Mr C is Pointing to Something Useful

ESC101: Fundamentals of Computing

Purushottam Kar

Announcements

- Advanced Track meetings on Friday – check your mail
- Emergency joint tutorial for sections B1 and B13
  - Friday, 28 September 2018, 12noon (same time as usual)
  - L19 (not the same room)
  - Only for B1, B13 – rest of sections go as usual to TB room
  - Special arrangement only for this week – next week as usual in TB for all

The sizeof various variable types

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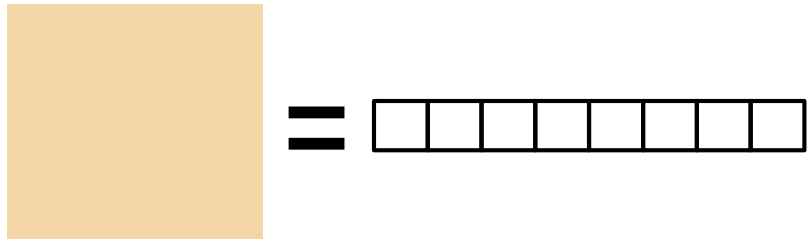

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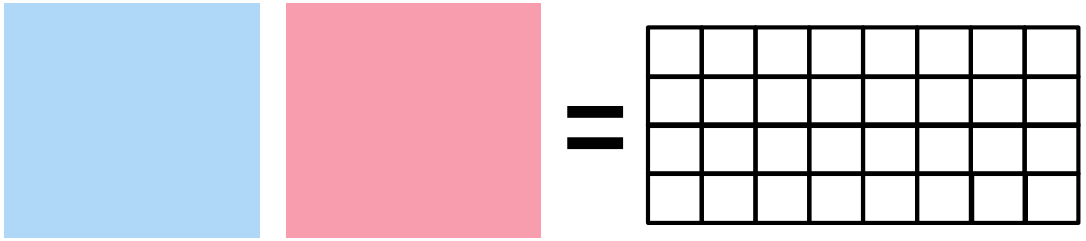

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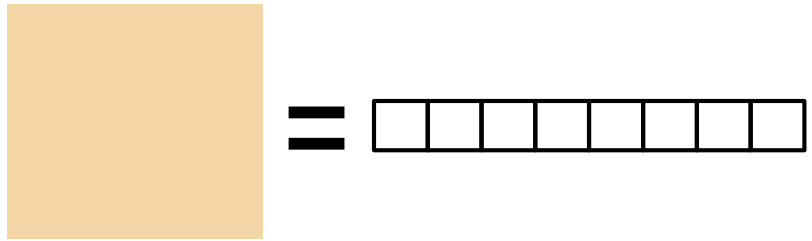

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Max value in int is 2,147,483,647
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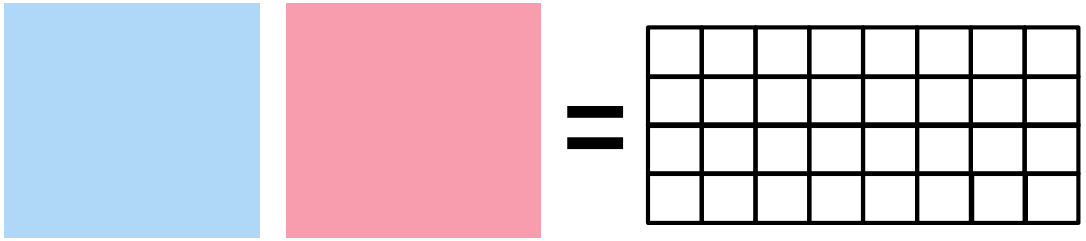

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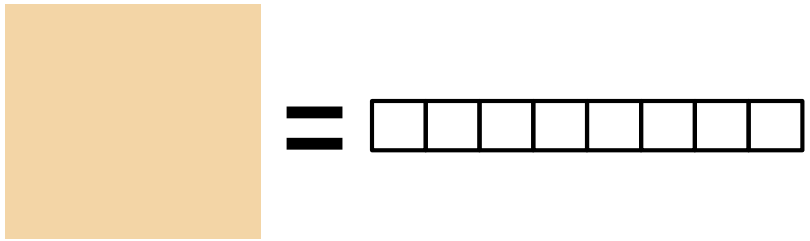

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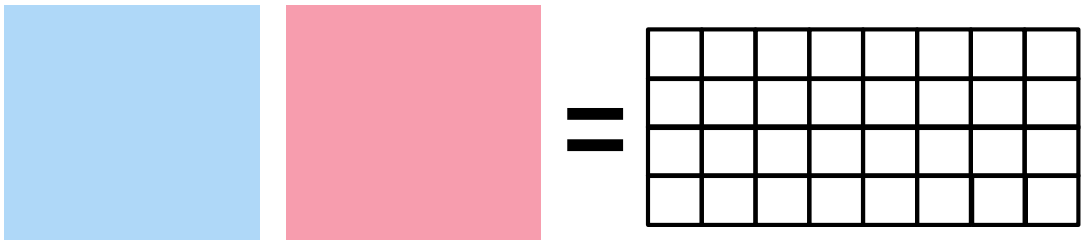

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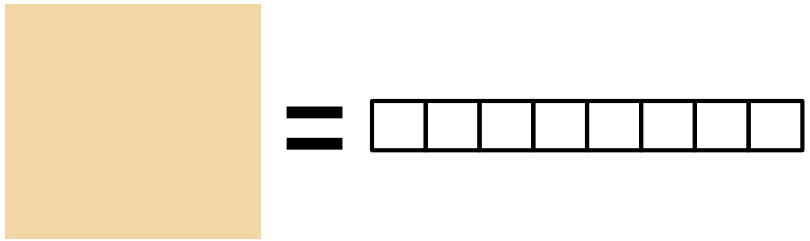

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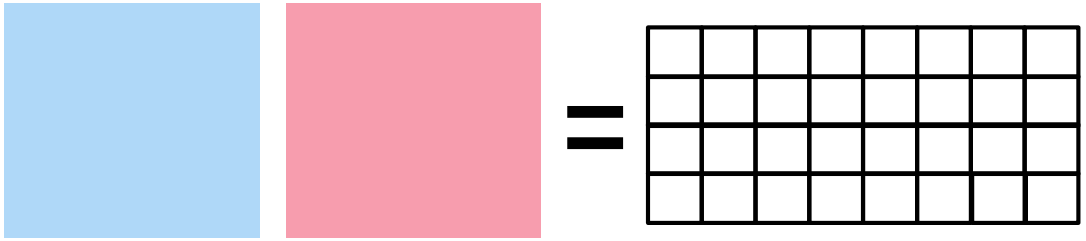

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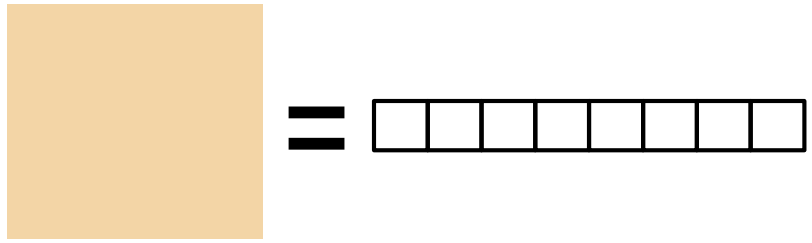

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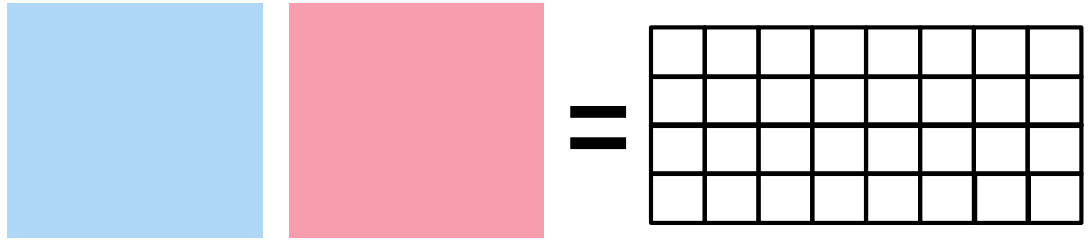

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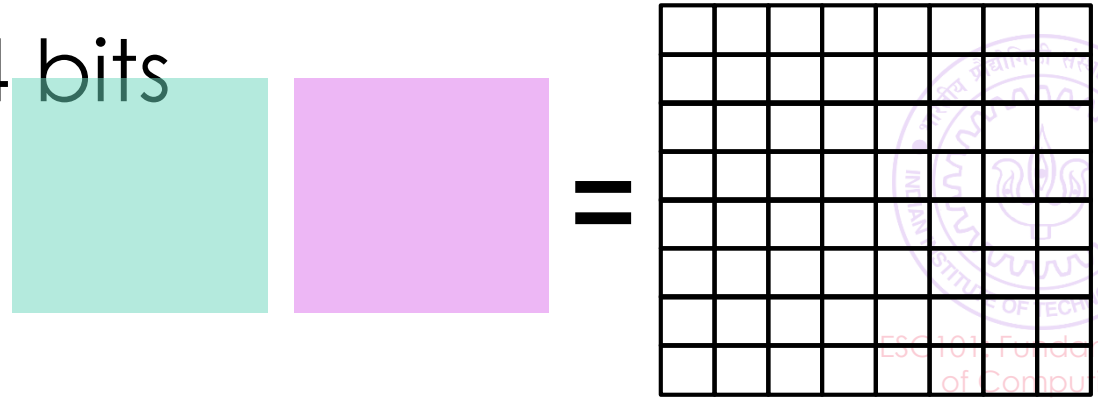

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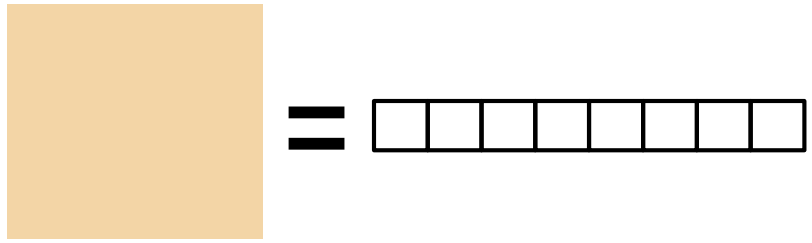

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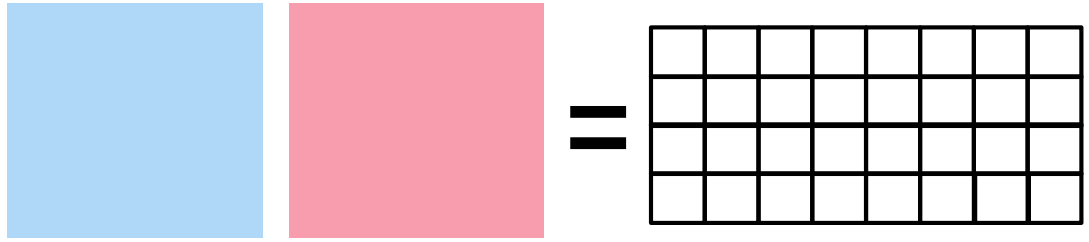

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Max value in long is 9,223,372,036,854,775,807
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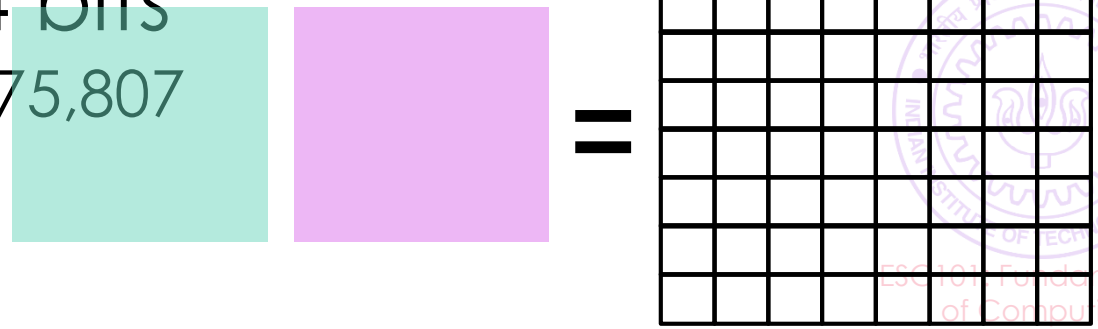

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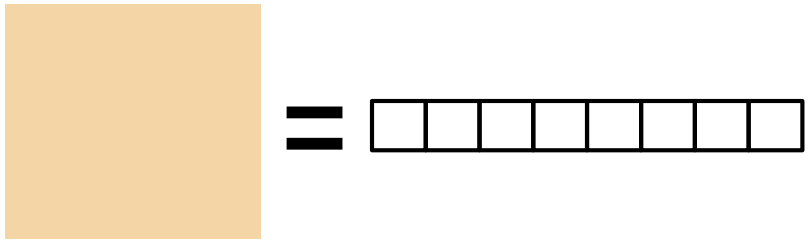

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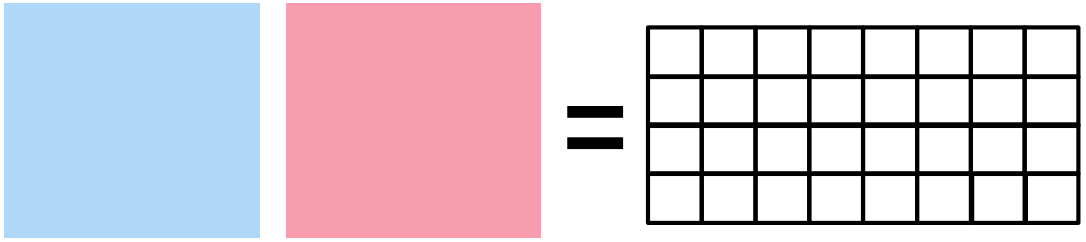

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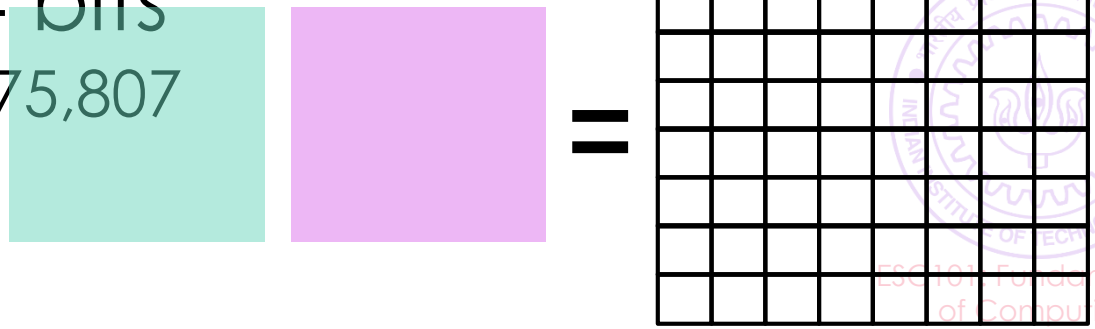

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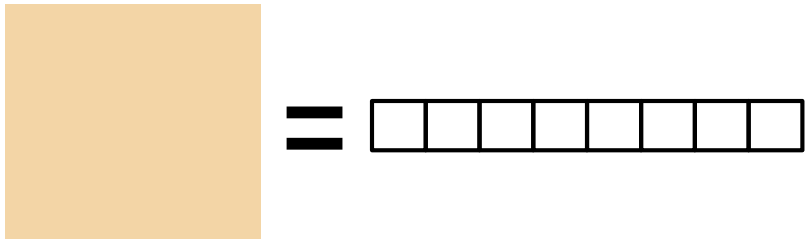

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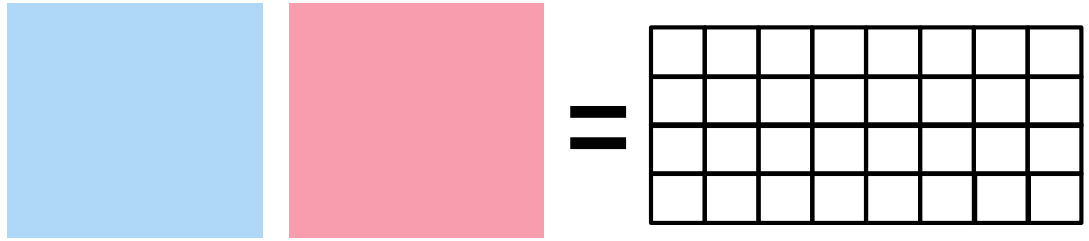

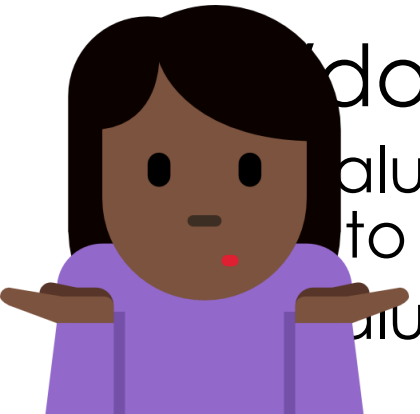

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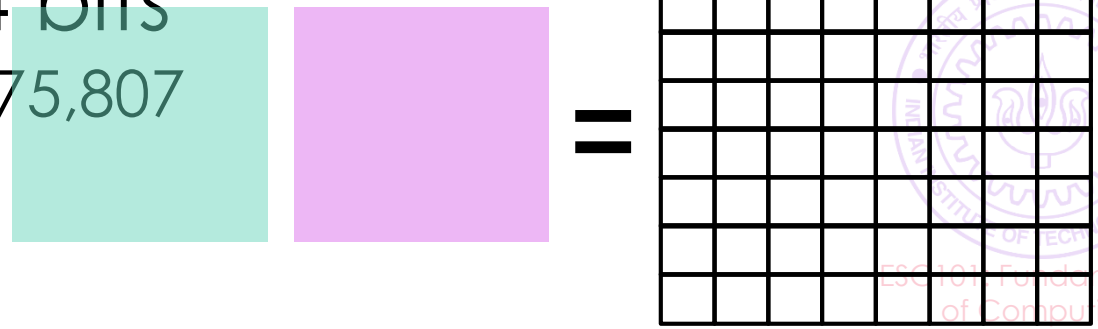

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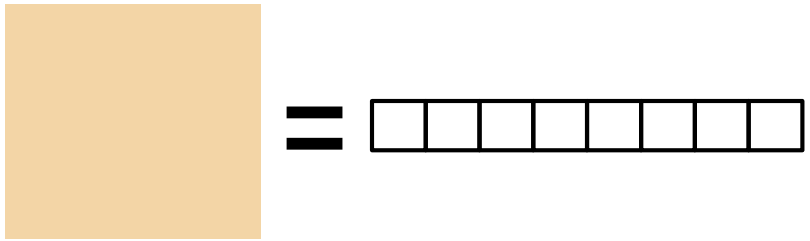

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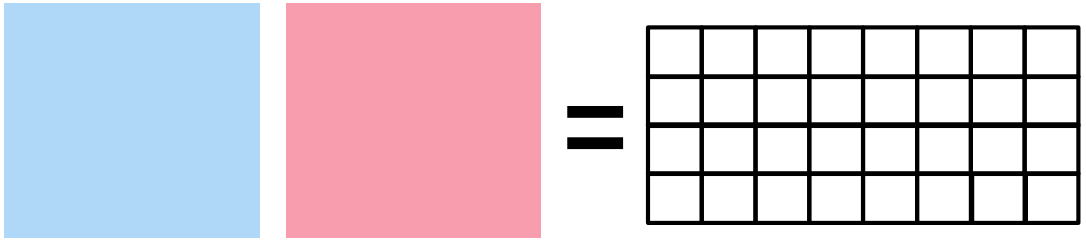

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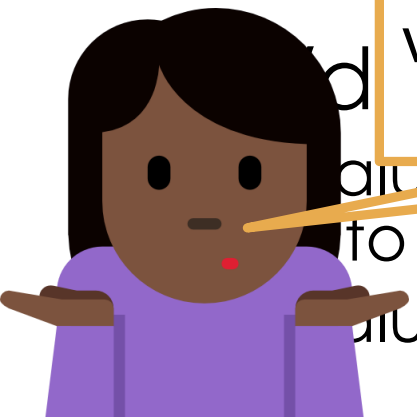

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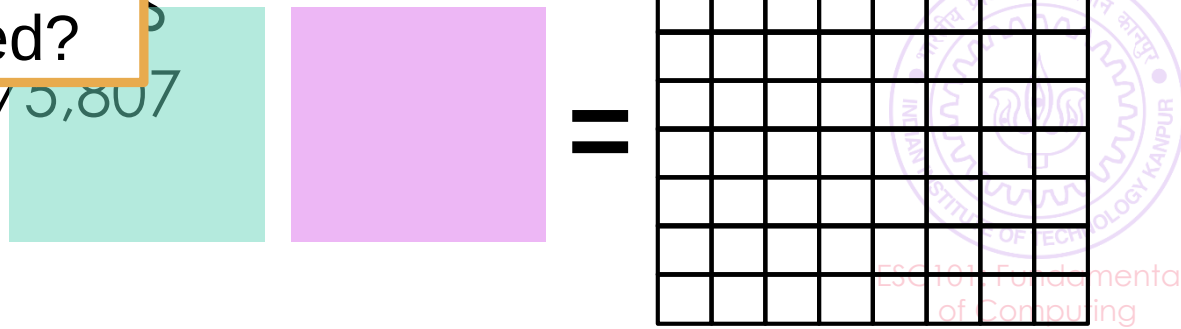

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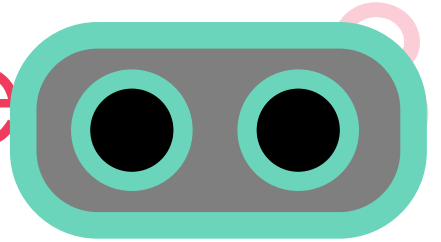

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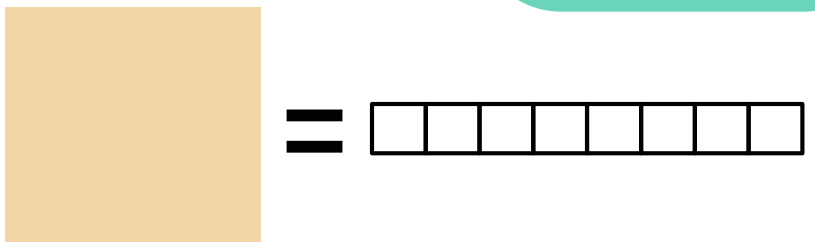

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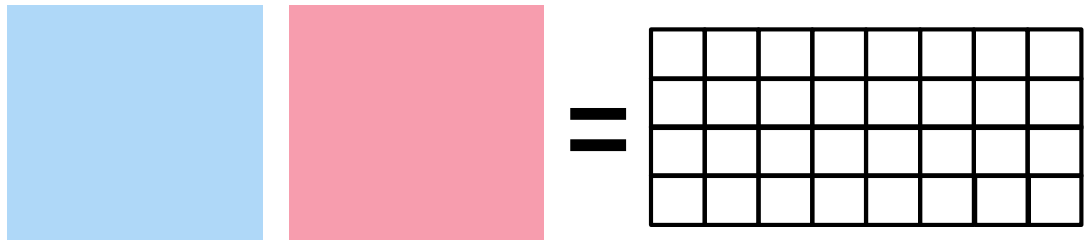

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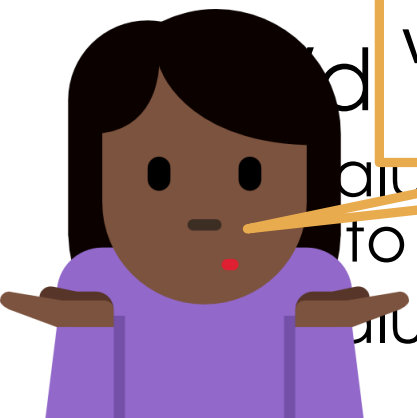

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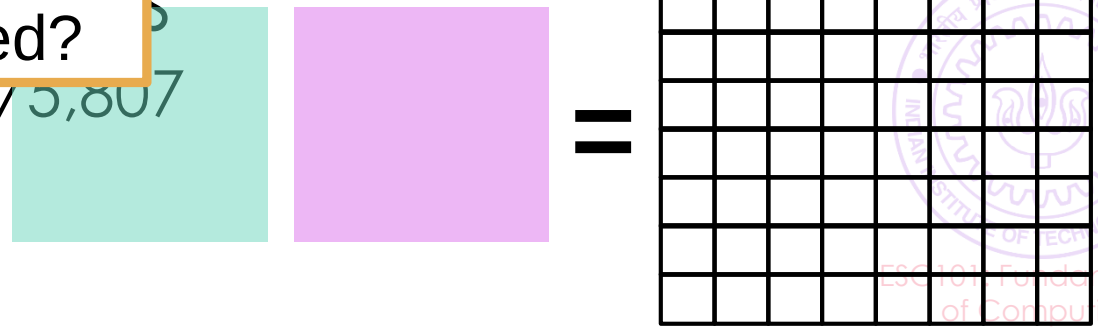

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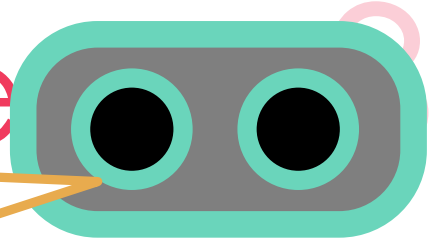

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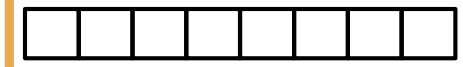

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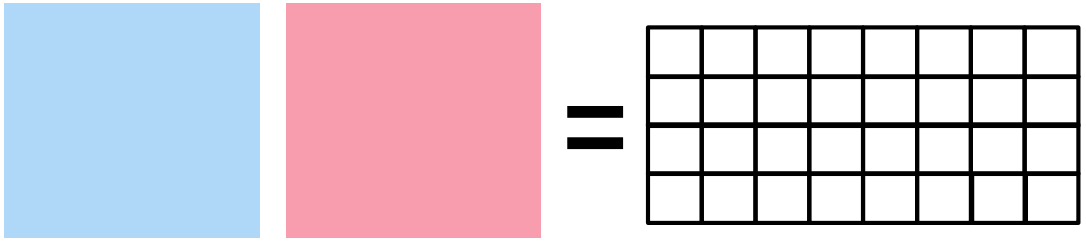

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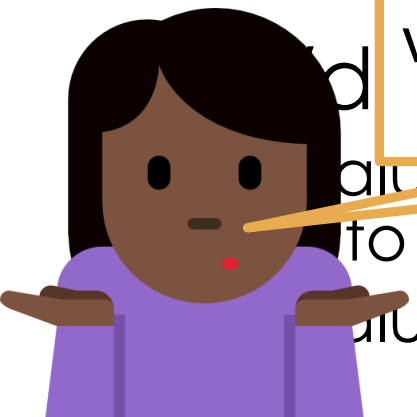

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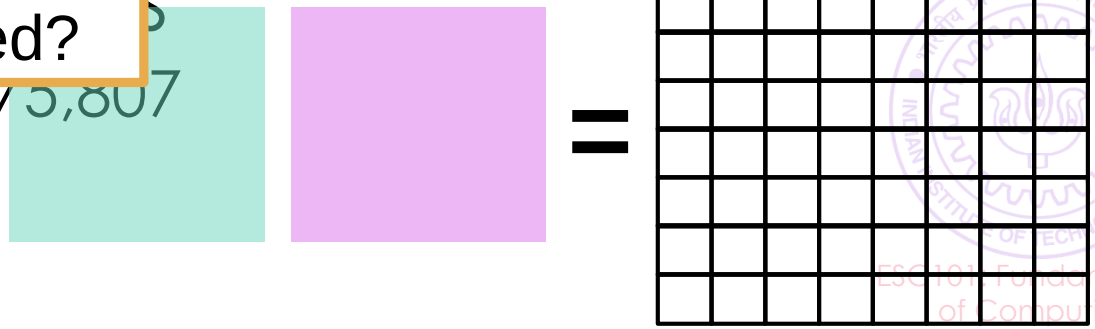

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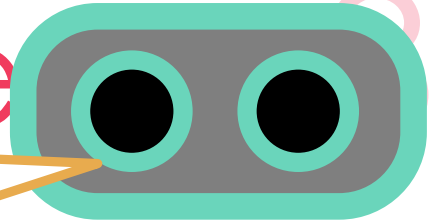

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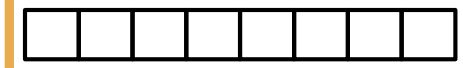

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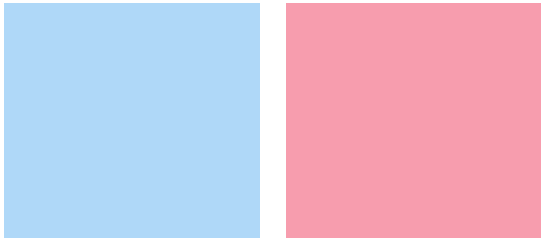

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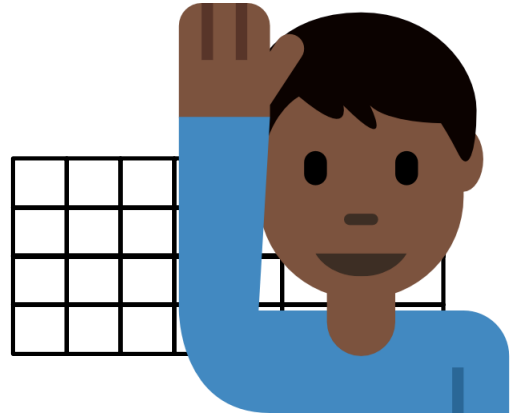

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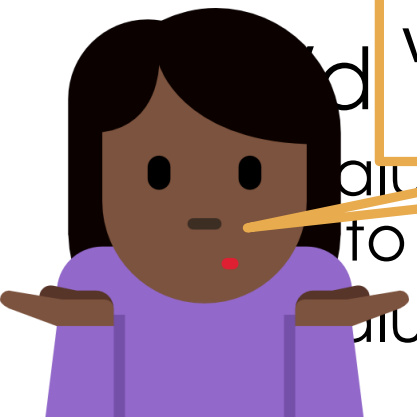

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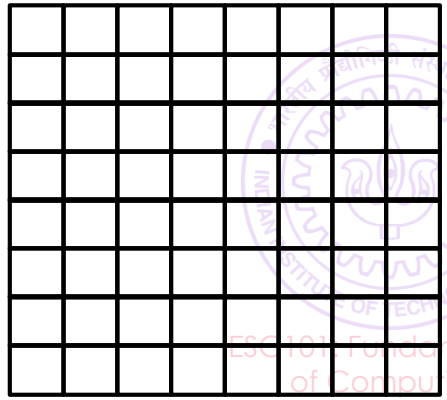

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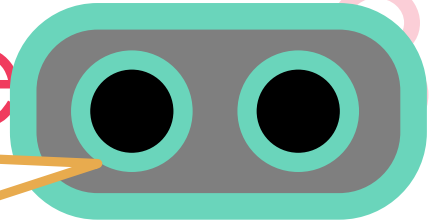

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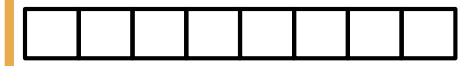

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We will wait a few weeks to learn how negative numbers are stored

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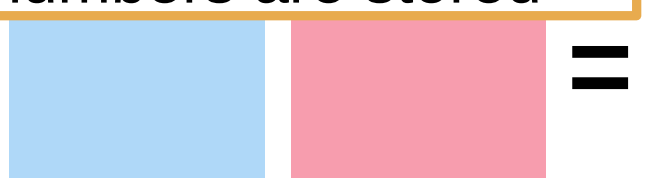
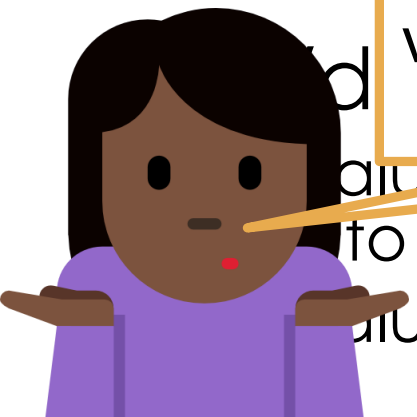
Max value in int is 2,147,483,647 equal to $2^{(32-1)}$-1 – verify

Max value of float discussed later



=

Why is max value for all these variables always $2^{(k-1)}$-1 and not 2^{k} -1 when there are k bits getting used?



d

s

alue i g is 9,223,372,036,854,775,807

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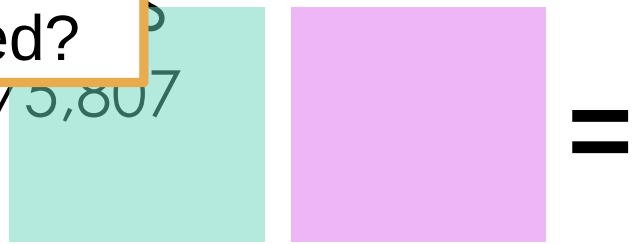

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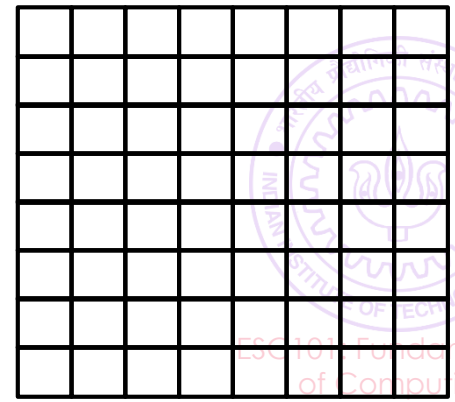

How Mr C stores variables

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He has a very long chain of bytes

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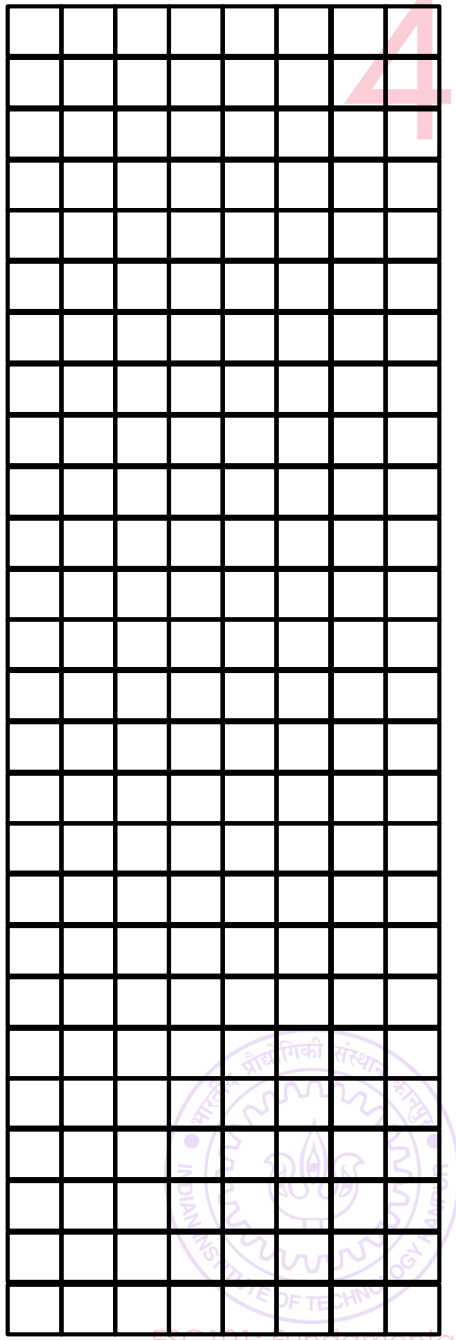

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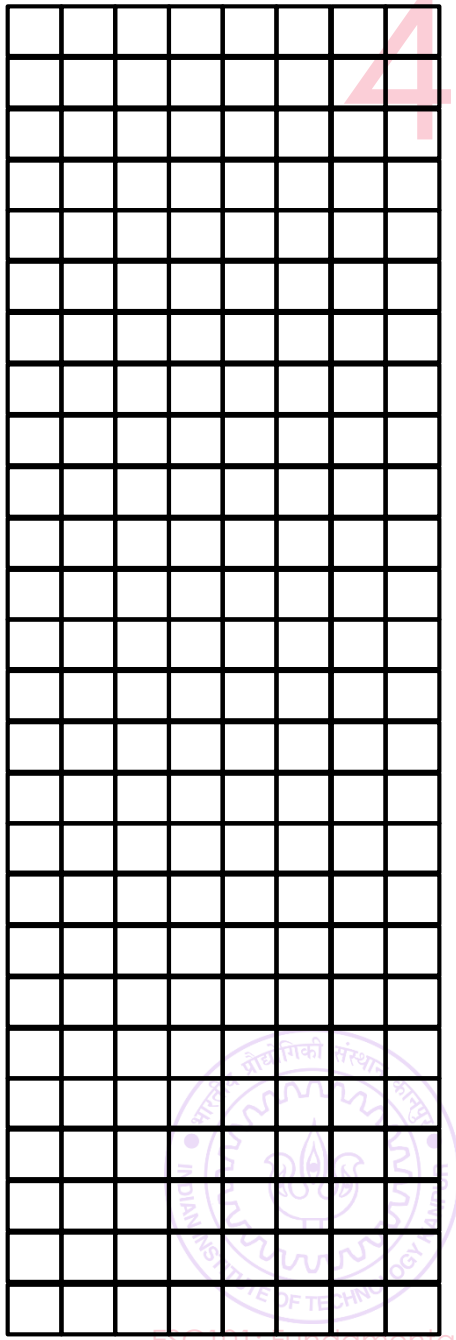

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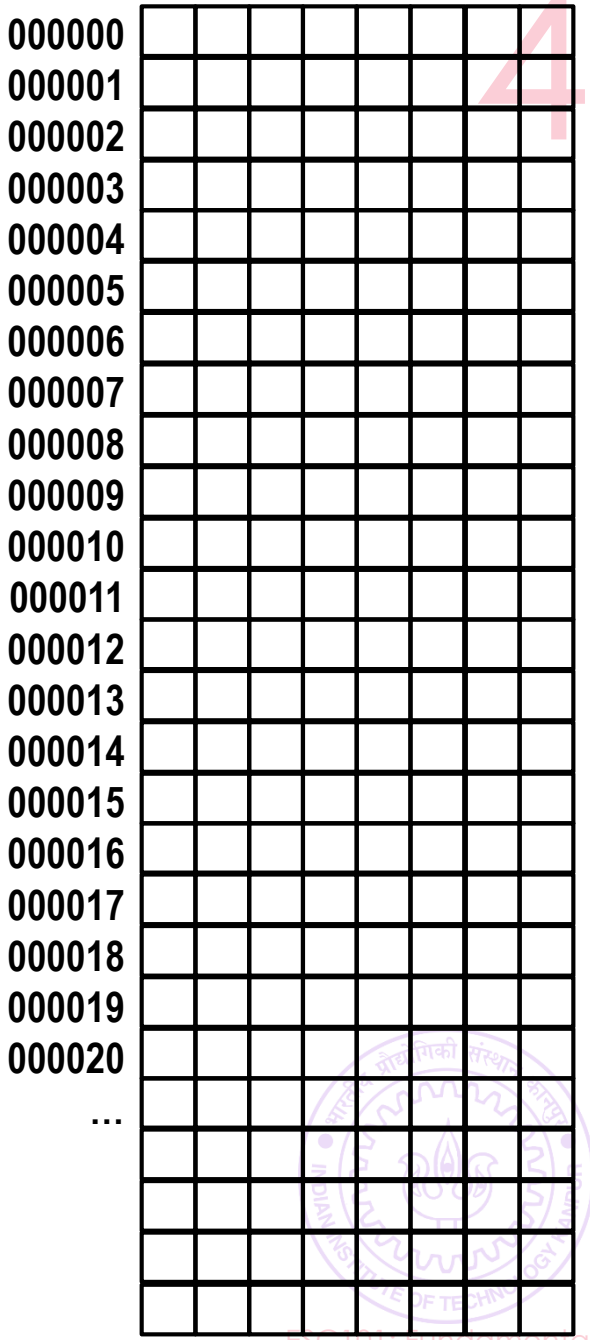

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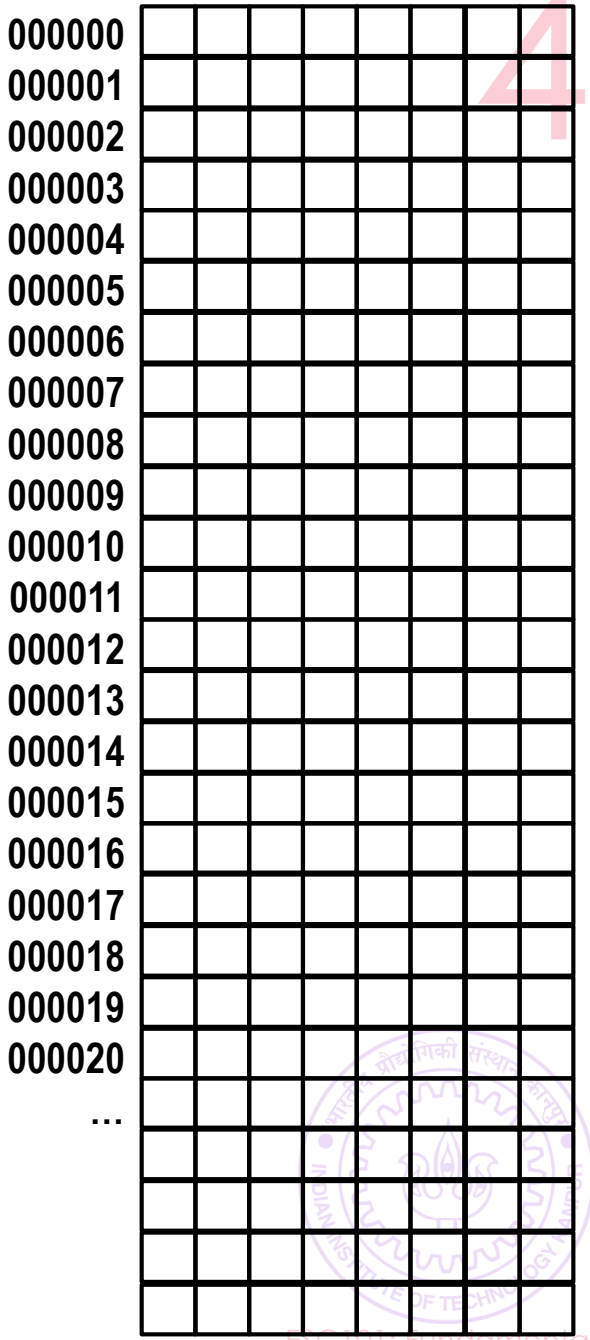

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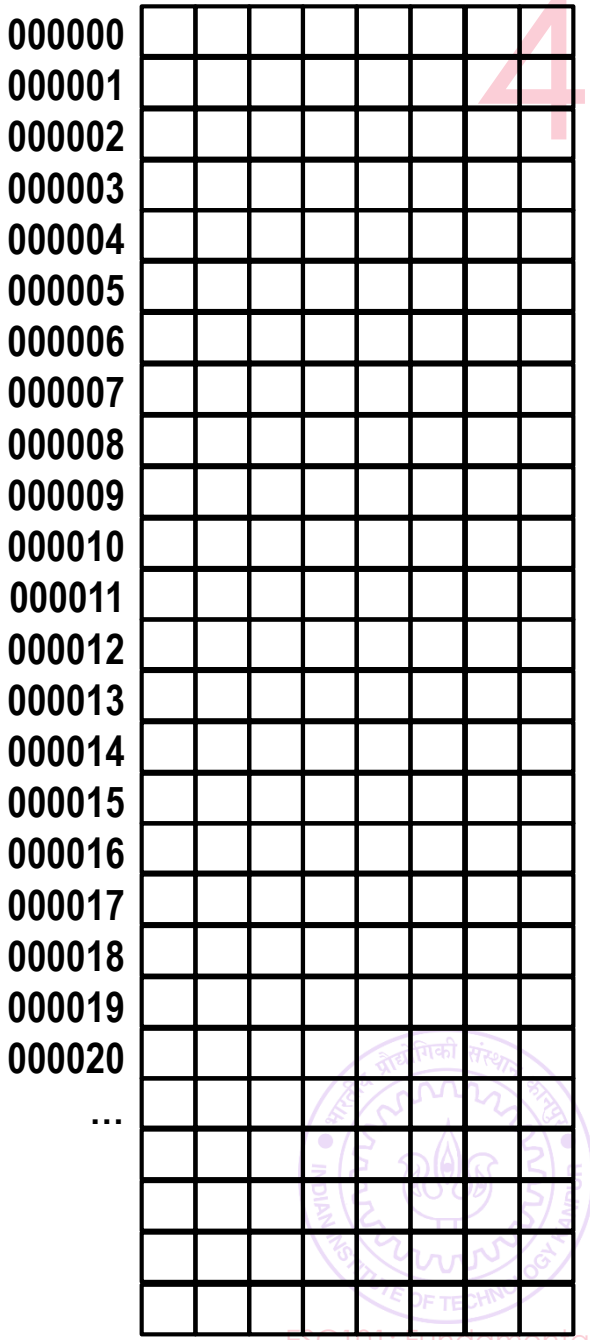

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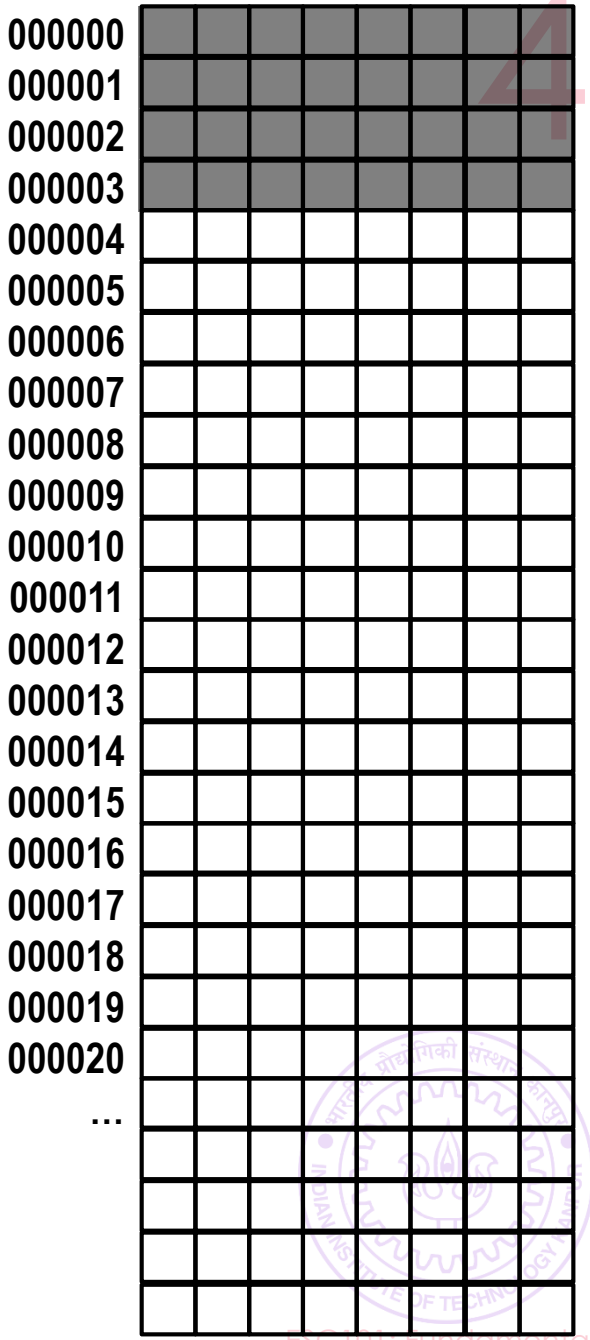

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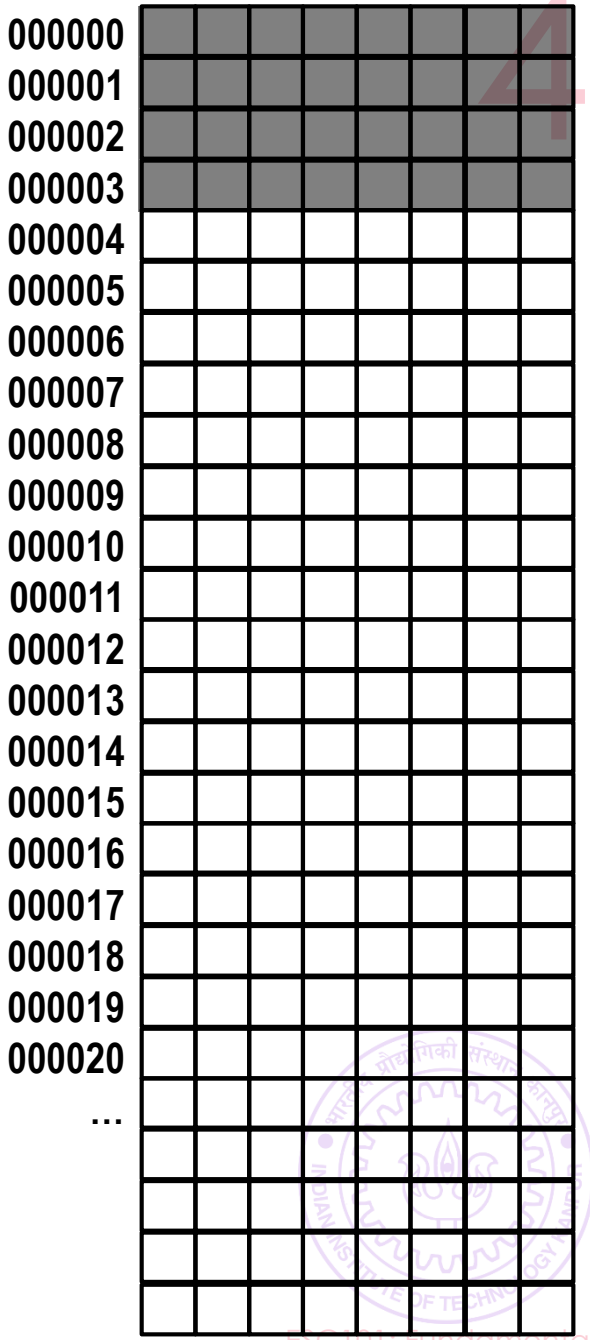

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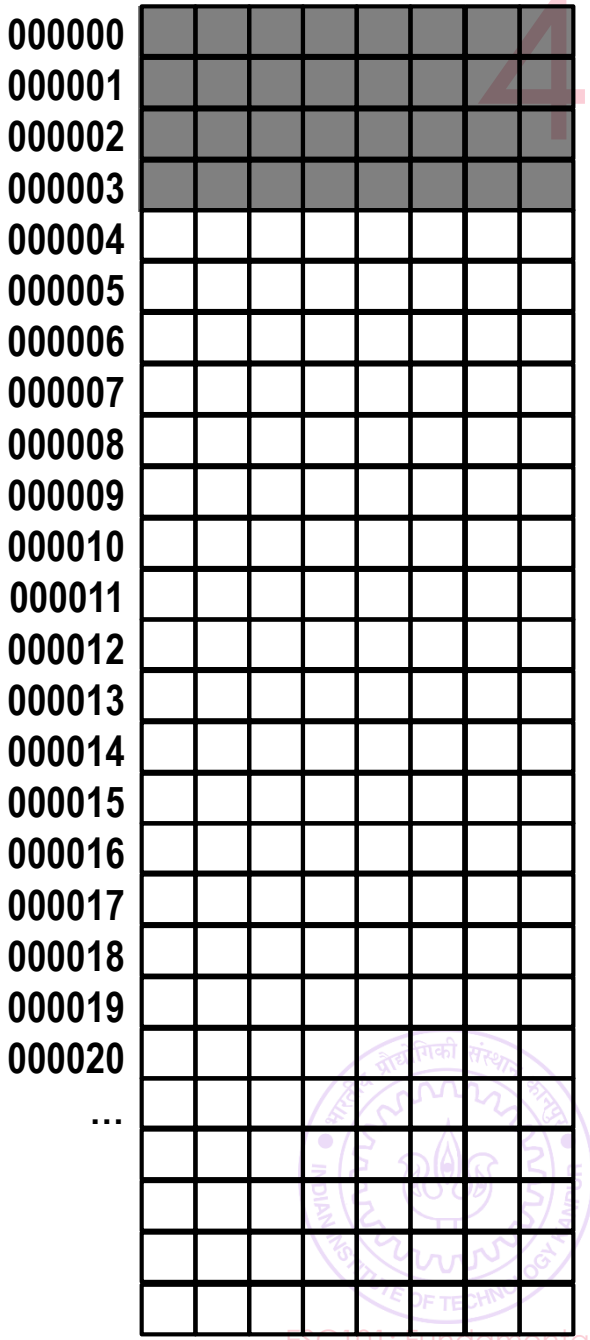

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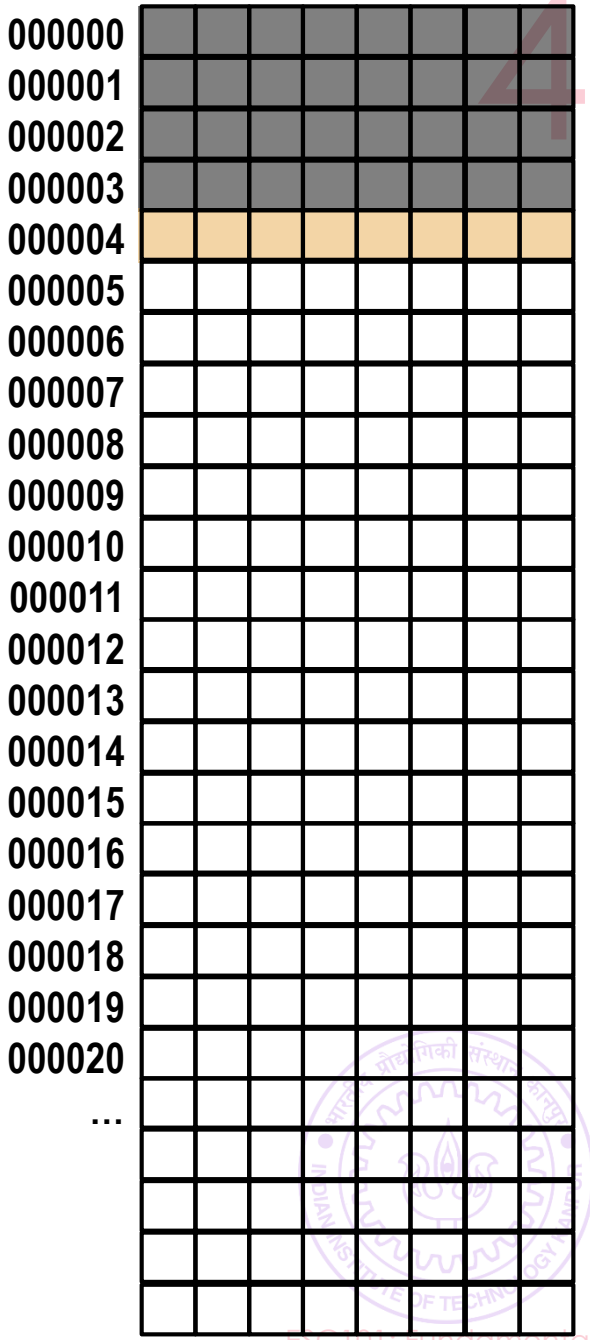

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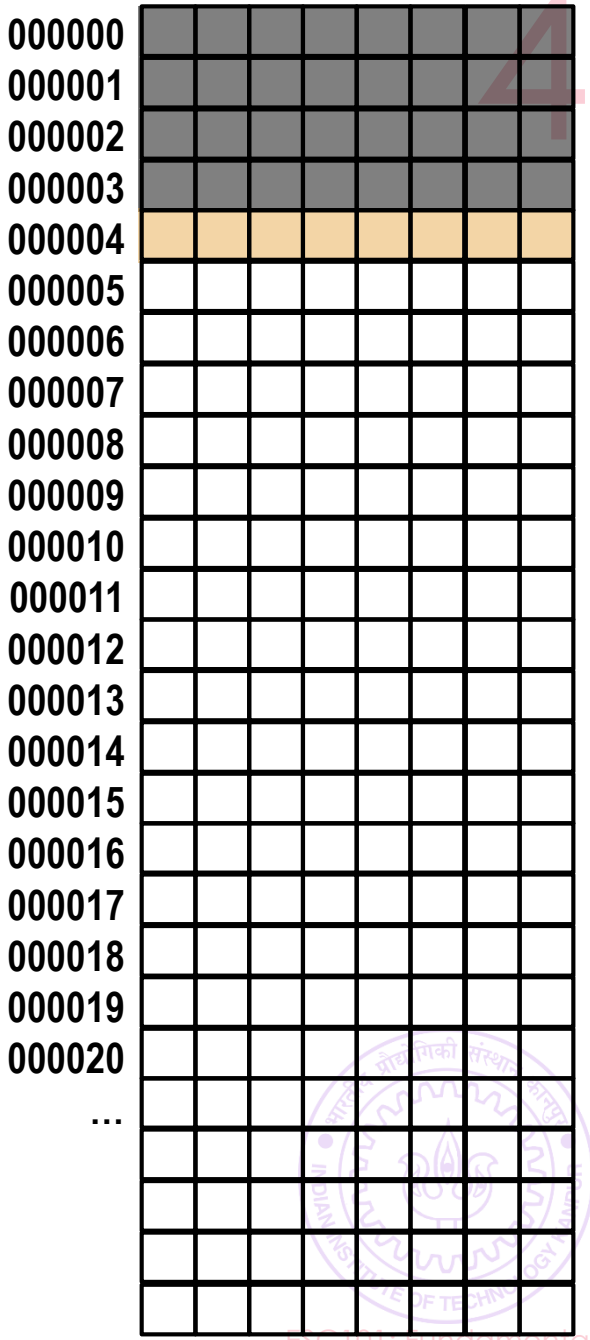

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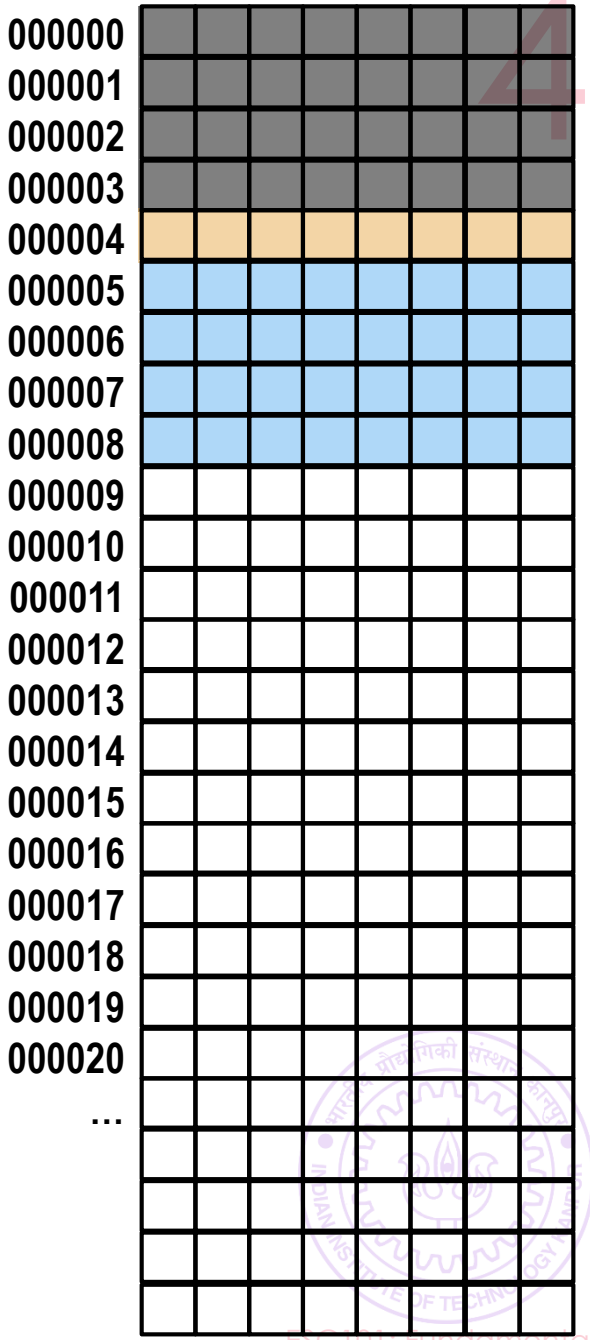

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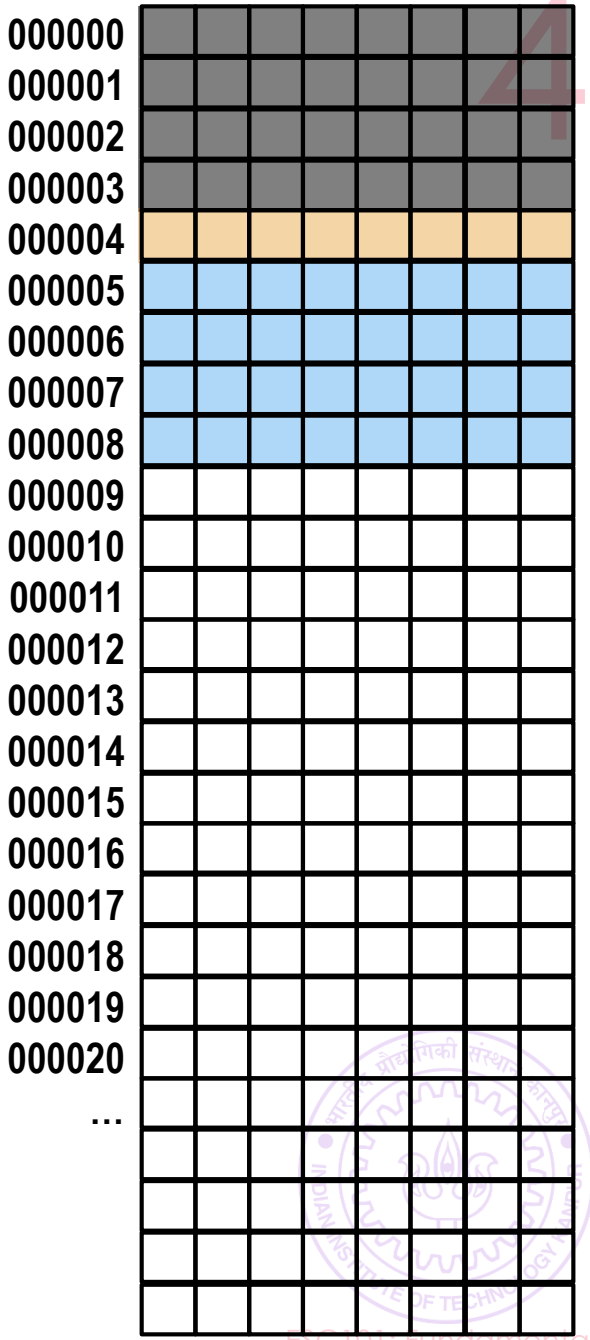
char c;
int a;
double d;
```



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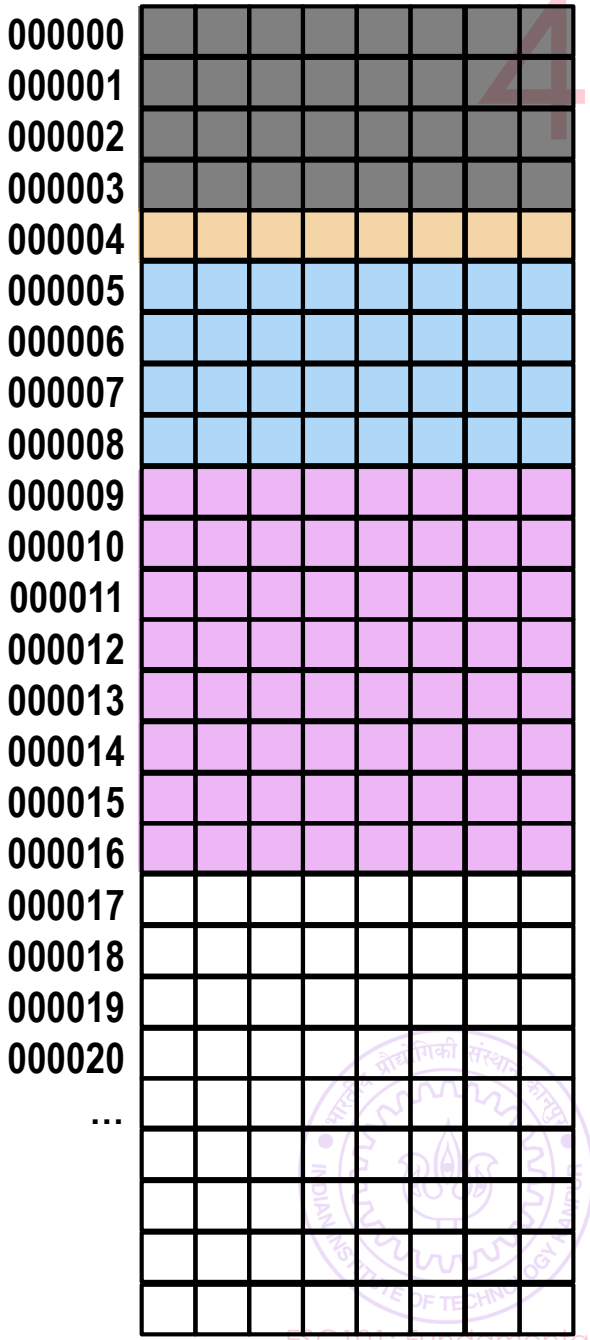

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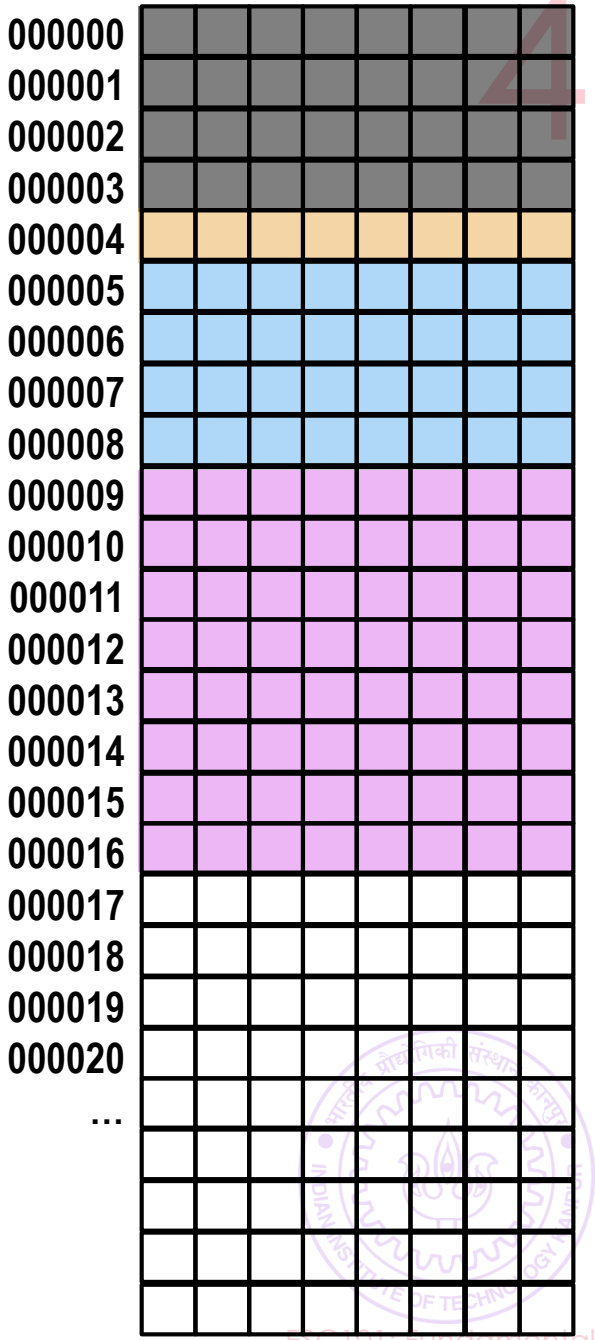
So c is stored at address 000004, a at 000005 and d at address 000009



Pointers

भारतीय प्रौद्योगिकी संस्थान कानपुर
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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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- Doing so will cause a segfault and crash your program/even your computer

My first pointer

My first pointer

HOW WE MUST SPEAK TO MR. COMPILER

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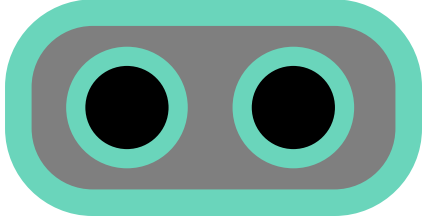

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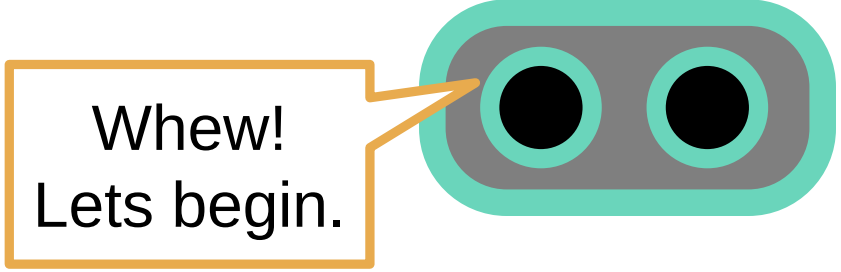

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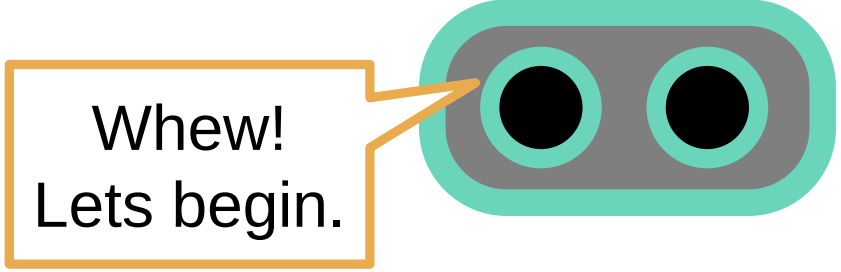

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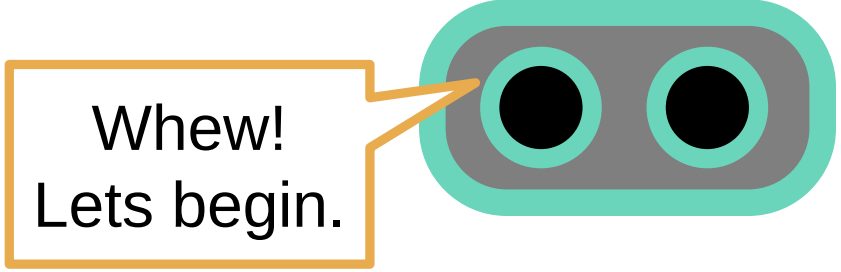

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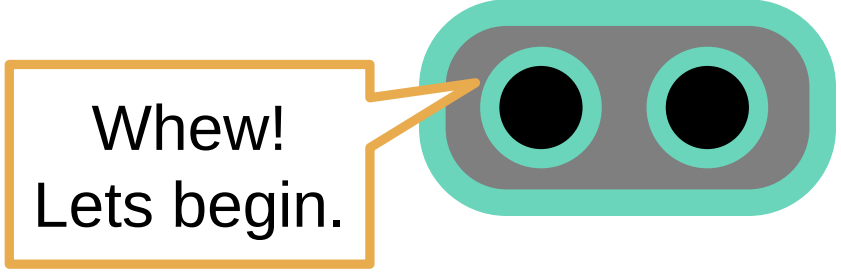

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42

000023

a

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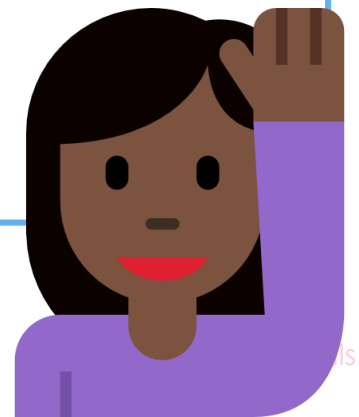
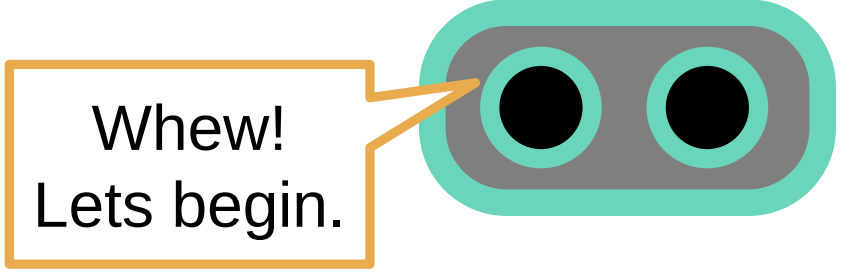


My first pointer



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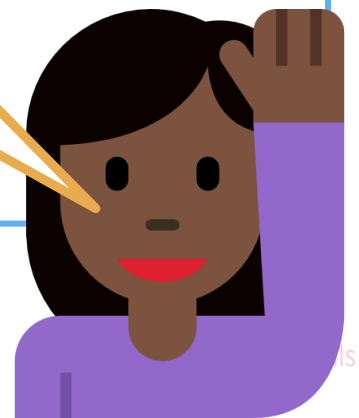
a is stored at internal location 000023



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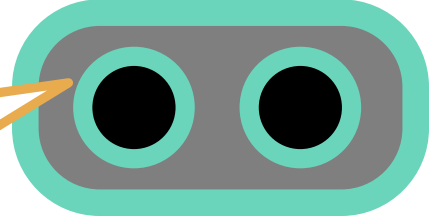

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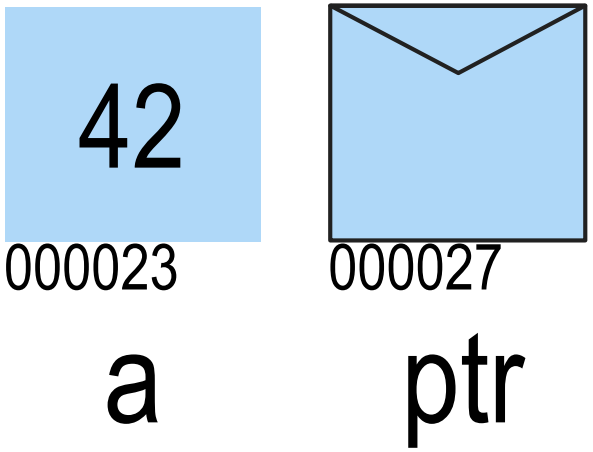

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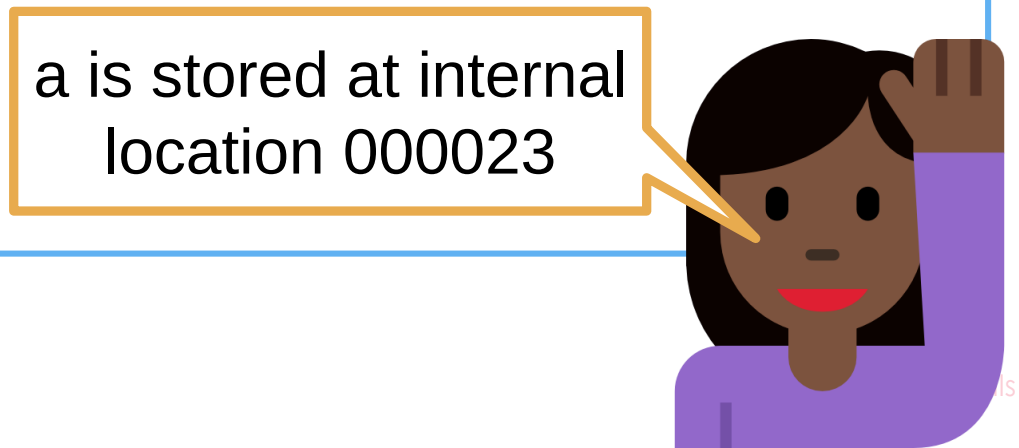
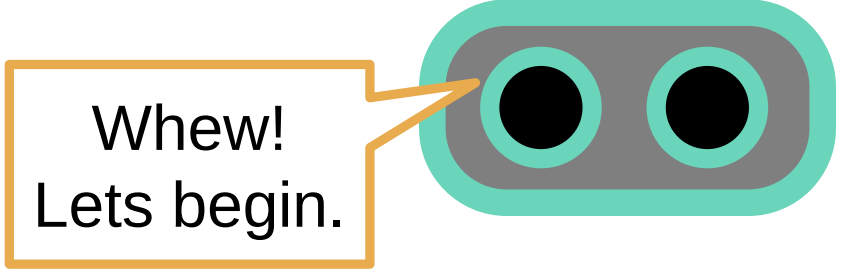


My first pointer



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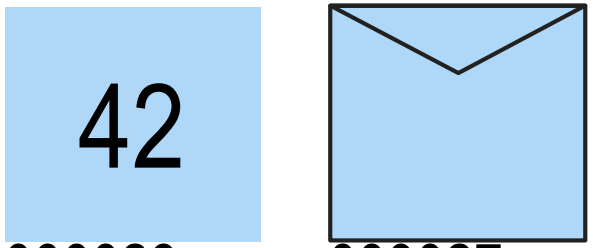

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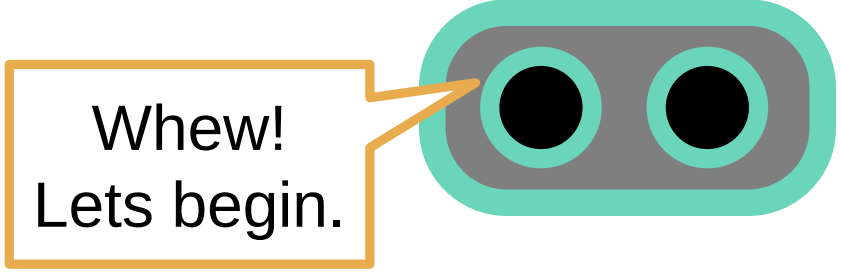

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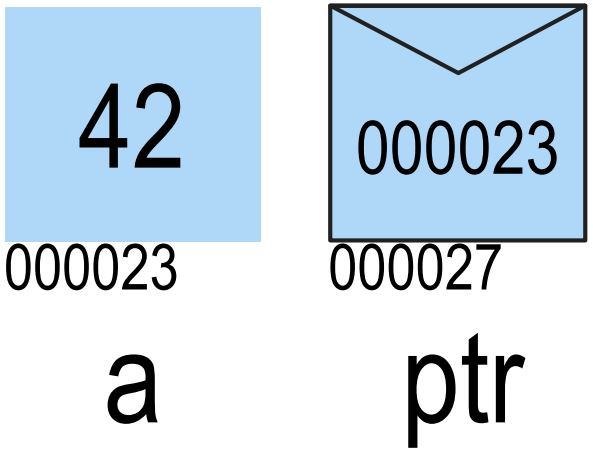

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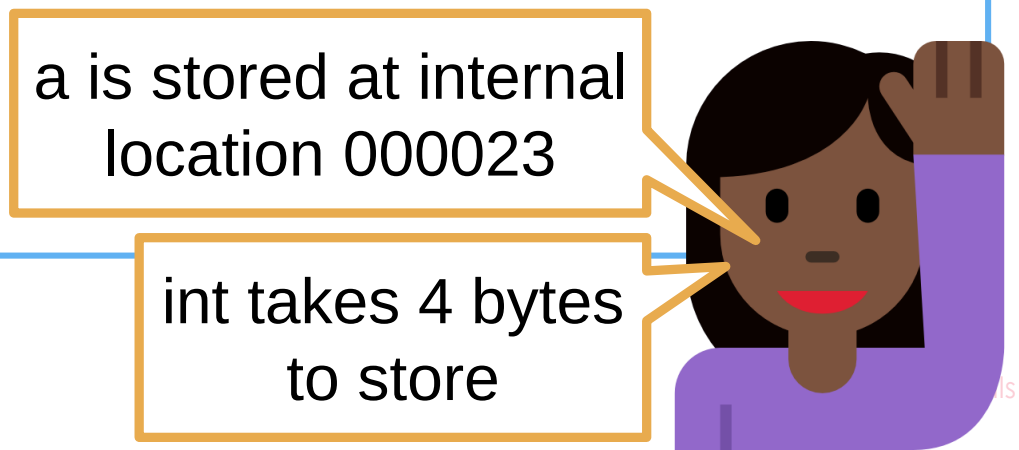

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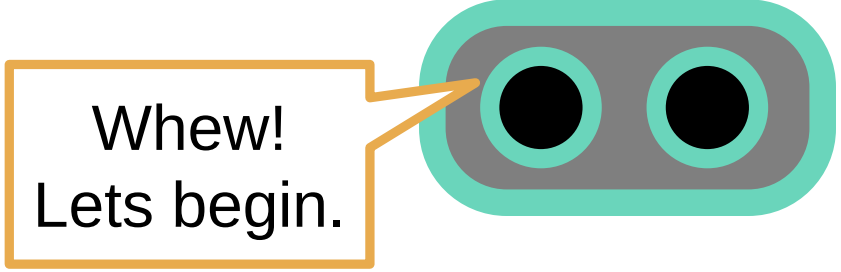

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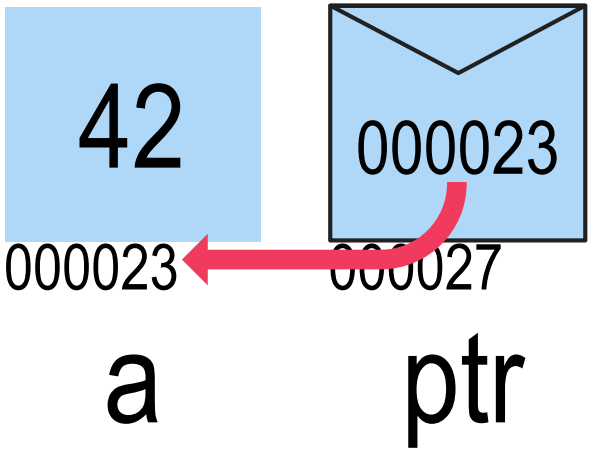

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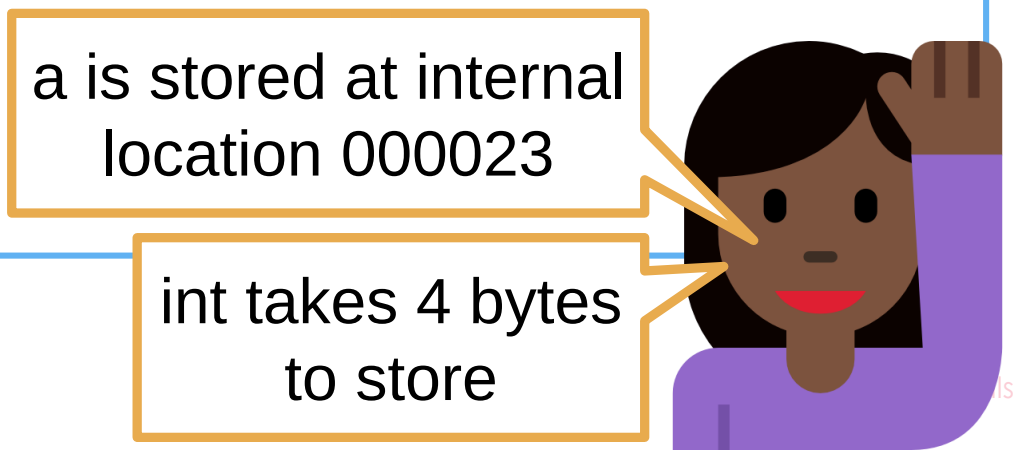

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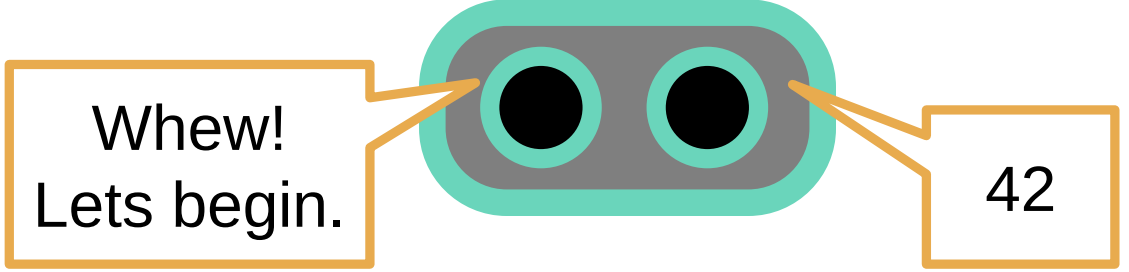

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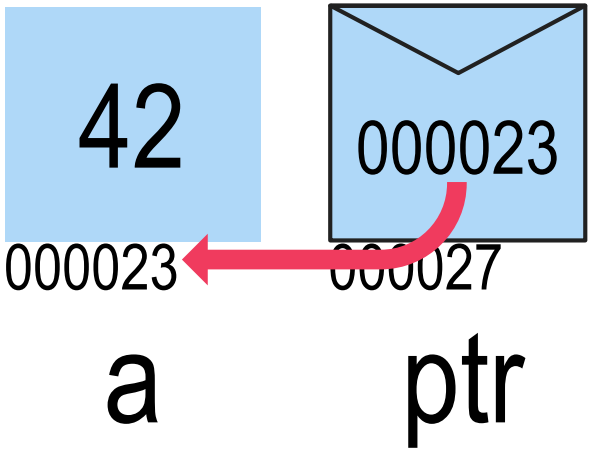

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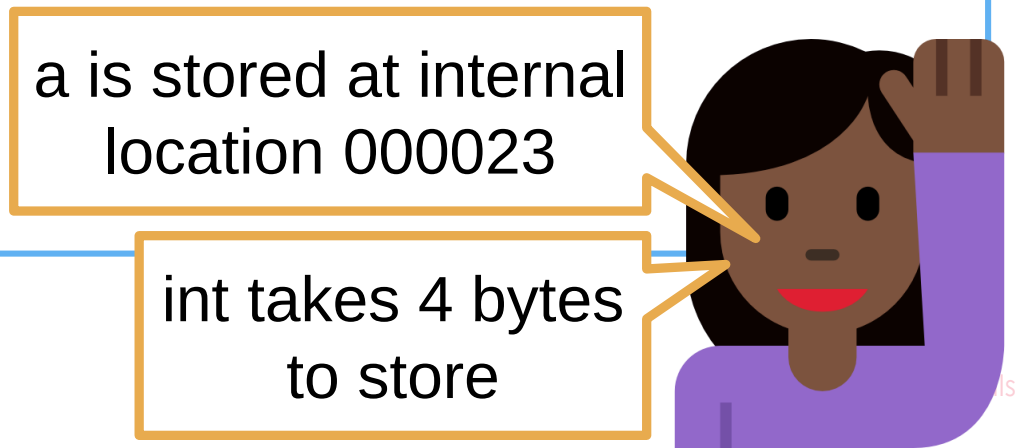

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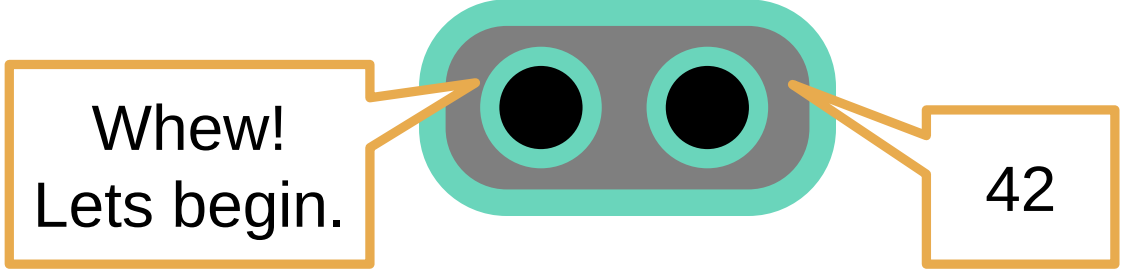

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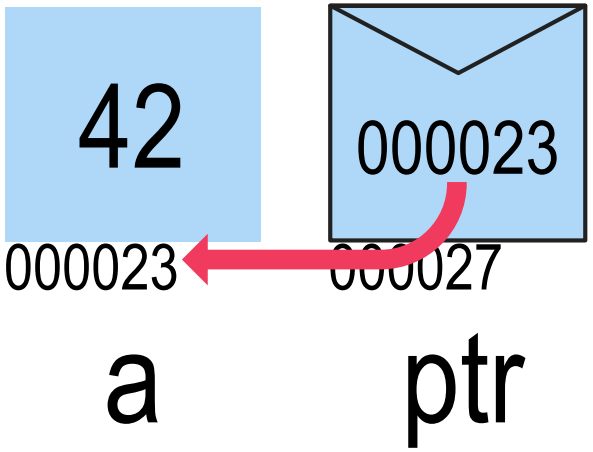

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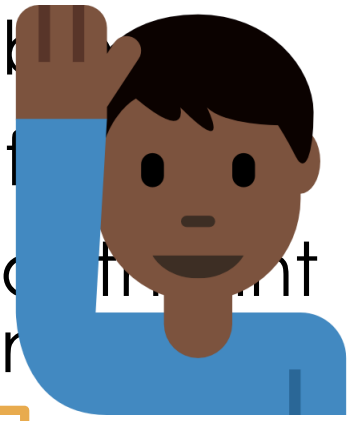

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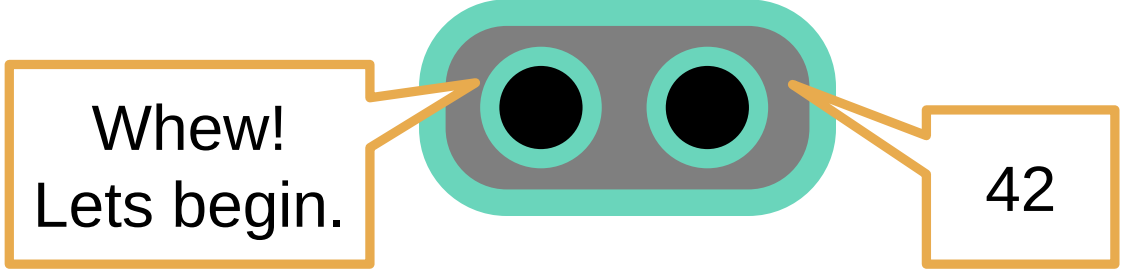

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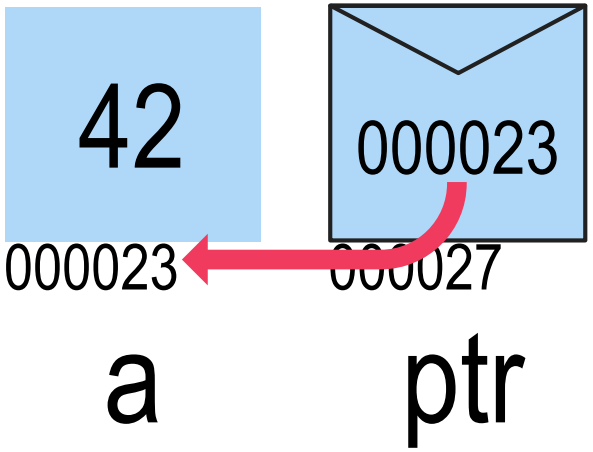

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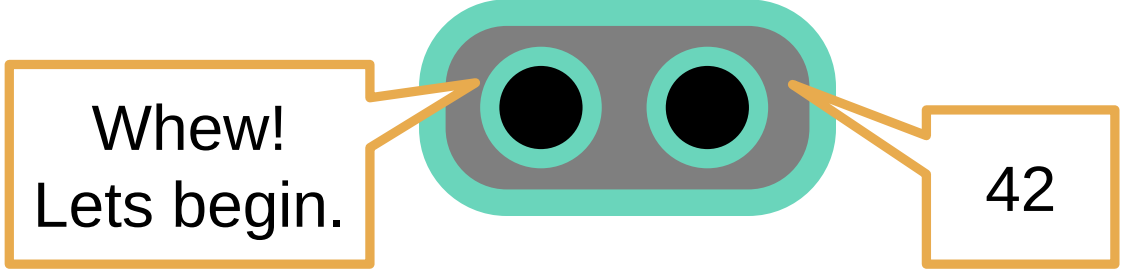

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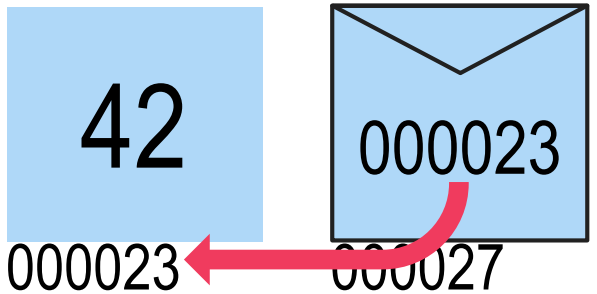

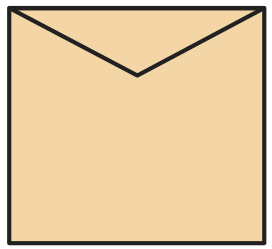

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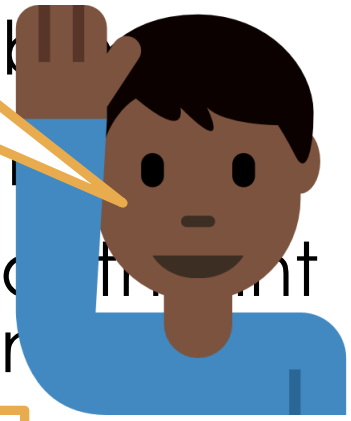

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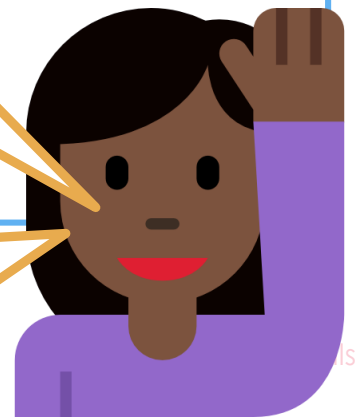

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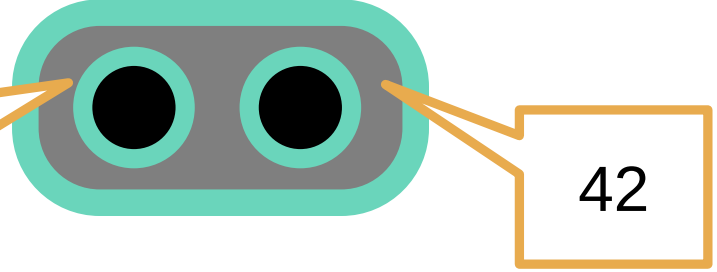

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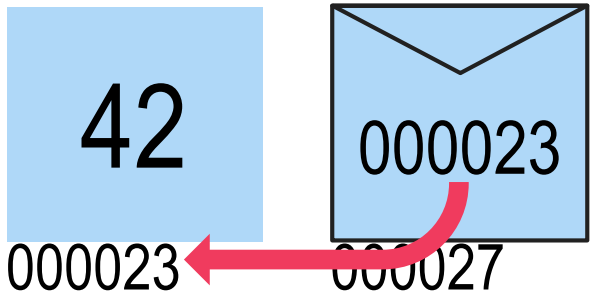

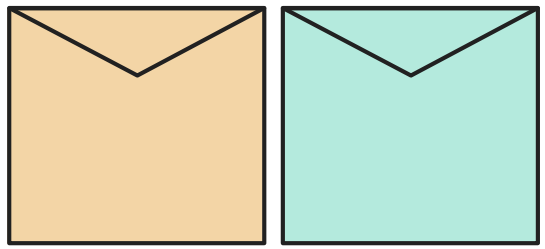

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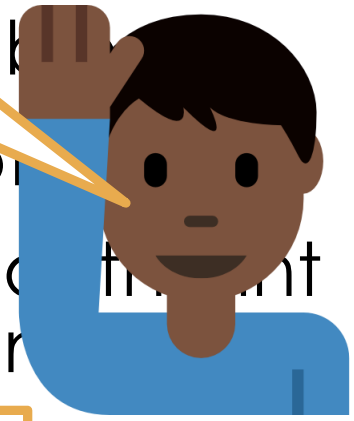

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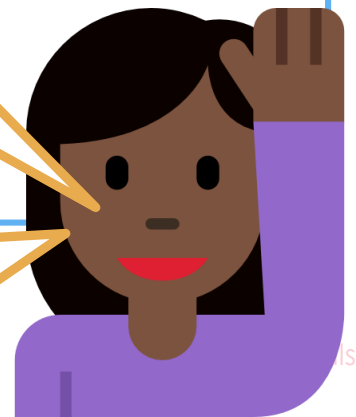

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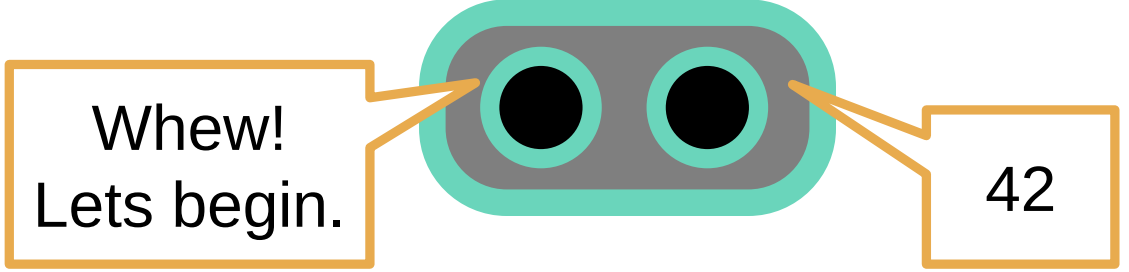

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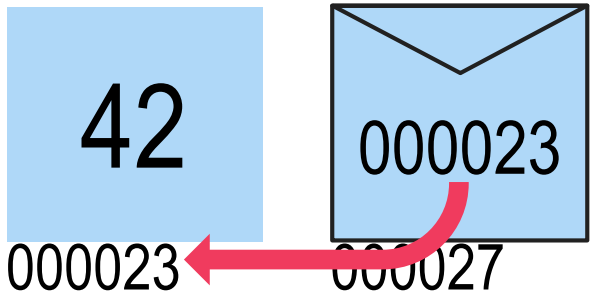

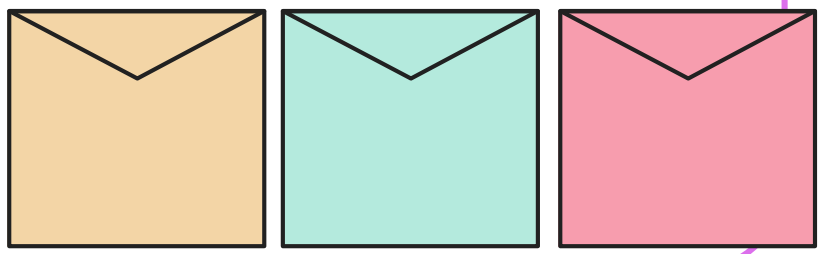

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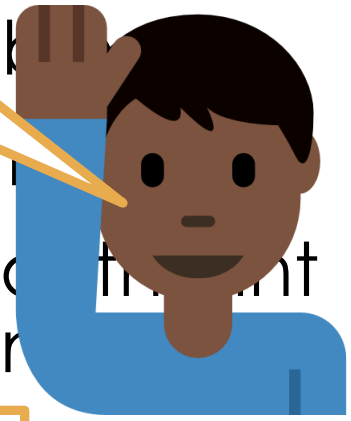

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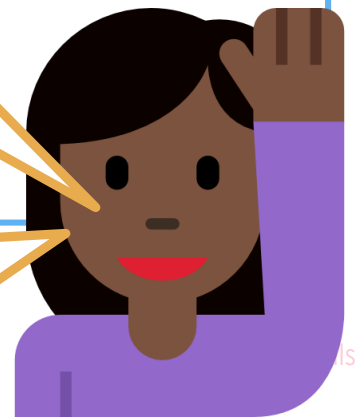

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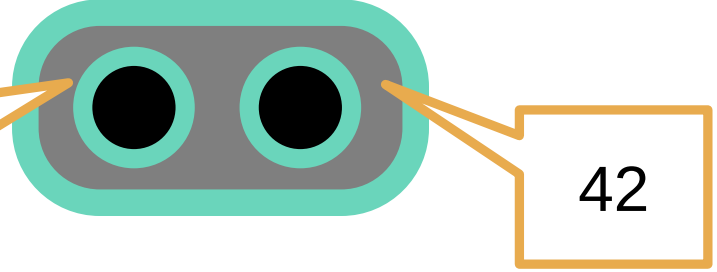

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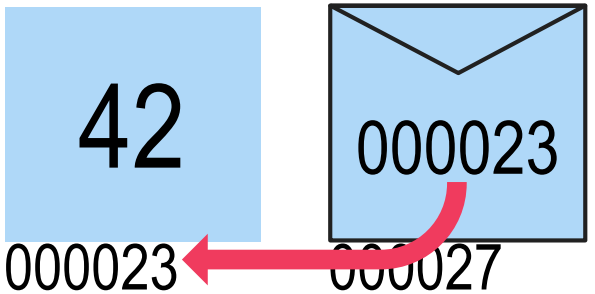

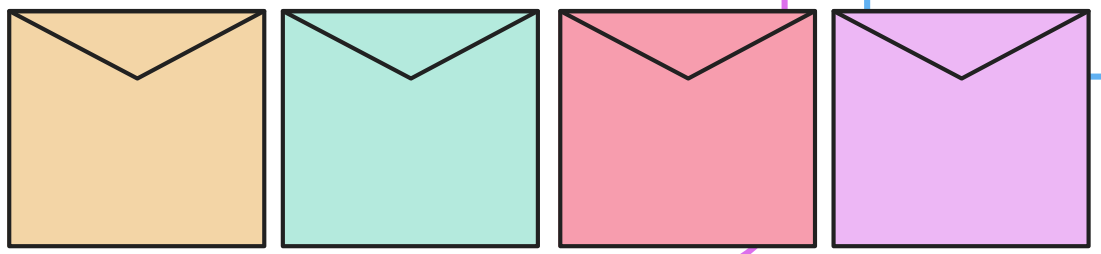

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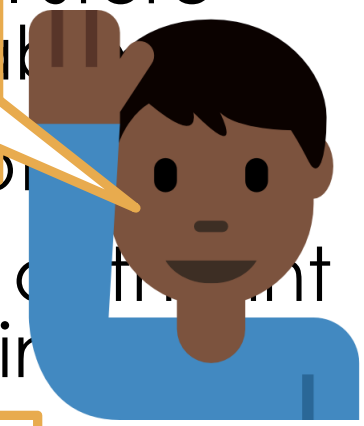

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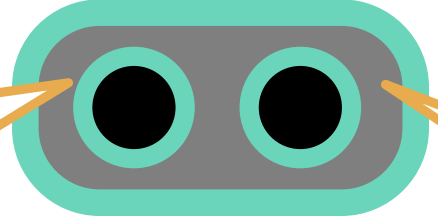

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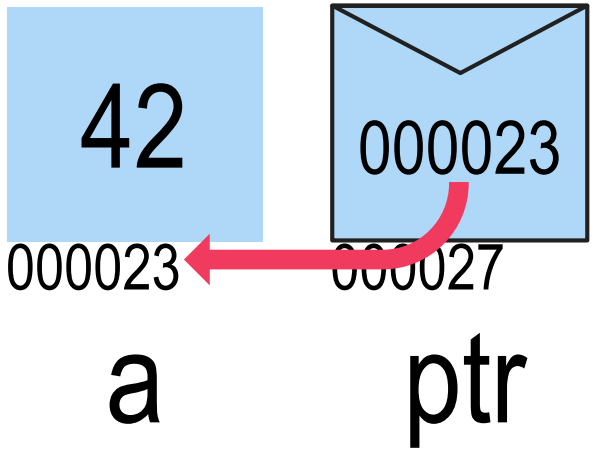

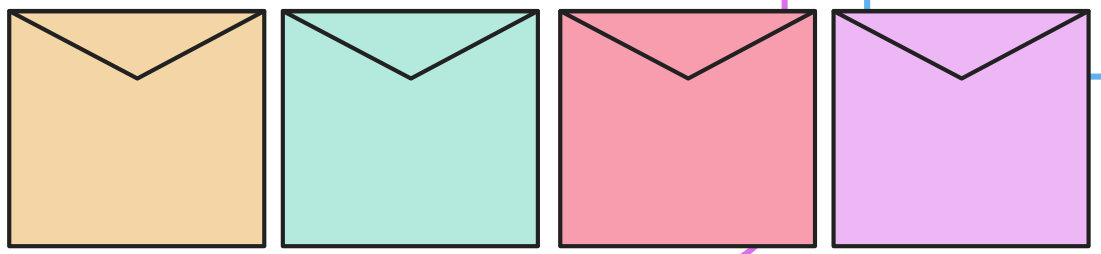

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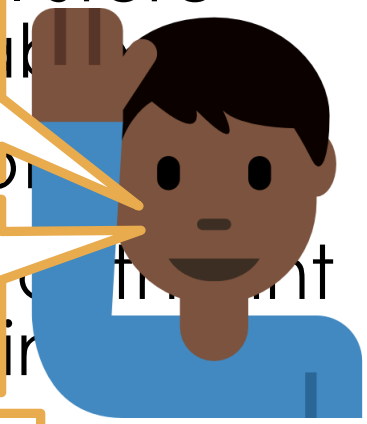
All these envelope-like boxes take 8 bytes



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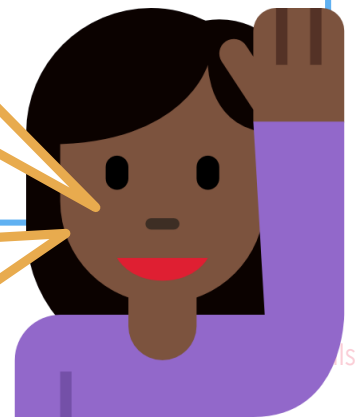

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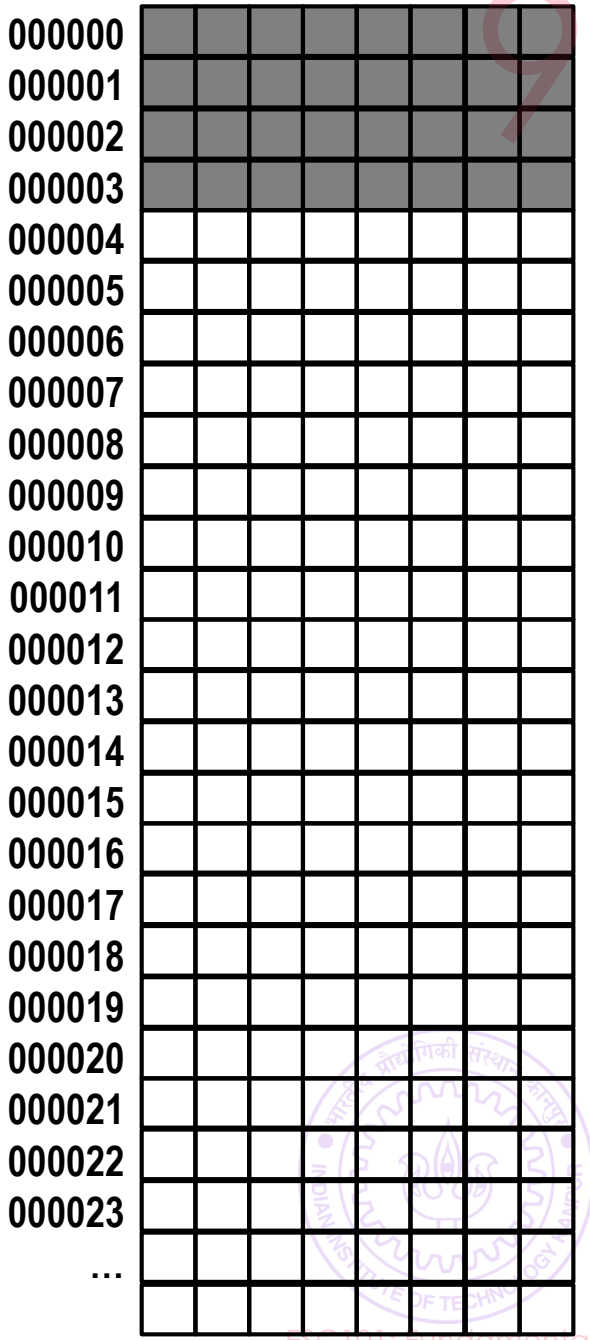
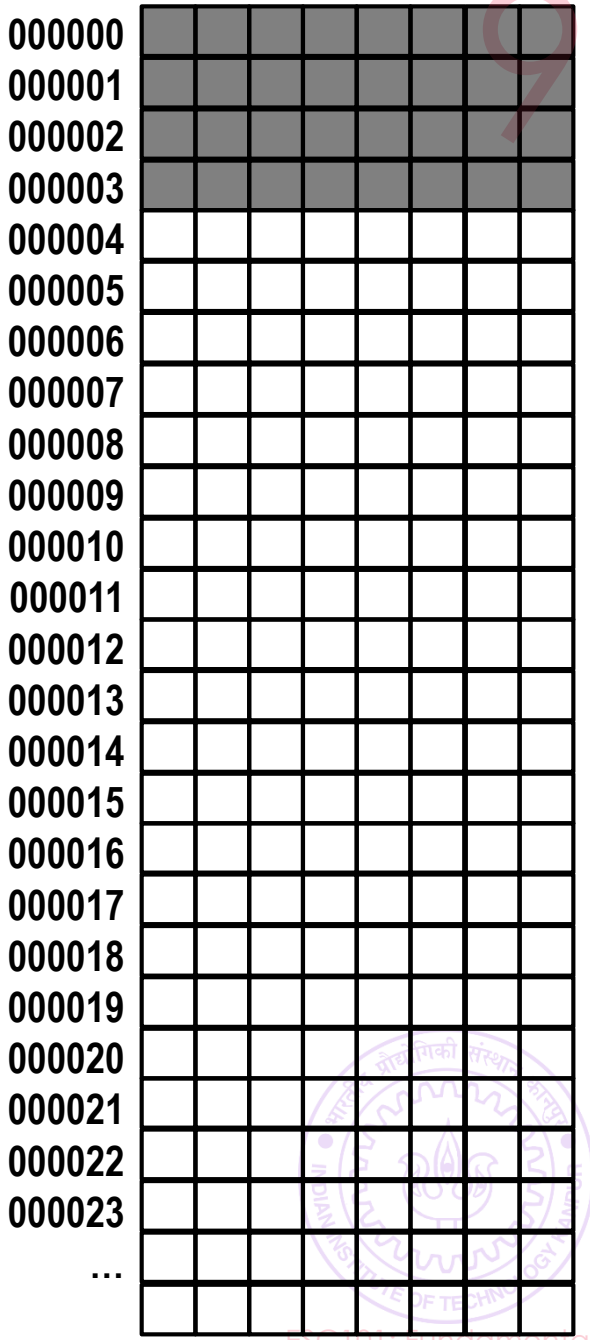
How Mr C stores arrays



How Mr C stores arrays

If we declare an array, a sequence of addresses get allocated



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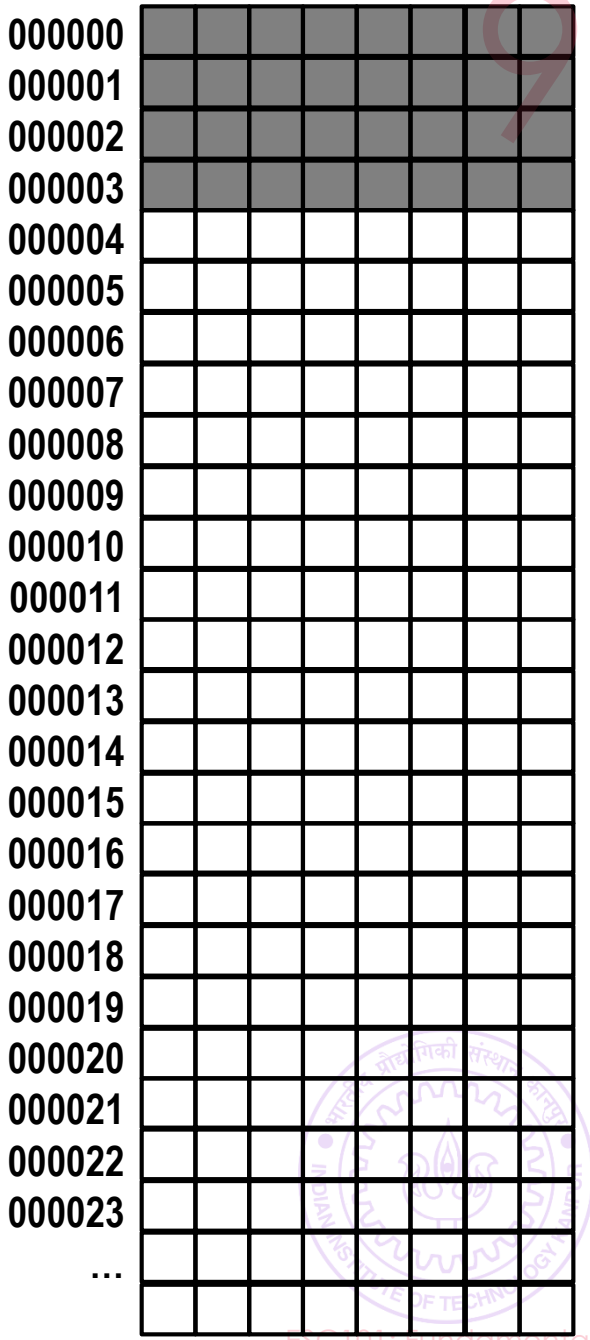

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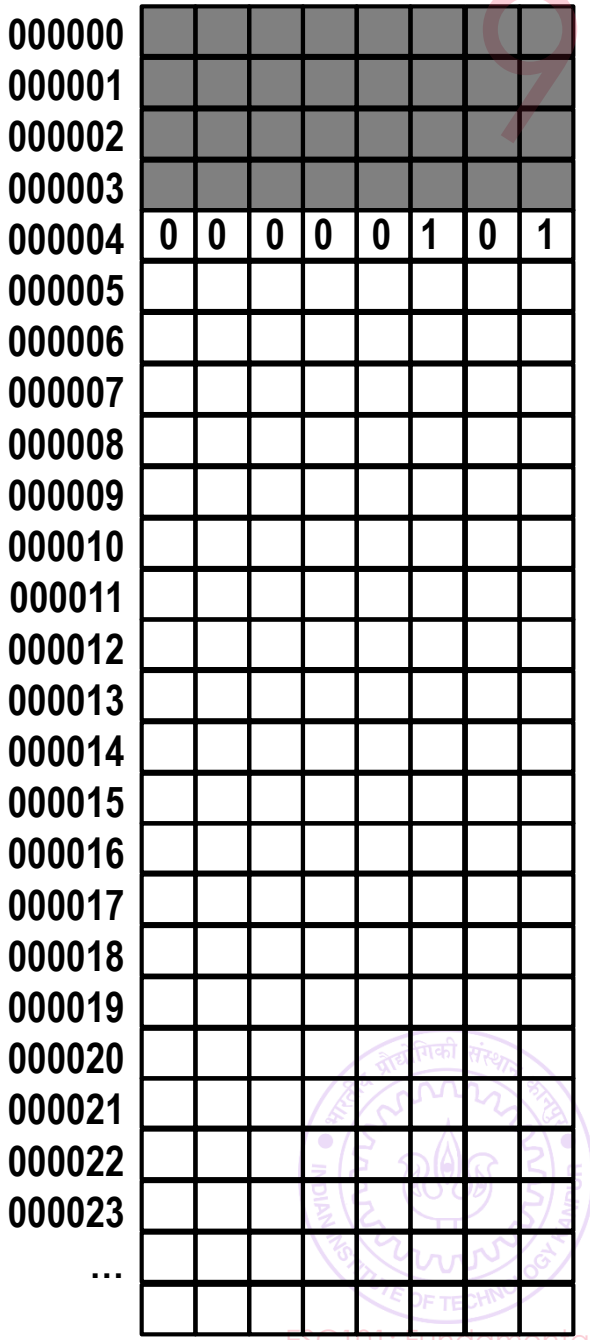

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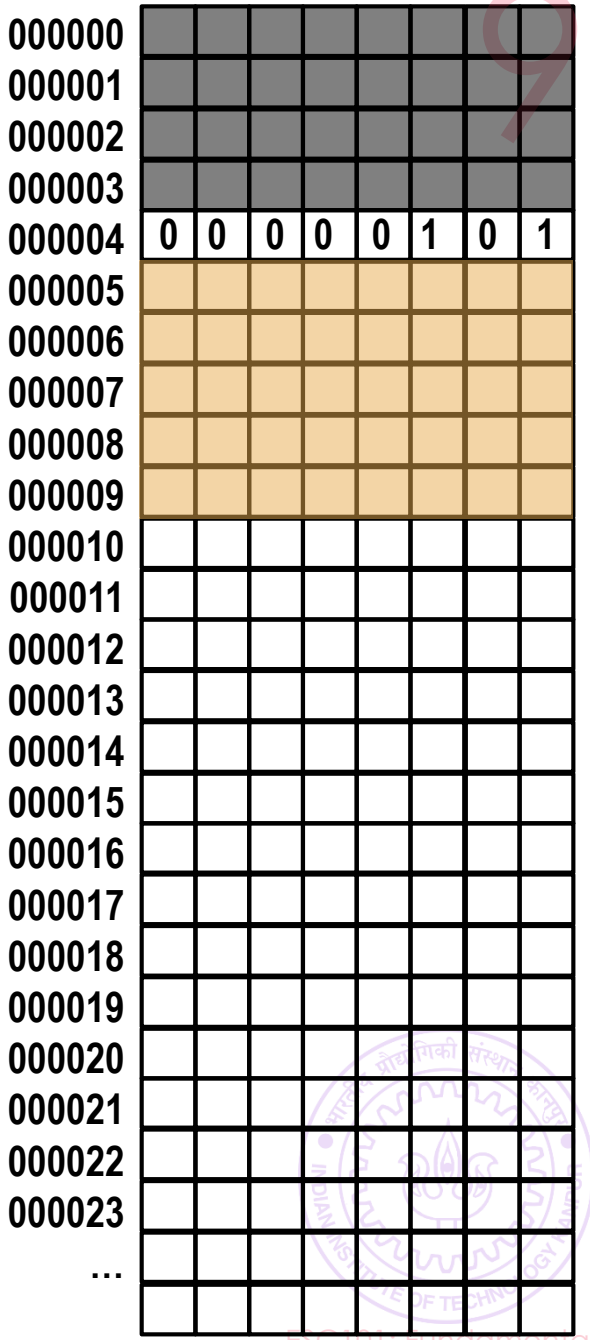

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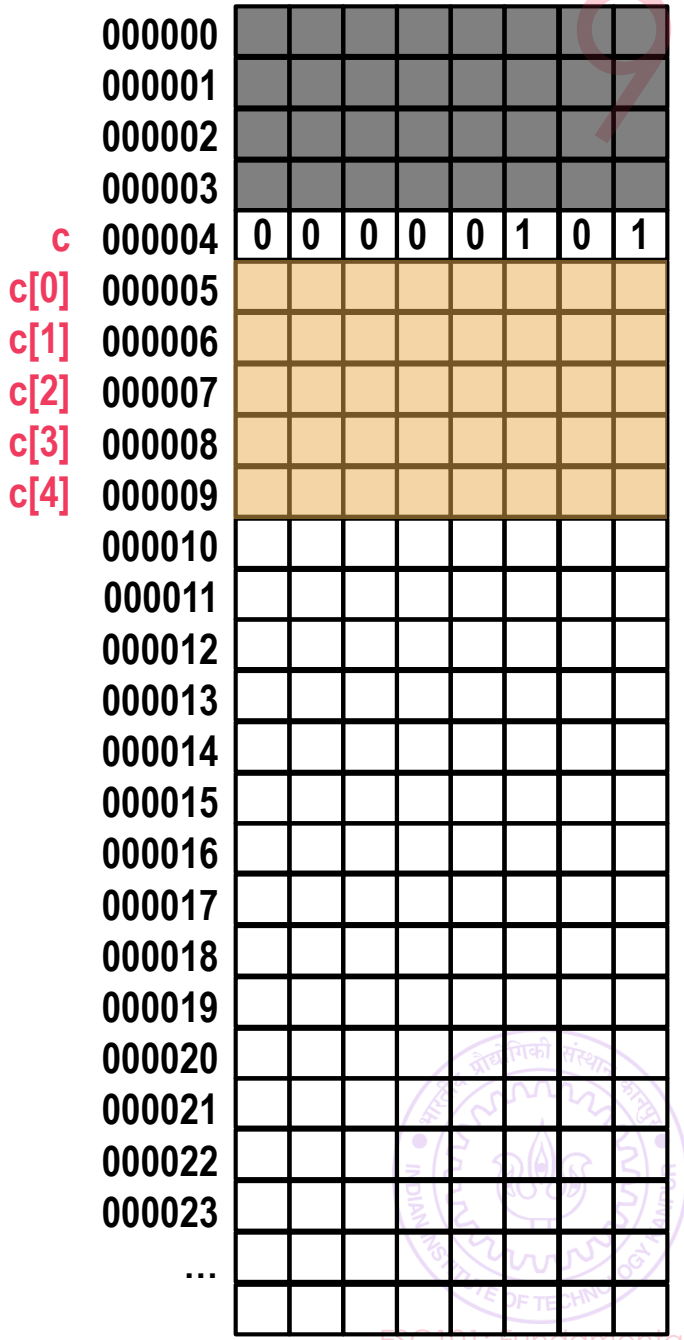

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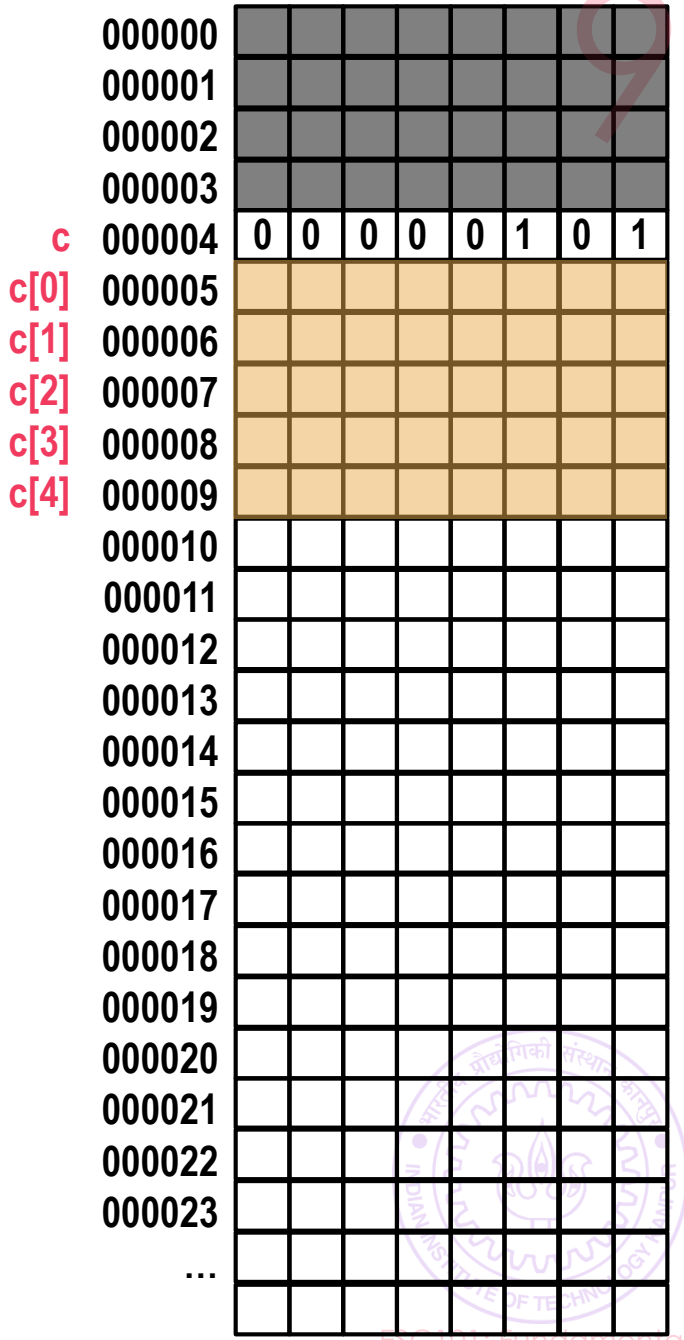

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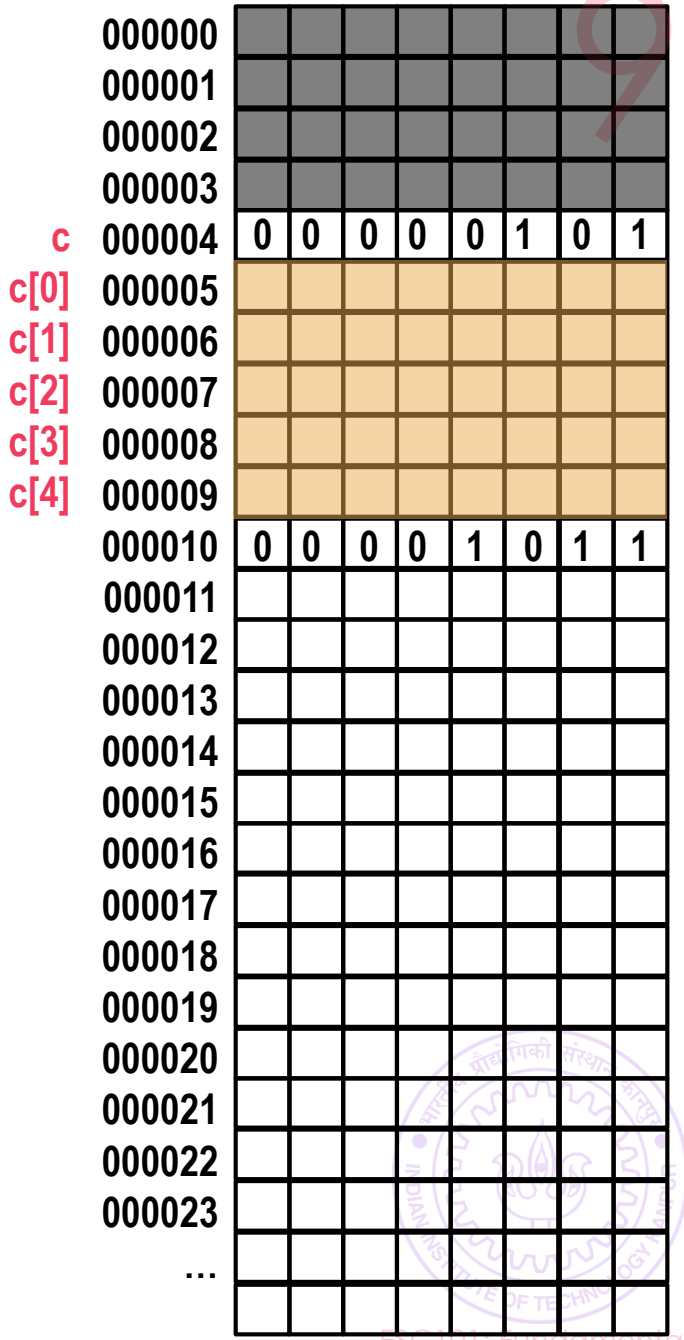

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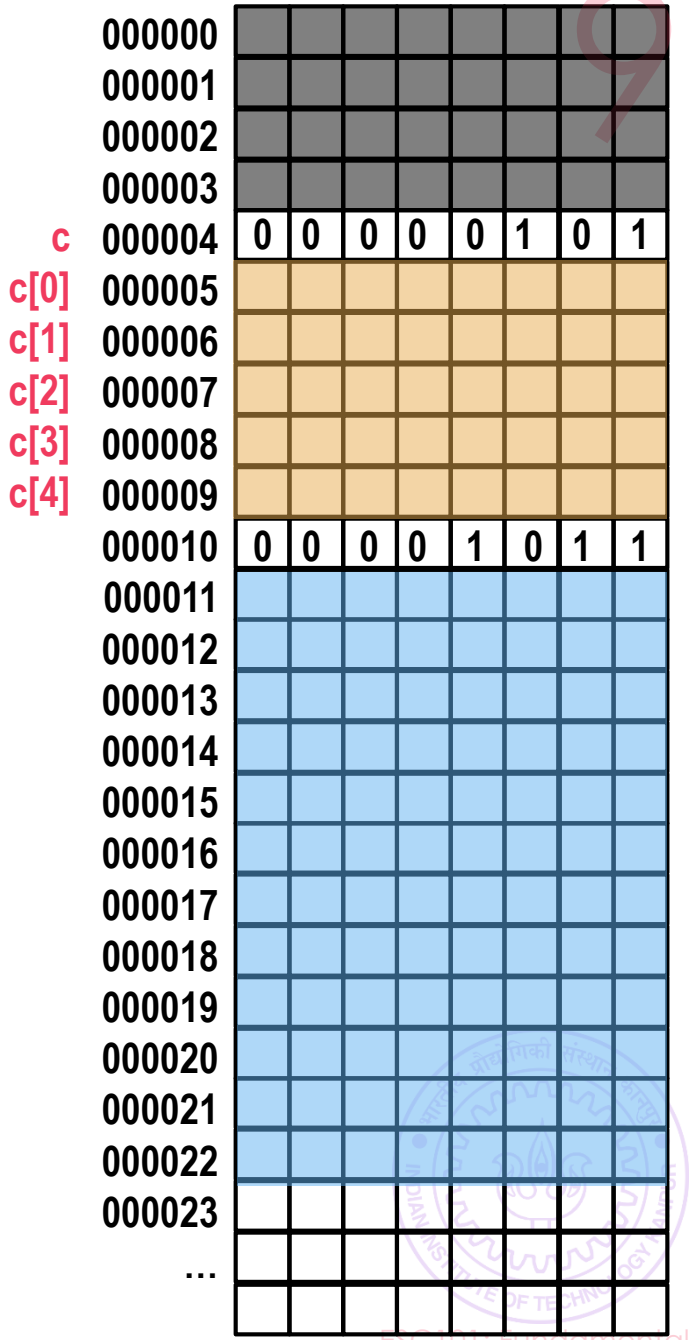

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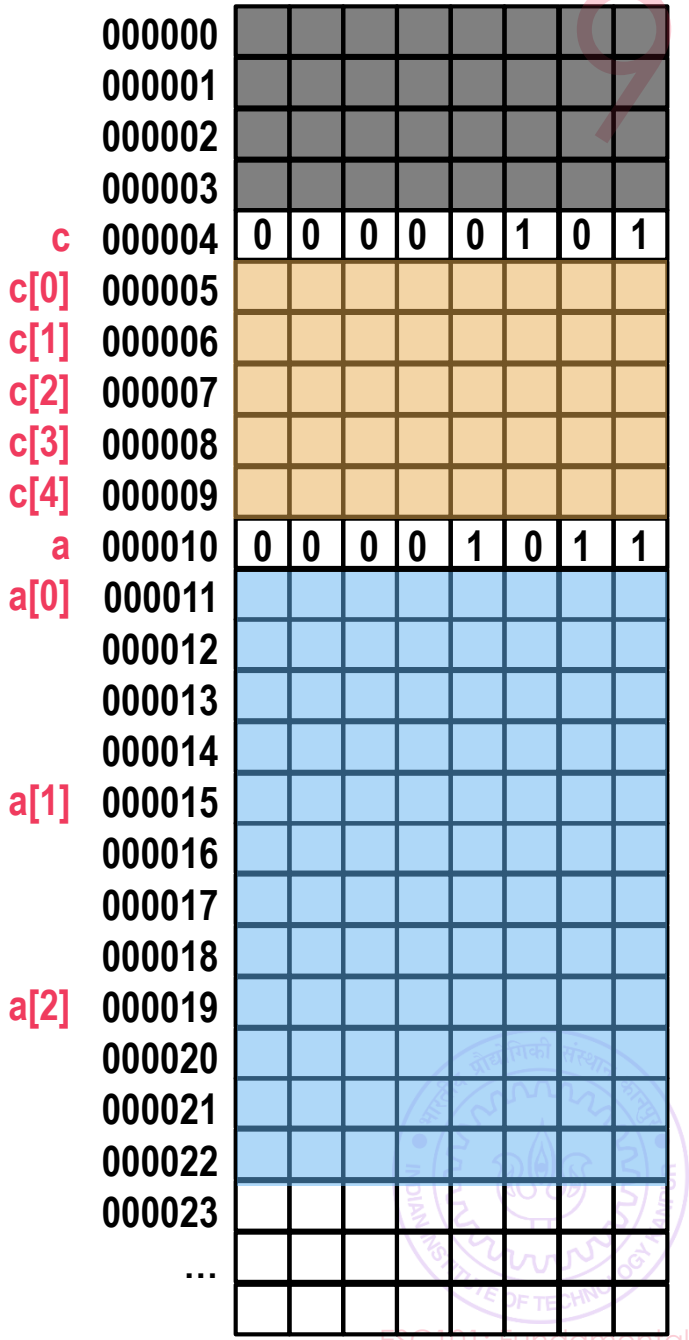

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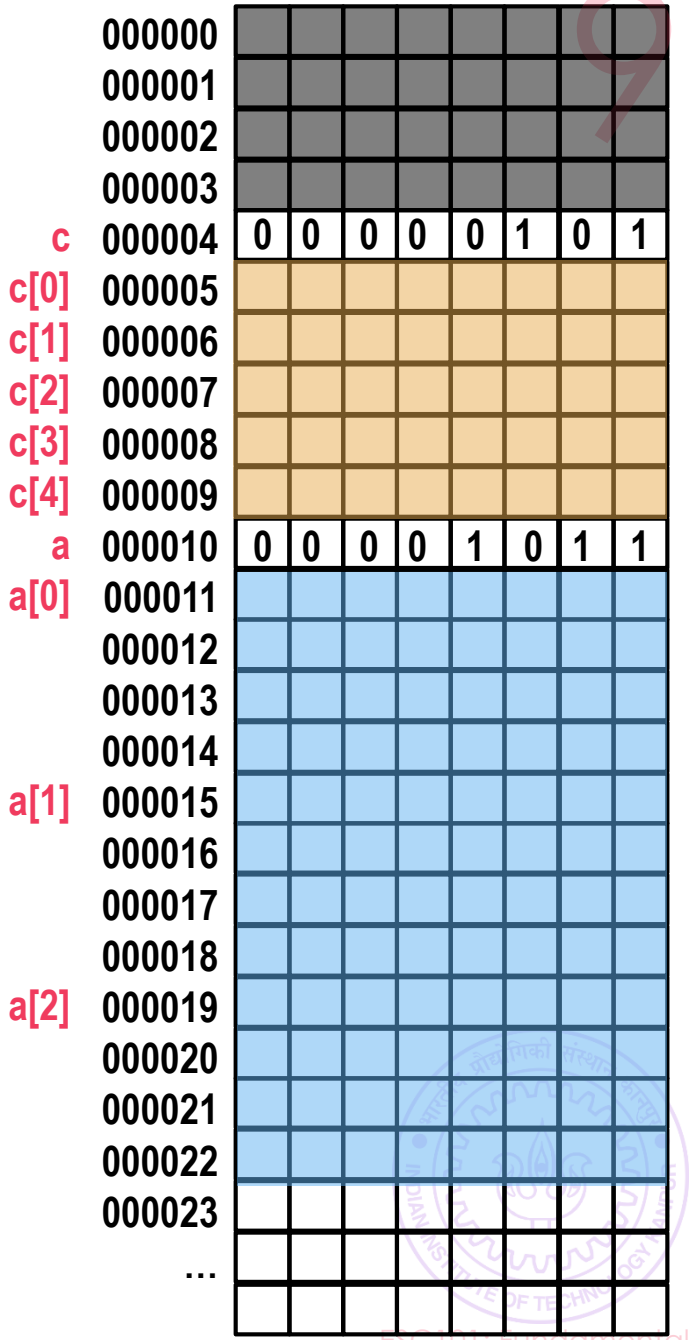

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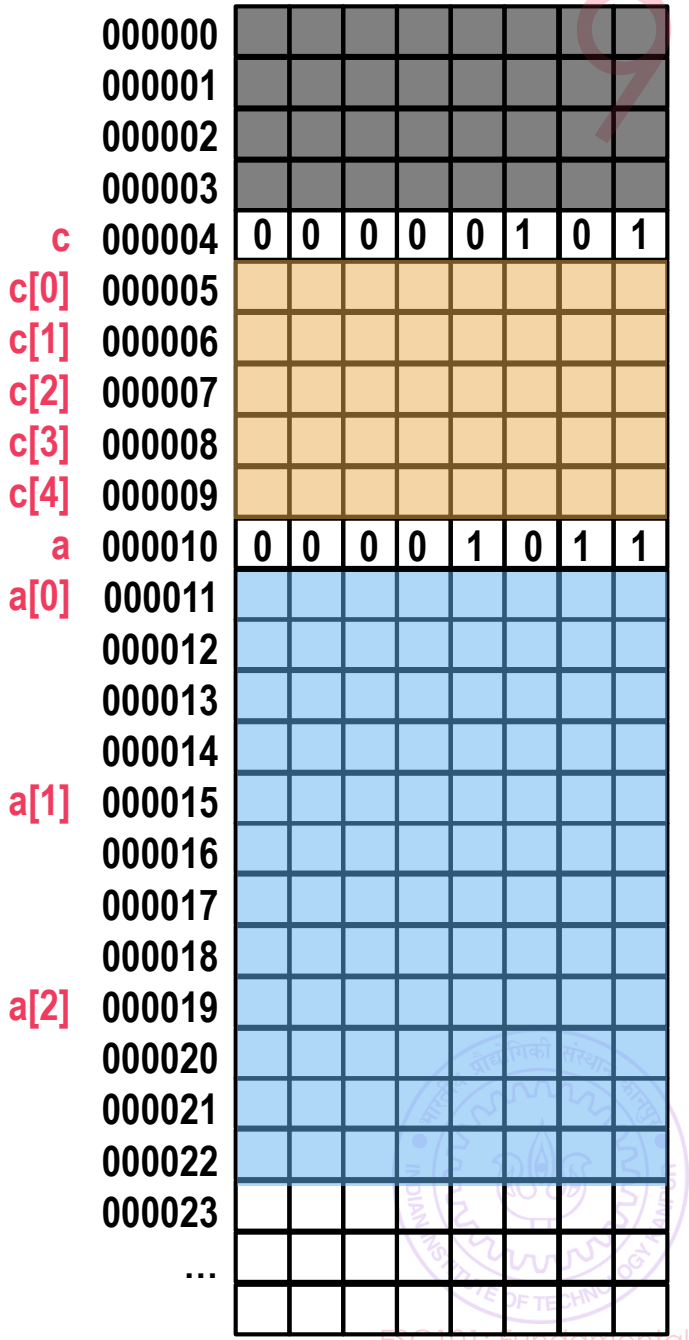

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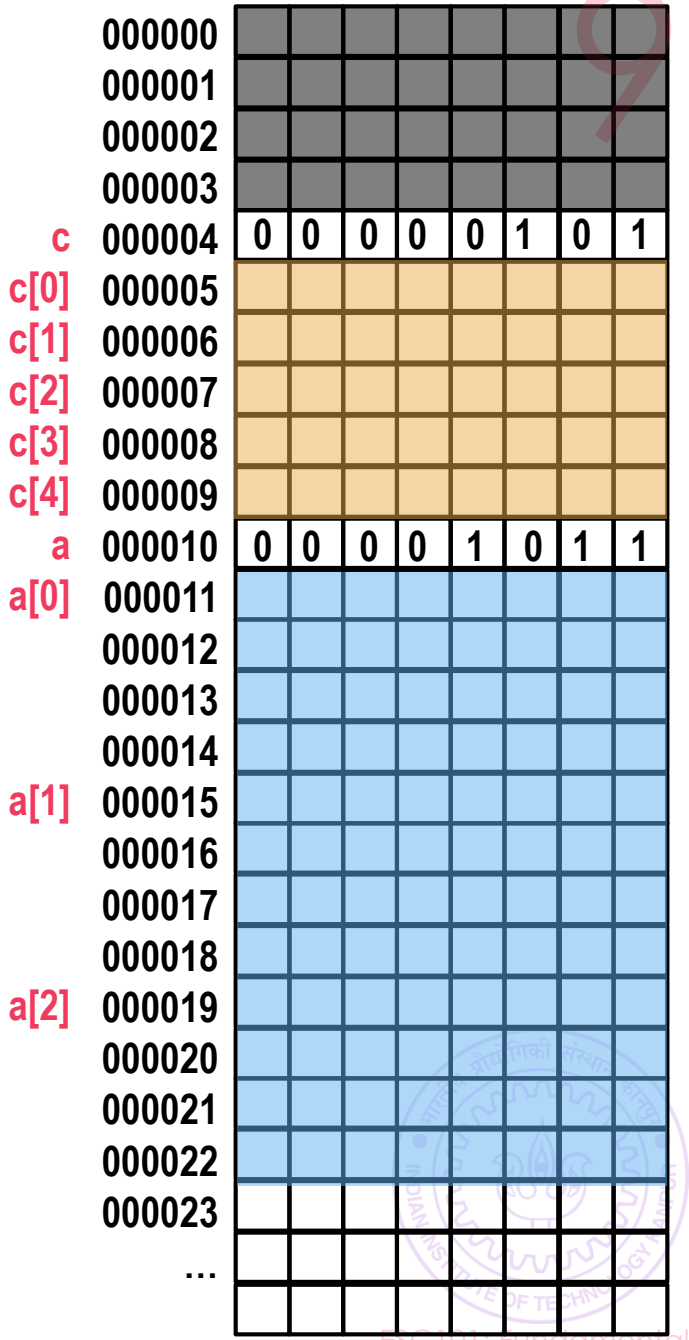

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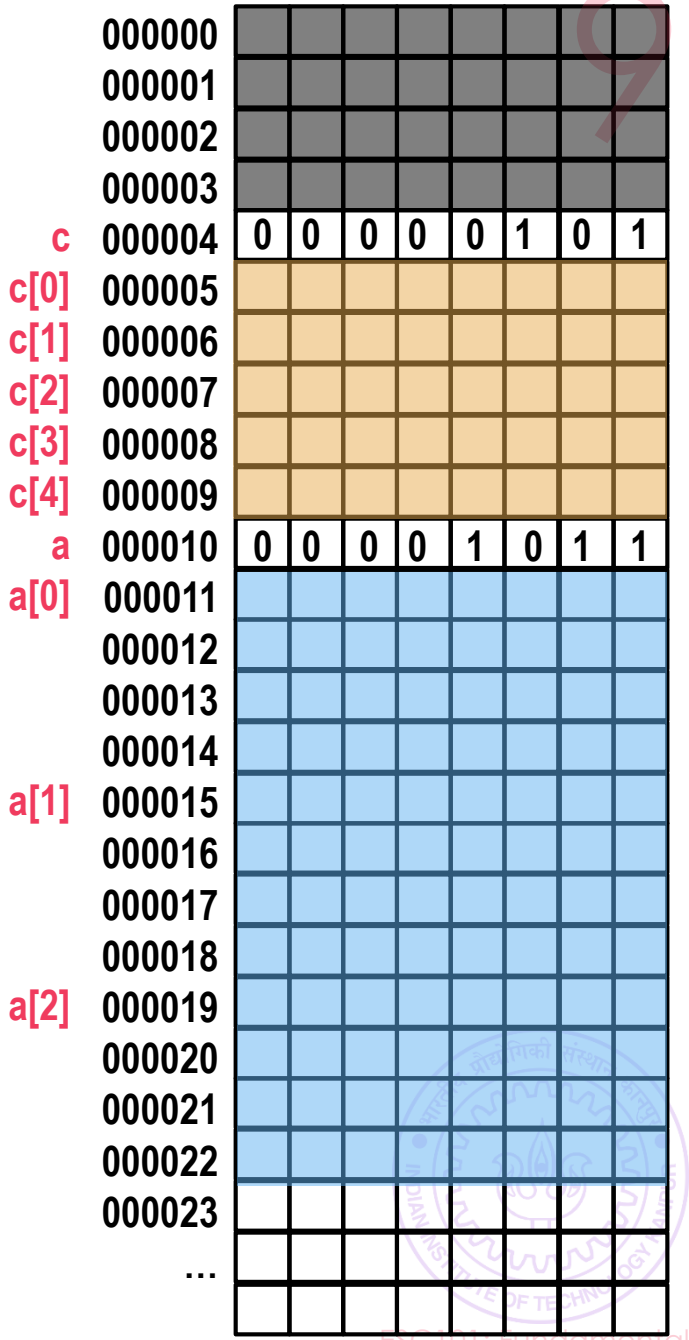

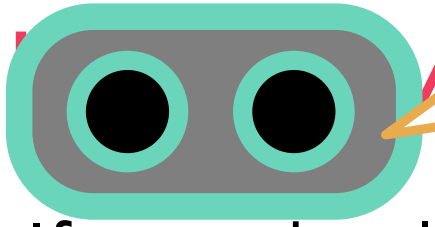

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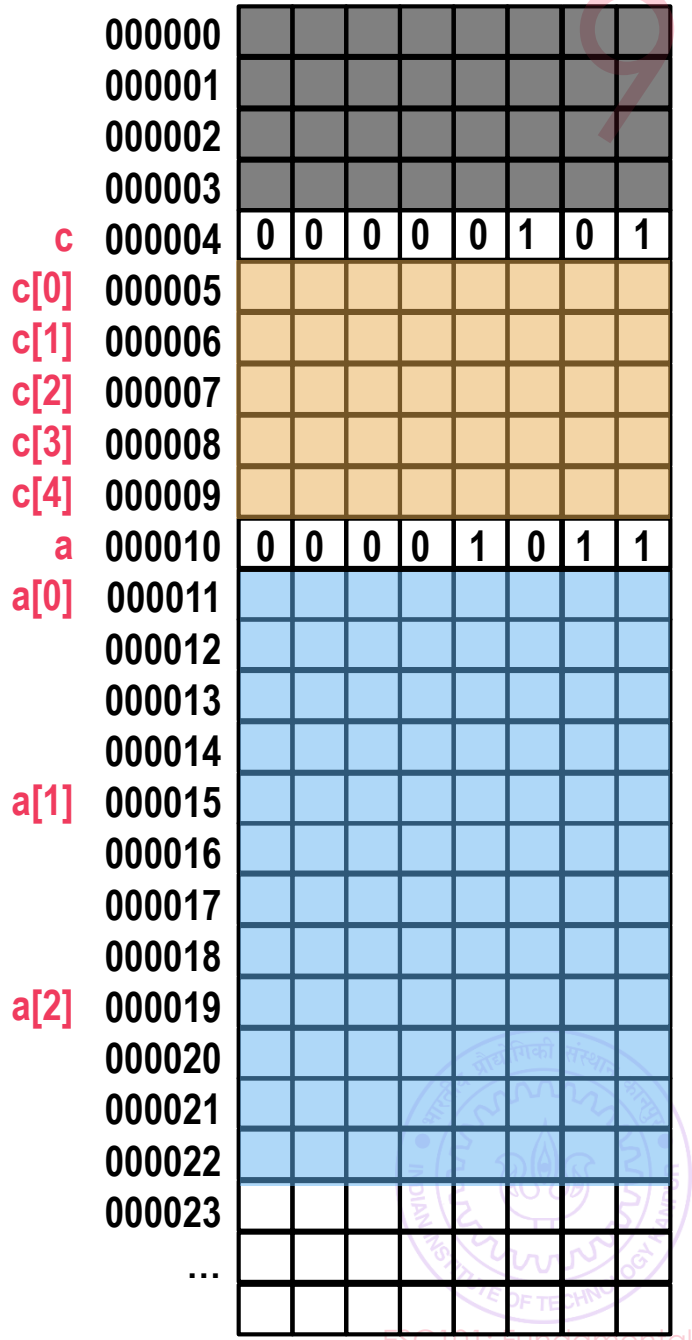

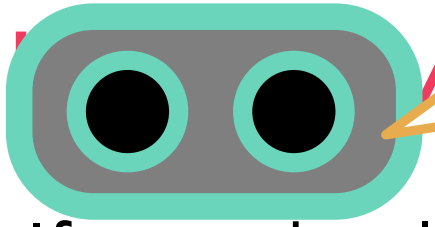

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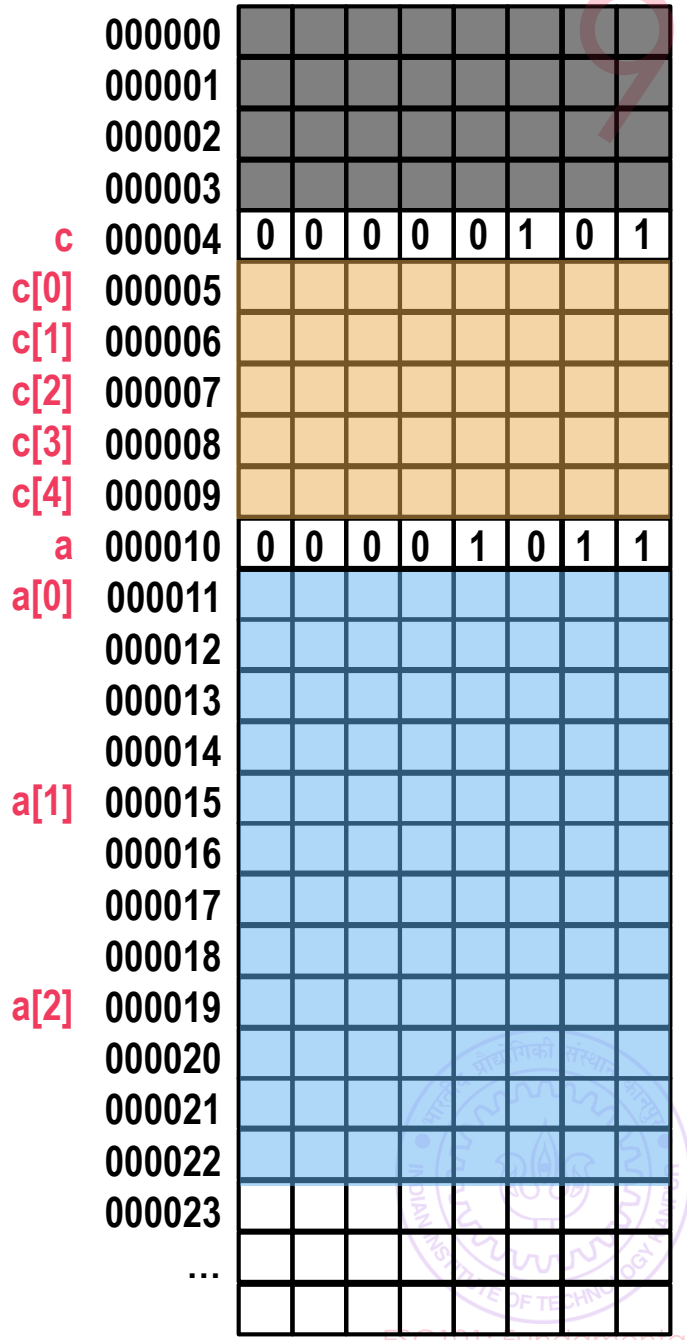

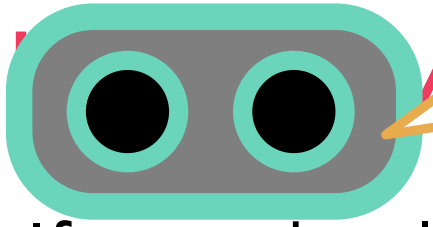

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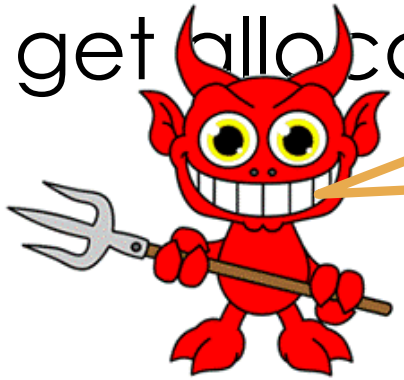

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