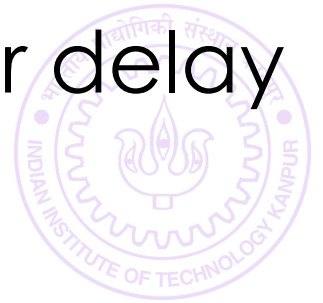
On-demand Service from Mr C

ESC101: Fundamentals of Computing

Purushottam Kar

Announcements

- October 2 (Tuesday) is a holiday – no lecture, no lab
- We will have replacement lab October 6 (Sat) 2-5PM at NCL for sections B4, B5, B6, B13,
- No replacement lecture since not a "DoAA Saturday"
- Extra doubt clearing session after extra lab on Sat i.e. Oct 06 (Sat) 5-6PM CC-02.
- Will release remaining grades this week – sorry for delay



Pointers - Recap

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Can typecast pointers too – will see a cute example

Pointers and Arrays

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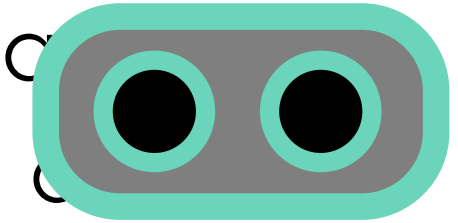

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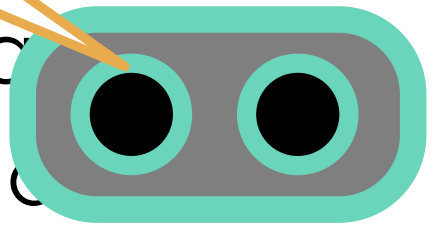

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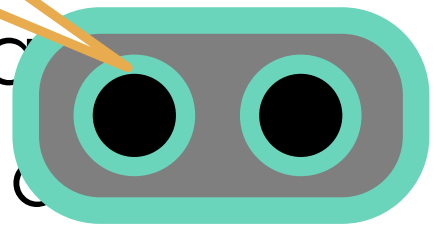

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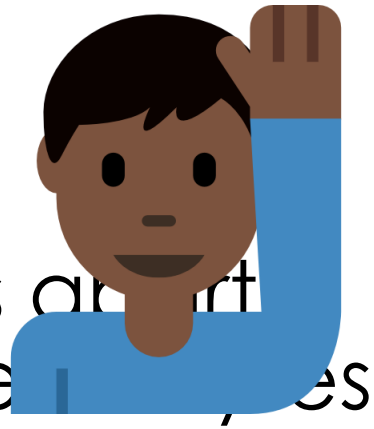

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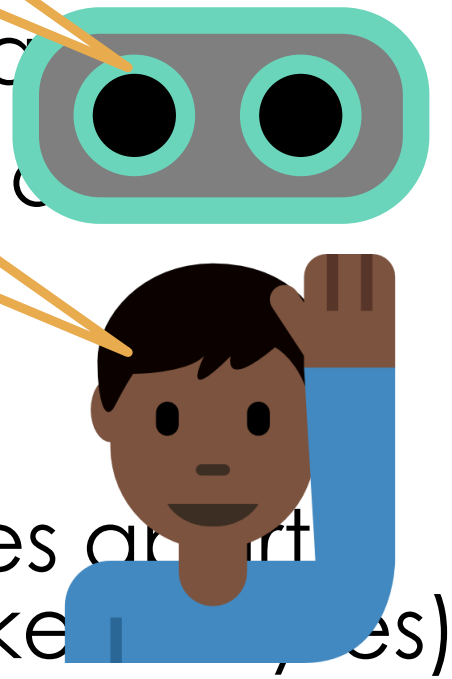
To do fancy pointer arithmetic, we should create a fresh pointer variable e.g. ptr



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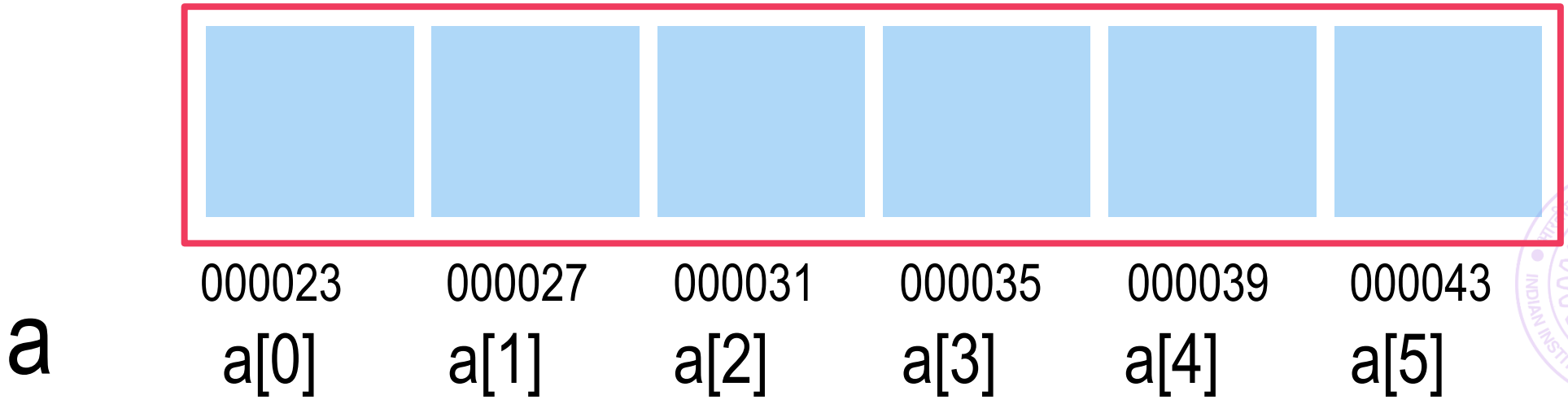

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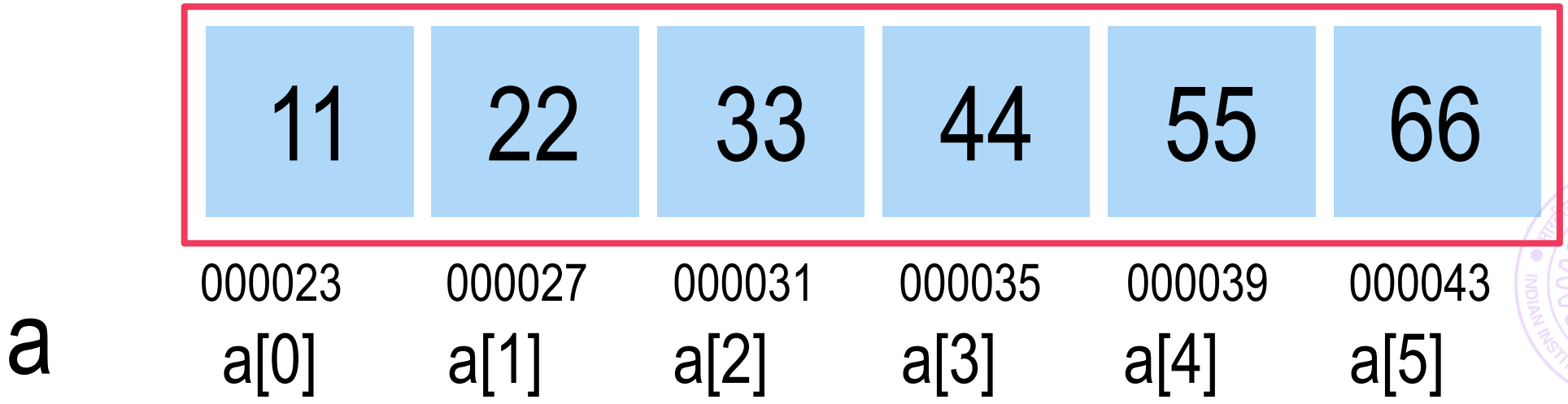

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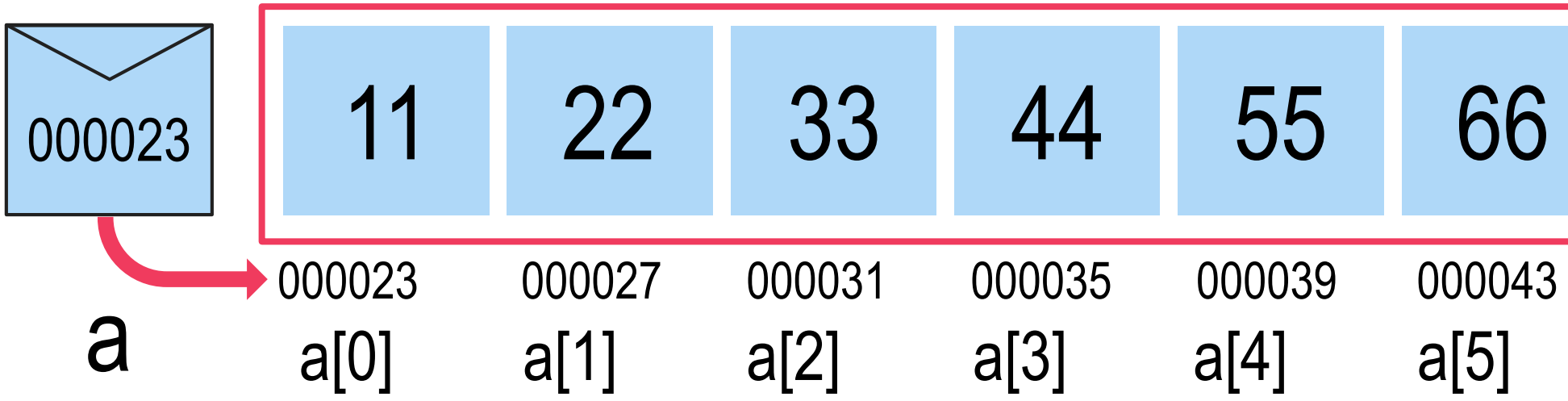

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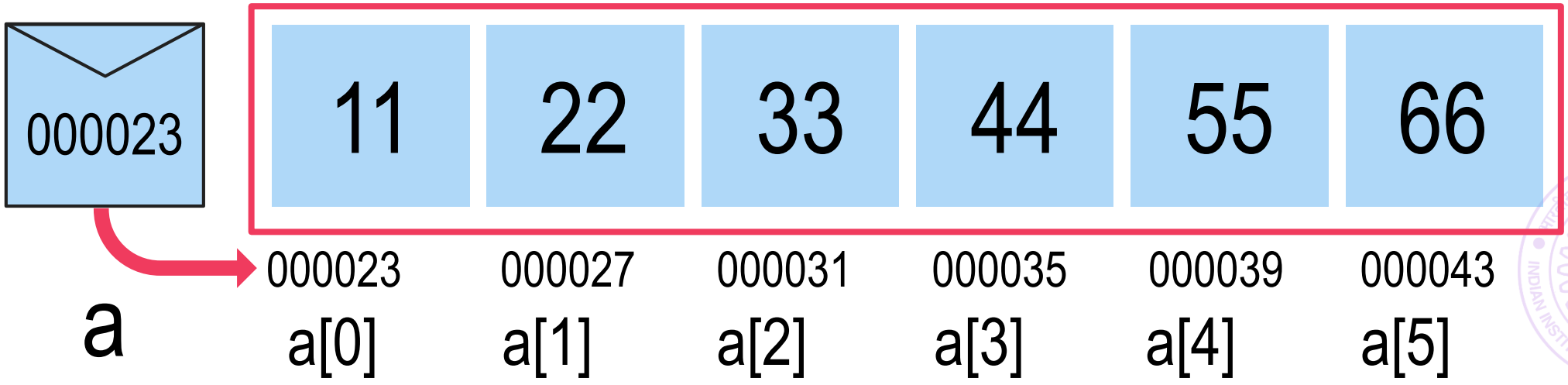

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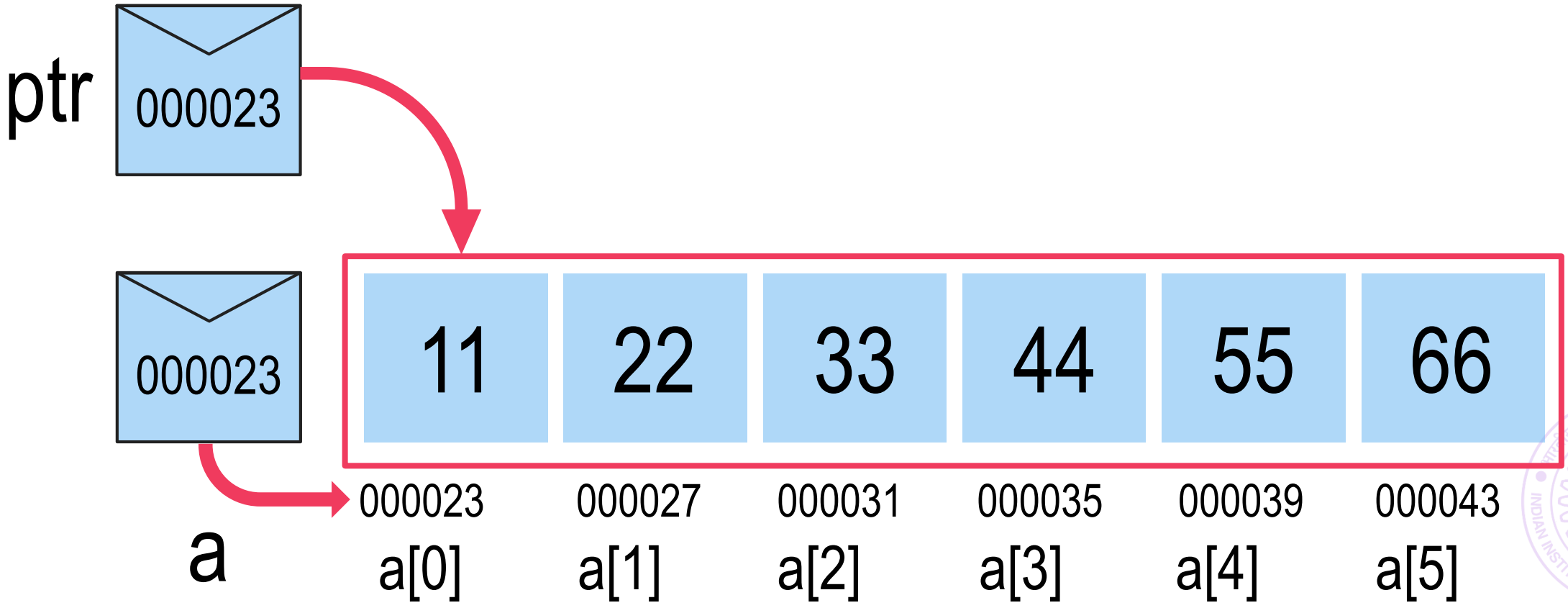

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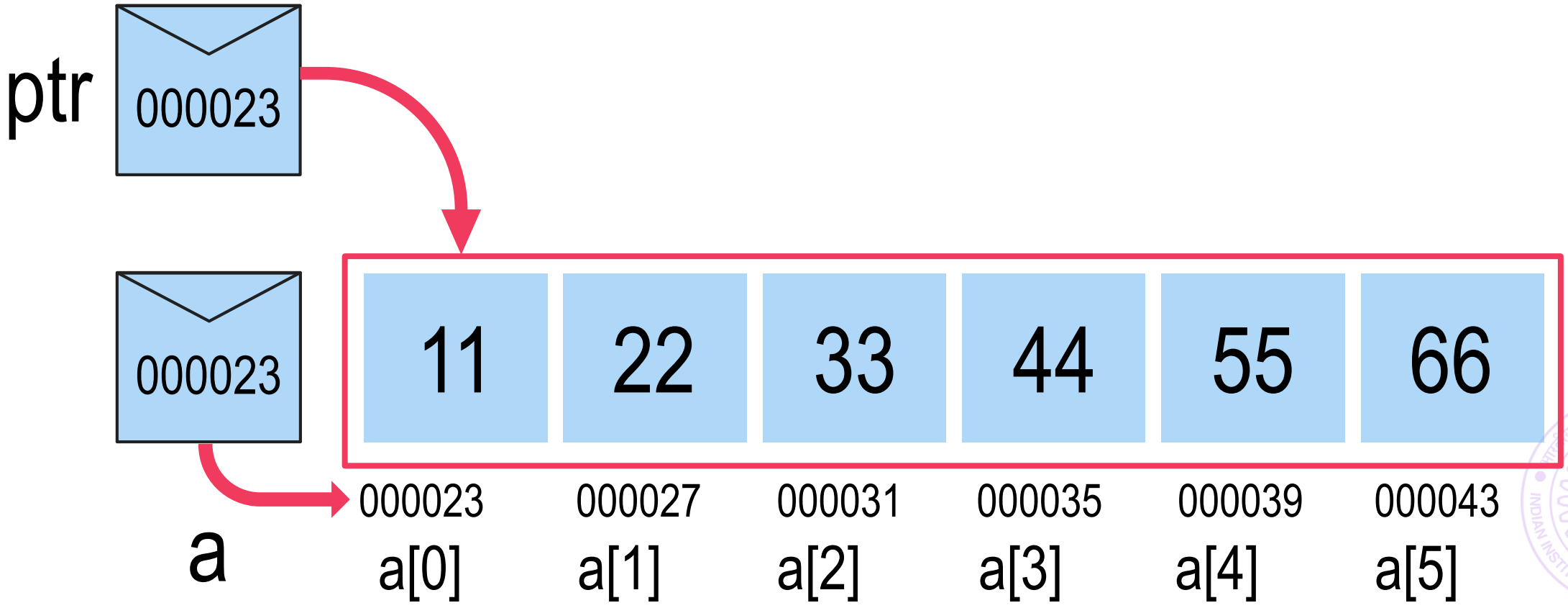

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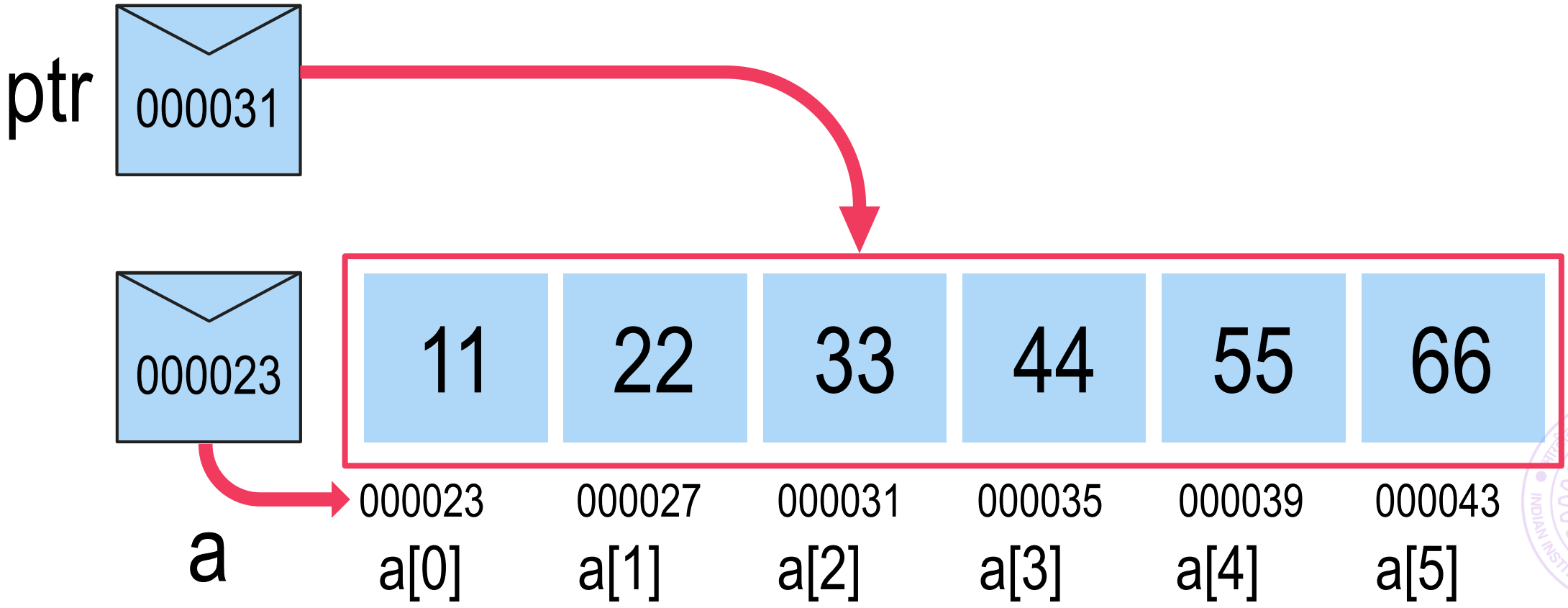

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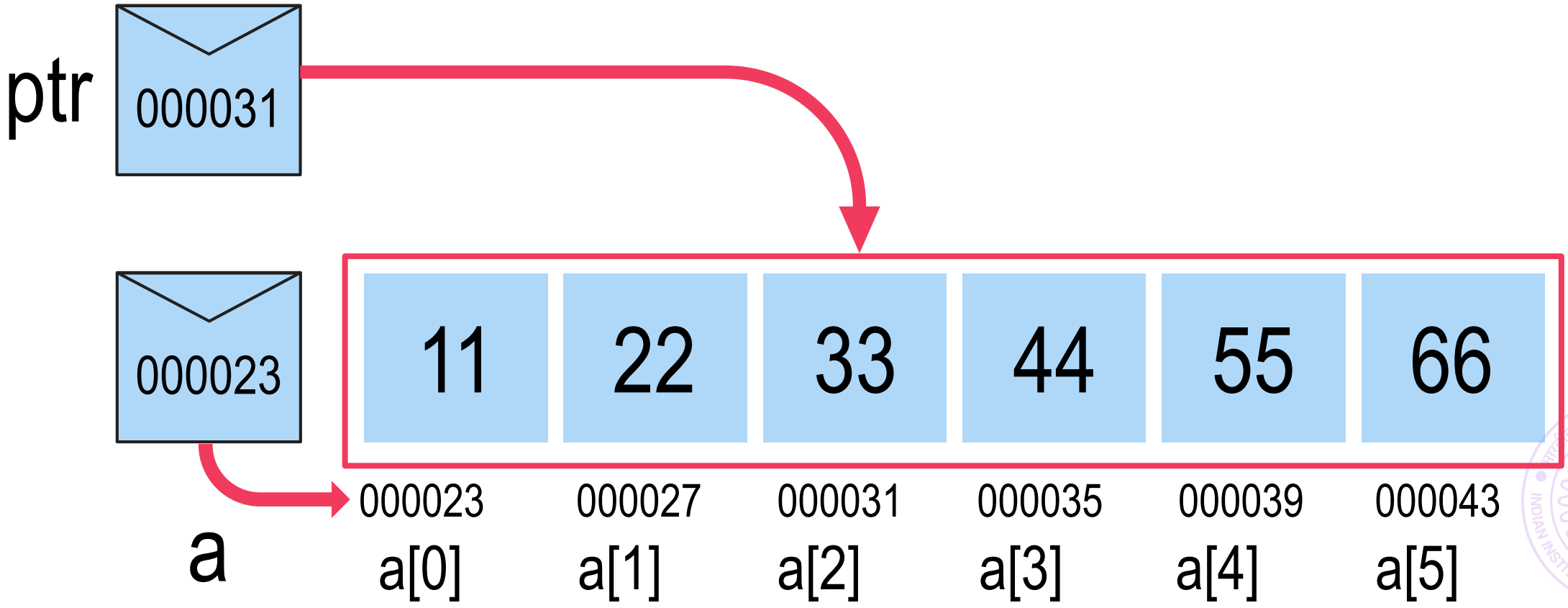

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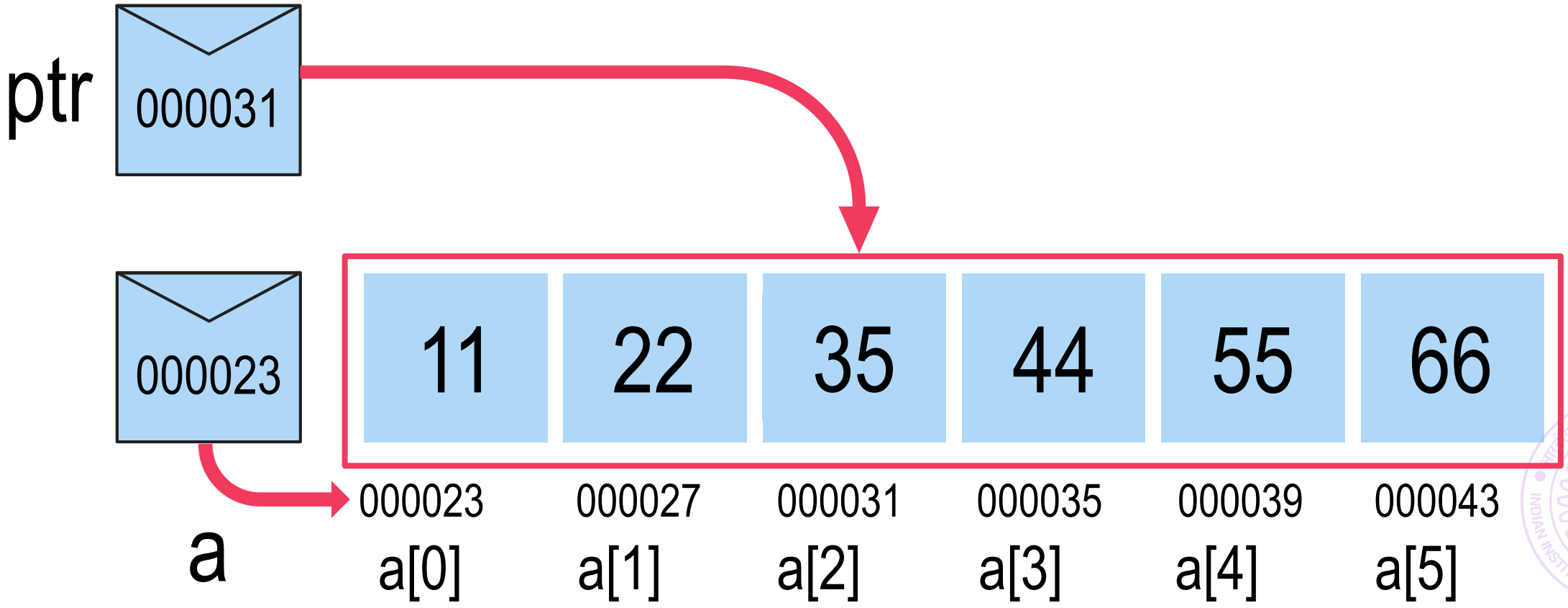

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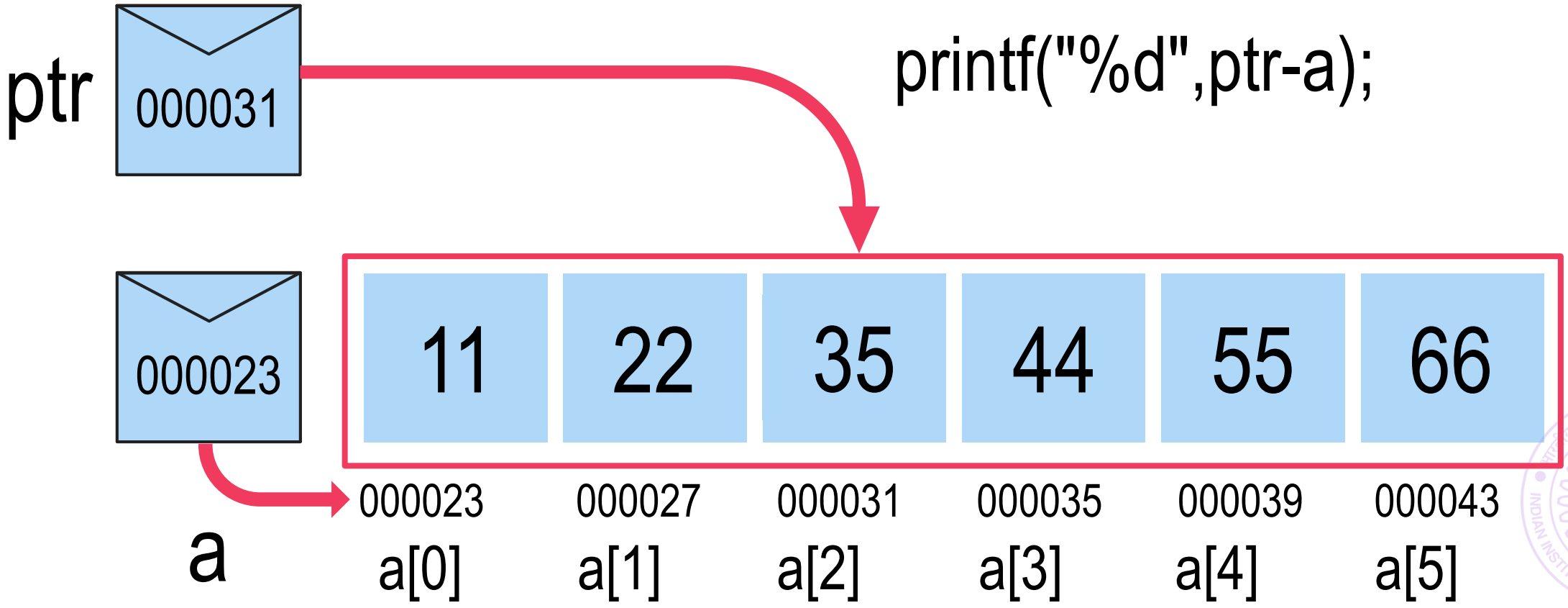

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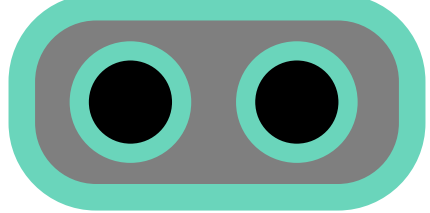

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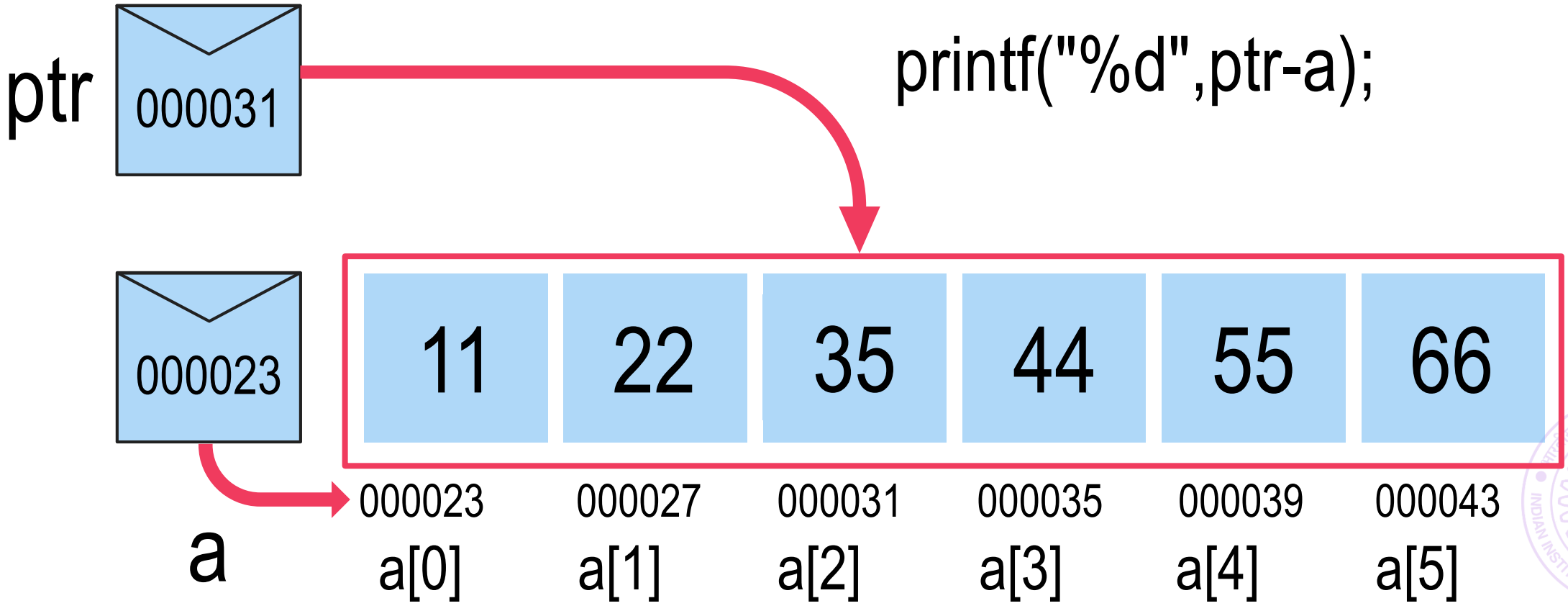

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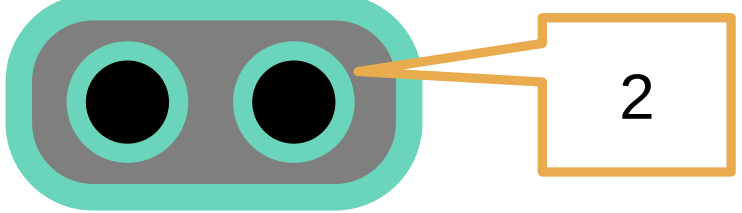


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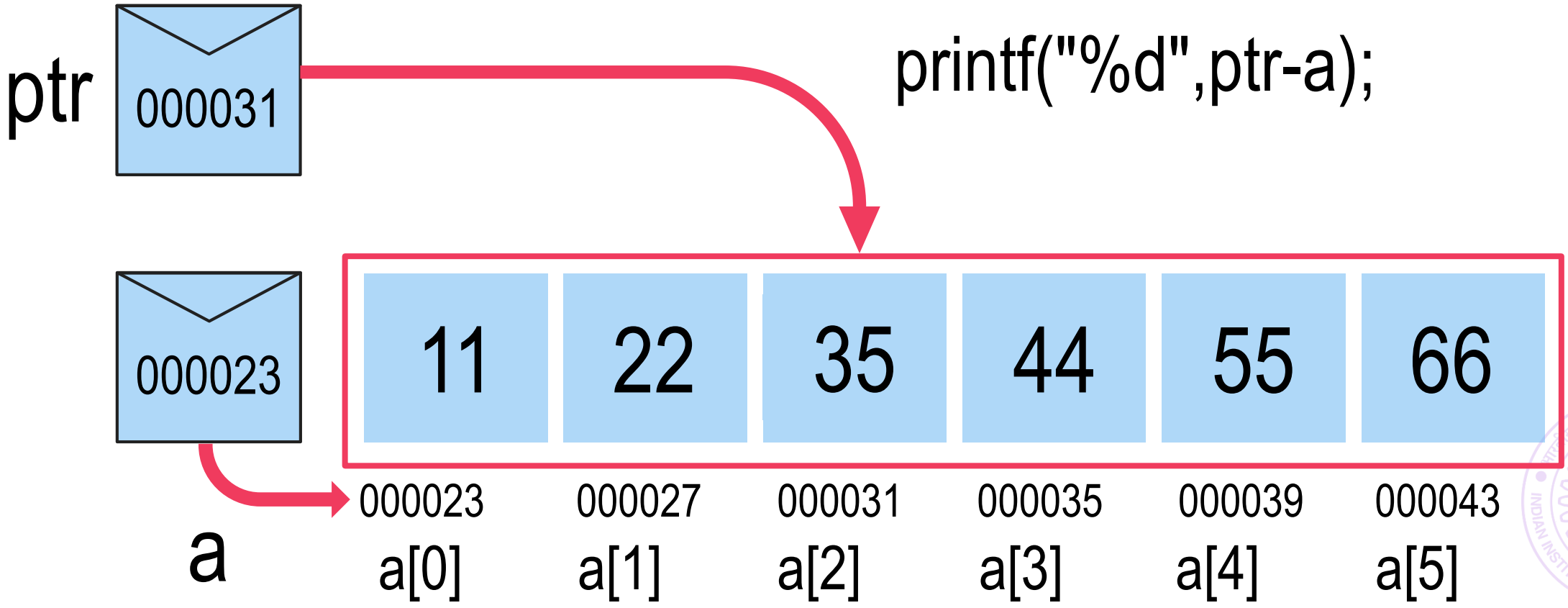

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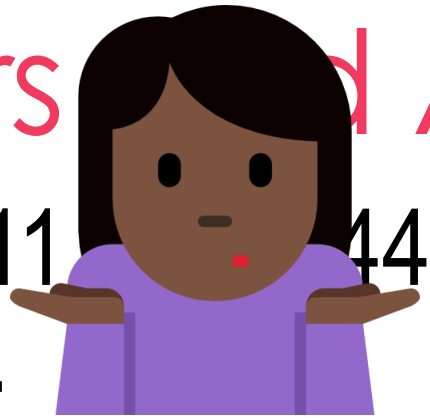

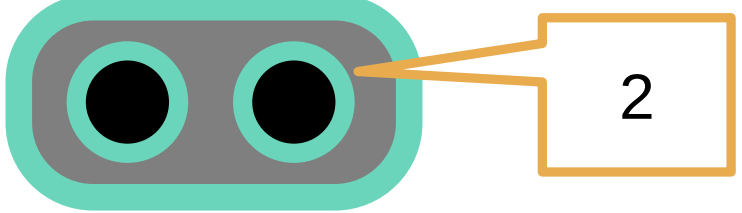


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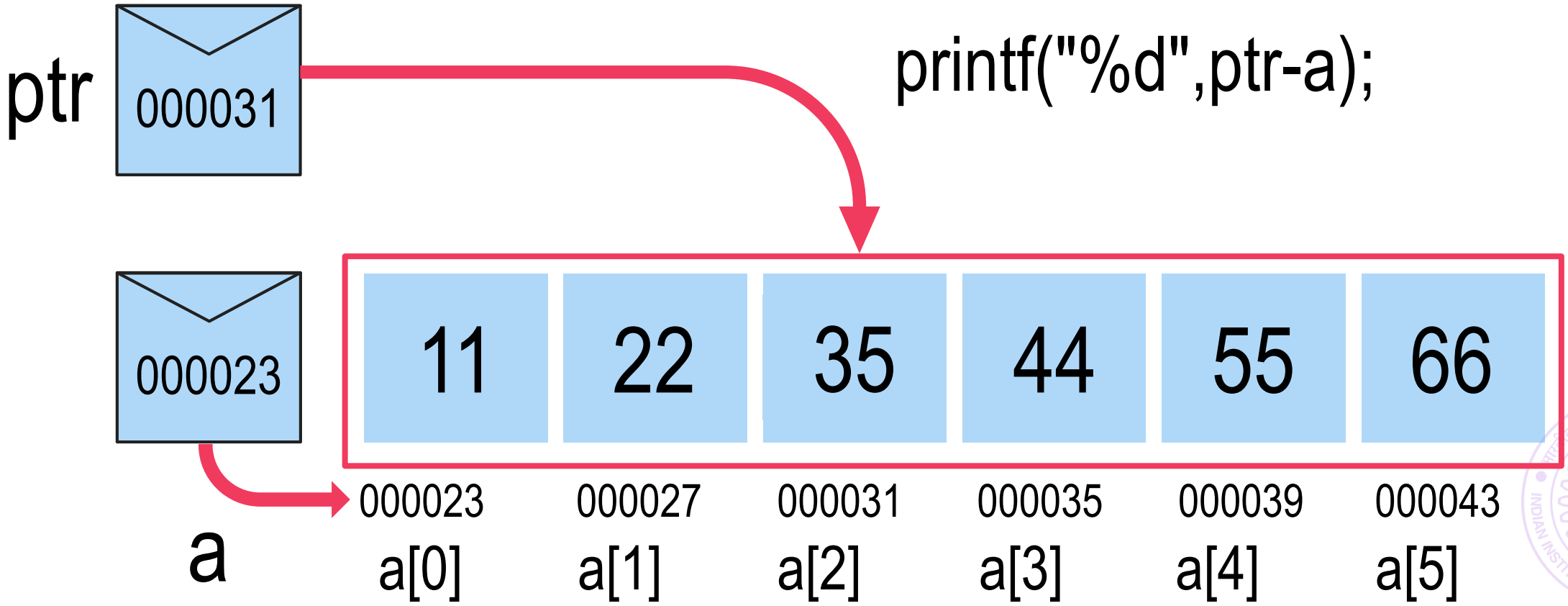

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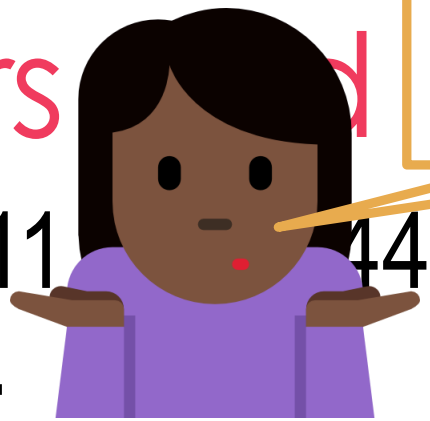
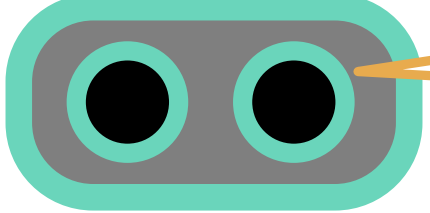


But the address difference is 31-23 = 8



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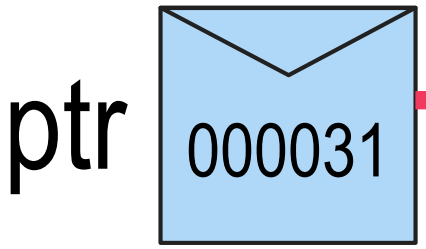

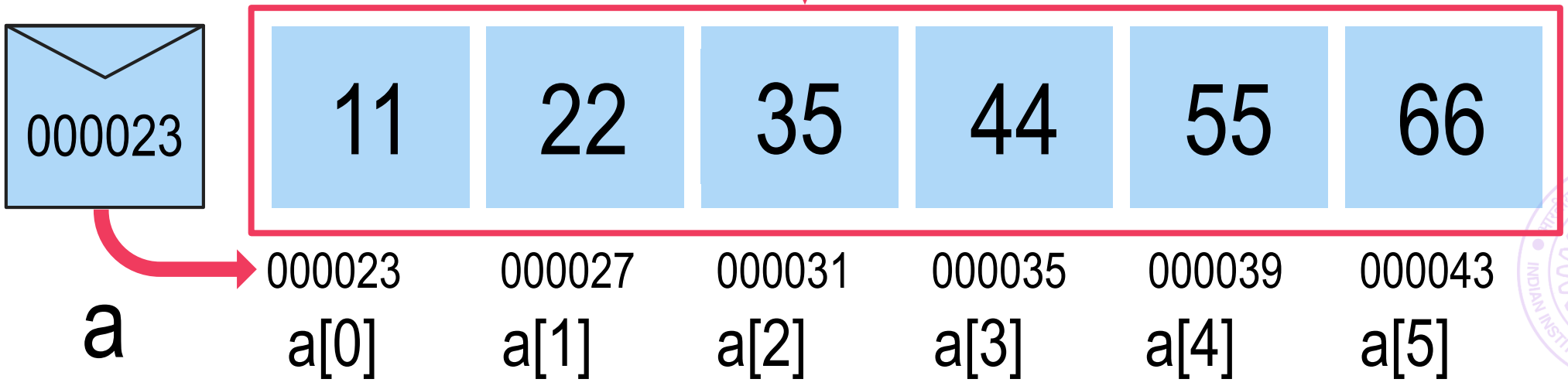

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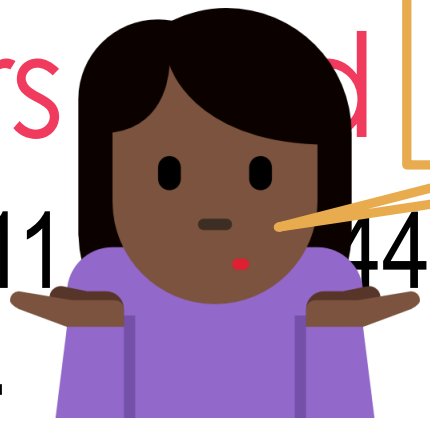

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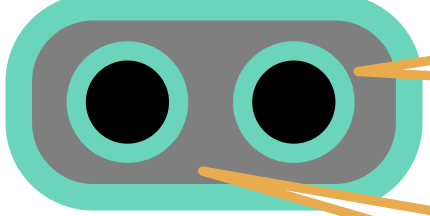

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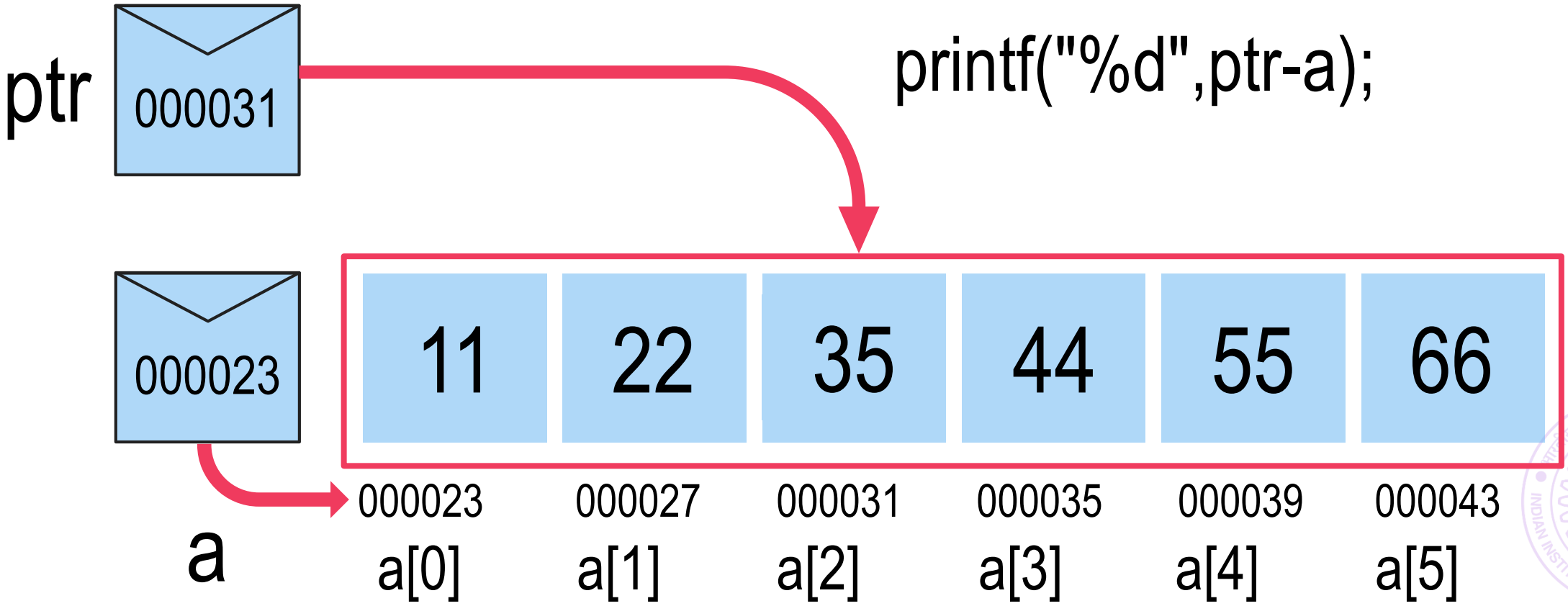

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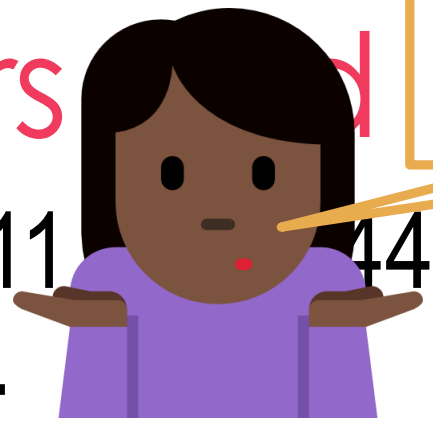

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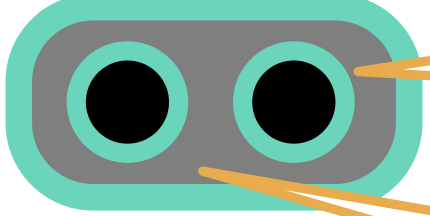

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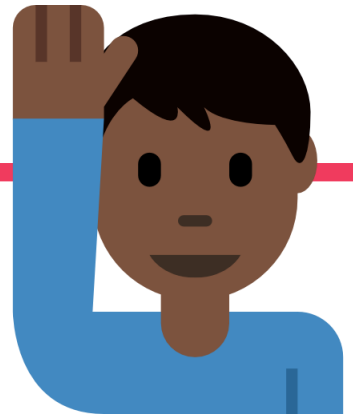

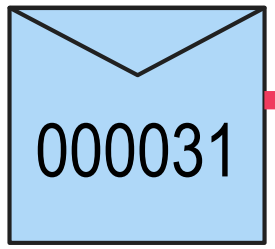

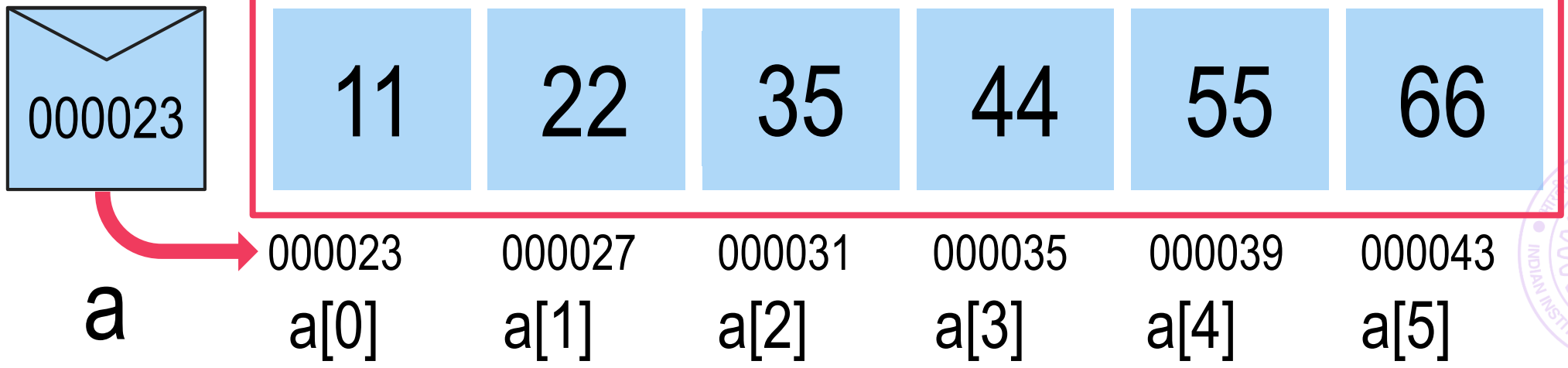

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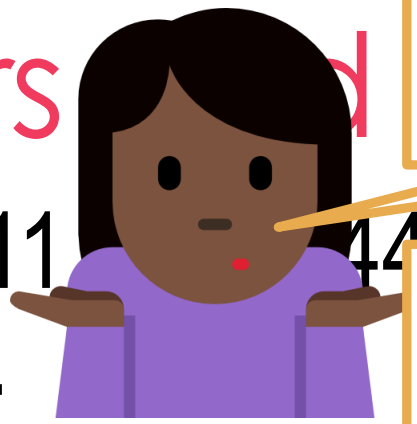

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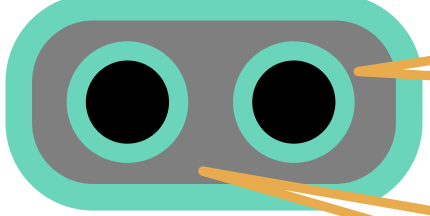

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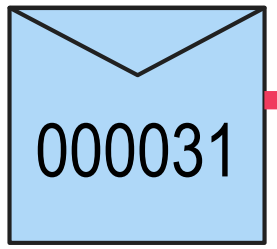
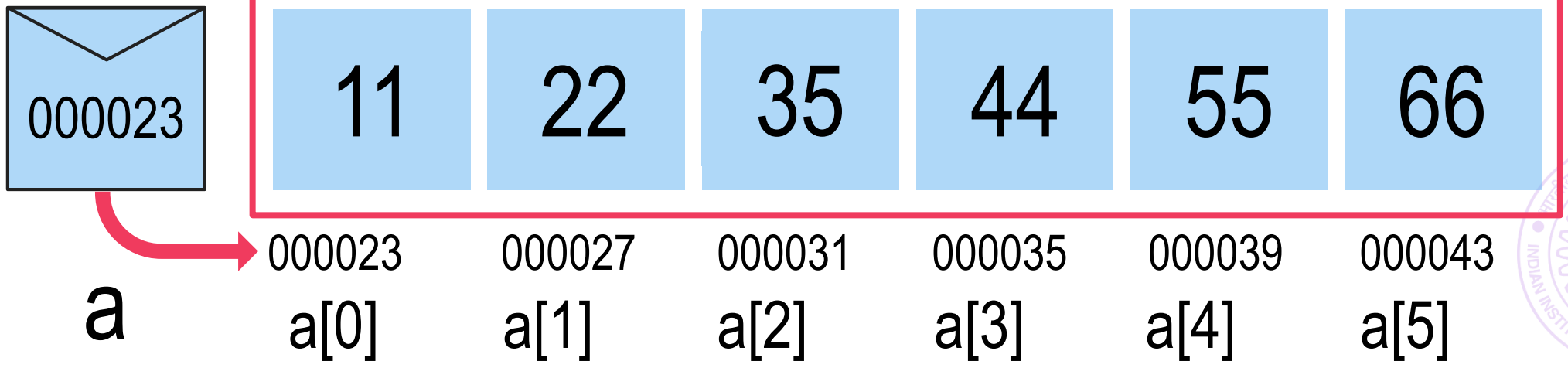
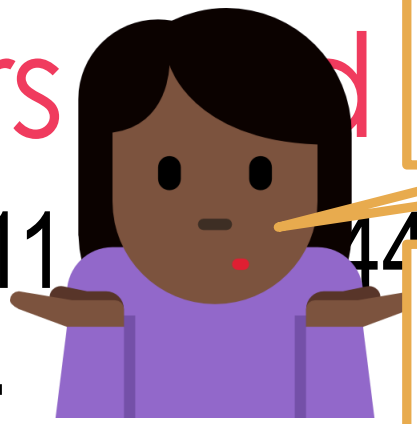
Mr C also disallows subtraction of pointers of different types

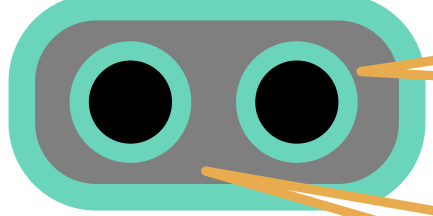




Pointers ...



But the address difference is 31-23 = 8



2

Yes, but since this is int type, I treat 4 bytes as a unit

```
int a[6] = {11, 22, 35, 44, 55, 66};
int *ptr = a;
ptr = ptr + 2;
printf("%d", *(ptr - 2));
```

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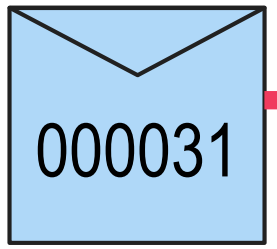
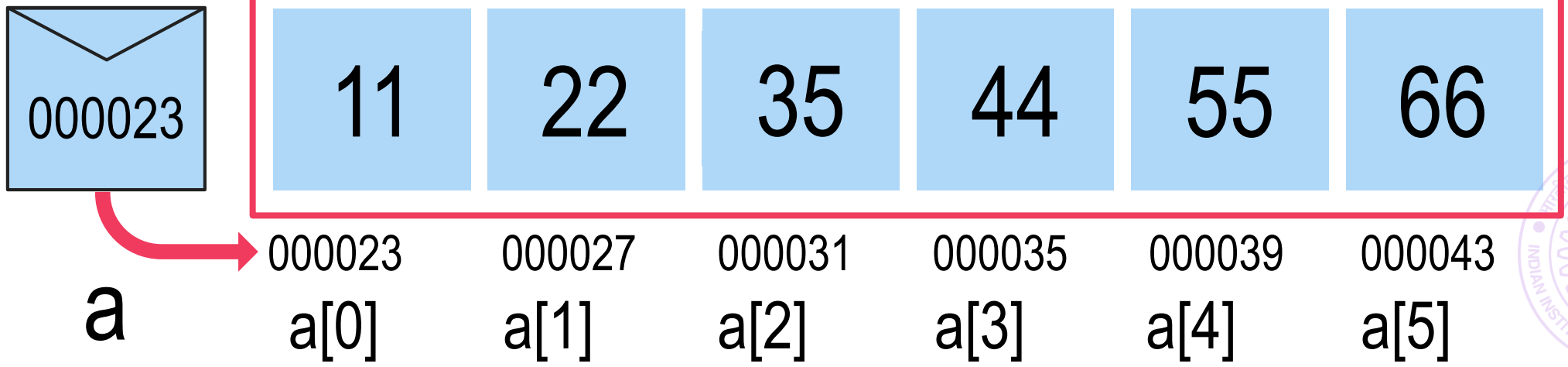
Yes, I will give an error it you, for e.g. subtract char* from int*





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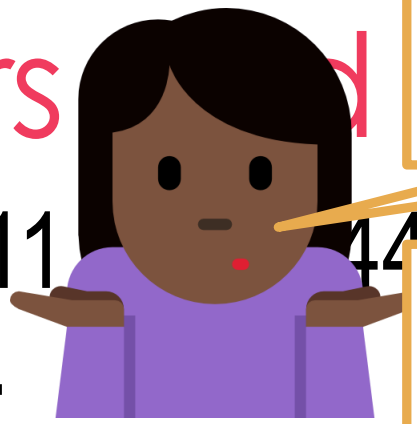

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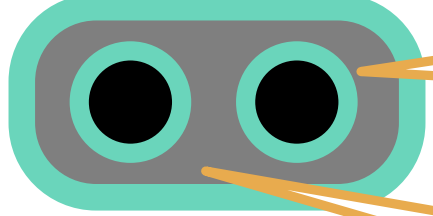

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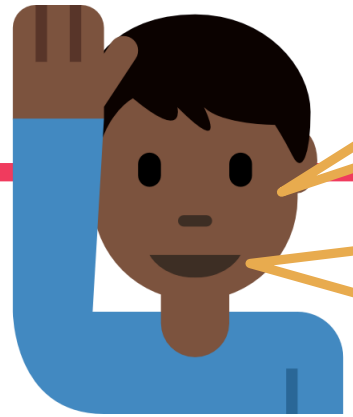

If we really want to subtract a char* from int*, do a typecast!

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ptr → 000031

000023

11	22	35	44	55	66
000023	000027	000031	000035	000039	000043
a[0]	a[1]	a[2]	a[3]	a[4]	a[5]

a

Pointers and Strings

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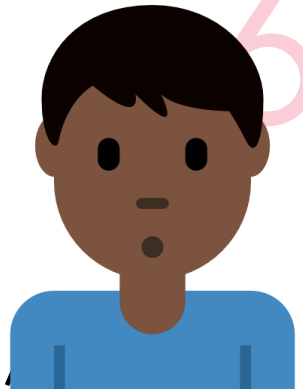

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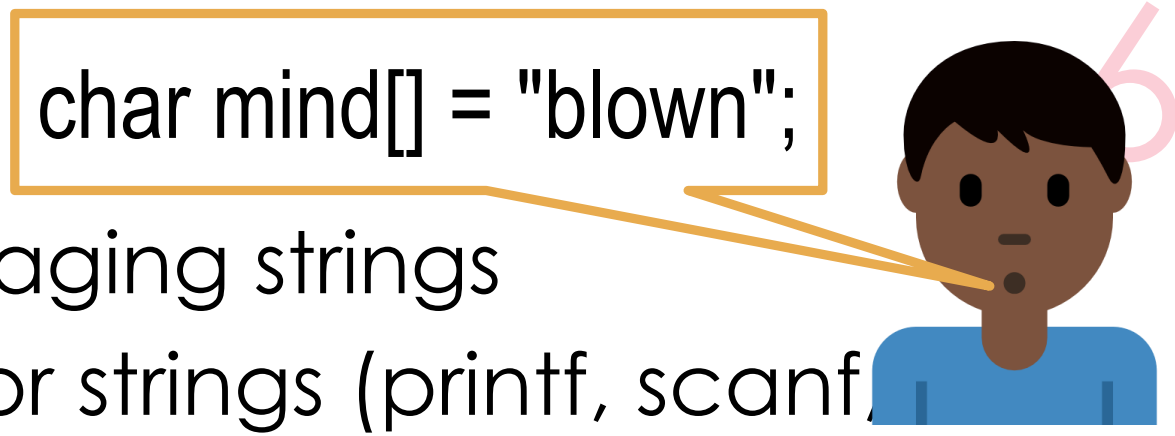

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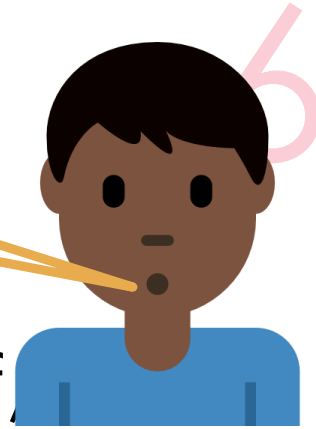

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printf("%s\n%s", str, ++ptr);
```

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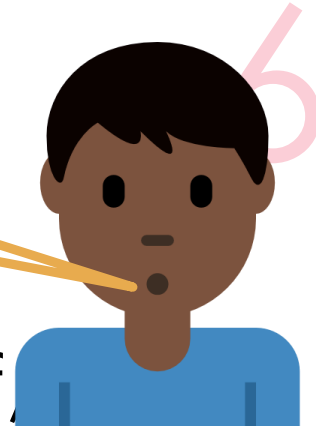

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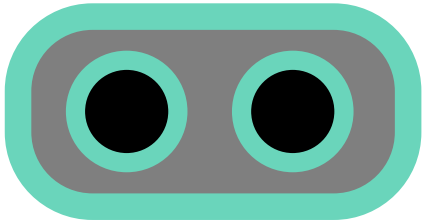

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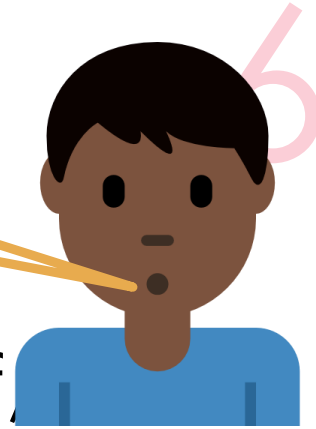

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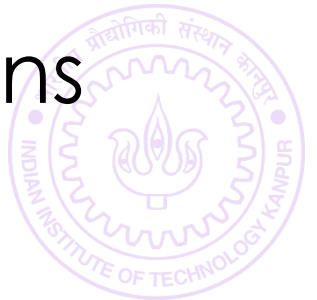
The secret behind getline and other modern functions



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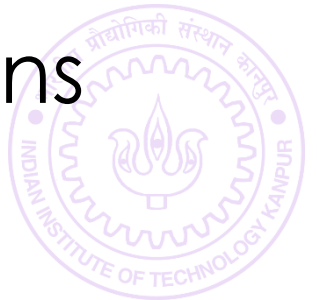

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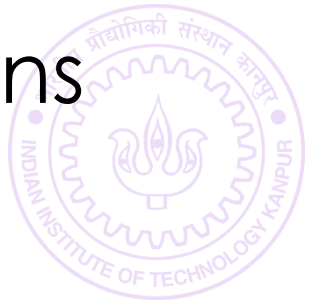
- malloc(), calloc(), realloc(), free()



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free

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Memory allocated using malloc/calloc should be "freed" once that memory is no longer needed

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… // Do things with the array ptr
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```
free(c); // Will cause runtime error
```

free

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Extremely bad coding habit

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Use realloc (described next) if need more memory

realloc – **re**vised **alloc**ation

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If you malloc-ed an array of 100 elements and suddenly find that you need an array of 200 elements ☹

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```
int *ptr = (int*)malloc(100 * sizeof(int));
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Can use realloc to revise that allocation to 200 elements

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```
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```
int *tmp = (int*)realloc(ptr, 200 * sizeof(int));
if(tmp != NULL) ptr = tmp;
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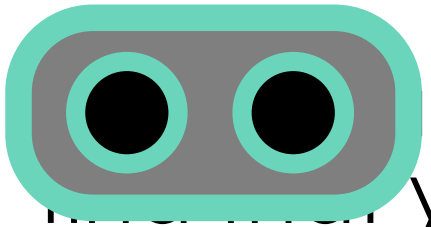

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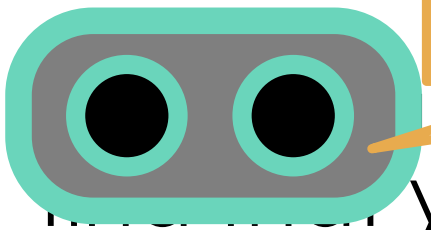

I realize that. That is why I will copy those 100 elements to the new array of 200 elements ☺

But I had so much precious data stored in those 100 elements

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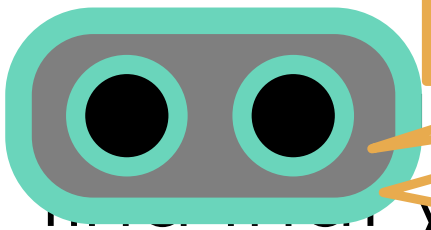

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I will also free the old 100 elements – you don't have to write free() for them

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200 elements ☹

```
int *ptr = (int
```

(int));

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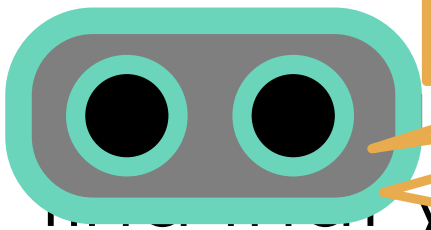

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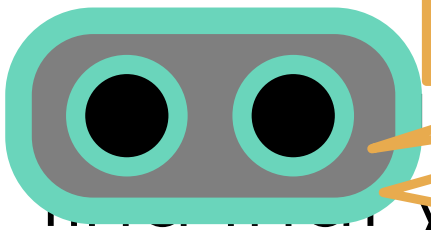
...200 elements ☹

```
int *ptr = (int...(int));
```

Can use realloc to revise that allocation to 200 elements

```
int *tmp = (int*)realloc(ptr, 200 * sizeof(int));
if(tmp != NULL) ptr = tmp;
```

realloc



I realize that. That is why I will copy those 100 elements to the new array of 200 elements ☺

I will also free the old 100 elements – you don't have to write free() for them

But I had so much precious data stored in those 100 elements

You are the best Mr C

int *ptr = (int*)malloc(100 * sizeof(int));

Can use realloc to revise that allocation to 200 elements

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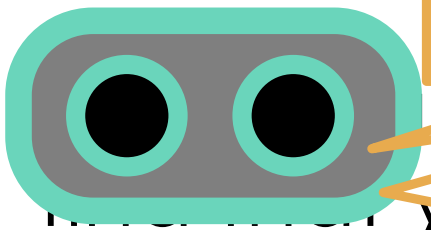
int *tmp = (int*)realloc(ptr, 200 * sizeof(int));
if(tmp != NULL) ptr = tmp;
```

realloc



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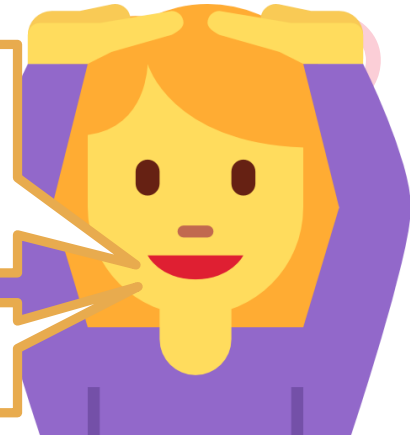

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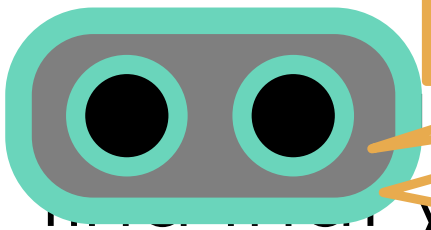
Don't use realloc to increase size of non-malloc arrays

realloc



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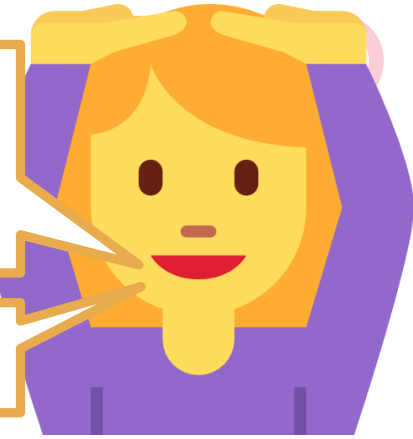

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```
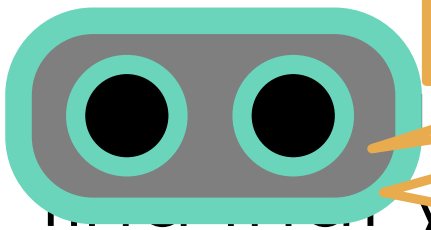

Don't use realloc to increase size of non-malloc arrays

```
int c[100];
int *ptr = (int*)realloc(c, 200 * sizeof(int)); // Runtime error
```

realloc



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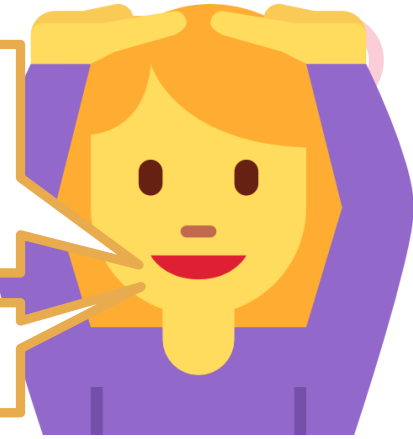

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Don't use realloc to increase size of non-malloc arrays

```
int c[100];
int *ptr = (int*)realloc(c, 200 * sizeof(int)); // Runtime error
```

Use realloc only to increase size of calloc/malloc-ed arrays