

CS & IT ENGINEERING

Data structure & Programming

Arrays

DPP 01


Discussion Notes



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TOPICS TO BE COVERED



01 Question

02 Discussion

Q.1

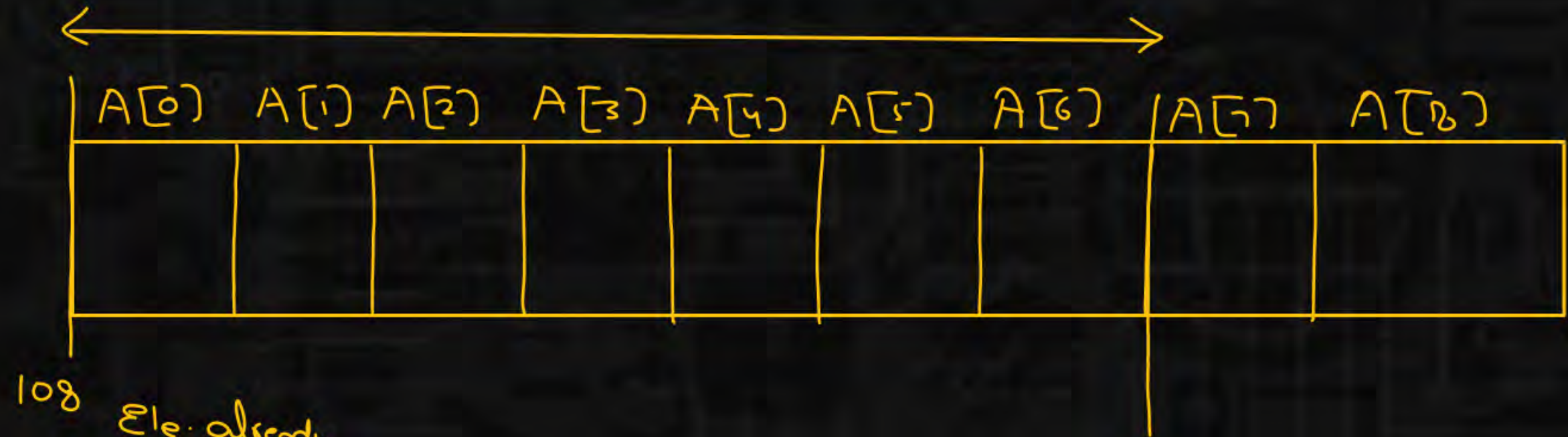


Consider a 1D array a with 9 elements. If the base address of the array is 108 and the size of each array element is 4 bytes, the

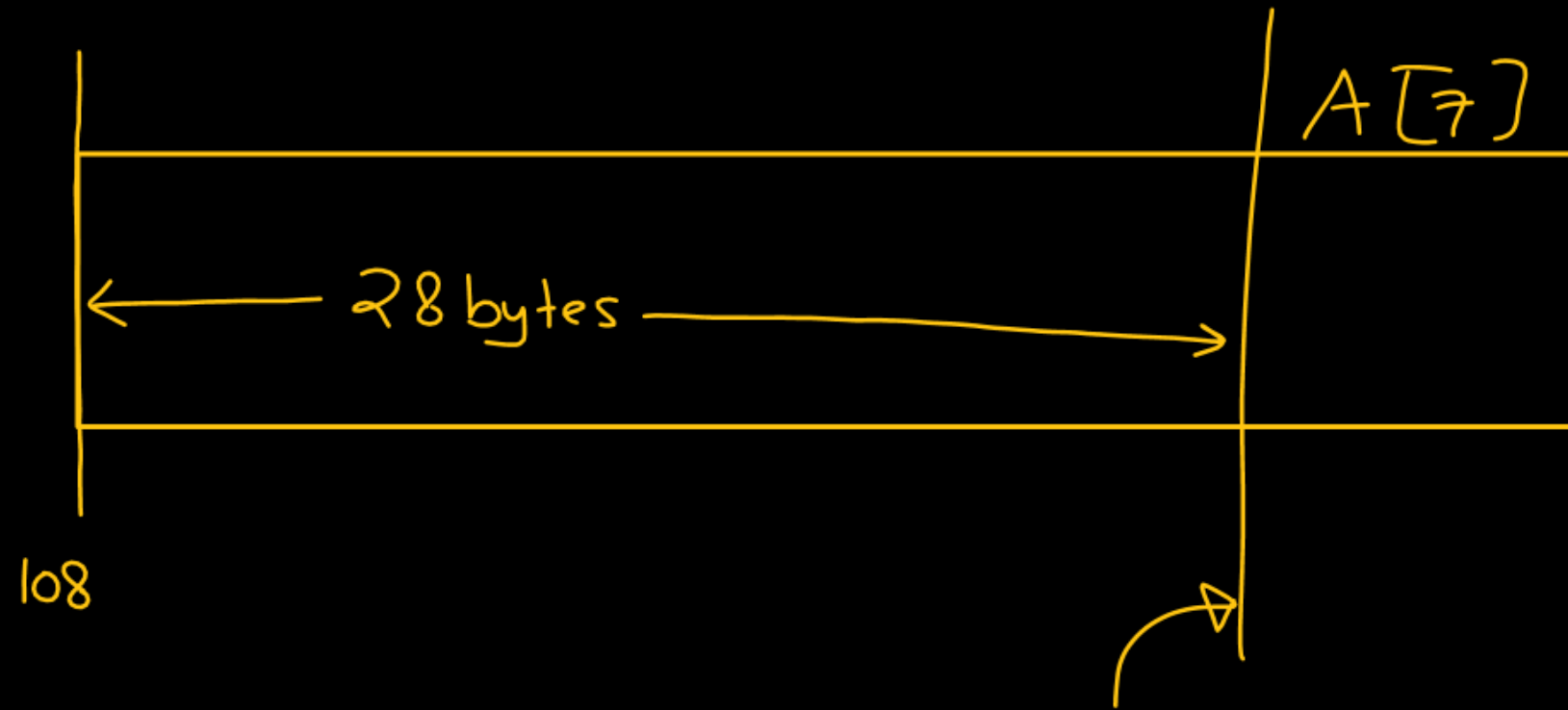
[NAT]

address of $a[7]$ is- 136

(Assume array index starts from 0)



108
Ele. already filled before = index from 0 to 6 = $6 - 0 + 1 = 7$ elements
 $A[7]$
Memory already filled before $A[7] = 7 \times 4 \text{ byte} = 28 \text{ bytes}$



$$\begin{aligned} \text{add}(A[7]) &= 108 + 28 \\ &= \underline{\underline{136}} \end{aligned}$$

Q.2



Consider a 1D array $a[-127 \dots +255]$ where -127 and $+255$ are the starting index and ending index of the array [NAT] respectively. The number of elements in the array is

383.

$a[-127 \dots +255]$
Smallest \swarrow \searrow largest index

-127 to $+255$

$$= 255 - (-127) + 1$$

$$= 255 + 127 + 1$$

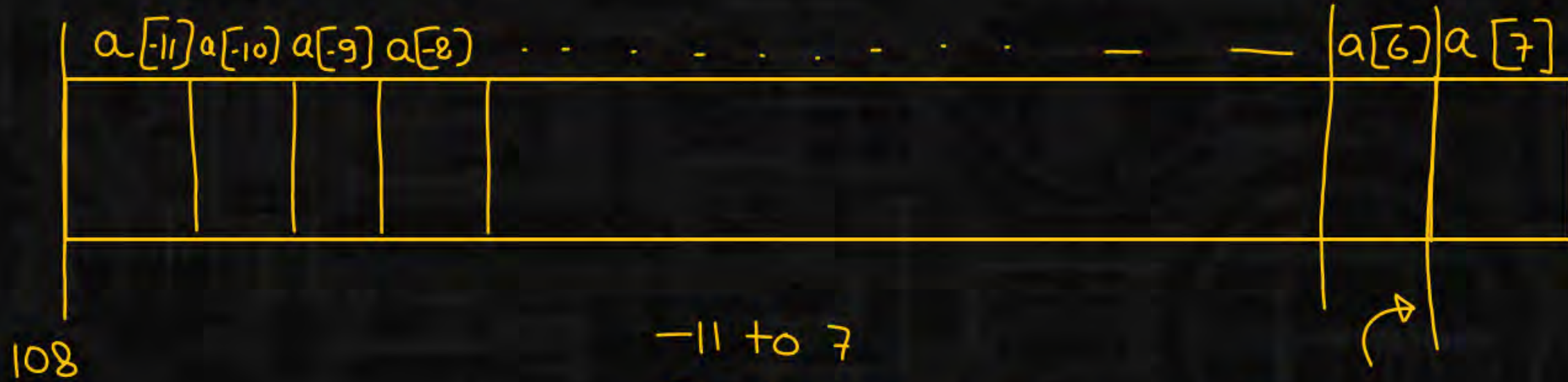
$$= 255 + 128$$

$$= 383$$

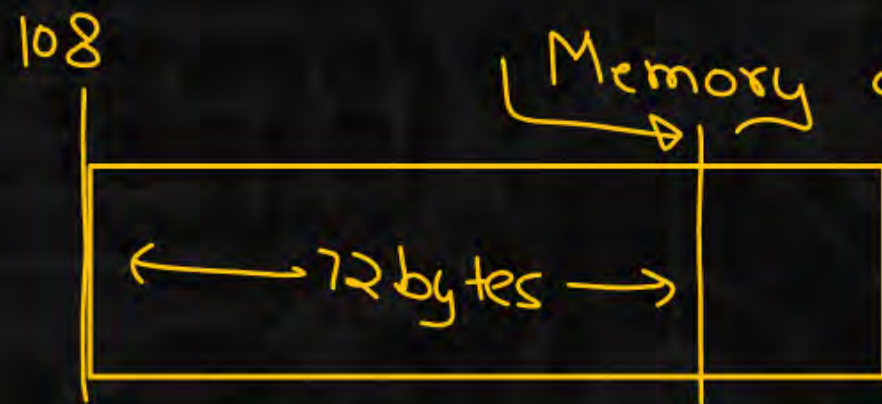
Q.3



Consider a 1D array a with 19 elements. If the base address of the array is 108 and the size of each array element is 4 bytes, the address of $a[7]$ is- (Assume array index starts from -11) 180 [NAT]



(1) No. of elements already filled before $a[7] \Rightarrow -11$ to 6
 $= 6 - (-11) + 1 = 18$ element



$$\Rightarrow 108 + 72 = 180$$

Q.4

Consider a 2D array $a[-127 \text{ to } +255][-13 \text{ to } +14]$. The number of elements in the array is _____.

**[NAT]**

$$\begin{array}{r} 612 \\ 383 \\ 28 \\ \hline 3064 \\ 766 \times \\ \hline \boxed{10724} \end{array}$$

$$\begin{aligned} \text{No. of rows} &= -127 \text{ to } 255 \\ &= 255 - (-127) + 1 \\ &= 255 + 127 + 1 \\ &= 255 + 128 \\ &= 383 \end{aligned}$$

$$\begin{aligned} \text{No. of col} &= -13 \text{ to } +14 \\ &= 14 - (-13) + 1 \\ &= 28 \end{aligned}$$

$$\text{Total Elements} = 383 \times 28 = \boxed{10724}$$

$$\begin{array}{c} -127 \\ -126 \\ \vdots \\ \vdots \\ 0 \\ 1 \\ 2 \\ \vdots \\ \vdots \\ 255 \end{array} \left[\begin{array}{cccccccc} -13 & -12 & \dots & 0 & 1 & 2 & \dots & 14 \end{array} \right]$$

Q.5

Consider the natural numbers from 1 to 256 are stored in a 2D array $\text{arr}[-28 \text{ to } 3][-3 \text{ to } 3]$. Find the element present at location $\text{arr}[-16][1]$. (Suppose, the elements are stored in row-major order) 89

[NAT]

$$\begin{aligned}\text{No. of rows} &= 3 - (-28) + 1 = 32 \\ \text{No. of cols} &= 3 - (-3) + 1 = 7\end{aligned}$$

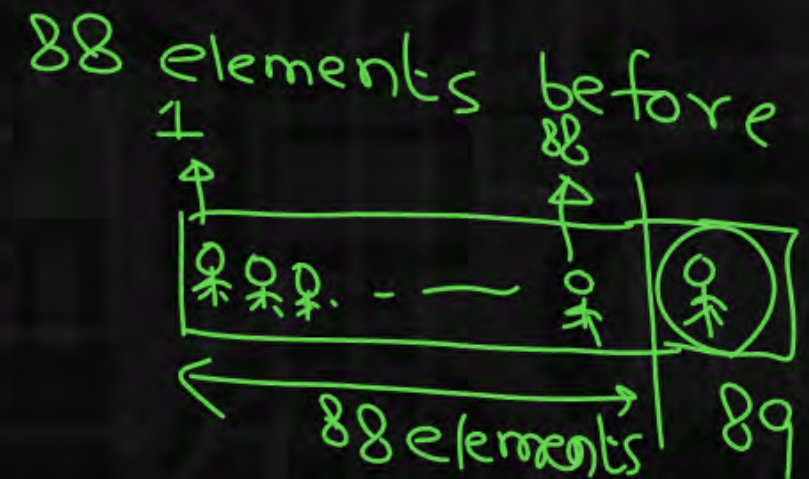
$$\text{arr}[-28 \dots 3][-3 \text{ to } 3]$$

Each index in
this dim = 7 elem

$a_{-16, 1}$

rows already filled = $-28 \text{ to } -17$
 $= -17 - (-28) + 1$
 $= -17 + 29$
 $= 12 \text{ rows}$
 $12 \times 7 = 84 \text{ elements}$

$-3 \text{ to } 0$
 $0 - (-3) + 1$
 $= 4$



Q.6



Consider the natural numbers from 1 to 256 are stored in a 2D array $\text{arr}[-28 \text{ to } 3][-3 \text{ to } 3]$. Find the address of the location $\text{arr}[-16][1]$ if the starting address of the array is 625 and size of each element is 4 bytes. (Suppose, the elements are stored in row-major order)

[NAT]

977

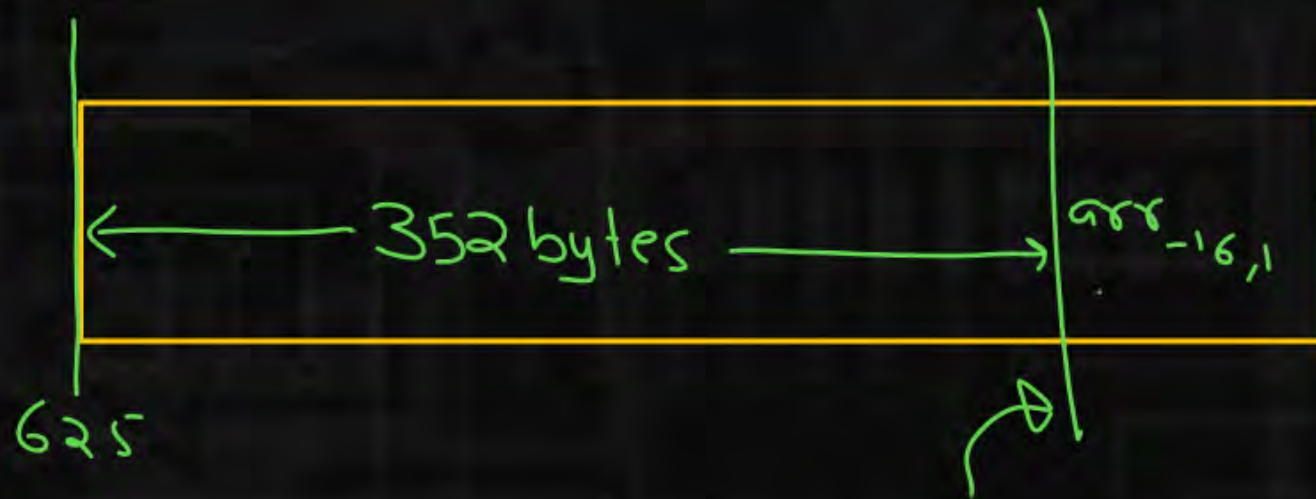
Total no. of elements already filled before $\text{arr}[-16][1] = 88$

Memory already filled before $\text{arr}[-16][1] = 88 \times 4 = 352$ bytes

$$\text{add}(\text{arr}[-16][1])$$

$$= 625 + 352$$

$$= 977$$



Q.7

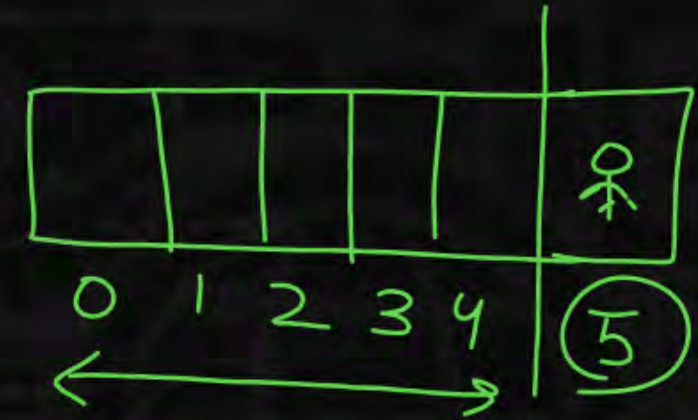


Consider the whole numbers from 0 to 127 are stored in a 2D array $\text{arr}[0 \text{ to } 15][0 \text{ to } 7]$. Find the element present at location $\text{arr}[6][4]$. (Suppose, the elements are stored in column-major order) 70

[NAT]

$\text{arr}[0 \dots 15][0 \dots 7]$

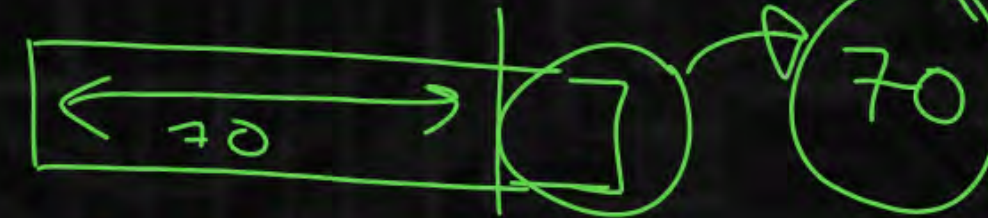
Each index = 16 ele.



$\text{arr}_{6,4}$

0 to 5
 $5 - 0 + 1$
6

of col. filled = 0 to 3 = $3 - 0 + 1 = 4$ cols
 $4 \times 16 = 64$ elements



Total 70 elements are already filled before $\text{arr}[6][4]$

Q.8

Consider a 2D array $\text{arr}[-15 \text{ to } 15][-7 \text{ to } 7]$. Find the address of the location $\text{arr}[-1][5]$ if the starting address of the array is 500 and size of each element is 4 bytes. (Suppose, the elements are stored in column-major order)

[NAT]

$$\begin{array}{r} 3386 \\ 4 \\ \hline 1544 \end{array}$$

2044

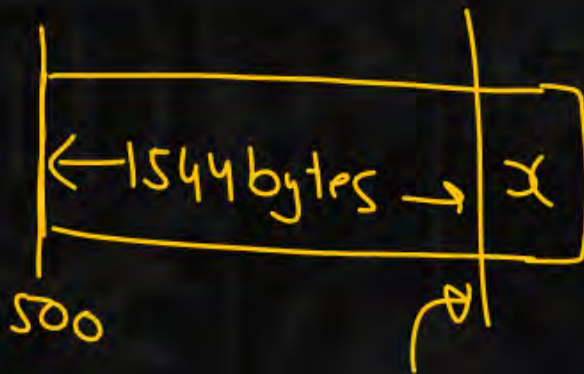
$$\text{arr}^{31}[-15 \dots 15]^{15}[-7 \dots 7]$$

$$\text{arr}[-1][5]$$

$$1 \text{ col} = 31 \text{ elements}$$

$$\begin{aligned} \text{Total ele} &= 372 + 14 \\ &= 386 \text{ ele} \end{aligned}$$

$$\begin{aligned} \text{Memory} &= 386 \times 4 \\ &= 1544 \text{ bytes} \end{aligned}$$



$$-15 \text{ to } -2$$

$$\begin{aligned} &= -2 - (-15) + 1 \\ &= -2 + 16 \\ &= 14 \end{aligned}$$

$$\# \text{ cols} \Rightarrow -7 \text{ to } 4$$

$$\begin{aligned} &= 4 - (-7) + 1 \\ &= 12 \text{ cols} \end{aligned}$$

$$\begin{aligned} &= 12 \times 31 \text{ elements} \\ &= 372 \text{ elements} \end{aligned}$$

$$500 + 1544 = 2044$$

