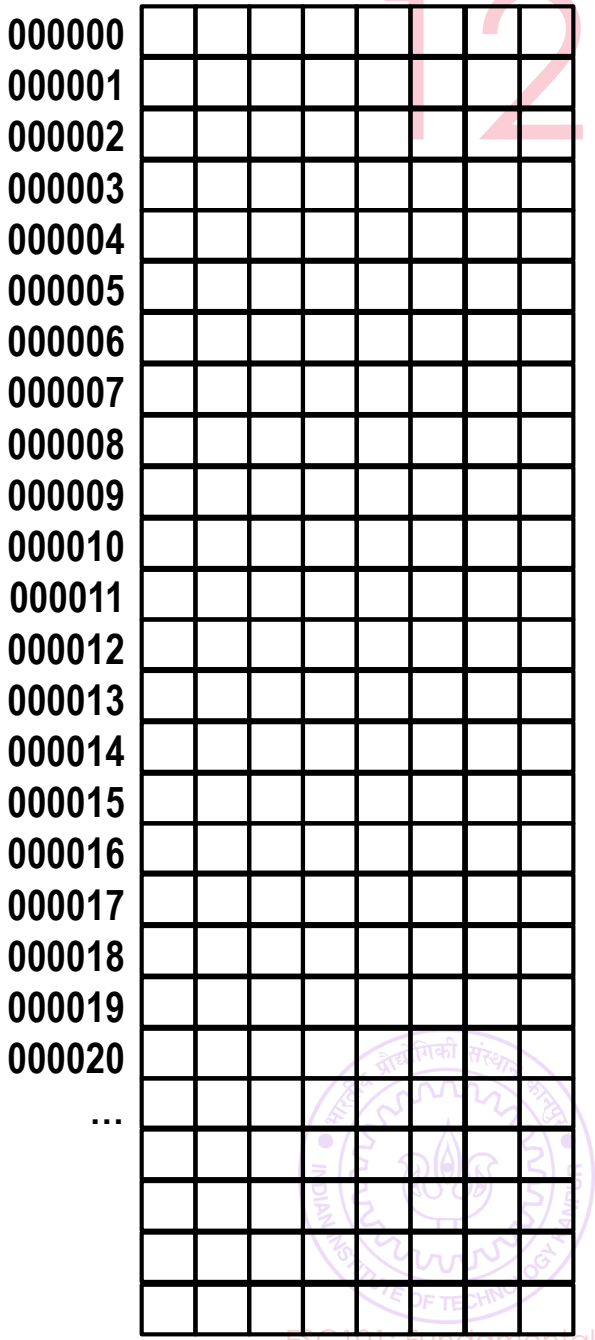
All addresses can be stored within 8 bytes



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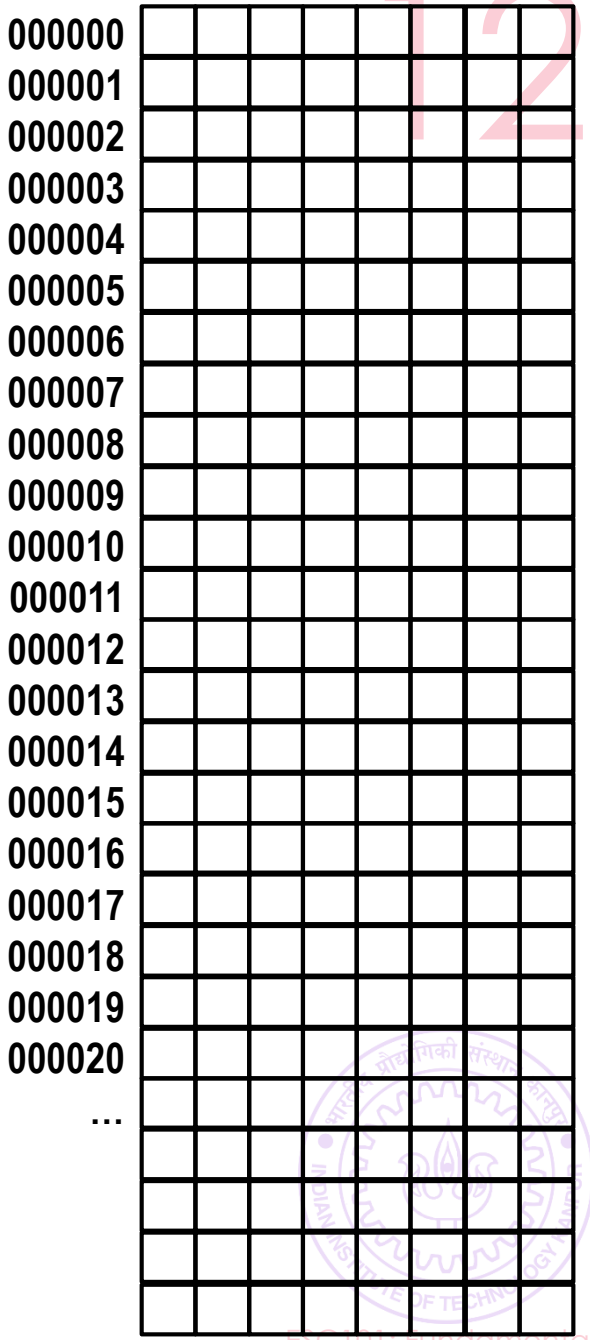

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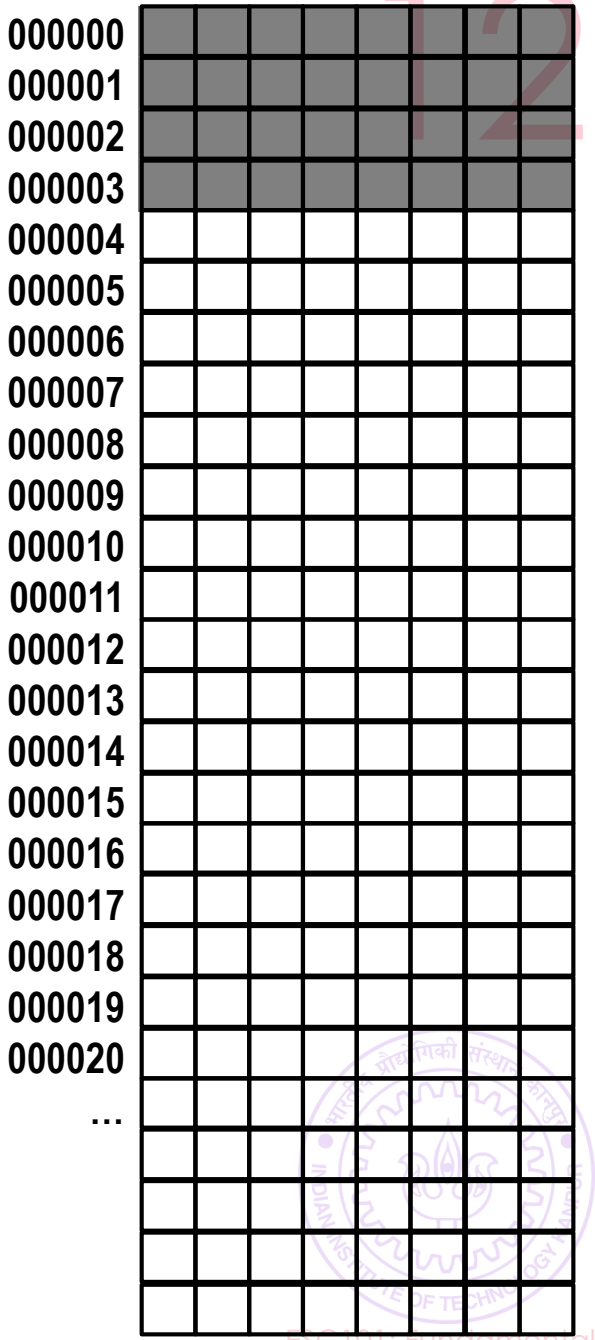

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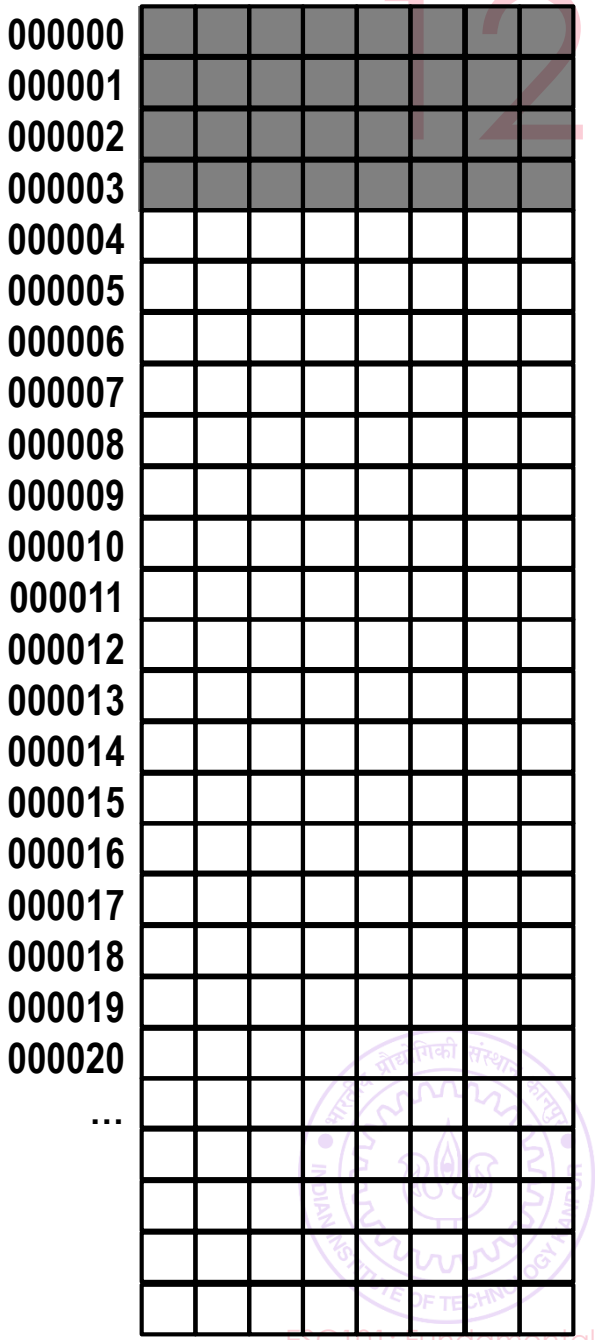

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char c;
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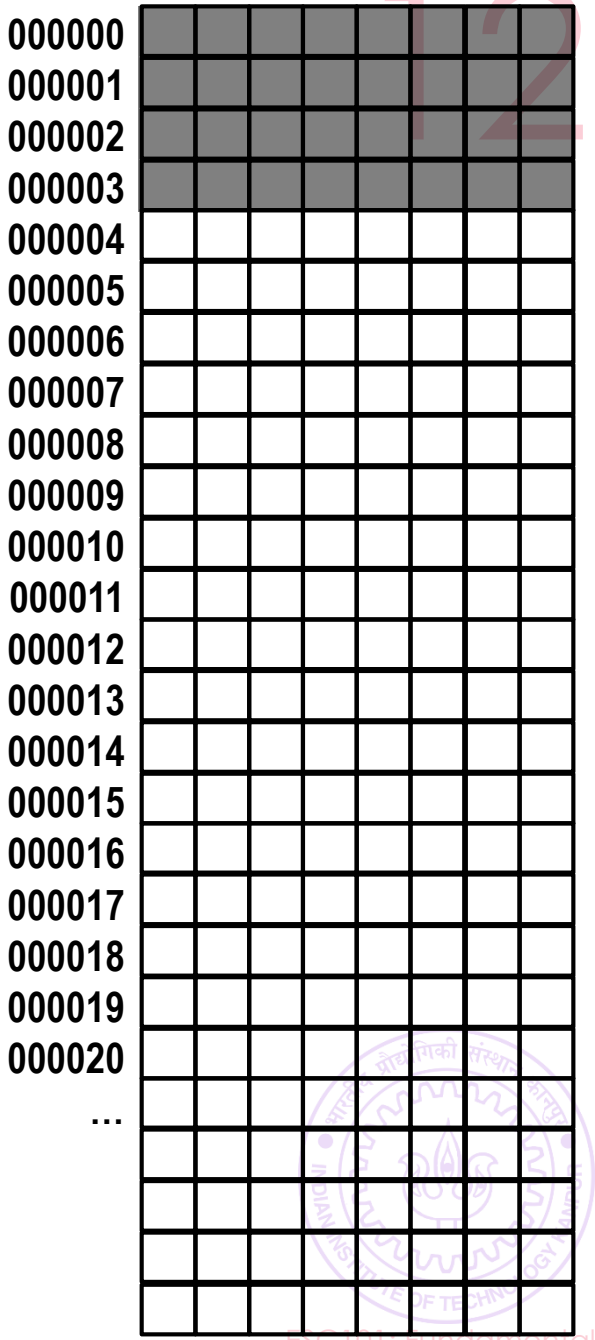

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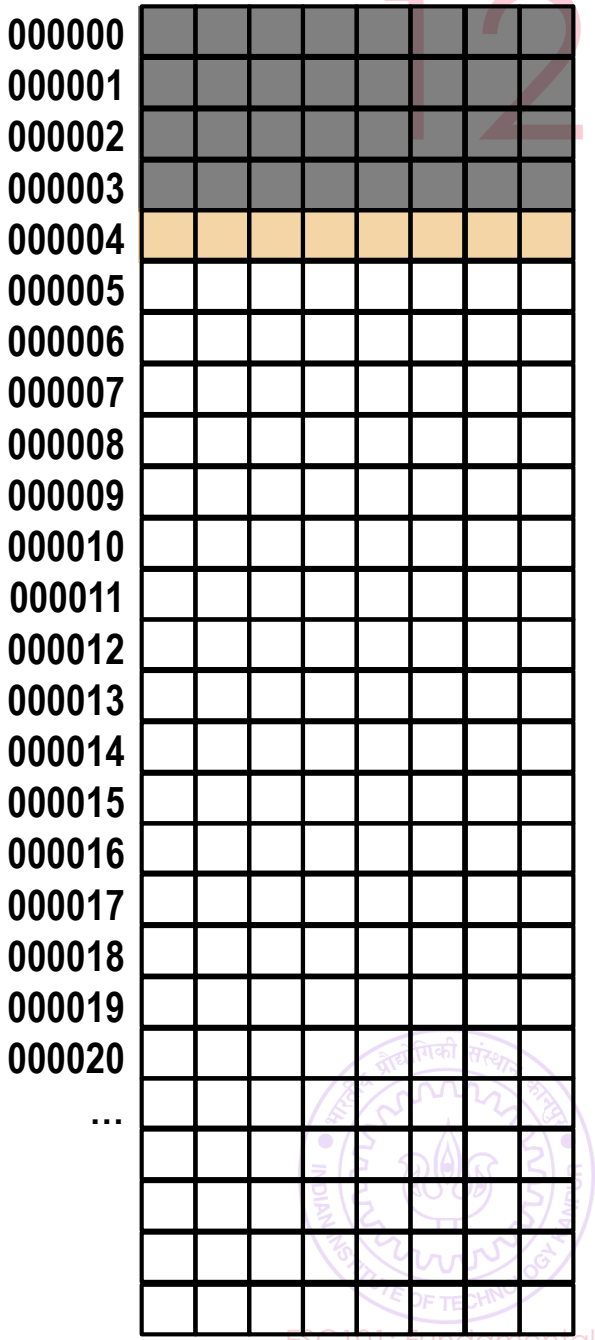

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```
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int a;
```

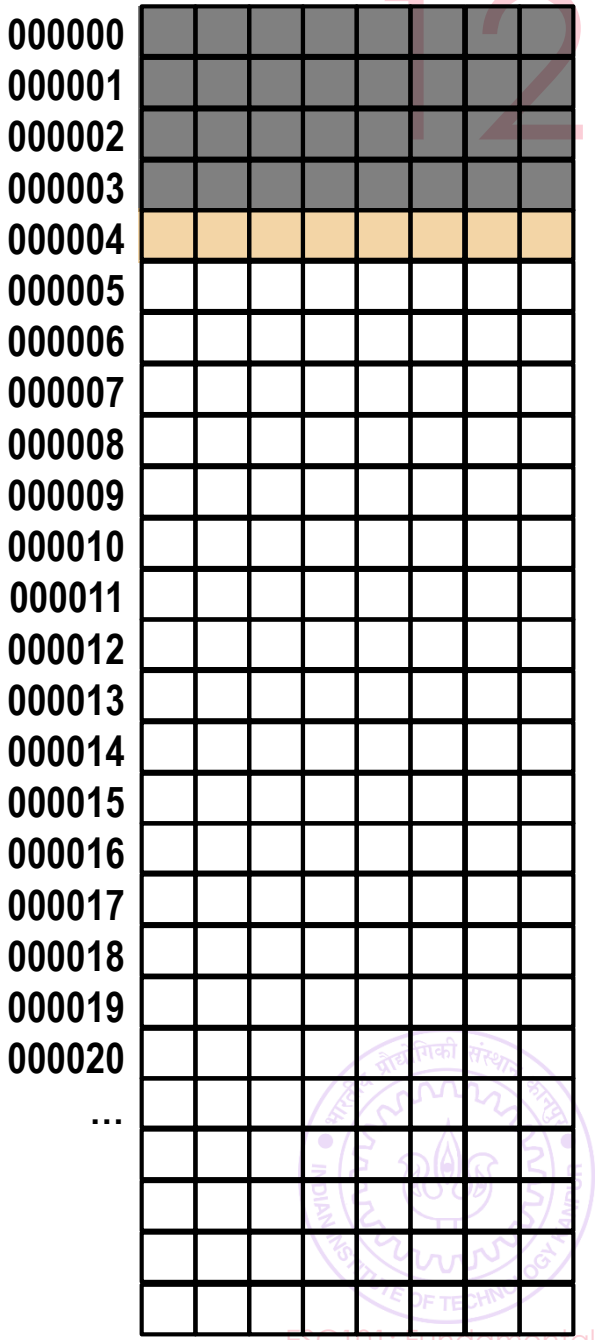

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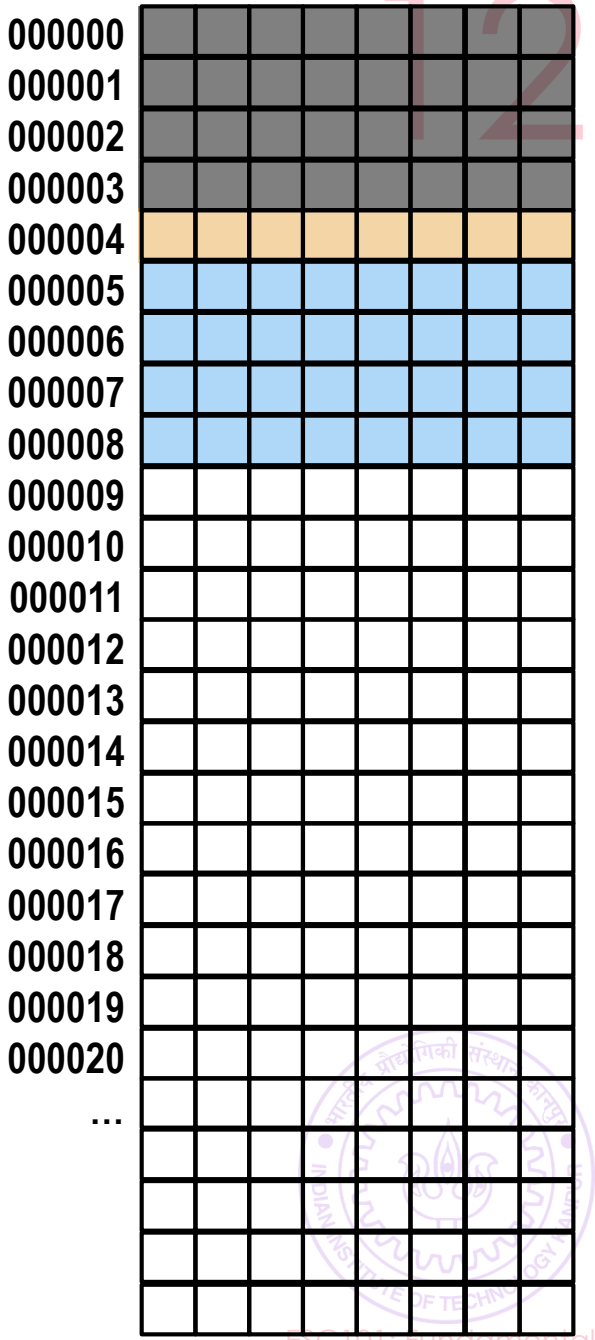

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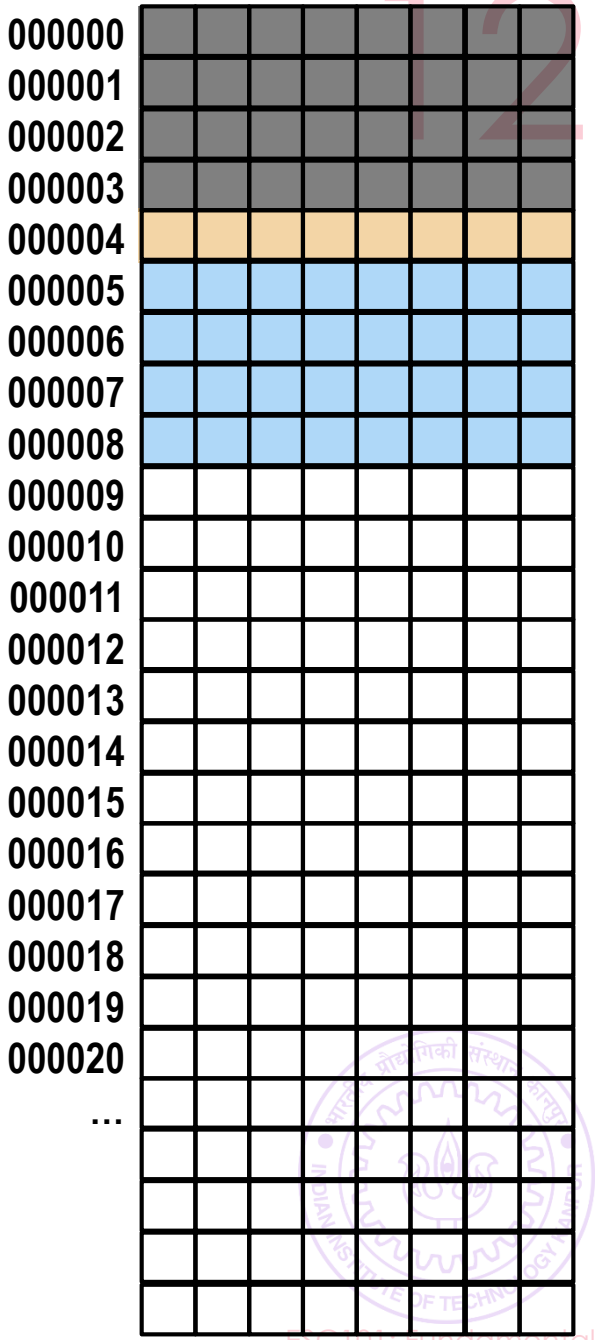
char c;
int a;
double d;
```



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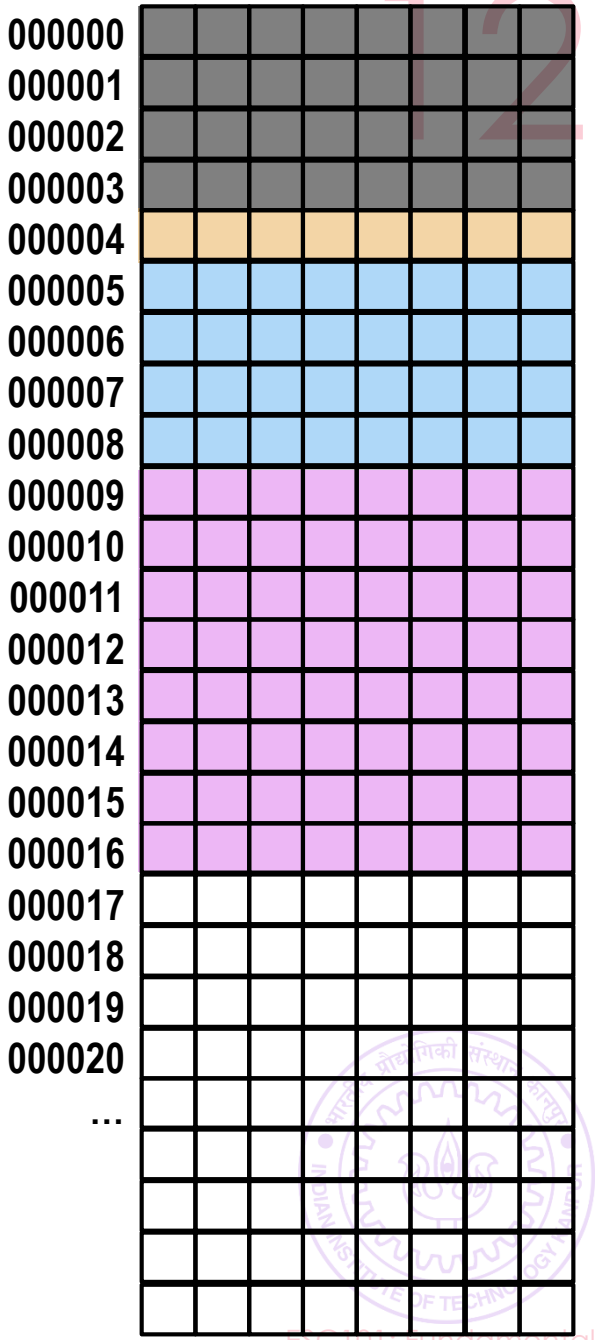

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char c;
int a;
double d;
```
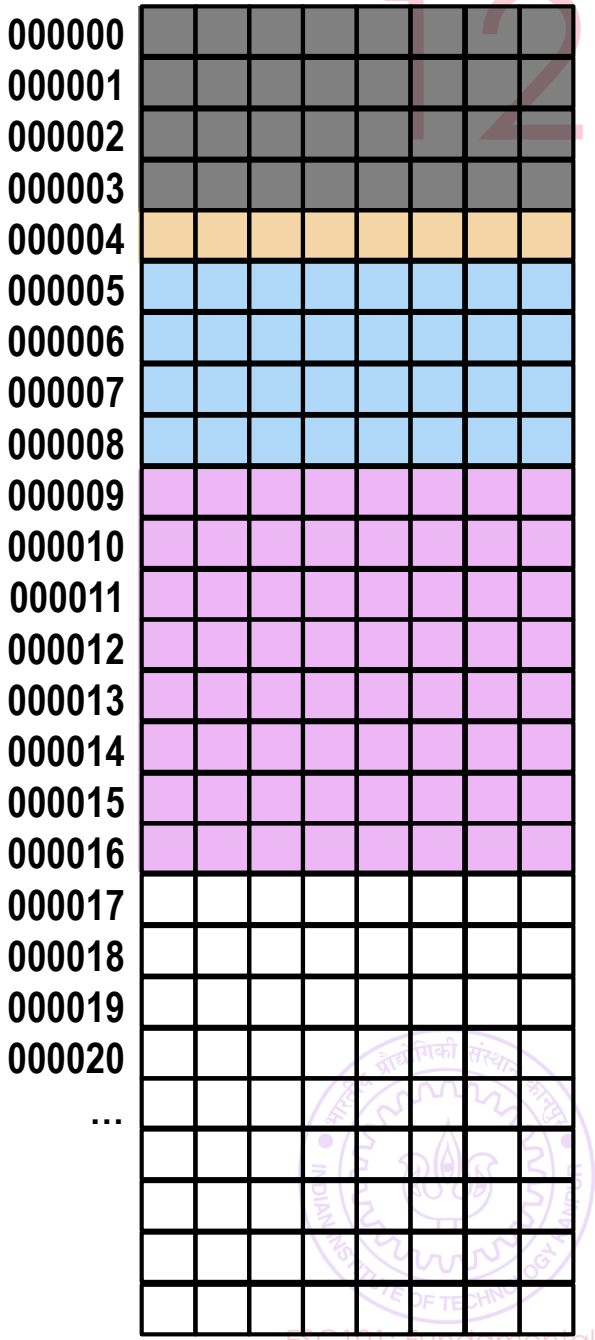

So c is stored at address 000004, a at 000005 and d at address 000009



Pointers

भारतीय प्रौद्योगिकी संस्थान कानपुर
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

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Pointers can allow us to write very beautiful code but it is a very powerful tool – misuse it and you may suffer ☺

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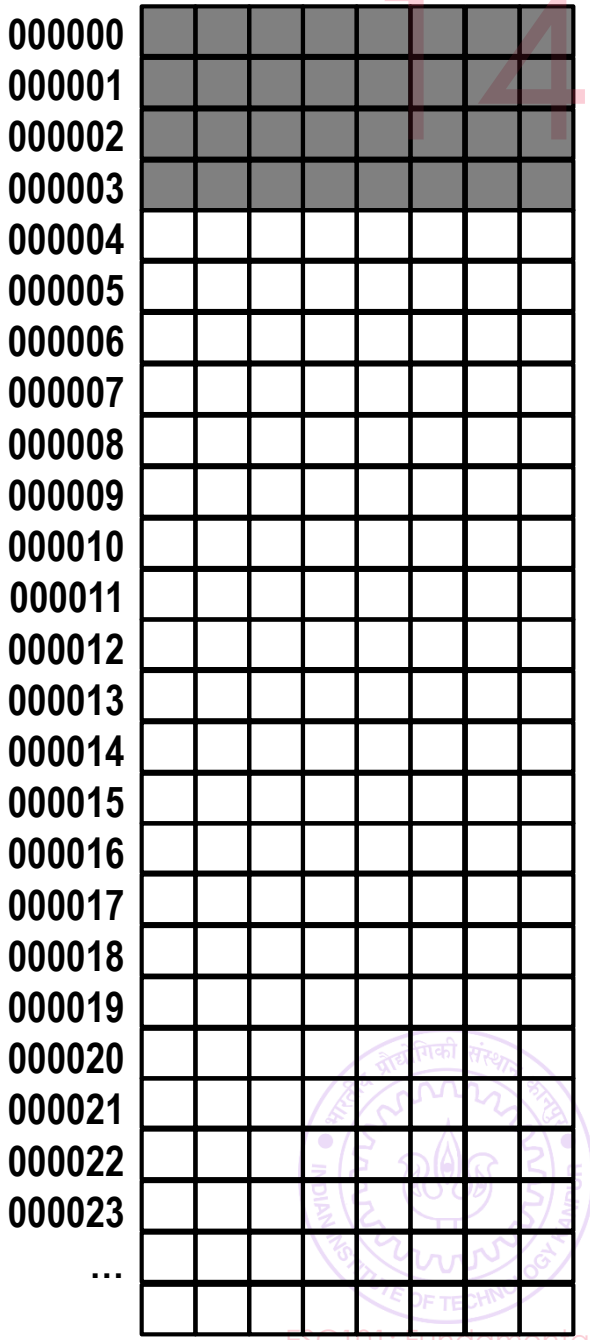

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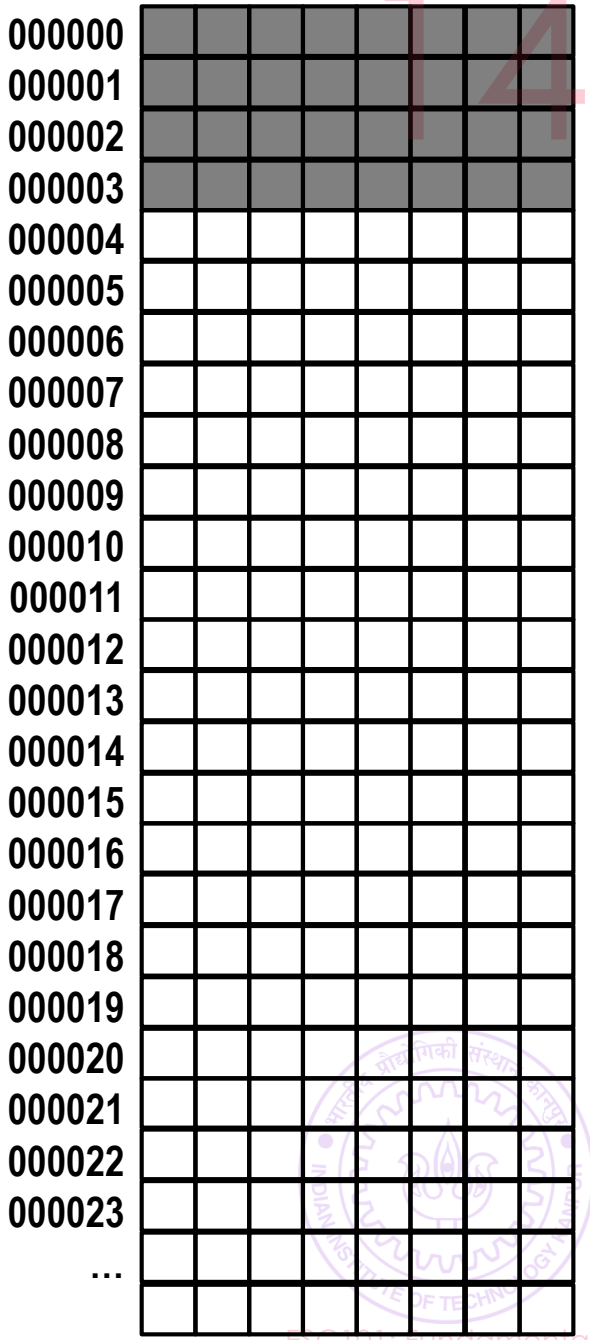

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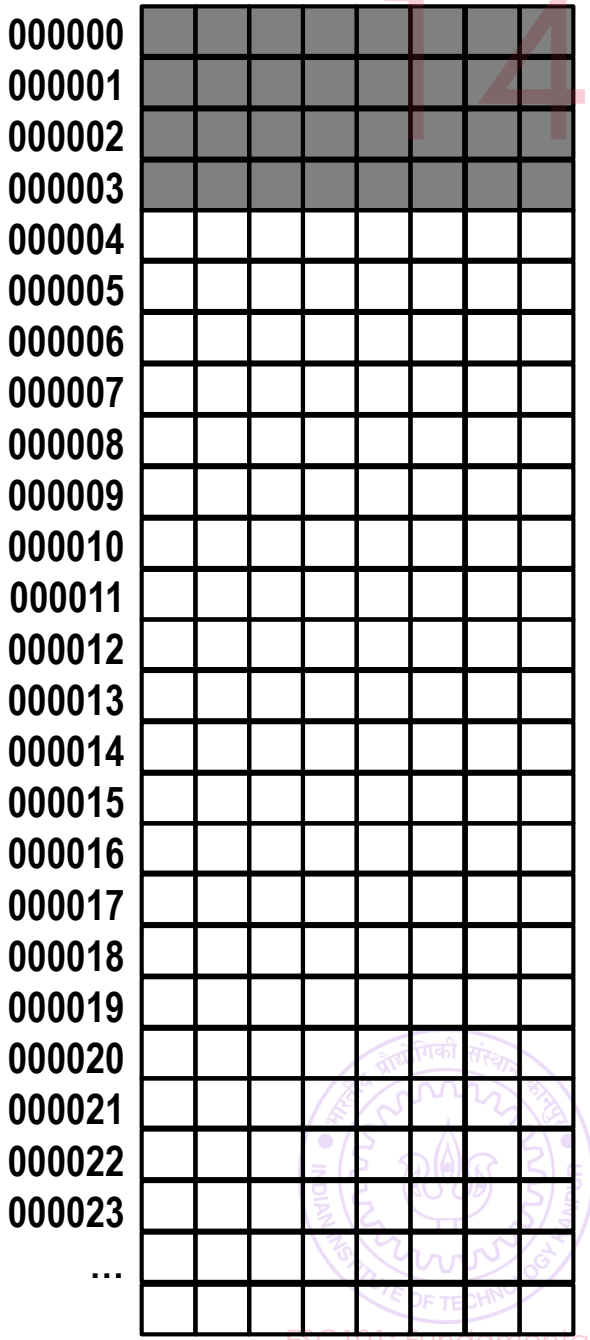

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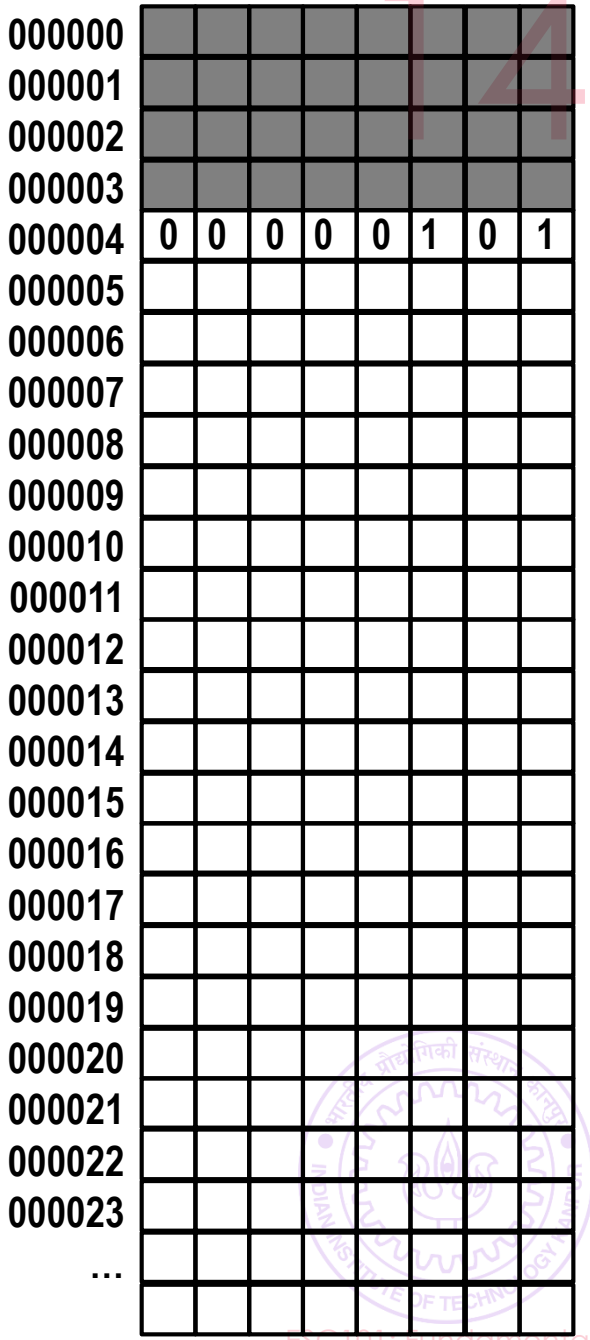

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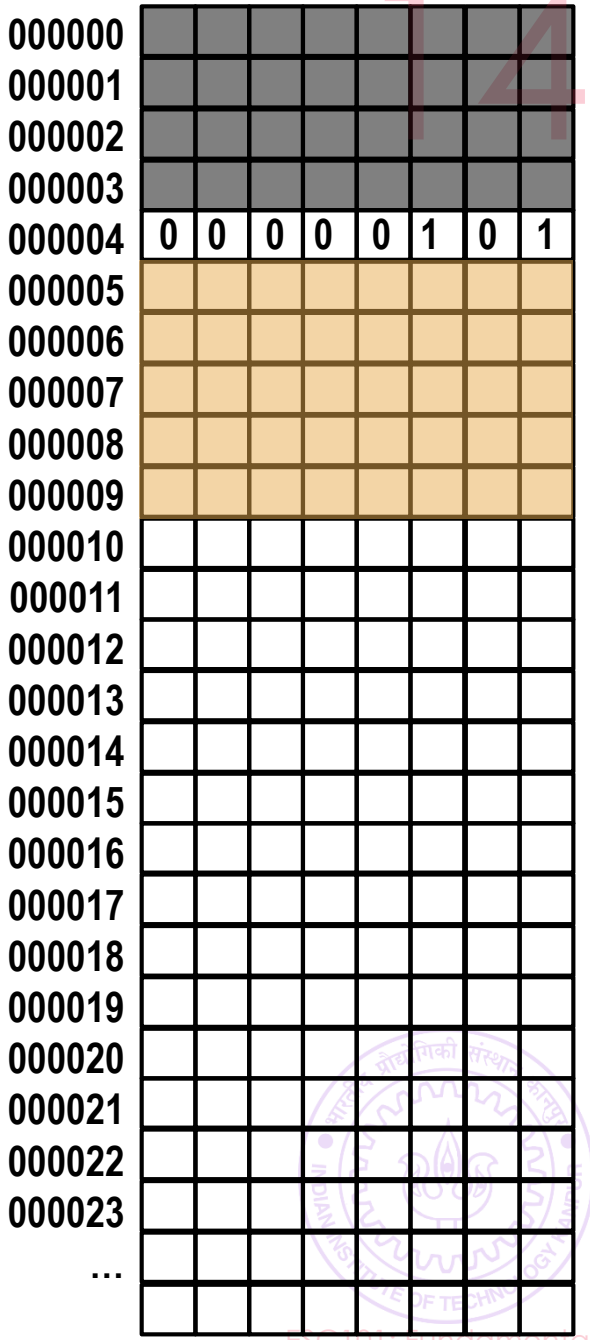

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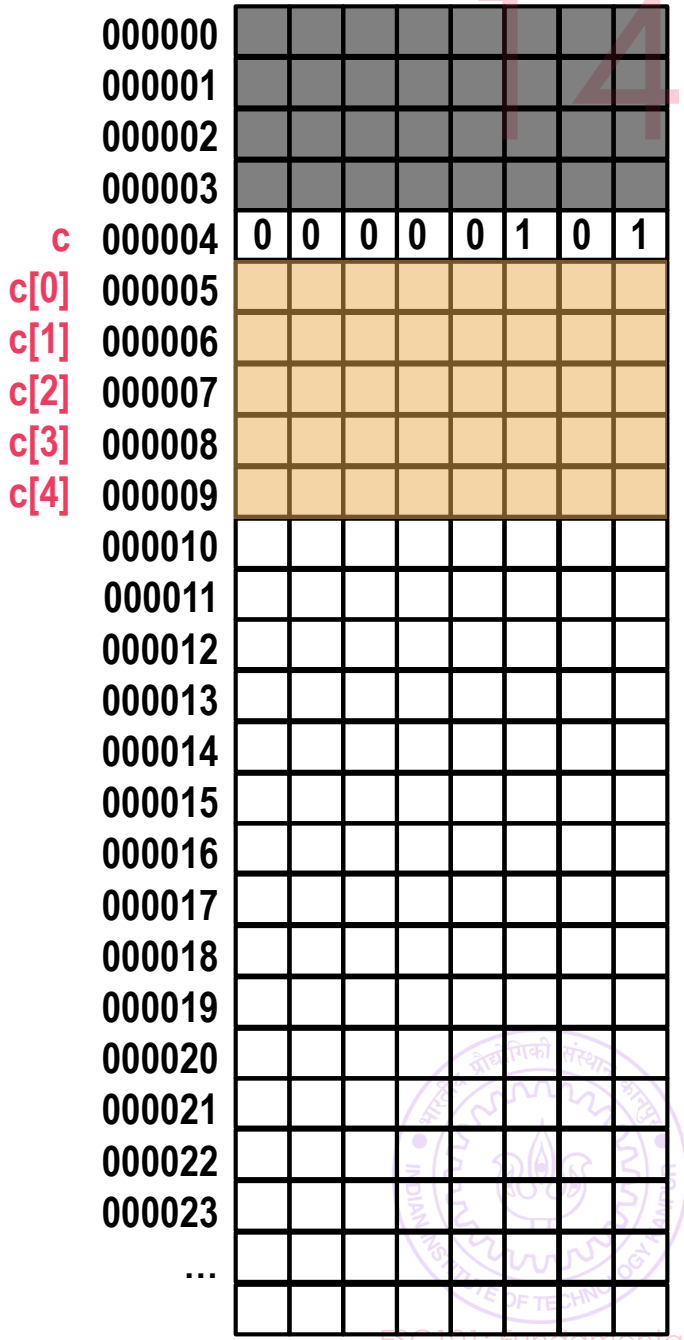

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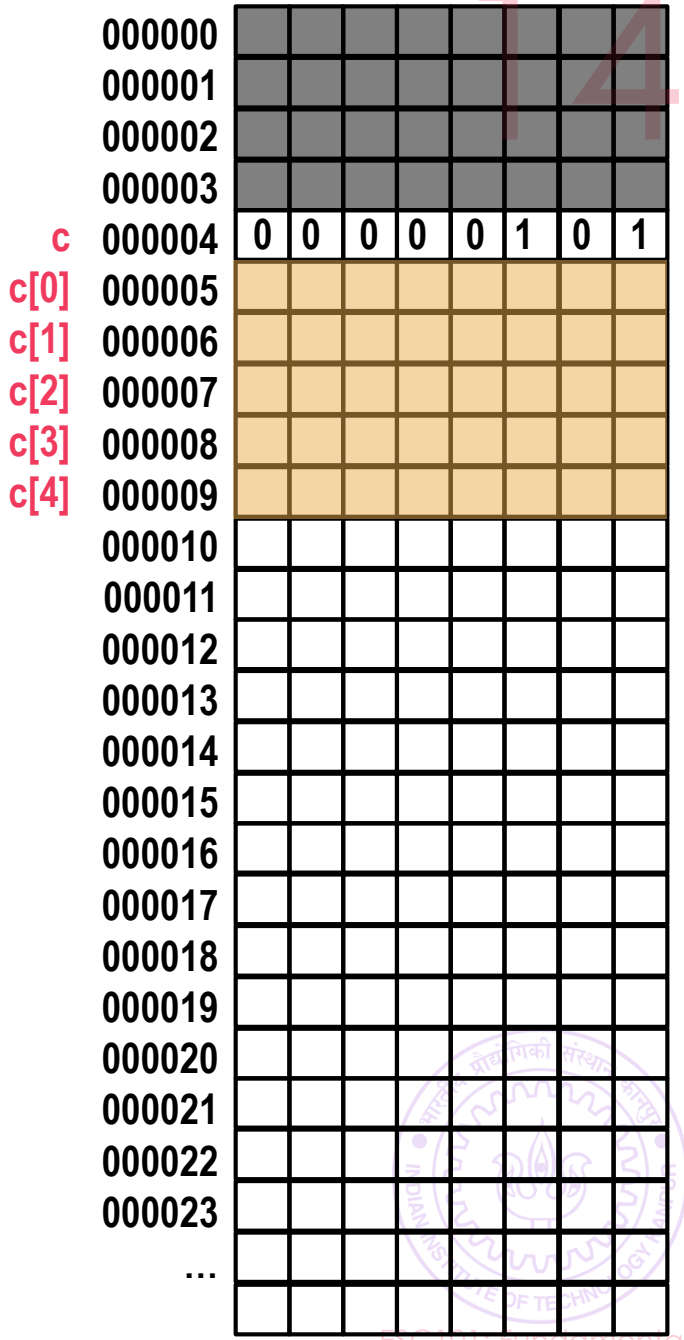

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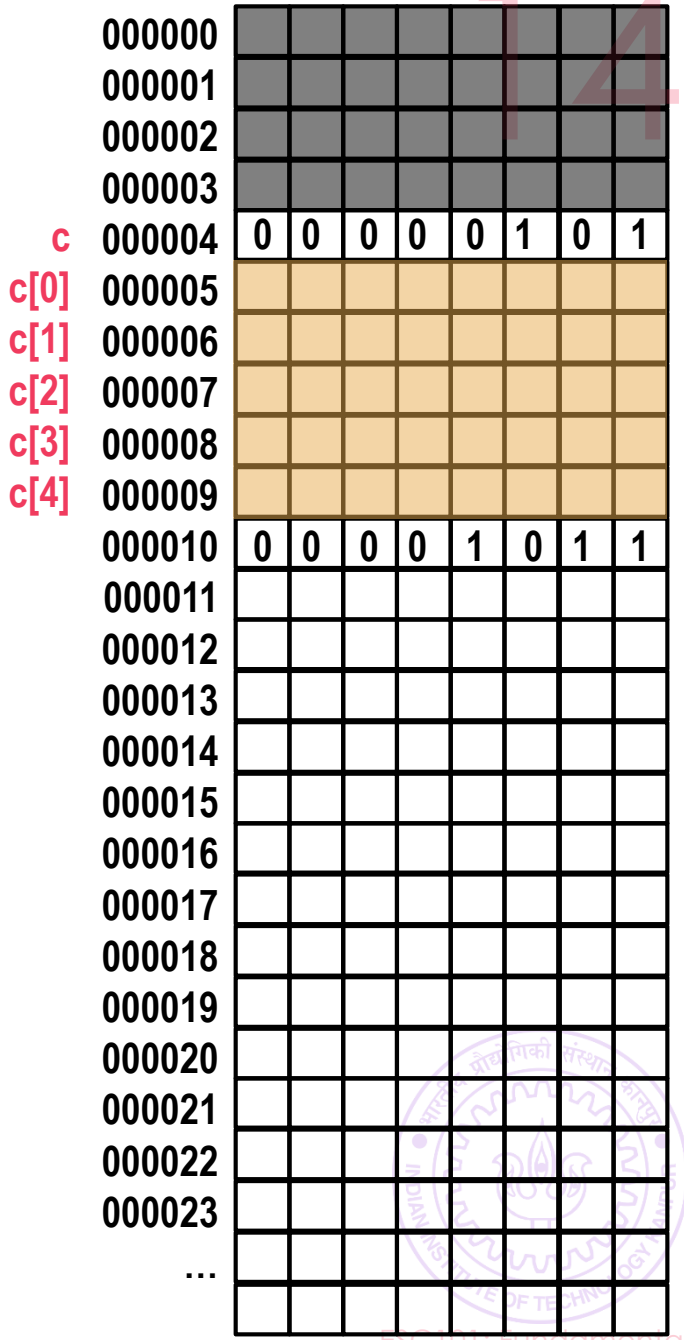

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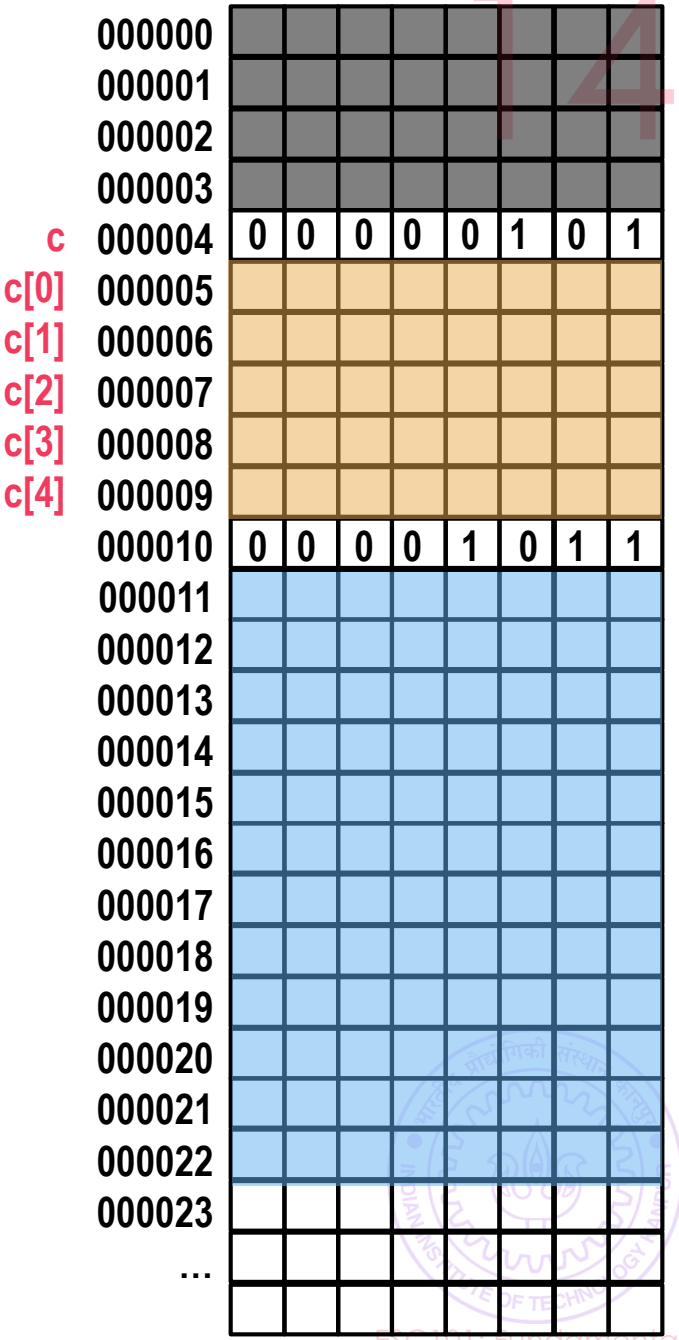

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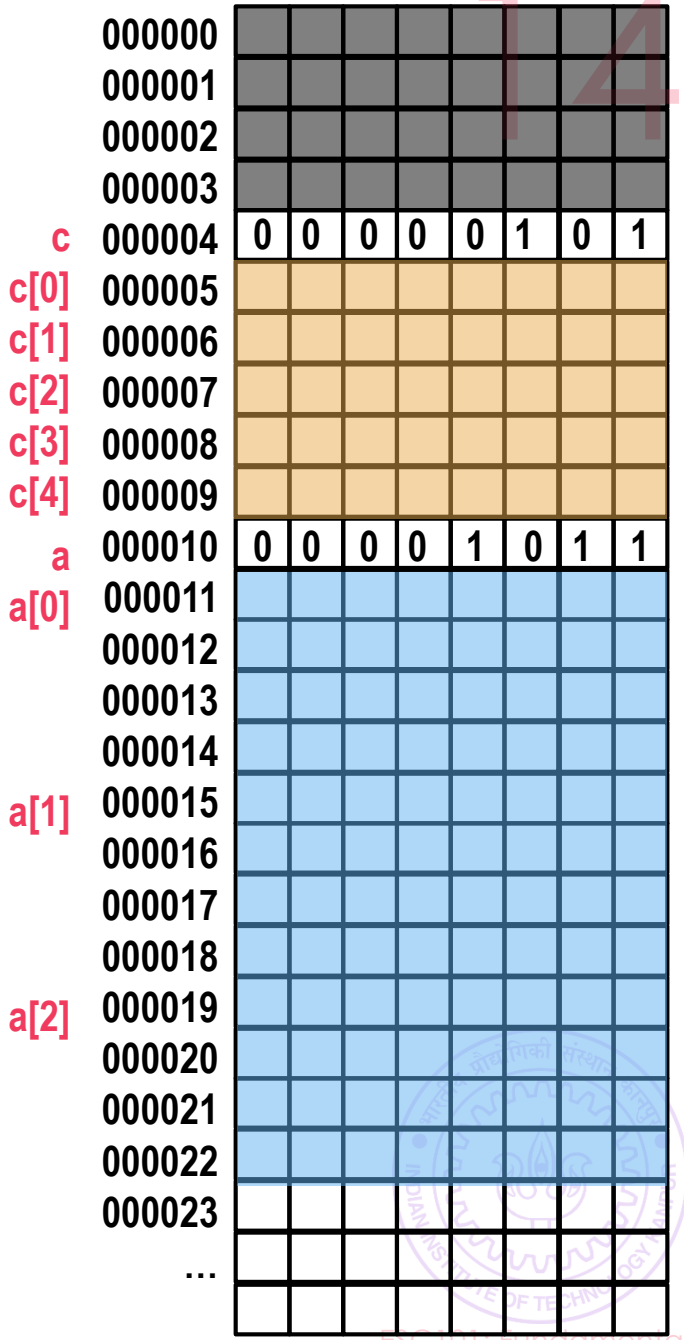

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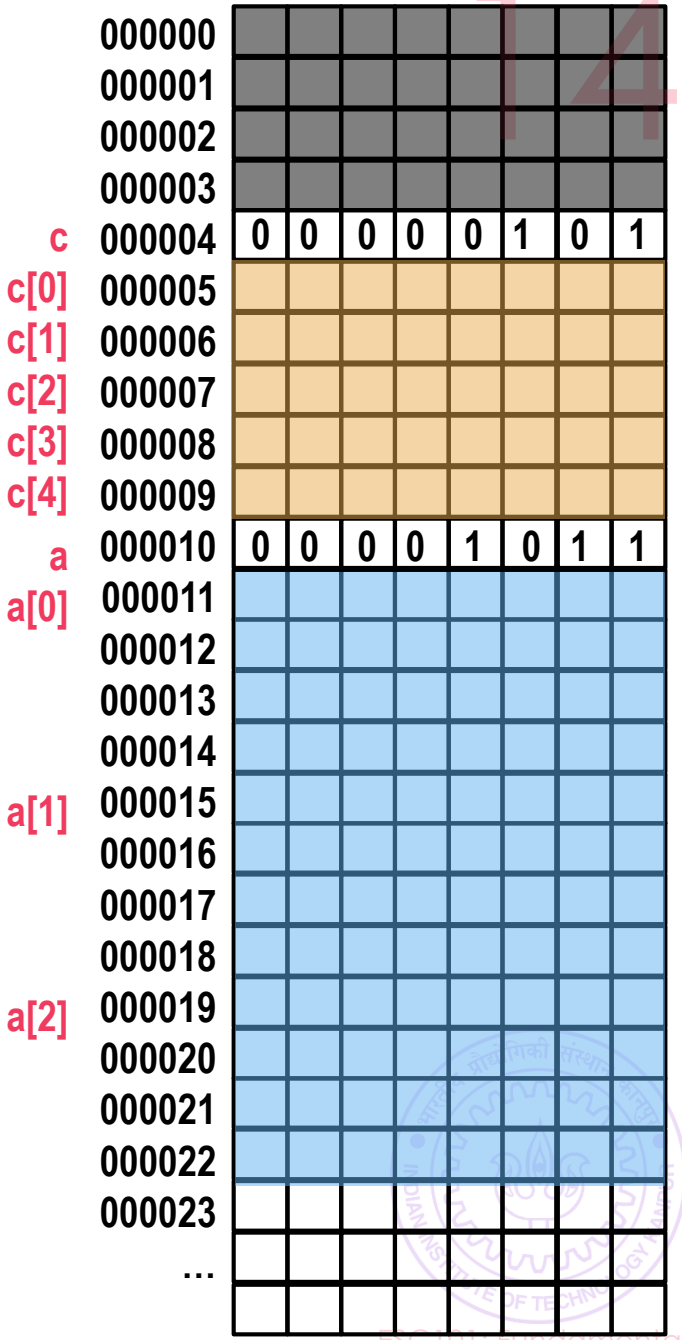

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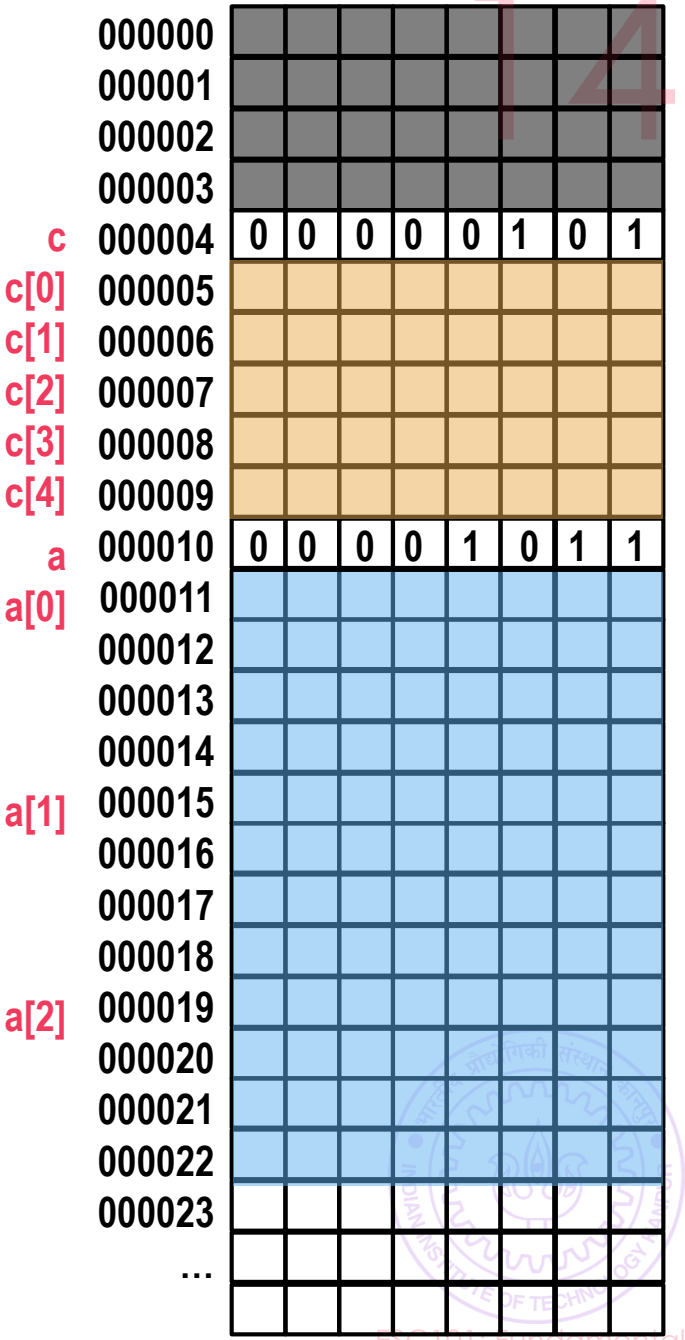

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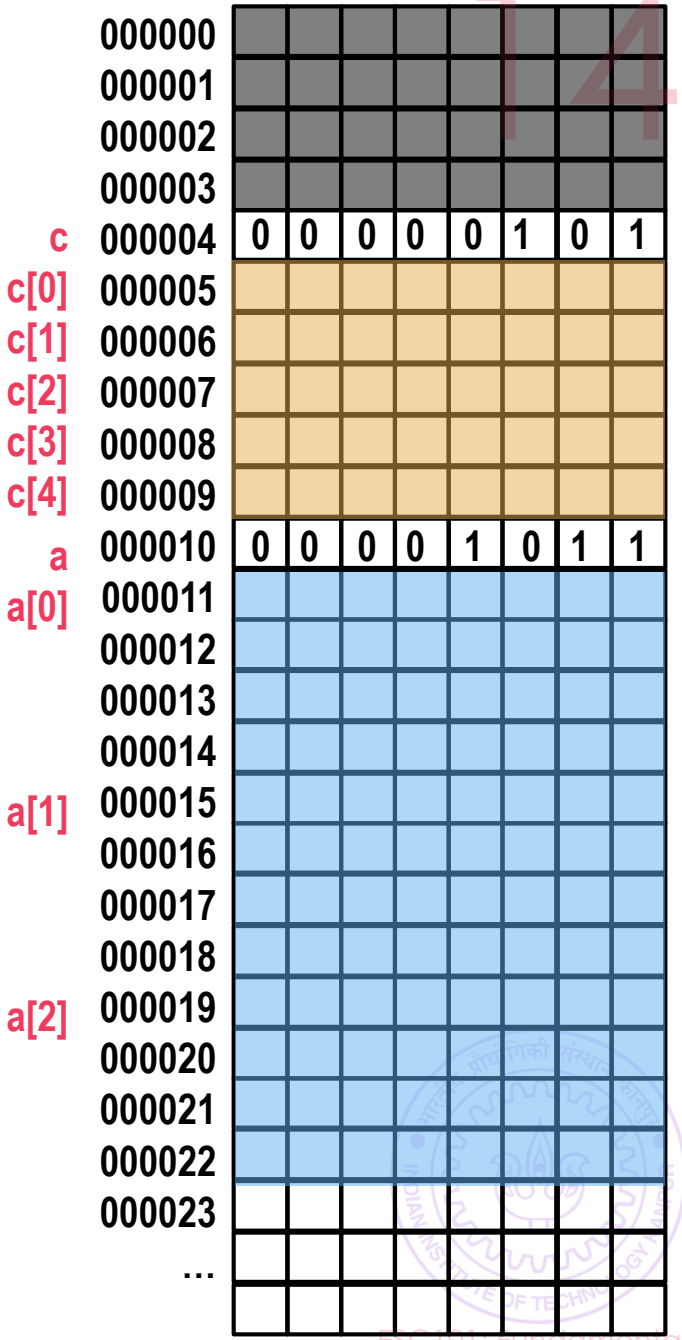

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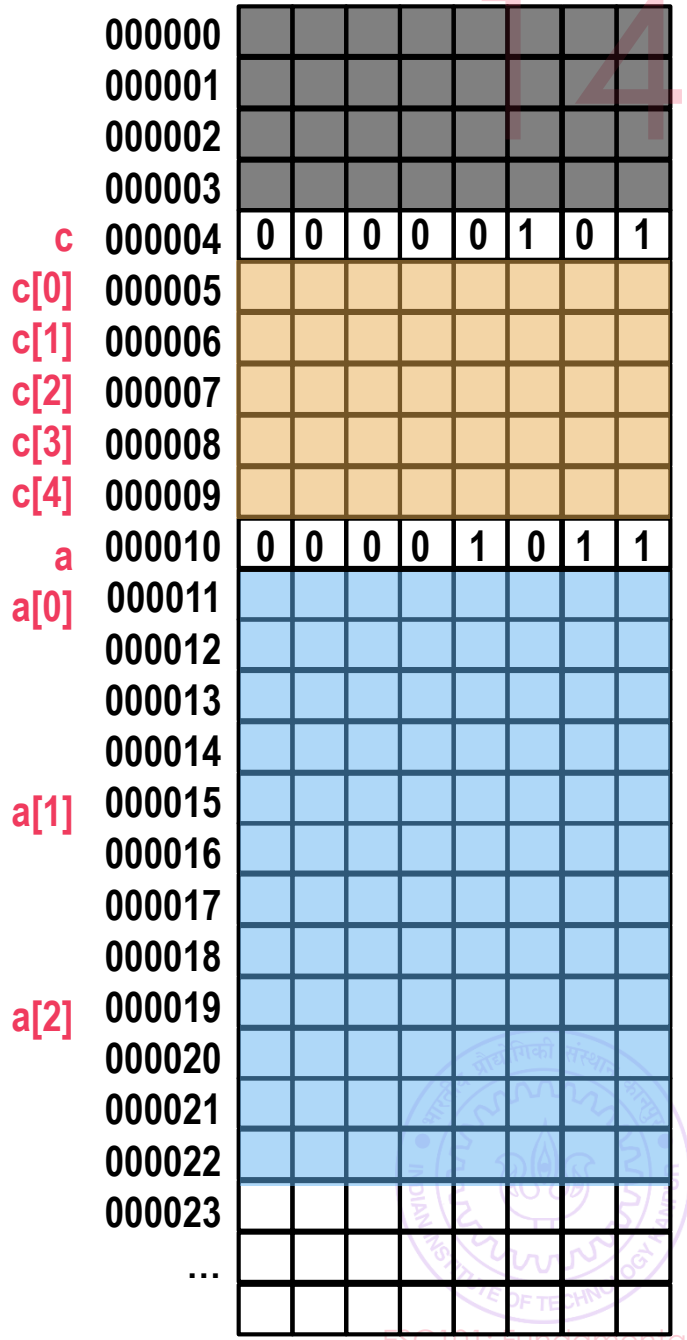

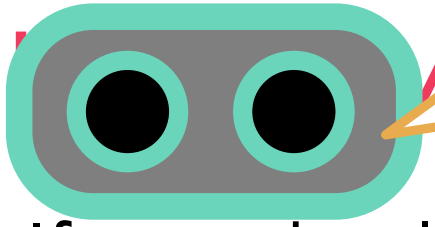

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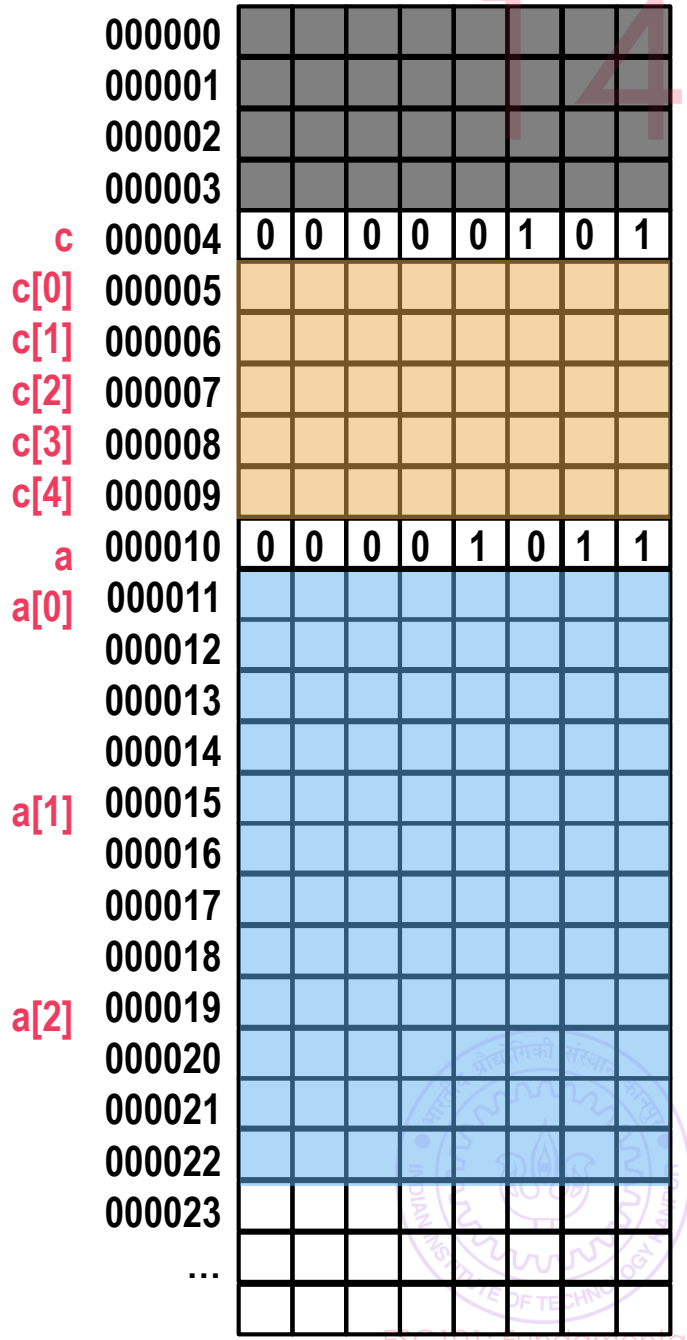

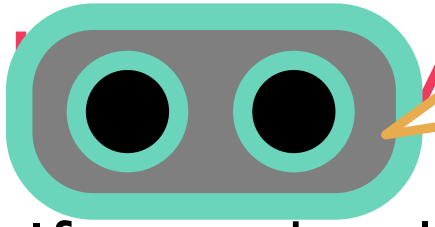

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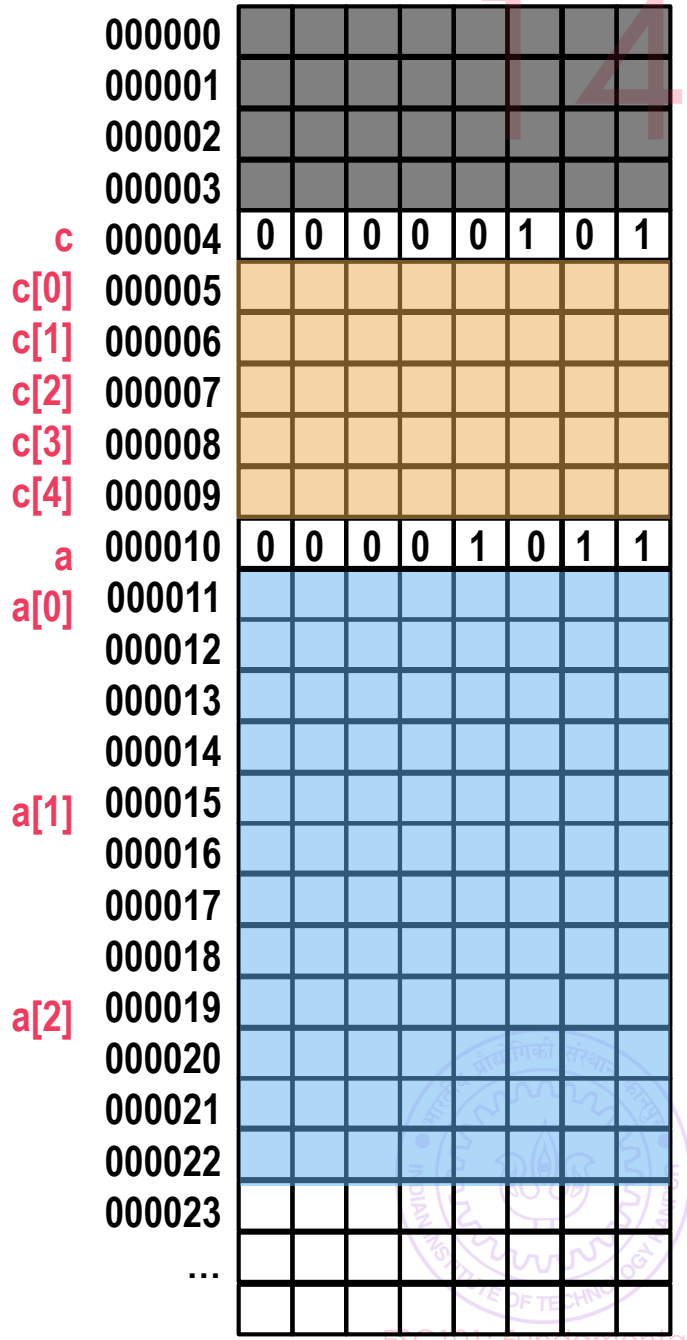

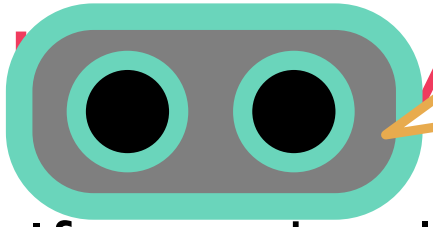

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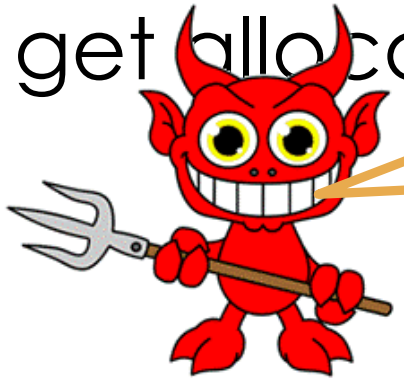

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