

CS & IT ENGINEERING



Data Structure & Programming

Lec No.- 01

1500 Series



By- Pankaj Sharma Sir



Topics to be Covered



Topic

Problem Practice

[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3; A00 = 3  
                case 1 : * (p+j*3+i) = j*i+1; A00 = 1  
                break;  
                case 2 : * (p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

```
}  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is_____.

[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3;  
                case 1 : * (p+j*3+i) = j*i+1;  
                break;  
                case 2 : * (p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

```
    }  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is_____.



[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3; A_{02}  
                case 1 : * (p+j*3+i) = j*i+1;  
                break;  
                case 2 : * (p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

```
}  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is ____.



[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3;  
                → case 1 : * (p+j*3+i) = j*i+1;  
                break;  
                case 2 : * (p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

i=1 j=0, 1, 2
i=2 j=0, 1, 2

```
}  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is ____.



[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3;  
                (P+4)=2 case 1 : * (p+j*3+i) = j*i+1;  
                break;  
                case 2 : * (p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

```
}  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is ____.

1	2	3	1	2	1			
A ₀₀	A ₀₁	A ₀₂	A ₁₀	A ₁₁	A ₁₂	A ₂₀	A ₂₁	A ₂₂

[NAT]

[1 Mark]

P
W

```
#Q. int main () {  
    int A[3][3];  
    int*p=&A[0][0];  
    for(int i=0; i<3; i++){  
        for(int j=0, j<3, j++){  
            switch (i) {  
                case 0 : A[i][j] = i*j+3;  
                case 1 : *(p+j*3+i) = j*i+1;  
                break;  
                case 2 : *(p+j*3+i) = j*i+1;  
                break;  
            }  
        }  
    }  
}
```

$i=1$ $j=0, 1, 2$
 $i=2$ $j=0, 1, 2$

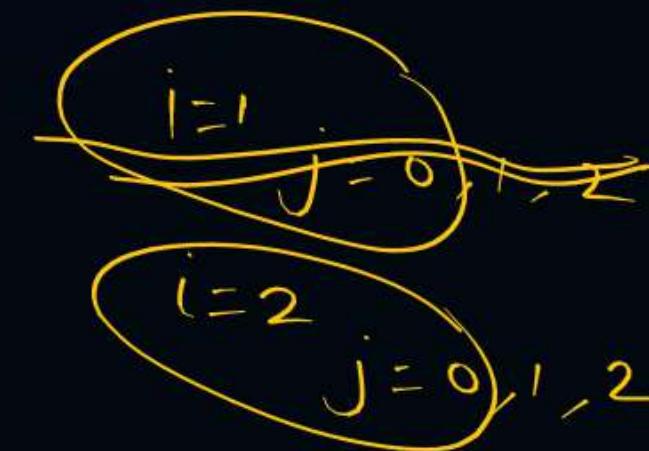
```
}  
}  
printf("%d", A[2][1]-A[2][0]);  
}
```

The output give 'C' code is ____.

1	2	3	1	2	1	3		
A_{00}	A_{01}	A_{02}	A_{10}	A_{11}	A_{12}	A_{20}	A_{21}	A_{22}

[NAT]

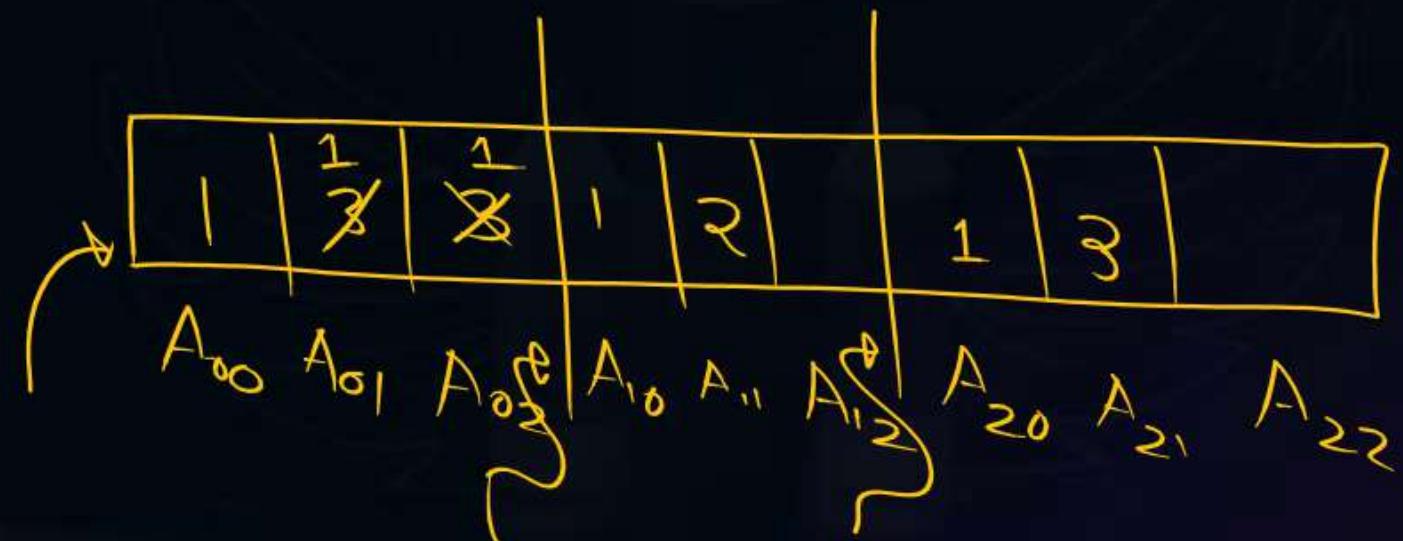
#Q. int main () {
int A[3][3];
int*p=&A[0][0];
for(int i=0; i<3; i++){
 for(int j=0, j<3, j++){
 switch (i) {
 case 0 : A[i][j] = i*j+3;
 case 1 : * (p+j*3+i) = j*i+1;
 break;
 case 2 : * (p+j*3+i) = j*i+1;
 break
 }
 }
}



[1 Mark]

}
}
printf("%d", A[2][1]-A[2][0]);
}

The output give 'C' code is ____.



[NAT]

[1 Mark]

P
W

#Q. int main () {

int A[3][3];

int*p=&A[0][0];

for(int i=0; i<3; i++){

i=2
j=1

for(int j=0, j<3, j++){

switch (i) {

~~case 0 : A[i][j] = i*j+3;~~

~~case 1 : * (p+j*3+i) = j*i+1;~~

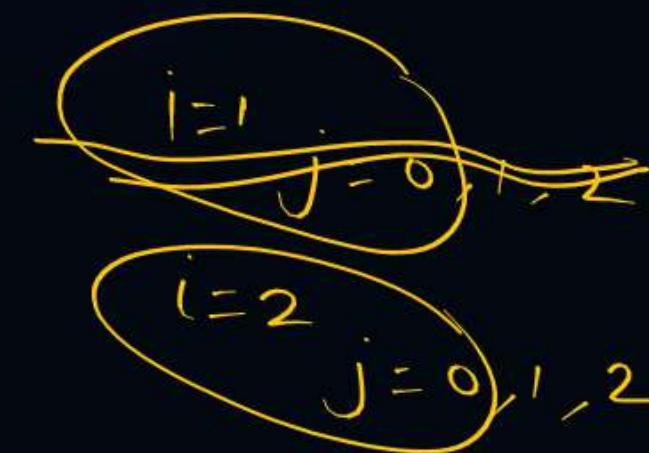
* (P + 3 + 2) = 3

~~break~~

~~case 2 : * (p+j*3+i) = j*i+1;~~

~~break~~

}



}

}

printf("%d", A[2][1]-A[2][0]);

}

The output give 'C' code is ____.

Diagram of a 3x3 matrix A with indices. The matrix has 9 elements labeled A₀₀, A₀₁, A₀₂, A₁₀, A₁₁, A₁₂, A₂₀, A₂₁, A₂₂. The first row has values 1, 1/3, and 1/3. The second row has values 1, 2, and 3. The third row has values 1, 1, and 3. Arrows point from the handwritten annotations to the matrix elements.

[NAT]

#Q. int main () {
int A[3][3];
int*p=&A[0][0];
for(int i=0; i<3; i++){

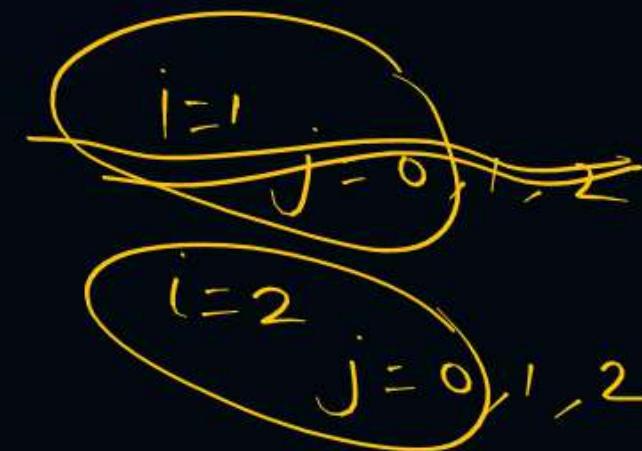
~~i=2~~ for(int j=0, j<3, j++){

switch (i) {
~~case 0 : A[i][j] = i*j+3;~~
~~case 1 : * (p+j*3+i) = j*i+1;~~

~~(P+6+2)~~
~~= 5~~
break

~~case 2 : * (p+j*3+i) = j*i+1;~~
break

}



}
printf("%d", A[2][1]-A[2][0]);
}
}

The output give 'C' code is 2.

1	1	1	1	1	2	3	1	3	5
A ₀₀	A ₀₁	A ₀₂	A ₁₀	A ₁₁	A ₁₂	A ₂₀	A ₂₁	A ₂₂	

P
W

[1 Mark]

#Q. What do the following declaration signify:

```
int(*(*f[5])(())[9];
```

- A f is an array of 5 pointer to function returning pointer to array of 9 integers.
- B F is a pointer of 9 integer array which pointer to 5 function of return type integer.
- C f is a pointer to an array of 5 functions returning an array of 9 integers.
- D F is a pointer to array of 5 elements which return an array of 9 class.

#Q. Which of the following declarations satisfy the explanation.

x is a pointer to a function that takes 2 arguments first is an array of 5 pointer to char and second argument is a character and function return pointer to float.

A float (*x) (char l [5],) char m);

B float **x(char l [5], char *m); $\times \rightarrow$ function

C float* (*x) (char* l [5], char m);

D float*(x)* (char * l[5], chart* m);

[NAT]

1 min

[1 Mark]

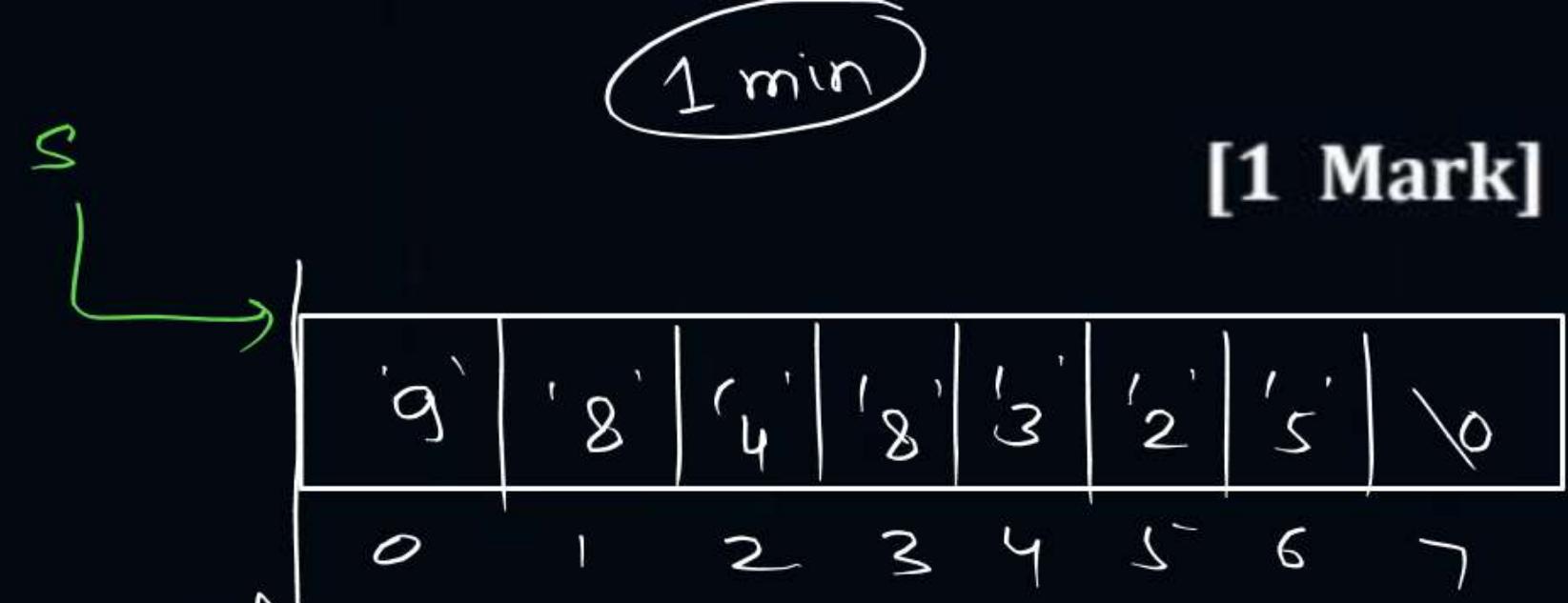
P
W

#Q. char s [] = "9848325";

char * c = s;

printf("%c", *(c+c[3] - 6[c]));

The output of snippet is 8.



c[c]

c[3] c[c]

'8' - '5'

c[3] - c[c] \Rightarrow 3

* (c + c[3] - c[c]) \Rightarrow c + 3

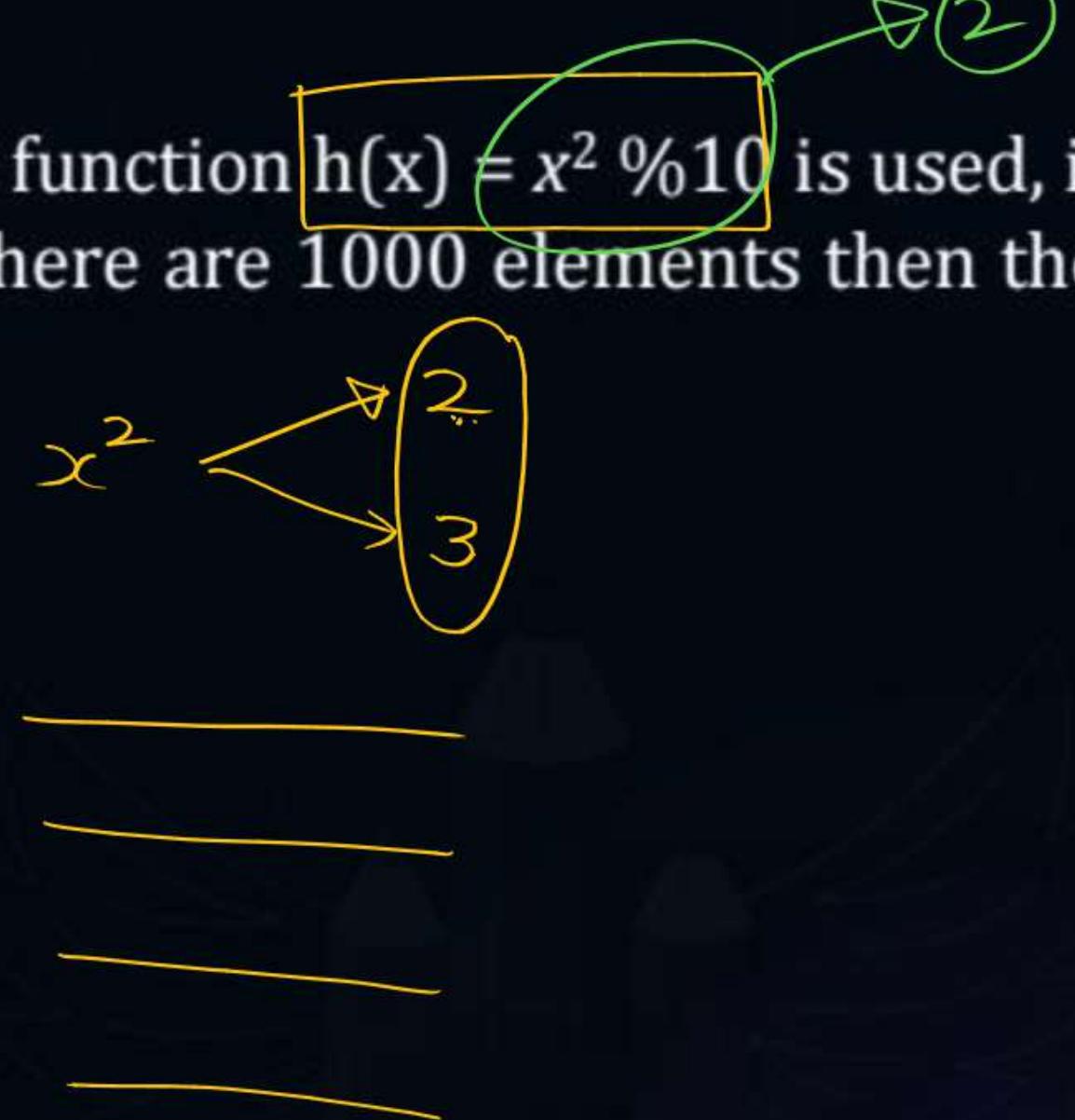
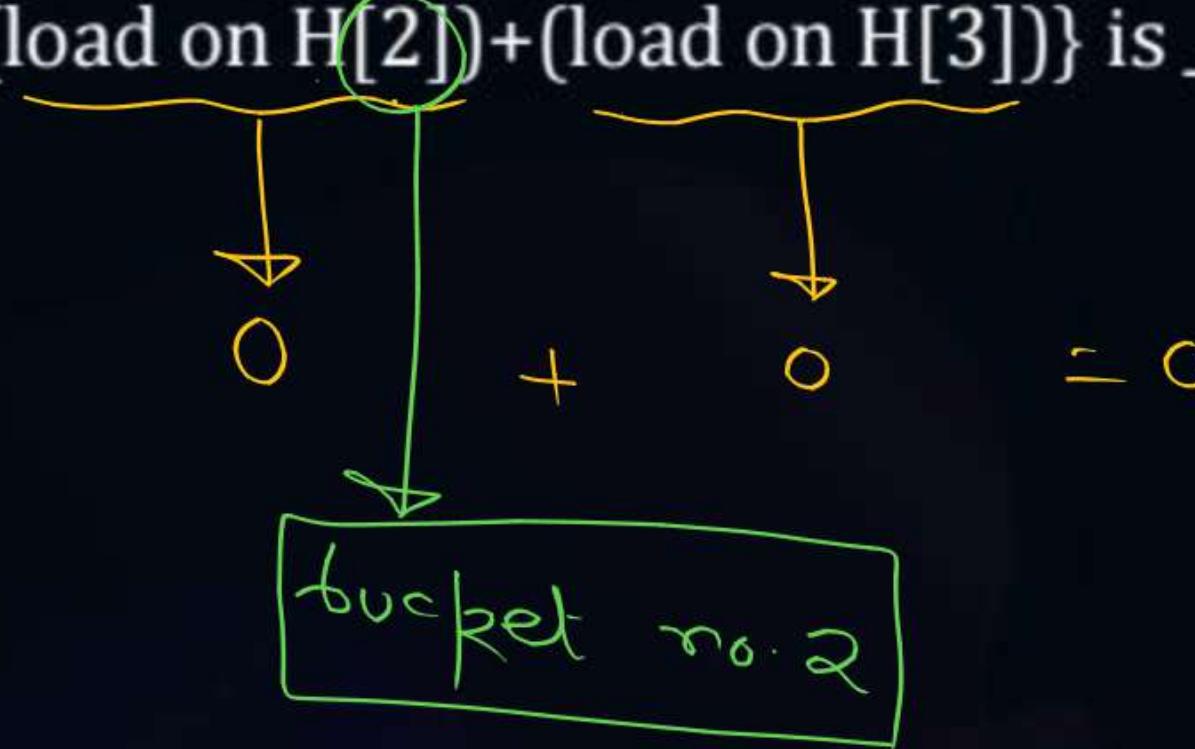
* (c + c[3] - c[c]) \Rightarrow * (c + 3) \Rightarrow c[3]

[NAT]

[1 Mark]

P
W

#Q. Consider a 'H' hash table of size 10 and the hash function $h(x) = x^2 \% 10$ is used, if collision occurs the elements will be replaced. If there are 1000 elements then the $\{(load\ on\ H[2]) + (load\ on\ H[3])\}$ is 0.



[MCQ]

8 16 13

P W

[1 Mark]

#Q. The following nodes are inserted into an AVL tree:

13, 8, 10, 6, 11, 4, then how many rotations did it take.

A

1 single rotation

B

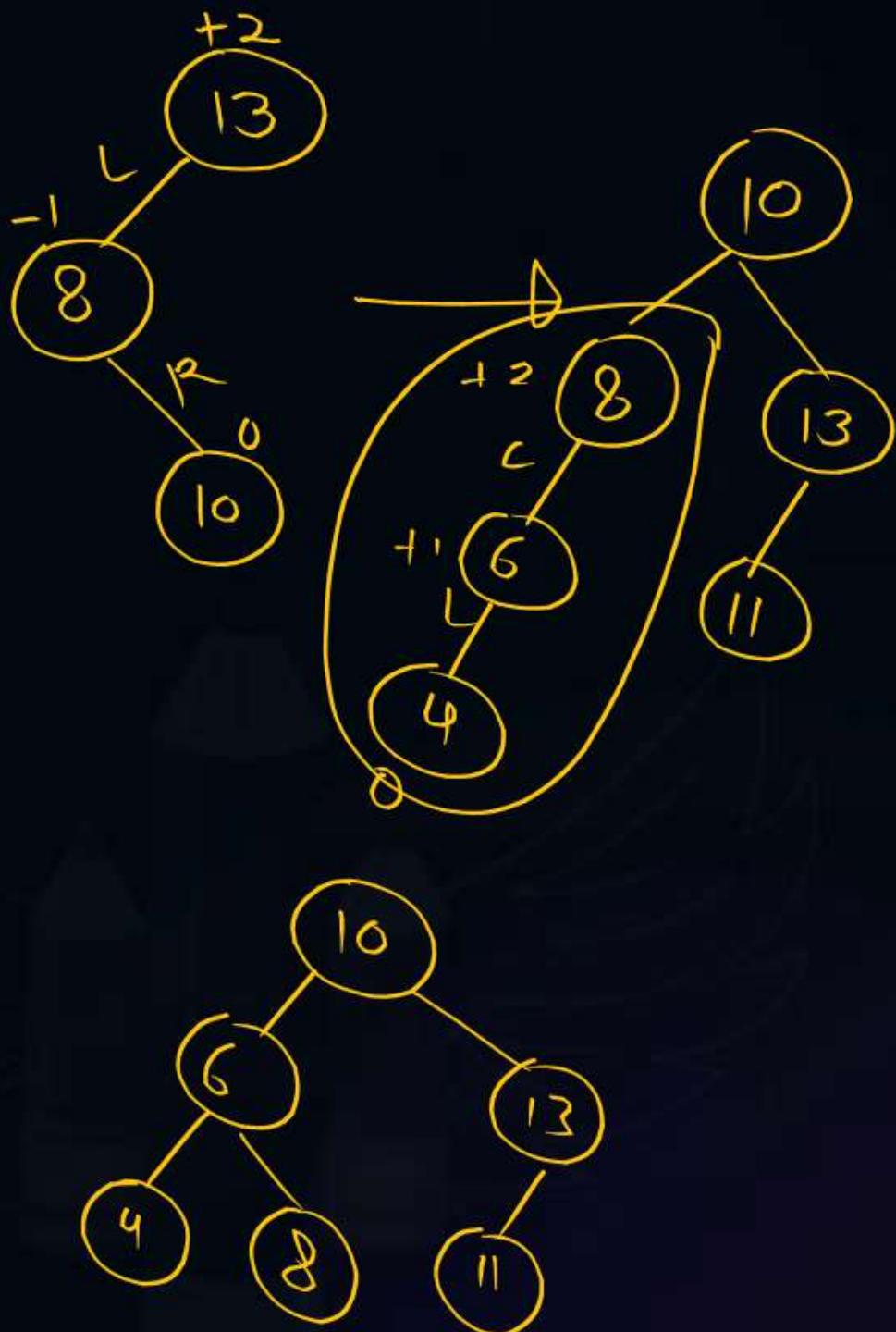
2 double rotations

C

one double rotation, one single rotation

D

2 high rotations

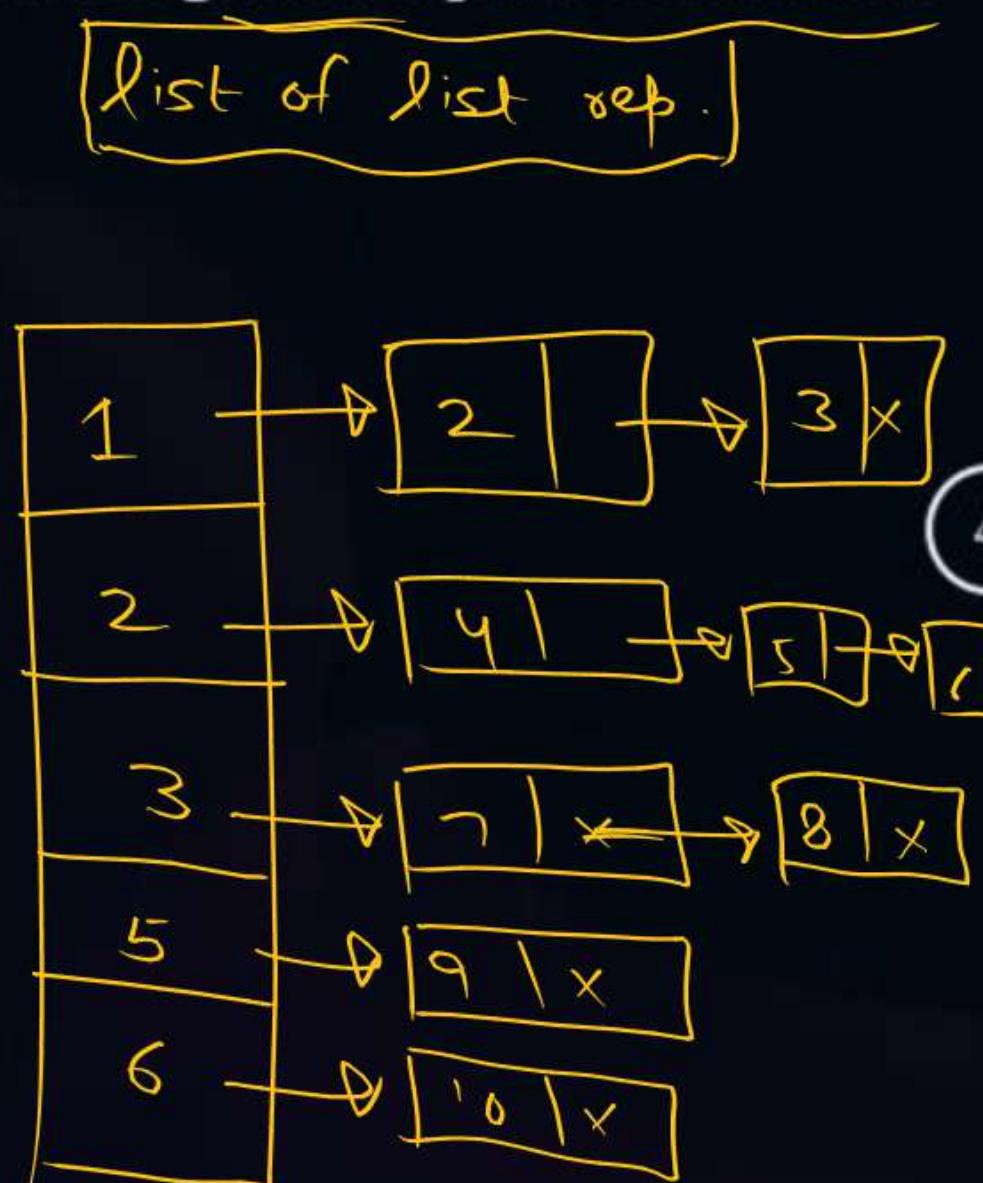


[MCQ]

P
W

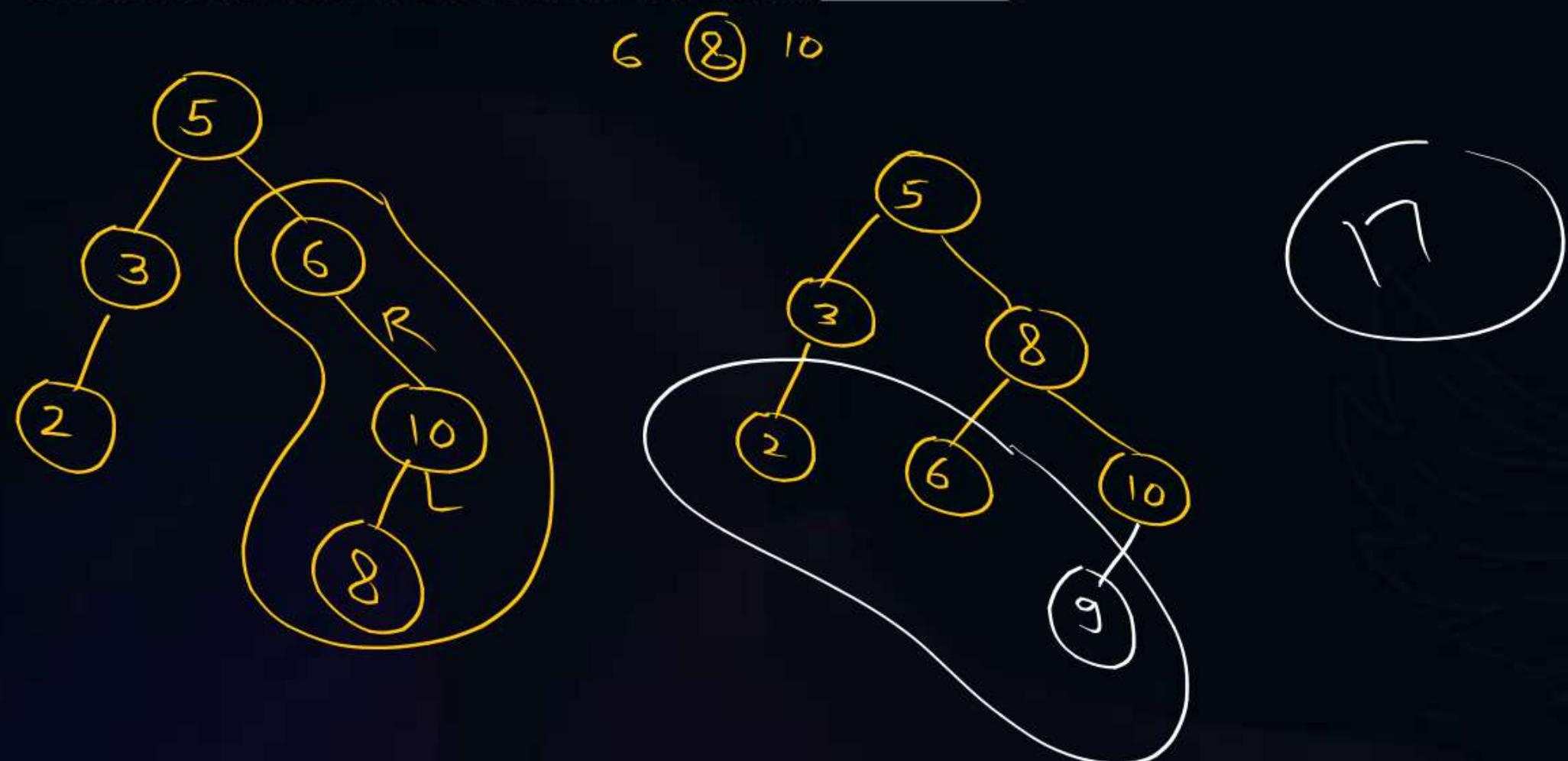
[1 Mark]

#Q. How many nodes are required to represent the following tree using list representation.



- A 14
- B 15
- C 12
- D 11

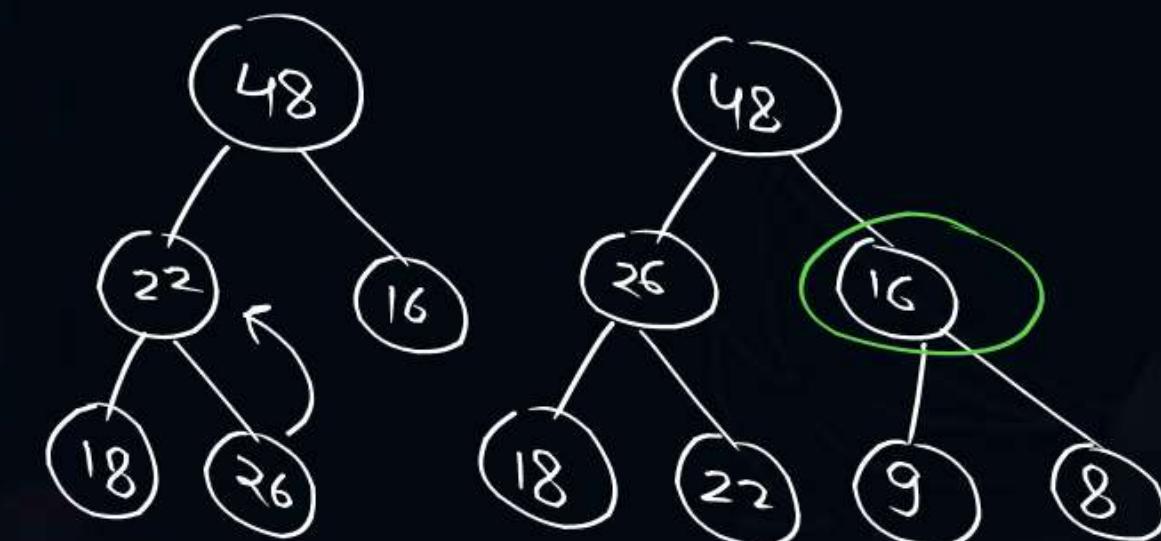
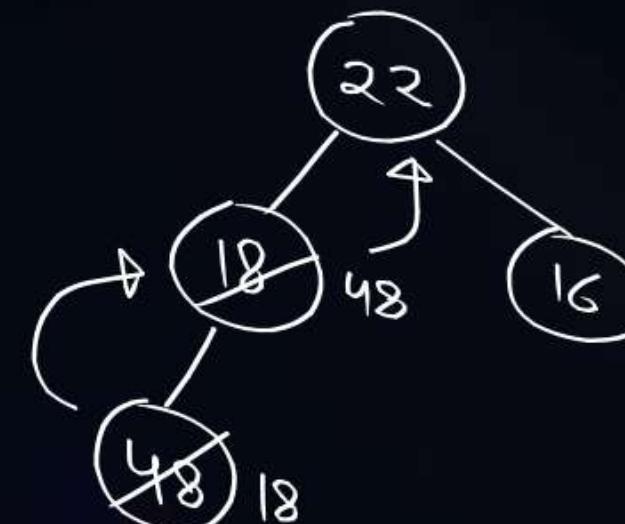
#Q. If the following elements are inserted into an empty AVL tree 5, 6, 3, 2, 10, 8, 9
then the sum of leaf nodes is_____.



#Q. Construct max heap by inserting following elements 22, 18, 16, 48, 26, 9, 8

Note that after every insertion the heap should be heapified then what is the element which is right child of the root.

- A 48
- B 16
- C 9
- D 26



[MCQ]

[1 Mark]

P
W

#Q. A 4-Ary tree where every internal nodes has exactly 4 children then number of internal nodes are there if there are 21 nodes in total.

$$21 = 4 \times I + 1$$

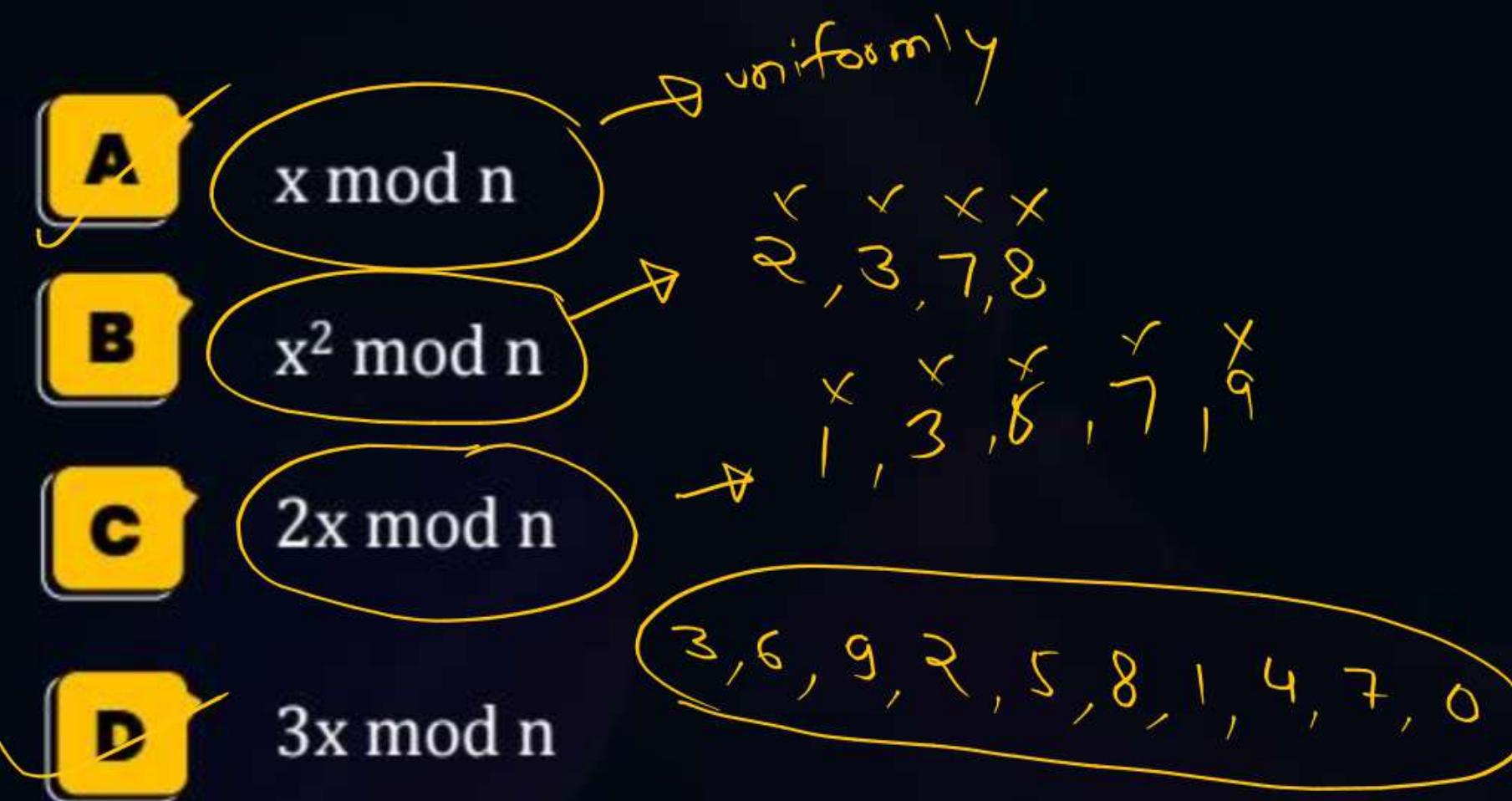
$$20 = 4 \times I$$

$$\boxed{I = 5}$$

- A 2
- B ~~5~~
- C 1
- D 3

#Q. Which of the following hash function are best expected to have less number of collisions

$$n = 10$$



[NAT]

$$(3+1^2) \bmod 10 = 4$$

[1 Mark]

$$(3+2^2) \bmod 10 = (3+4) \bmod 10 = 7$$

#Q. Consider a hash table which stores string, hash table size is 10 and hash function $h(x) = x \% 10$ where x is XOR of all characters in the string.

Consider 2, 3, 4, 6, 8 places are filled in the hash table if quadratic probing is used then at what index 'ab' will be stored 7.

'a' - 97
'b' - 98 } XOR

$$x \rightarrow 3 \\ h(3) = 3 / 10 \Rightarrow 3 \rightarrow \text{col}$$

$$\begin{array}{rcl} 97 & \rightarrow & 64 + 32 + 1 \\ 98 & \rightarrow & 64 + 32 + 2 \end{array}$$

$$98 \rightarrow 64 + 33 + 2$$

$$\begin{array}{r}
 01100001 \\
 01100010 \\
 \hline
 00000011 \Rightarrow ③
 \end{array}$$

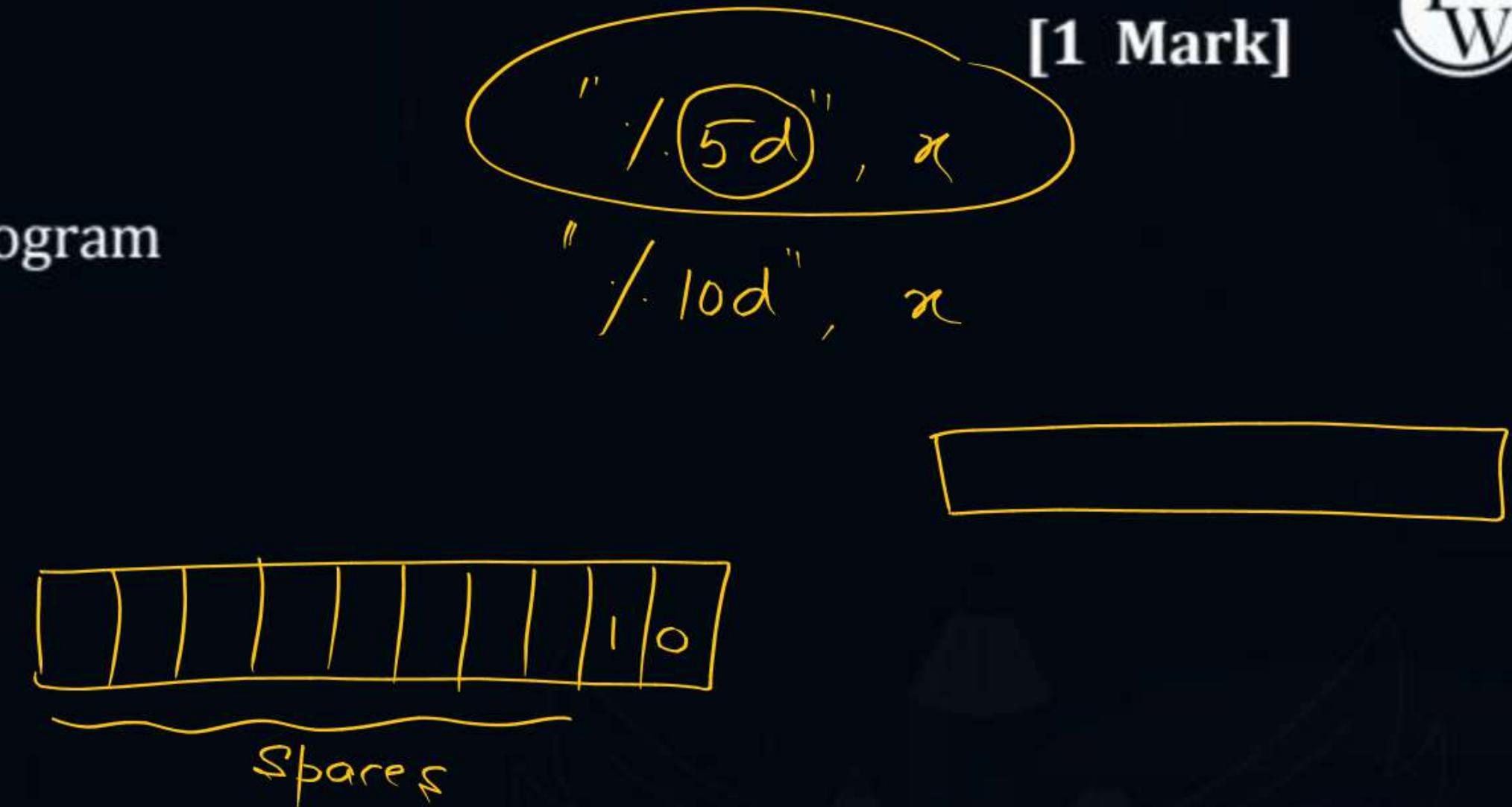
[MCQ]

P
W

[1 Mark]

#Q. What is the output of the program

```
int main () {  
    int x = 10;  
    printf ("% *d", x, x);  
    return 0;  
}
```



- A** Runtime error
- B** Compilation error
- C**10 ('.' is space)
- D**10 ('.' is null character)

#Q. void fun (int x) {
 int i;
 if (x == 1) printf ("%d", x/2);
 i = 0;
 l :printf("%d", x - i);
 i += 2
 if (i < x) goto l;
 fun (x/2);
}

What is the output of fun(5)

return

- A** infinite loop
- B** 5 3 1 2 0
- C** stack overflow
- D** 5 3 2 1 0

[MCQ]

[1 Mark]

P
W

#Q. main () {
 int x = 25; → odd
 do {
 printf ("%d", x)
 x -= 2; → 25
 }
 while (x); → 1
}

What is the output of the program.

for loop based
Question
+
cyclic property

- A** 25
- B** None
- C** infinite loop
- D** 25, 23,, 1

```
#Q. main () {  
    int * p = (int *) 0 ;  
    if (P == (int *) 0) {  
        int a = 20;  
        p = &a;  
        printf ("%d", *p)  
    }  
}
```

What is the output of the program.

- A** 20
- B** Garbage value
- C** Compile time error
- D** Segmentation fault.



2 mins Summary



Topic

One -

Topic

Two -

Topic

Three

Topic

Four

Topic

Five

10 AM - 12:00

Revise
2 Pgs

linked list
flow control statement
operators



THANK - YOU

CS & IT ENGINEERING

Data Structure & Programming

1500 Series

Lecture No.- 02

By- Pankaj Sharma Sir



Recap of Previous Lecture



Topic

Problem Practice Part-01

Topics to be Covered



Topic

Problem Practice Part-02

#Q. Consider the following code

```
main () {  
    int * p = (int *) 0; // NUL L  
    *p = 10;  
    print ("%d", *P);  
}
```

What is the output of the program ?

A

Uninitialized pointer

C

10

B

Segmentation fault

D

Garbage value

#Q. Consider a doubly linked list, which has front pointer which of the following operations depend on the size of the list.

A

Searching an element

B

Inserting element at front

C

Inserting element at last

D

Deletion element at front.

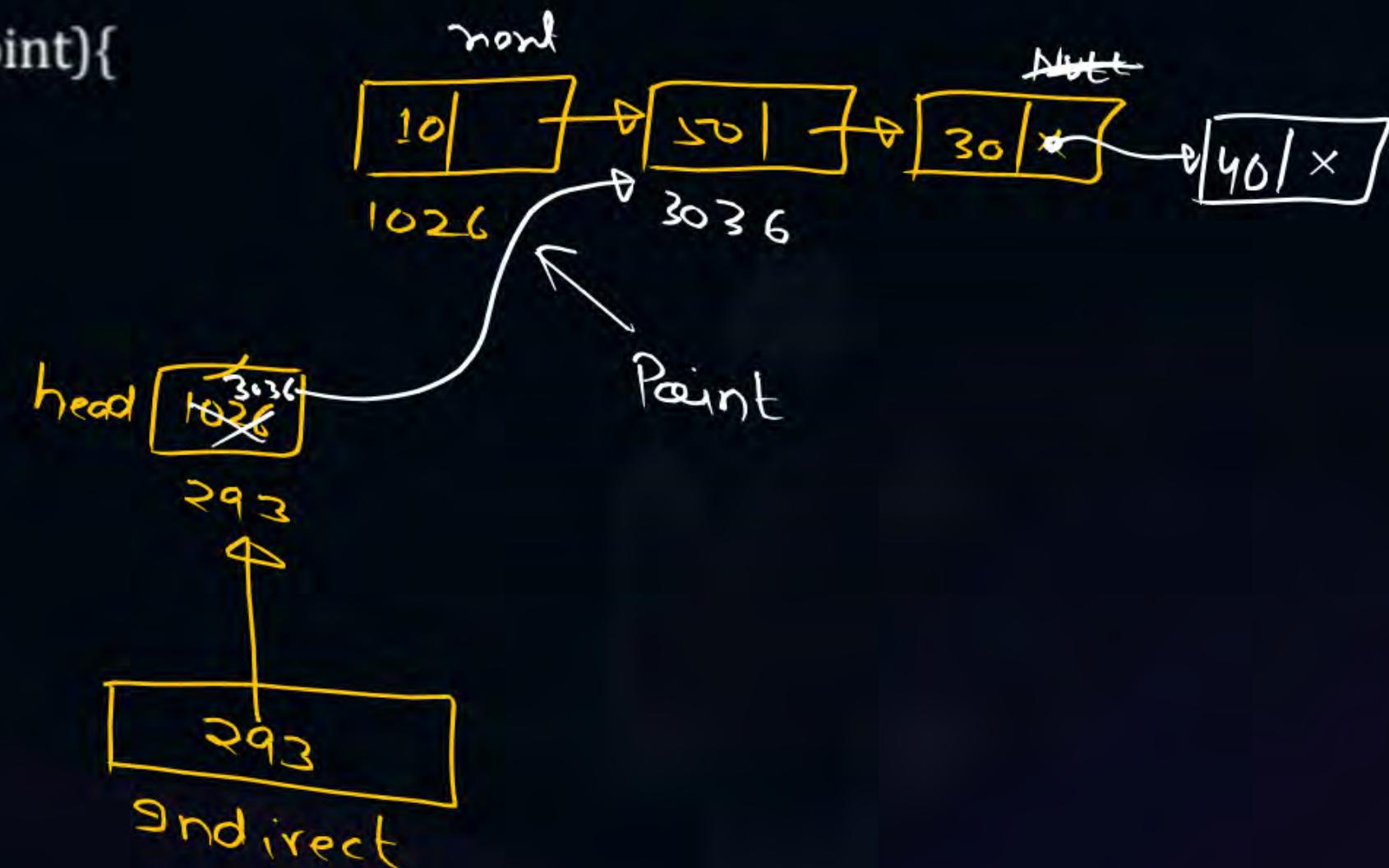


#Q. Consider a function that works on a single linked list. Consider head being the pointer pointing first node of list.

(Assume LL is not Empty)

```
typedef struct node Node;
void function(Node* head, Node* point){
    Node** indirect = & head;
    while ((*indirect) != point)
        Indirect = & (*indirect) ->next;
    *indirect = point ->next;
}
```

What does this function do?



A

Swap head and point nodes

B

Delete all the nodes from head to point



C

Delete the node which is pointed by point

D

Segmentation fault.

#Q. Consider all the required libraries are included and struct node is defined properly.

```
typedef struct Node Node;
void insert (Node*head, Node *last, int data){
    Node*node= (Node*) malloc (size of (node));
    If (head == null){
        head = node;
        last = node;
        head → data = data;
        head → next = Null;
    }
```

```
last → next = node;
last = node;
last → data = data;
last → next = Null;
```

```
}
```

```
main () {  
    head  
    Node*head = Null, *last = Null;  
    insert (head, last, 5);  
    printf ("%d", head → data);  
}
```

local
var

A

Null

B

Garbage value

C

5

D

Segmentation fault.

[MCQ]

#Q. Consider the pseudocode

 $a = 2048$ $i = 0$ $\text{while } (a \geq 1) \{$ $a = \log_2 a;$ $i = i + 1;$ $\}$ at the end of the code what is the value of i .

$$\begin{aligned} & \log_2^{11} \\ & 2^3 \rightarrow 8 \\ & 2^4 \rightarrow 16 \\ & 2^5 = 32 \\ & 2^6 = 64 \end{aligned}$$

 $a = 2^{11}$ $a = 11$ $a = 3 \cdot x$ $a = 1 \cdot y$ $a = \sim$ $i = 0$ $i = 1$ $i = 2$ $i = 3$ $i = 4$ **A**

10

C

11

B

4

D

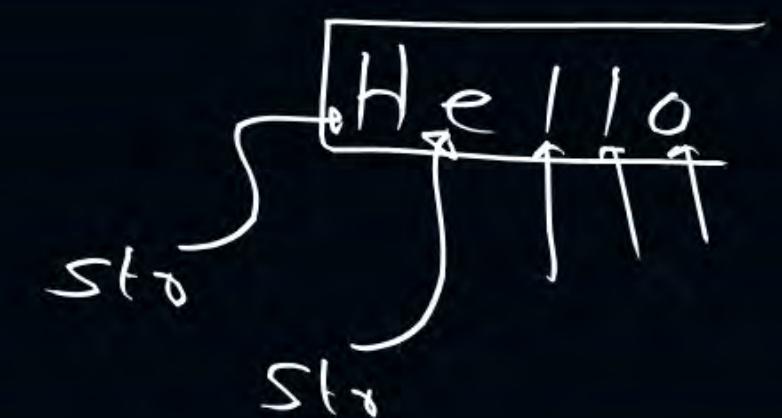
3

#Q. What is the output of following code segment

```
char *str = "Hello\0";
for (; printf("%s", str); (str++));
```

for (, bf("/s", str) ; str++)

Helloellollooloo



- A** nothing
- B** Helloellollooloo
- C** Infinite loop
- D** Hello

[NAT]

P

W

#Q. int fun (int x) {
 if (x == 1)
 return 1;
 return (printf ("%d", x) & printf ("%d", fun (--x)));
}

2 digit \Rightarrow 2

$\text{pf}(\cdot \cdot \text{d}^{\cdot}, \text{fun}(3))$

1

~~$\text{pf}(\cdot \cdot \text{d}^{\cdot}, 2)$~~

What is the minimum positive value of x for which fun ()
return '0' 10.

fun(10)

fun(a) \Rightarrow 1

$\rightarrow 1 \&$

$\text{pf}(\cdot \cdot \text{d}^{\cdot}, 10) \& \text{pf}(\cdot \cdot \text{d}^{\cdot}, \text{fun}(a))$

$\text{pf}(\cdot \cdot \text{d}^{\cdot}, 10)$ $\&$ 1

0 $\&$ 1 \Rightarrow

$\begin{array}{r} 0010 \\ 0001 \\ \hline 0000 \end{array}$

1 $\&$ $\text{pf}(\cdot \cdot \text{d}^{\cdot}, \text{fun}(2))$

$\text{pf}(\cdot \cdot \text{d}^{\cdot}, 2)$ $\&$

$\text{pf}(\cdot \cdot \text{d}^{\cdot}, \text{fun}(1))$

1 $\&$ 1 $\&$ $\text{pf}(\cdot \cdot \text{d}^{\cdot}, \text{fun}(1))$

1

#Q. int*fun (int x){
 int y = x+ 10;
 return (&y);
}

void main () {
 int*x ;
 x =fun (10);
 printf ("%d", *x);
}



What does the above code prints?

A

10

C

0

B

20

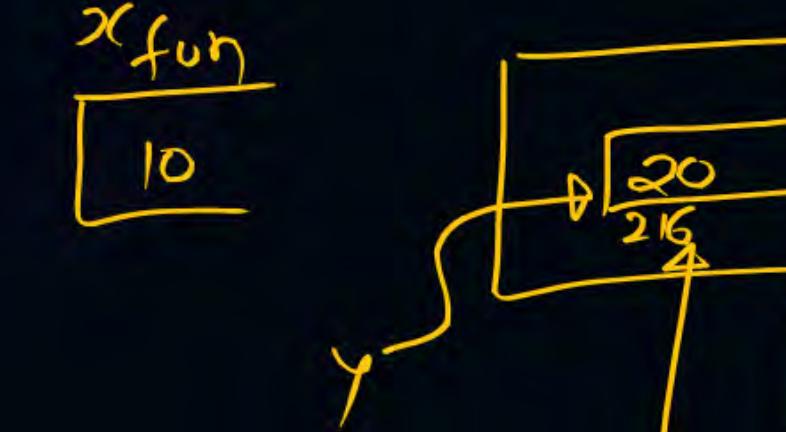
D

Runtime error

[MCQ]

```
#Q. int* fun (int x){  
    int *y;  
    y = (int*) malloc (size of (int));  
    *y = x + 10;  
    return y;  
}
```

```
void main () {  
    int *x;  
    x = fun (10);  
    printf ("%d", *x) ✘ [216]
```



- A** Garbage value
- B** 20
- C** Compile error
- D** Runtime error

What does above code prints?

#Q. Which of the following will give error?

++

Token

+++

A

x+++1

x+++1

\Rightarrow

(x++) + 1

✓

B

1+++x

1+++x

1++ + x

Error

C

1-++x

1-++x

1- (++)

✓

D

-- (++x)

-- (++x)

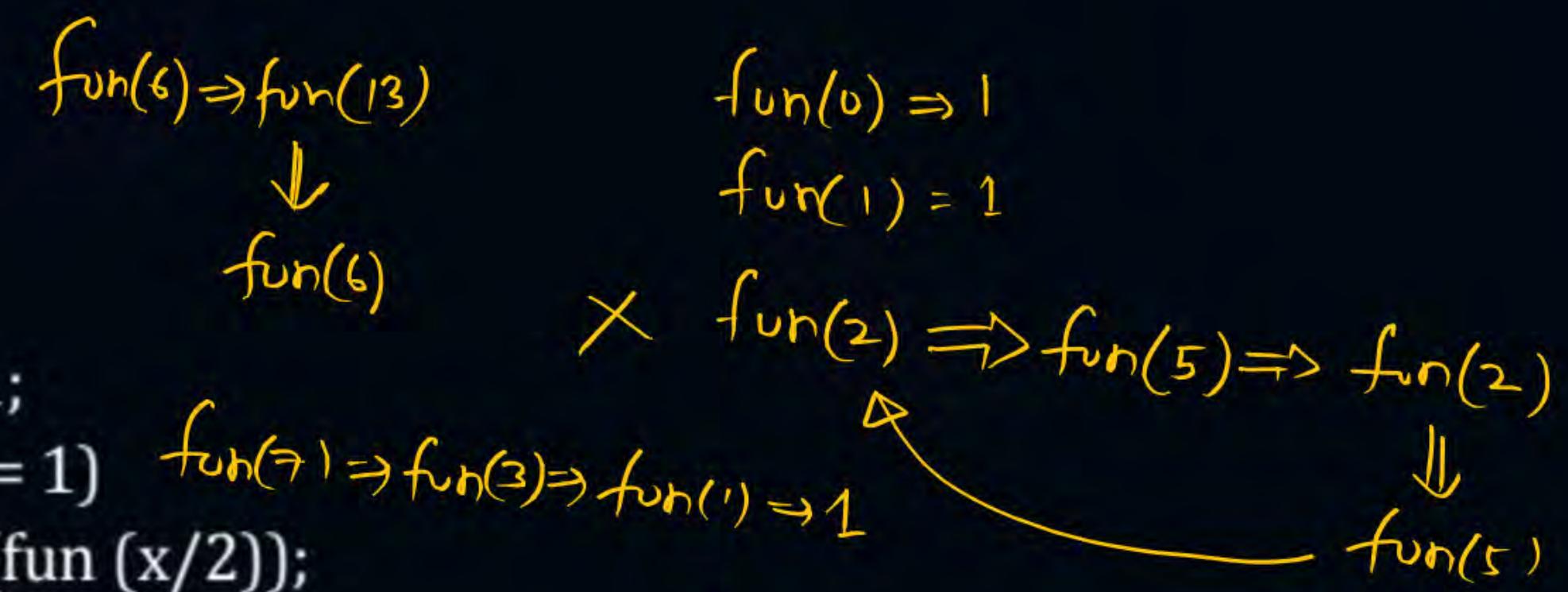
\Rightarrow

Error

[MCQ]

P
W

```
#Q. int fun (int x ){  
    if (x == 1)  
        return 1;  
    else if (x % 2 == 1)  
        return (fun (x/2));  
    else  
        return (fun (x*2 +1));  
}
```



fun(3) \Rightarrow fun(1) \Rightarrow 1 ✓

\times fun(4) \Rightarrow fun(9) \Rightarrow fun(4) \Rightarrow fun(9)

for which values the function will terminate ?

$$\left\{ \frac{1}{3}, 7 \right\}$$

A

Only 1

C

Only 0 and 1

fun(5) \Rightarrow fun(2) \Rightarrow Non-term ✗

B

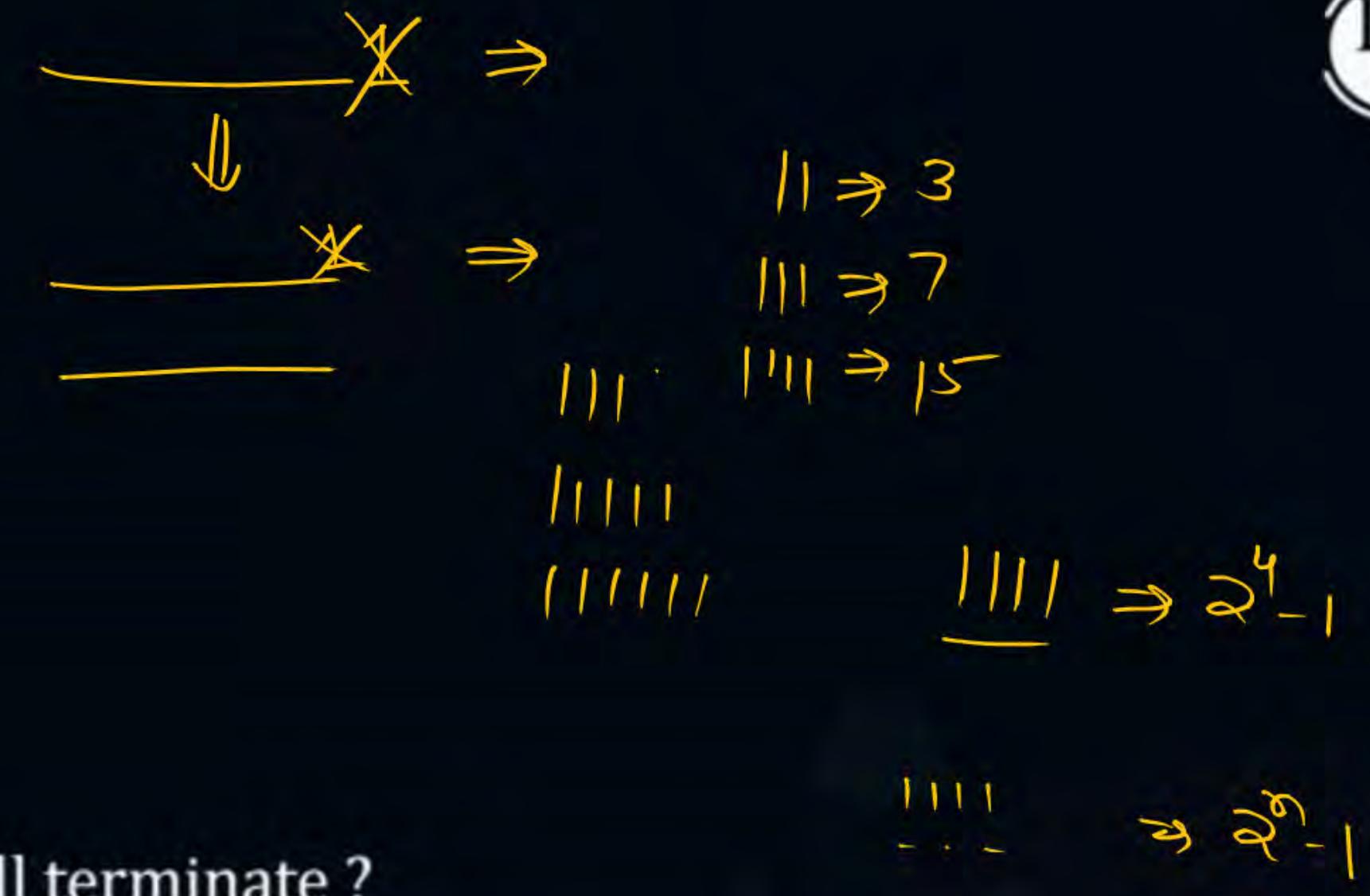
$2^n - 1$ $n \geq 0$

D

$2^n - 1$ $n \geq 0$ and its multiples

[MCQ]

```
#Q. int fun (int x){  
    if (x == 1)  
        return 1;  
    else if (x % 2 == 1)  
        return (fun (x/2));  
    else  
        return (fun (x*2 +1));  
}
```



for which values the function will terminate ?

A

Only 1

C

Only 0 and 1

B $2^n - 1 \dots n \geq 0$ **D** $2^n - 1 \dots n \geq 0$ and its multiples

$$\frac{x}{\cancel{\boxed{0}}} \Rightarrow 2x$$

$$\frac{x}{\cancel{\boxed{1}}} \Rightarrow 2x + 1$$

```
#Q. void main () {  
    int i = 'a';  
    switch (i)  
    {  
        case 'a':  
            printf ("hello");  
        case 97:  
            printf ("world");  
            break;  
        default:  
            print("nothing");  
    }  
}
```

- What is the output of this code;
- A Hello world
 - B world
 - C Nothing
 - D Compile error
- Annotations:*
A green circle highlights the label 'a' in the first case statement.
A green arrow points from the label 'a' to the value '97'.
A green arrow points from the value '97' to the word 'printf'.
A green arrow points from the word 'printf' to the label 'duplicate case labels'.
A green checkmark is placed next to option D.

#Q. Consider the following code:

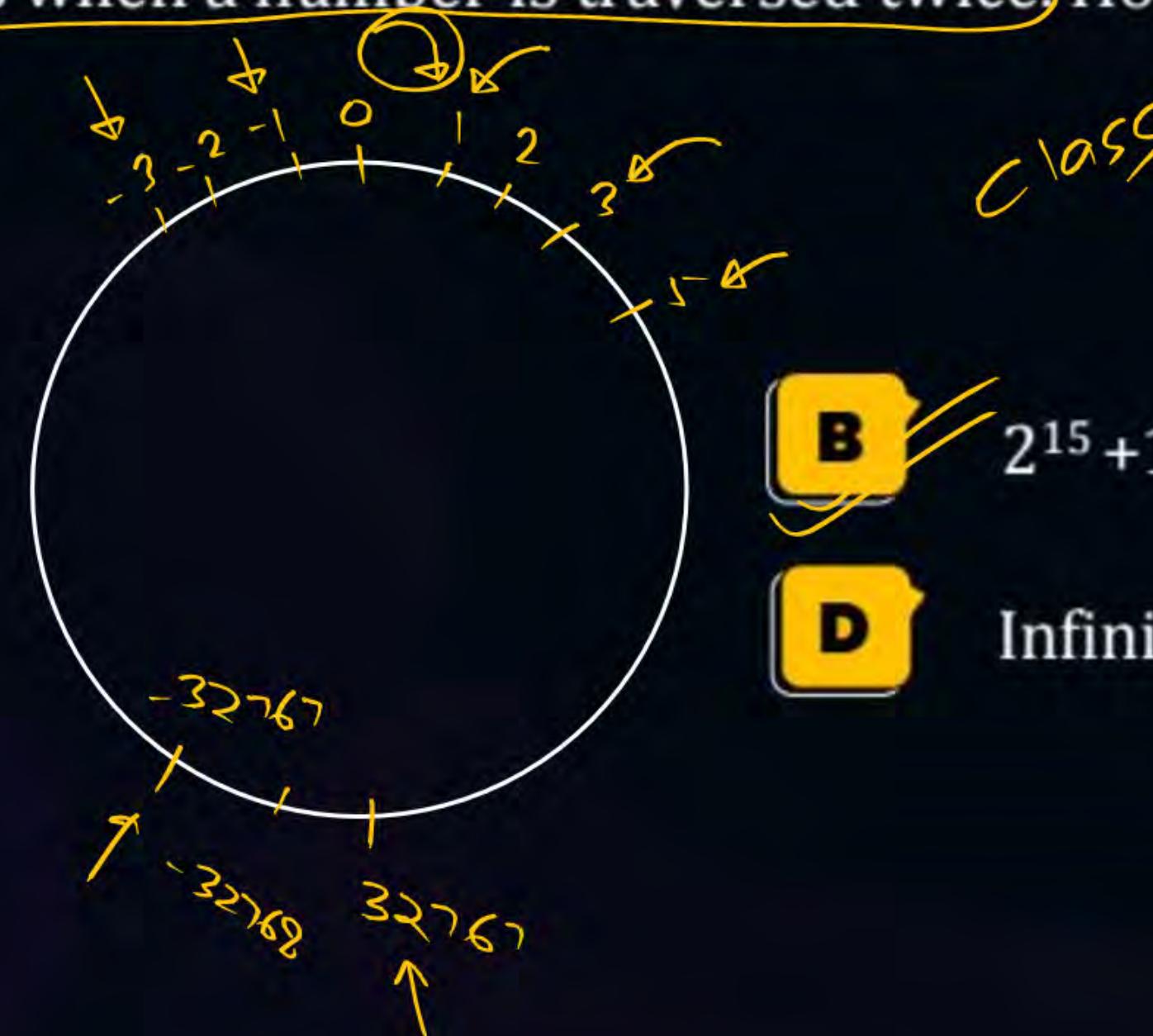
```
int i; ←  
  
void main () {  
  
    for (i = 0; i < 10; i++) {  
  
        int i;  
        i = i - 1;  
  
    }  
  
}
```

- A
- B
- C
- D

- Compile error: redeclaration of i
- Code never terminate
- For loop executed 10 times
- Runtime error: declaration of i

What is the result of above code?

#Q. In a code, there is a for loop which increments by 2 at each iteration and iterator i, is initiated at 1. Here signed integer is used of size 2 bytes. [For loop terminates when a number is traversed twice]. How many times for loop is executed.



A $2^{16} - 1$

C 2^{16}

B $2^{15} + 1$

D Infinite times



2 mins Summary



Topic One -

Topic Two -

Topic Three

Topic Four

Topic Five

Operators
Trees
Pointers } revise

THANK - YOU

CS & IT ENGINEERING

Data Structure & Programming

1500 Series

Lecture No.- 03



By- Pankaj Sharma Sir

Recap of Previous Lecture



Topic

Problem Practice Part-02

Topics to be Covered



Topic

Problem Practice Part-03

[MCQ]

```
#Q. int * f1() {  
    int * l;  
    *l = 8;  
    return l;  
}
```

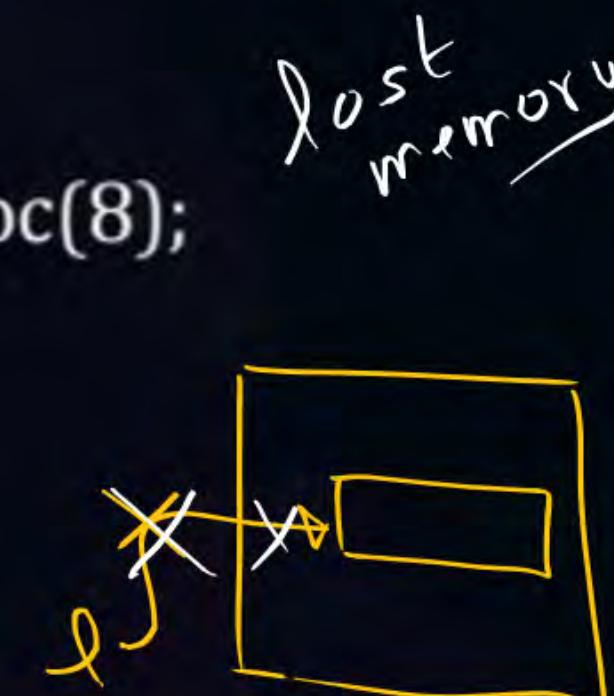
```
int * f2() {  
    int * l = malloc(8);  
    l = null;  
    return l;  
}
```

```
void f3() {  
    int * p;  
    p = (int*) malloc(sizeof(int));
```

wild pointer (uninitialized pointer)

```
*p = 10;  
free(p);  
*p = 11;  
}
```

What are the **problems** within above functions f1,f2,f3 respectively.



A

None, dangling Pointer, Lost Memory

B

Dangling pointer, None, uninitialized pointer

C

Uninitialized pointer, Lost Memory, dangling pointer

D

Dangling pointer, Lost Memory, uninitialized pointer

#Q. struct test {

 struct test * i; $\rightarrow 8$

 char arr[20]; $\rightarrow 20$

 int arr2 [2][3]; $\rightarrow 24$
 $\overbrace{\quad\quad\quad}^{52 \text{ byte}}$

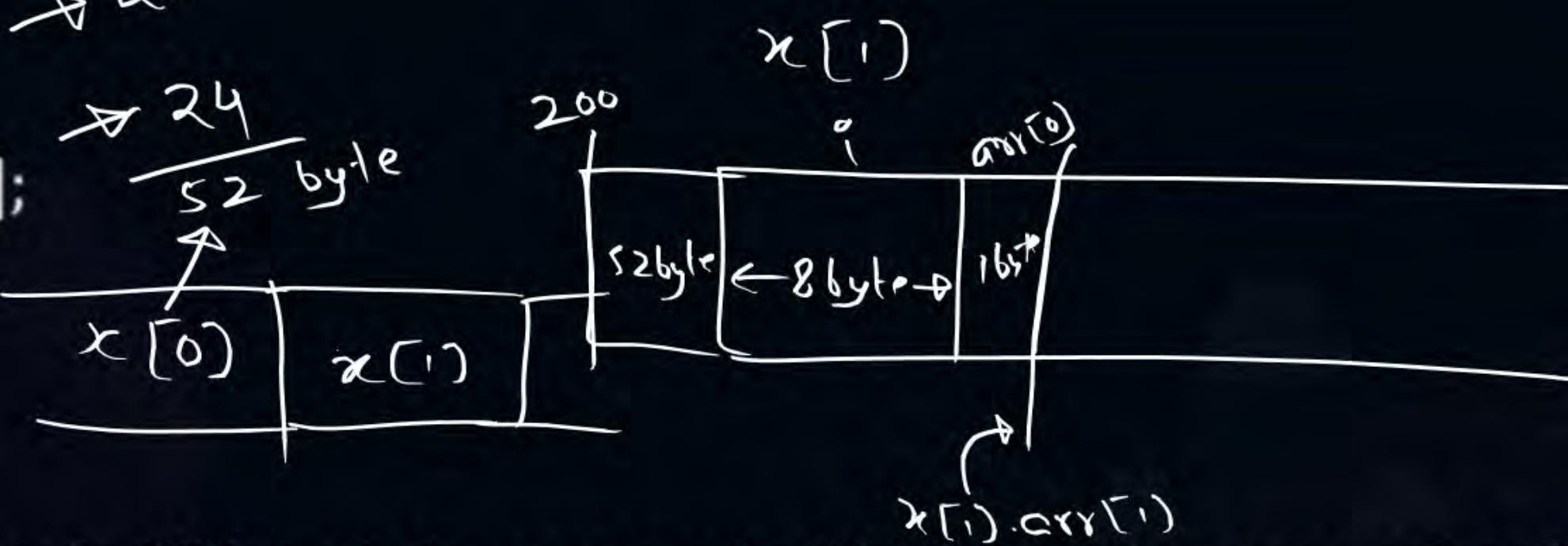
};

struct test x[10];

pointer size - 8 byte

char - 1 byte

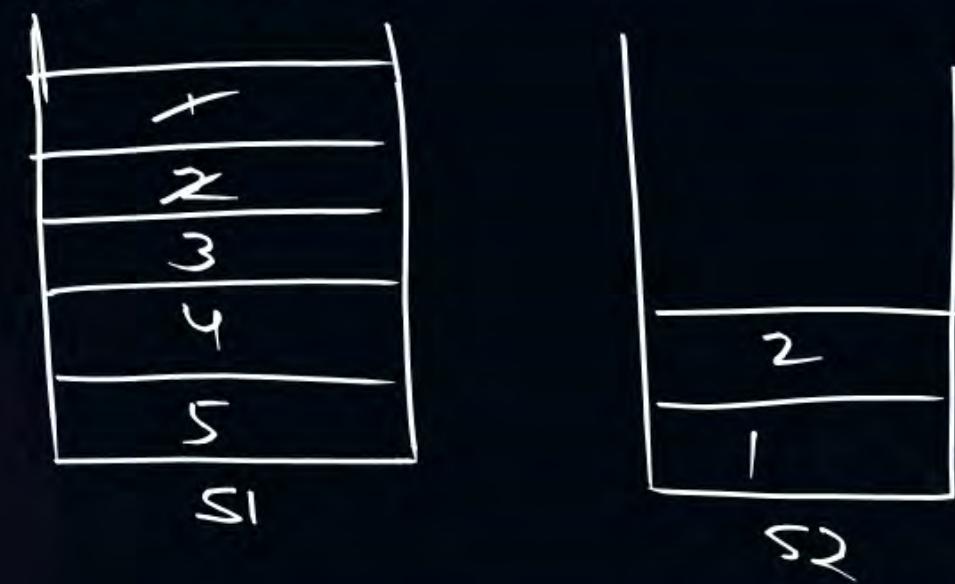
int - 4 byte



if base address of x is 200 and the system is 64 bit architecture, what is the address of x[1].arr[1] _____.

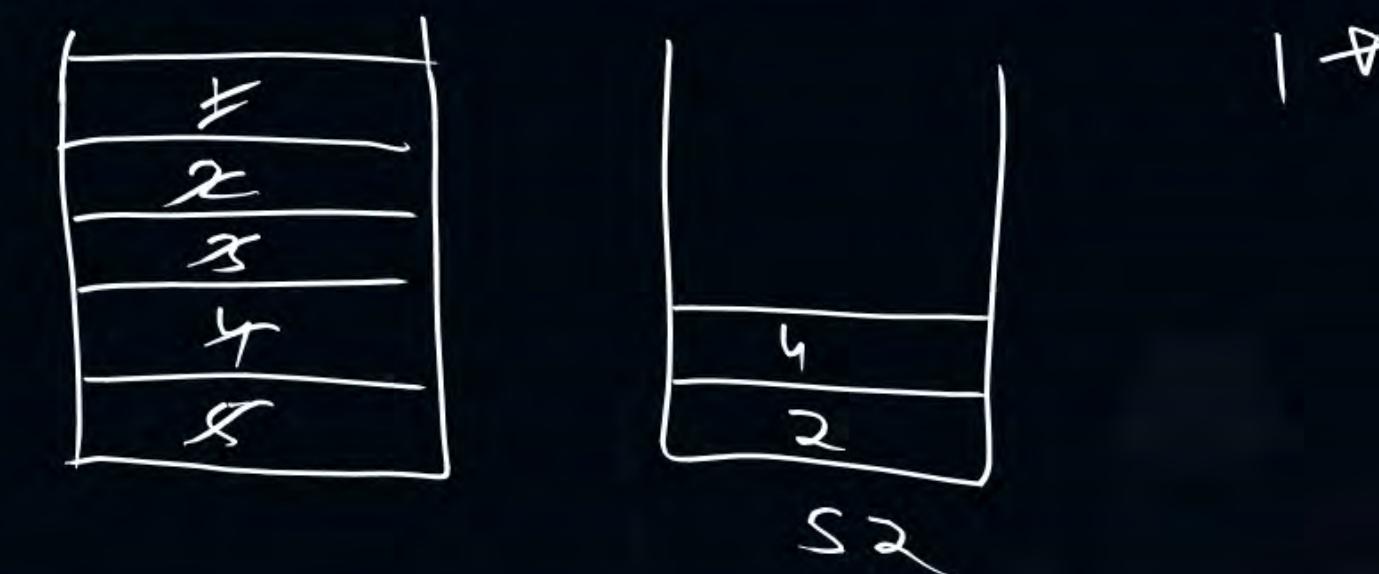
#Q. Stack s1 has elements 5 4 3 2 1 in the sequence where 1 is at top. s2 is an empty stack. when an element popped from s1, it can be either printed or pushed into s2 not both. But when you pop from s2 it can only be printed. Which permutation is not possible.

- A 1 2 3 4 5 ✓
- B 3 4 5 2 1
- C 3 4 5 1 2
- D 1 3 5 4 2

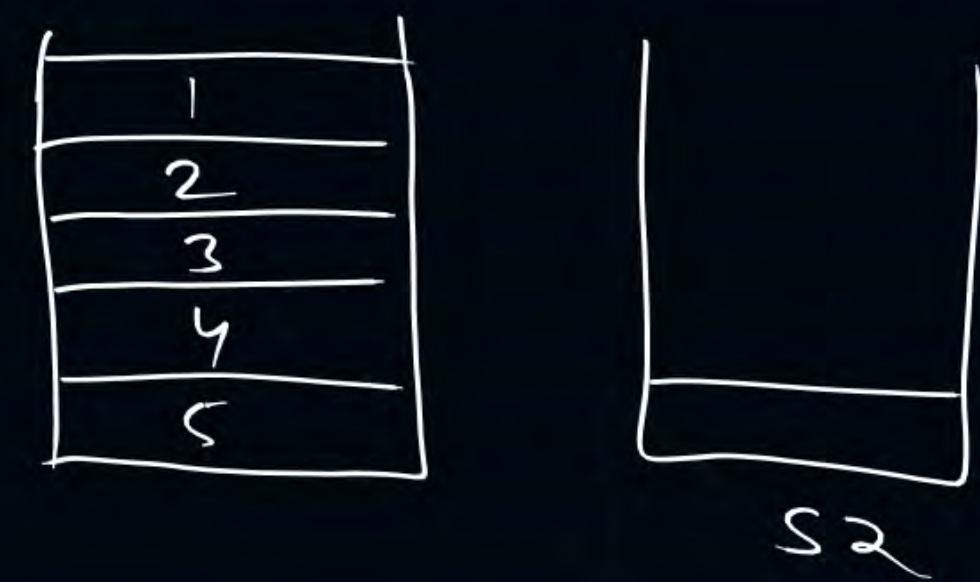


#Q. Stack s1 has elements 5 4 3 2 1 in the sequence where 1 is at top. s2 is an empty stack. when an element popped from s1, it can be either printed or pushed into s2 not both. But when you pop from s2 it can only be printed. Which permutation is not possible.

- A 1 2 3 4 5 ✓
- B 3 4 5 2 1
- C 3 4 5 1 2
- D 1 3 5 4 2



#Q. Stack s1 has elements 5 4 3 2 1 in the sequence where 1 is at top. s2 is an empty stack. when an element popped from s1, it can be either printed or pushed into s2 not both. But when you pop from s2 it can only be printed. Which permutation is not possible.

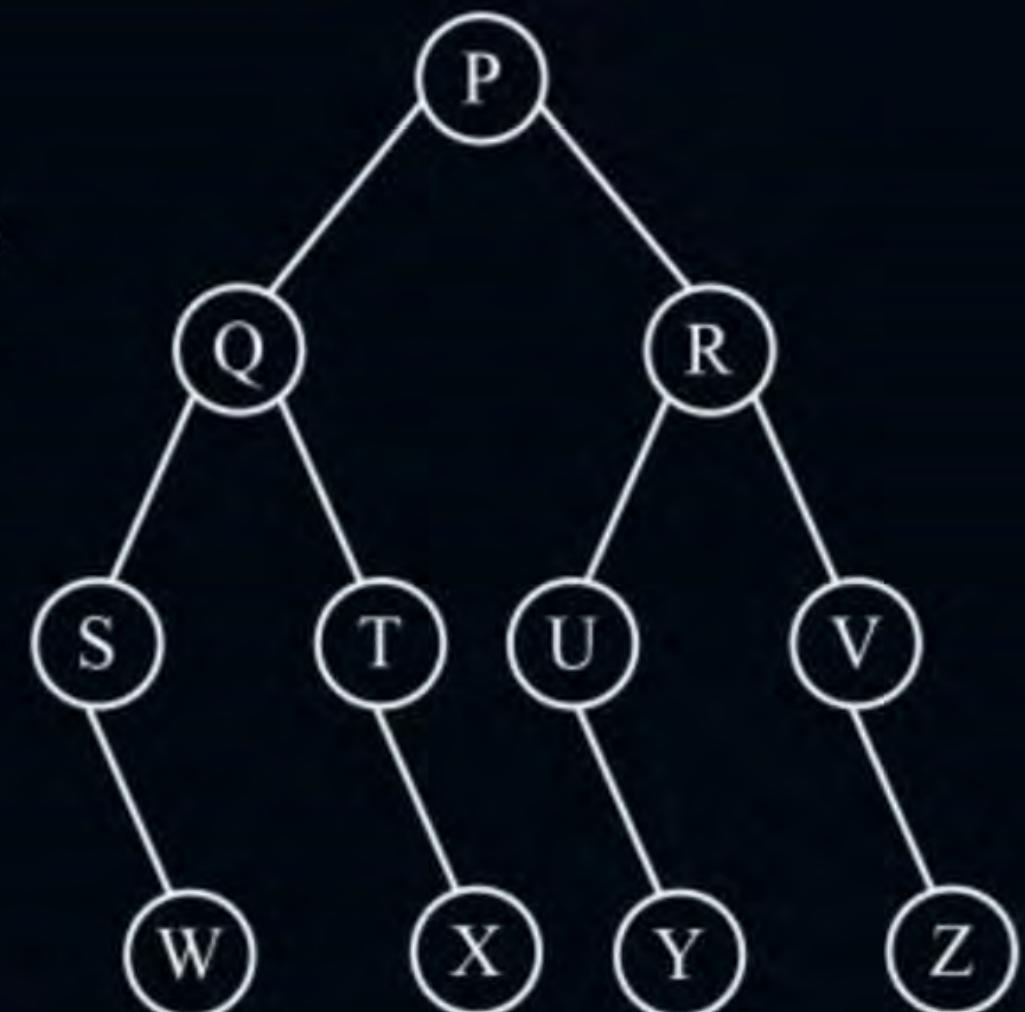


- A** 1 2 3 4 5 ✓
- B** 3 4 5 2 1 ✓
- C** 3 4 5 1 2
- D** 1 3 5 4 2

#Q. Consider the following tree

PT: WSXTQ YUZVRP
3 - 9 + X 14 + 7 - + /

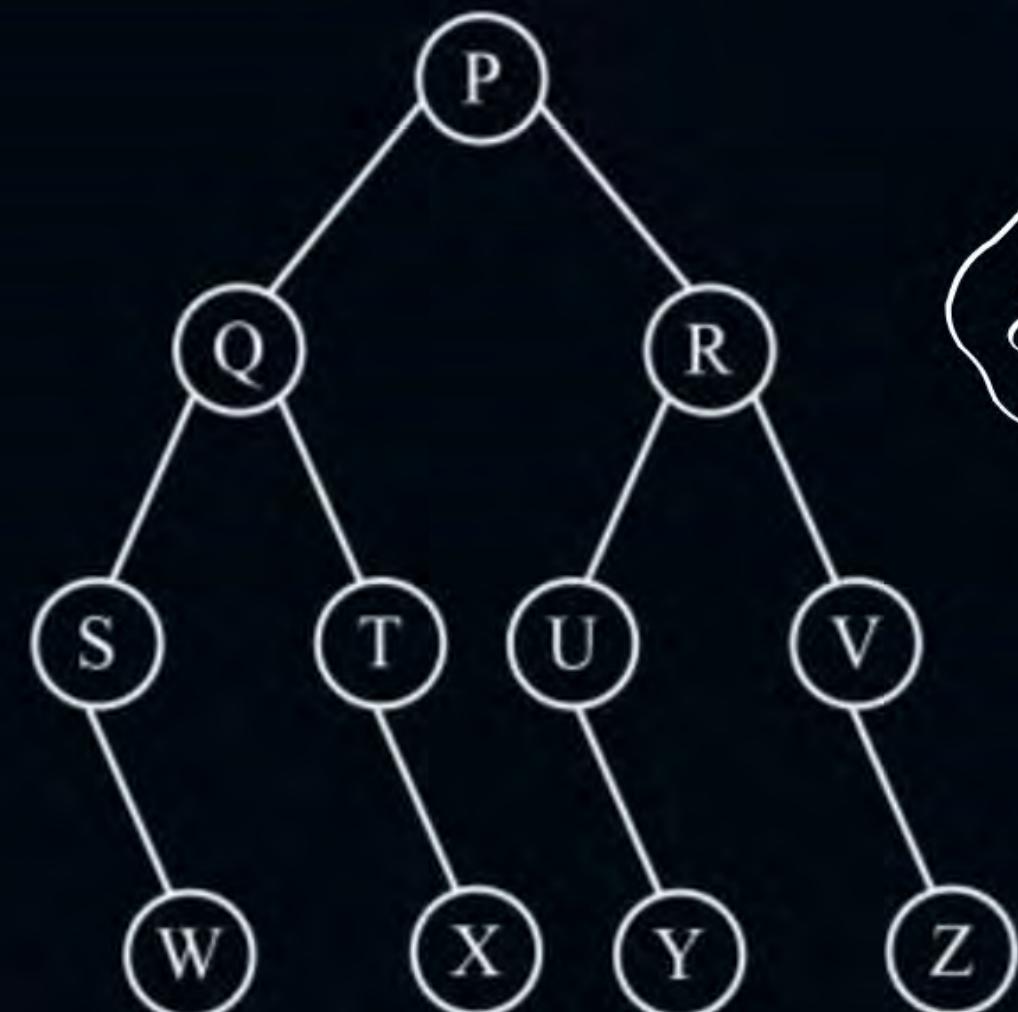
SWQXPYVZ
- 3 * 9 / 14 - 17



If the postorder traversal of above tree is, 3-9+ * 14 + 17 - + /. Then the SWQXPYVZ = _____(round off two decimal places)

#Q. Consider the following tree

$$\begin{aligned}
 & -3 \times 9 / 14 - 17 \\
 & -27 / 14 - 17 \\
 & -1.9286 - 17
 \end{aligned}$$



$$\begin{aligned}
 & -18.9286 \\
 & = -18.93
 \end{aligned}$$

Easy Question

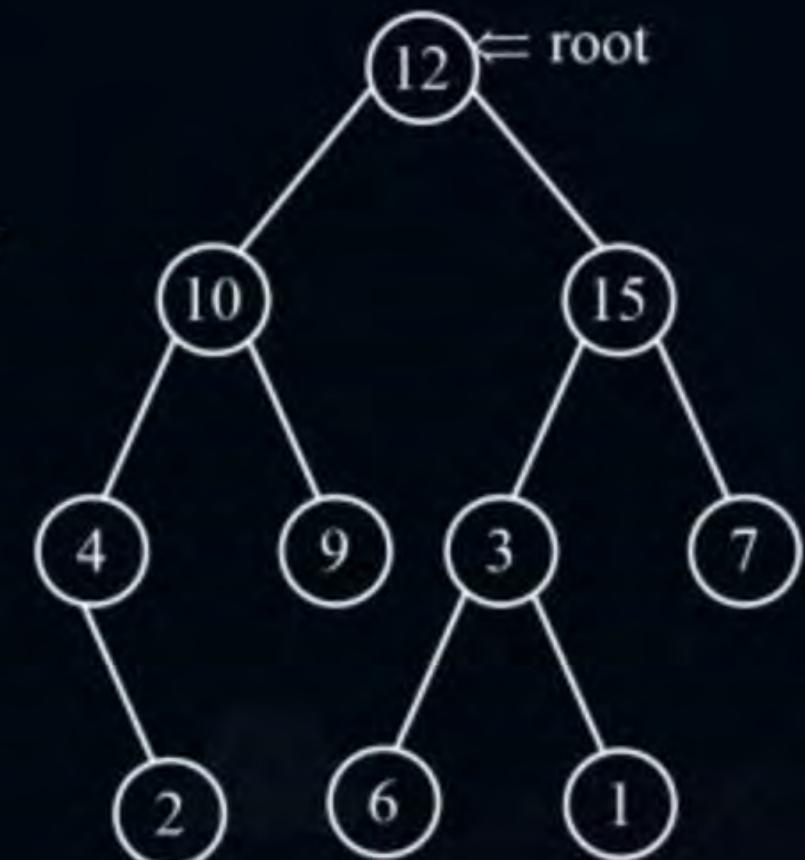
If the postorder traversal of above tree is, $3-9+ * 14 + 17 - + /$. Then the SWQXPYVZ = _____ (round off two decimal places)

#Q. Consider a binary tree,

Following **pseudocode** executed on function compute
(root, 12) then return value is ____.

Compute (V, S) // V is node, S is value of node

```
{  
    if (V.is leaf () || V.left == Null || V.right == null)  
        return S;  
    S = S + compute (V.left, S) →  
    S = S - compute (V.right, S); // For parameter 'S' is value of respective node.  
    return S;  
}
```



Compute(root, 12)

⑦ $S = 12 + \text{compute}(810, 10)$

⑨ $S = 10 + \text{compute}(84, 4)$

③ $S = 14 - \text{compute}(89, 9)$

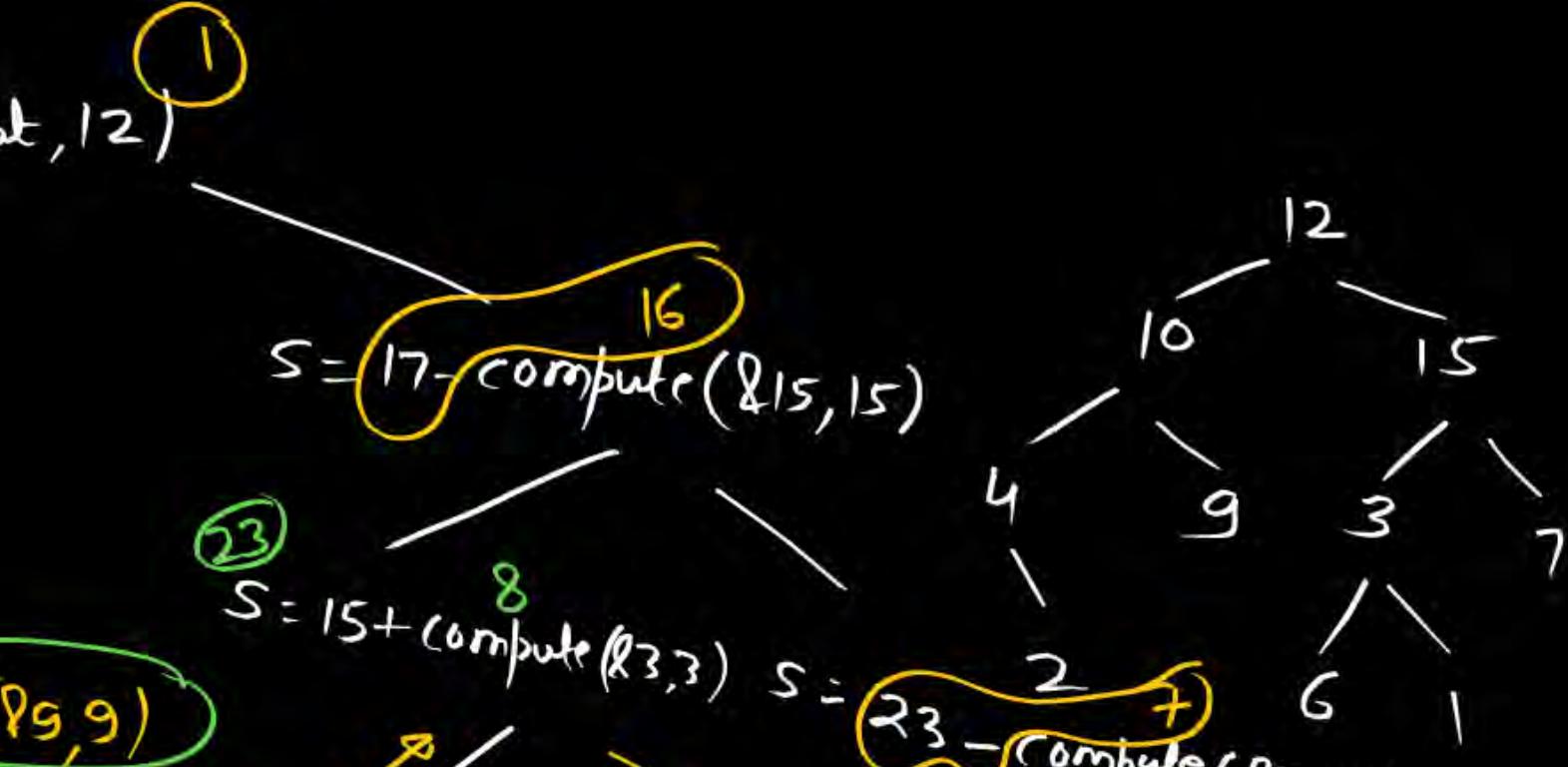
⑥ $S = 17 - \text{compute}(815, 15)$

⑧ $S = 15 + \text{compute}(83, 3)$

⑤ $S = 3 + \text{compute}(86, 6)$

⑩ $S = 23 - \text{compute}(87, 7)$

⑪ $S = 9 - \text{compute}(81, 1)$



#Q. Height balanced trees are binary tree with the following restrictions.

(i) The height difference of the children is atmost 1.

(ii) $| \text{right child length} - \text{left child length} | \leq h$

Maximum height of this tree with 232 nodes is 10.

(Assume that the height of a tree with a single node is 0.)

$\left\{ \begin{array}{l} \text{min height / max nodes} \\ \text{max height / min nodes} \end{array} \right\}$

h	0	1	2	3	4	5	6	7	8	9	10
n_{\min}	1	2	4	7	12	20	33	54			

$$n(h) = 1 + n(h-1) + n(h-2)$$

88 143 232

#Q. Which traversal is the **most suitable** for deleting all the nodes in a binary tree?

- A Inorder
- B Preorder
- C Postorder
- D Any Traversal



#Q. #include <stdio.h>

```

int main (){    a[0]      a[1]      a[2]
                ↓          ↓          ↓
int a [ ] [5] = {1,2,3,4,5} {11, 12, 13, 14, 15}, {21, 22, 23, 24, 25} ;
                &a[0][0]  &a[0][1]  &a[0][4]
int*p[ ] = {a[1]+5, a[1], a[0]+9, &a[2][1]};
int ***x = p;
printf ("%d",*(++x)[1]);
return 0;
}

```

x

$\boxed{\&P[0] \&P[1]}$

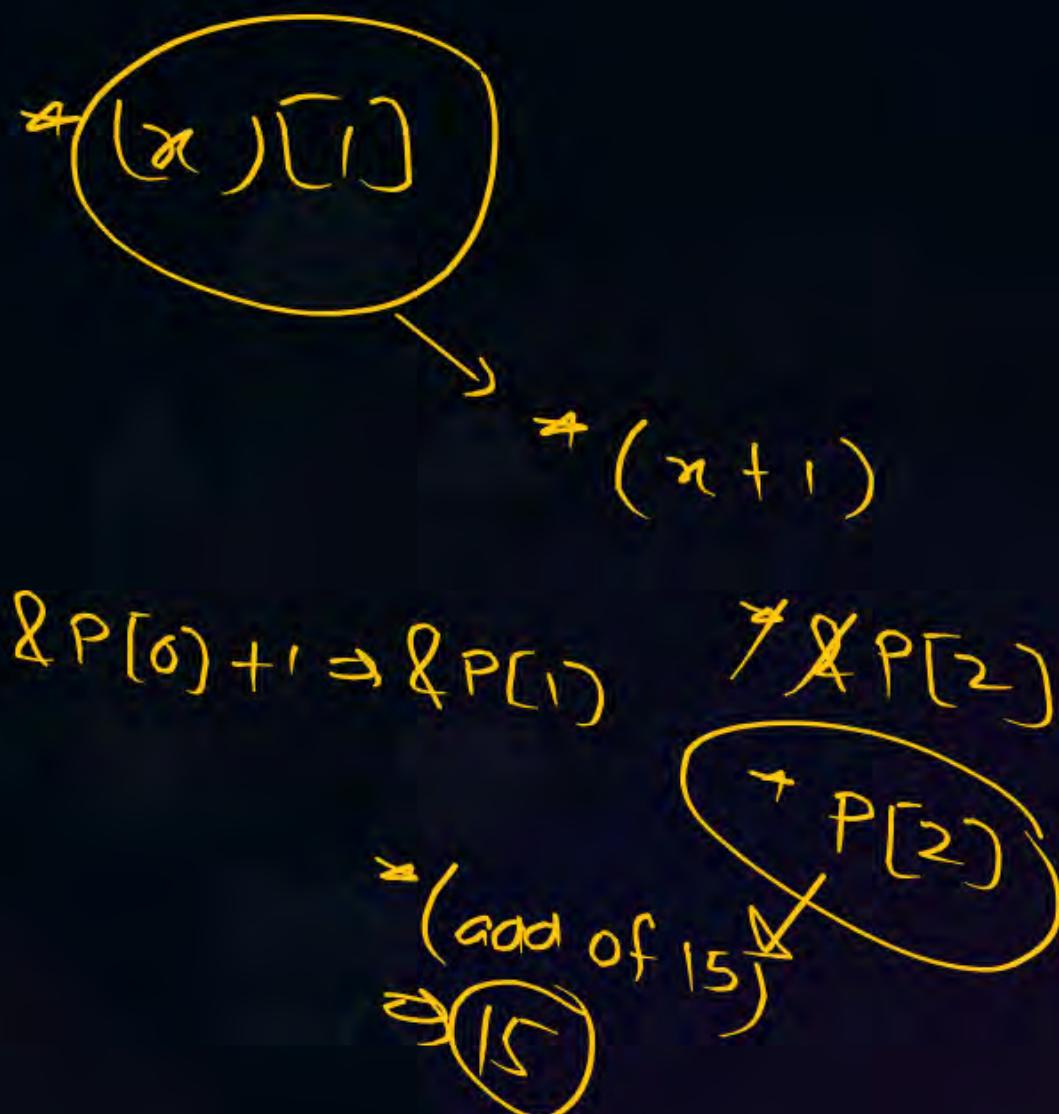
$\rightarrow (x+1)$

$\rightarrow ((x+1)+1)$

a) $x = x + 1 \Rightarrow x = \&P[0] + 1 \Rightarrow \&P[1]$

b) $\star (x+1)$

The output of above code is ____.



#Q. Array of 1023 elements used to construct the binary heap with starting index '0'. If the right child node is stored at index 510 then its parents parent node is at index ____.



$$2i+2 = 510$$

$$2i = 508$$

$$\boxed{i = 254}$$

#Q. Which data structure is most efficient to find top k largest items out of n items stored in file?

→ Try to write ^{Pseudo} code / logic

- A Max heap
- B Min heap
- C BST
- D Sorted array

#Q. The height of a binary tree is the maximum number of edges in any root node to leaf node path. The maximum number of nodes in a binary of height 15 is _____.

$$\begin{aligned}n_{\max} &= 2^{h+1} - 1 \\&= 2^{15+1} - 1 \\&= 2^{16} - 1 \\&= 65536 - 1 \\&\textcircled{65535}\end{aligned}$$

#Q. int a = 5, b = 6, c, d = 7;

c = a++ + b-- * d / 2; (No space)

print ("%d", c);

What is the output 26.

$$c = (a++) + (b--) * d / 2$$

$$c = 5 + \underline{6 \times 7} / 2$$

$$\begin{array}{l} 5 + 42 / 2 \\ \textcircled{5 + 21} \end{array}$$

#Q. int a = 7, b = 6, c;

$$c = a >> 2 + 3 * 8 == 8 * 8 + b;$$

printf ("%d", c);

Output is 0.

$$C = 7 >> 2 + \underline{3 * 8} == 8 * 8 + 6$$

$$C = 7 >> 2 + 24 == \underline{8 * 8} + 6$$

$$C = 7 >> 2 + 24 == 64$$

$$C = \boxed{7 >> 26} == 64 + 6$$

$$C = \boxed{7 >> 26} == 70$$

$$C = \boxed{0 == 70}$$

$$C = 0$$

[NAT]

```
#Q. Struct temp {  
    int data ;  
}  
struct temp2{  
    int data ;  
    struct temp*h;  
}  
int main () {  
    struct temp h ;  
    h. data = 5;  
    struct temp2 x;  
    x.data = 6;  
    x.h = &h;  
    printf ("%d", 5*x.data +(x.h)→data);  
}
```

What will be the output of the above code?

H.W → Try

L me/PWpankajsirP





2 mins Summary



Topic One -

Topic Two -

Topic Three

Topic Four

Topic Five



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CS & IT ENGINEERING

Data Structure &
Programming

1500 Series

Lecture No.- 04

By- Pankaj Sharma Sir



Recap of Previous Lecture



Topic

Problem Practice Part-03

Topics to be Covered



Topic

Problem Practice Part-04

[MCQ]

x_{static} $\cancel{x} \cancel{x} 3$

#Q. The integer value printed by the ANSI-C program given below is:

```
#include <stdio.h>
int func(){
    static int x = 1;
    ++x;
    return x;
}
int main () {
    int x, y;
    x = func();
    if((func() - 3) || (x--)) {
        printf ("%d", x);
    }
    return 0;
}
```

if ((3-3) || (x--))
if (0 || (x--))
if (1)

x_{main}
 $\cancel{x} 1$

1

- | | |
|---|---|
| A | 4 |
| B | 3 |
| C | 2 |
| D | 1 |

#Q. The integer value printed by ANSI-C program given below is _____.

```
#include <stdio.h>
```

```
int main () {
```

```
    char exam []= "GATE 2\0 24";
```

```
    char organising [] = "IISc\0\0";
```

⑤ int len, size;

⑥ len = strlen (exam) + strlen (organising);

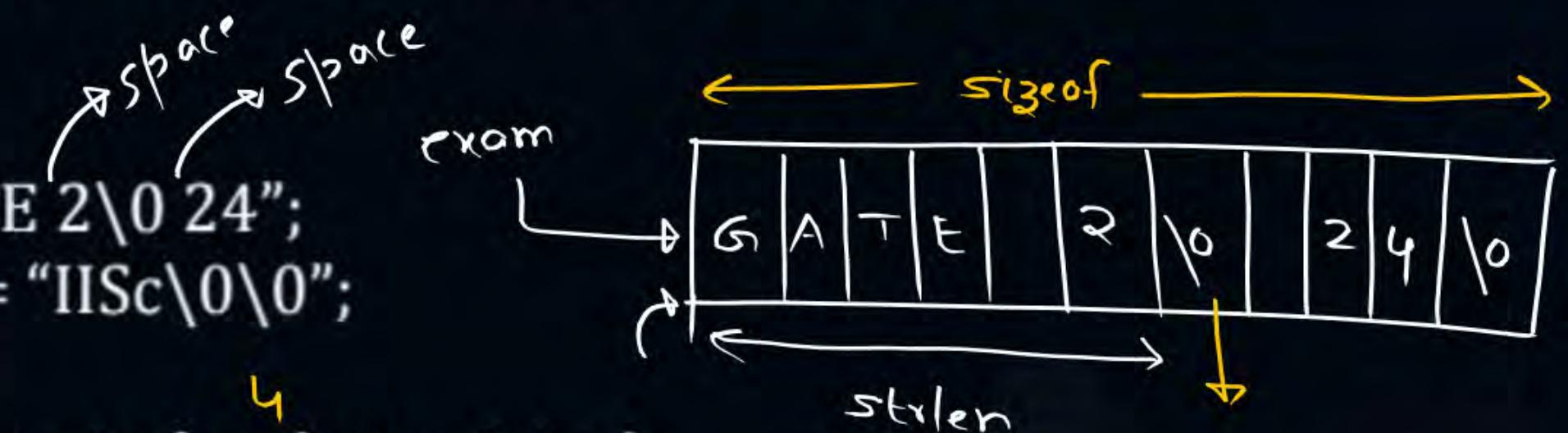
⑦ size = sizeof (exam) + sizeof (organising);

```
printf ("%d", size - len);
```

```
return 0;
```

```
}
```

8



[NAT]

#Q. The output of the 'C' program snippet is _____.

int main () {

char str [] = "GATE 2024";

char *ptr = str;

printf ("%d", (int) strlen (str + 1 [ptr] - ptr [8] - 9));

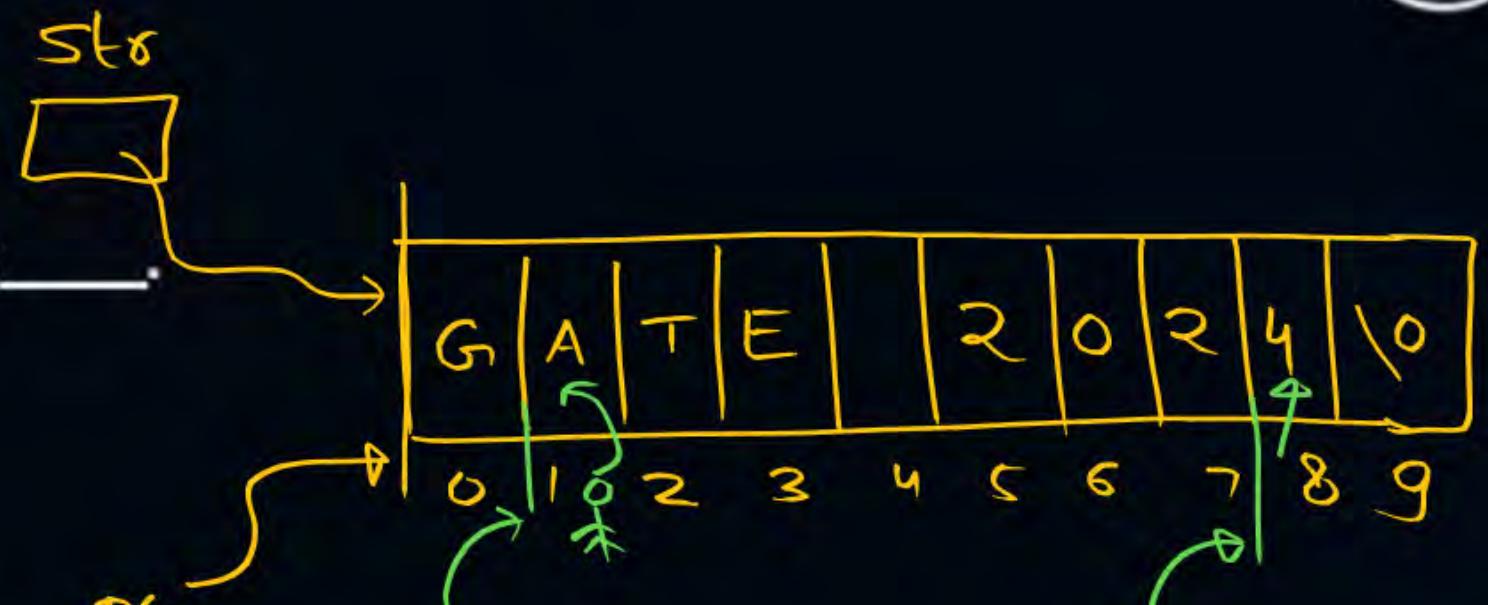
return 0;

}

$$str + 65 - 52 - 9$$

$$str + 13 - 9$$

$$str + 4$$



$$str + 'A' - '4' - 9$$

$$\downarrow \\ * (1 + ptr)$$

$$\downarrow \\ * (ptr + 1)$$

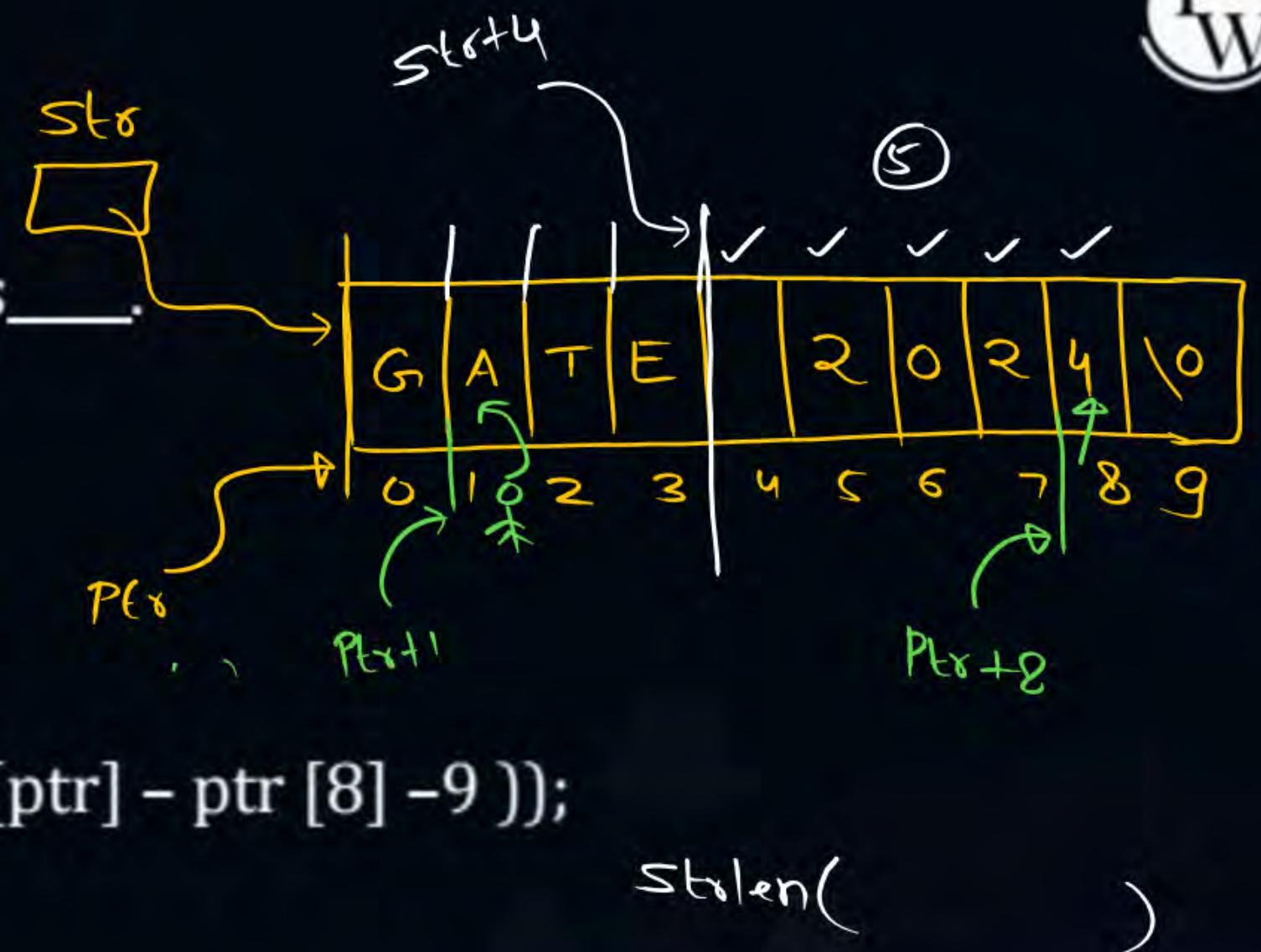
$$\downarrow \\ ptr[1]$$

ASCII
A → 65
O → 48
1
2
3
4 → 52

#Q. The output of the 'C' program snippet is _____.

```
int main () {
    char str [] = "GATE 2024";
    char *ptr = str;
    printf ("%d", (int) strlen (str + 1 [ptr] - ptr [8] - 9));
    return 0;
}
```

(5)

 $str + 65 - 52 - 9$ $str + 13 - 9$ $str + 4$ 

#Q. #include <stdio.h>
int fun (static int x) {
 static int y;
 x++;
 y++;
 return x + y;
}
int main () {
 printf ("%d%d", fun (5), fun(5));
 return 0;
}
output of the program is -

- A** Garbage value
- B** 7 8
- C** 7 9
- D** Compilation error.

```
#Q. #include <stdio.h>
int main () {
    register int x;
    x = 5;
    switch(size of(x)){
        Case 1 : printf ("1");
        Case 2 : printf ("2");
        Case 3 : printf ("3");
        l: Case 4 : printf ("4");
        Case 8 : printf ("8");
        default: printf ("%d", size of (x));
        Case 5 : if( >>>= 5) goto l;
    }
}
```

$\text{int} \Rightarrow 4 \text{ byte}$
program is ____.

(If the code has compilation error answer is 1, if segmentation fault then answer is 0.)

if ($5 \geq 5$)

484484

x 54

#Q. #include <stdio.h>
int fun1() {
 static int x = 5;
 printf ("%d", x);
 x--;
 return x && fun1();
}
main () {
 fun1 ();
}

Output of program is-

short circuit

A

Compilation error

B

5 4 3 2 1

C

Stack overflow (since no base case)

D

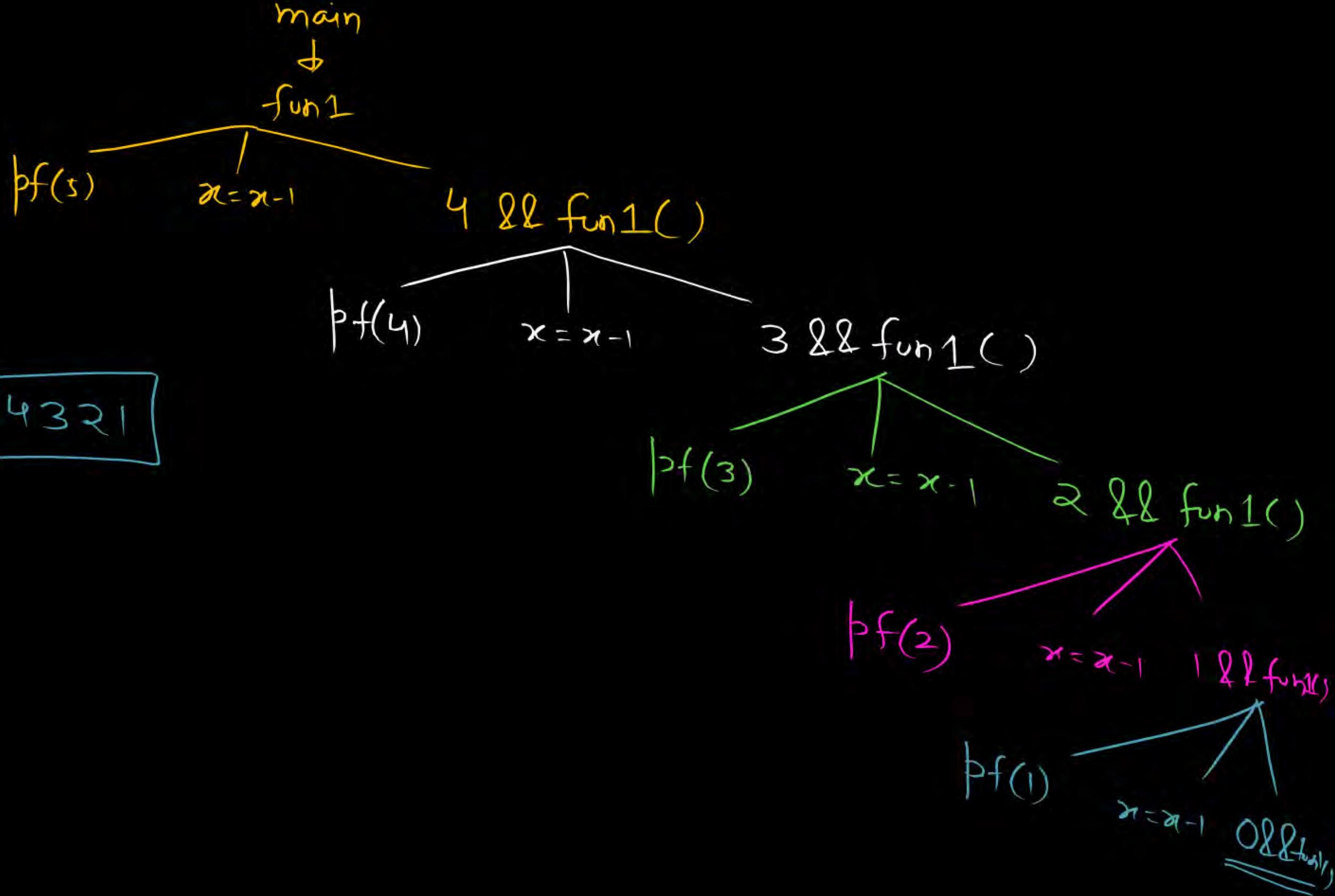
5 4 3 2 1 0

x

8 4 3 2 1 0

5

5 4 3 2 1



[MCQ]

#Q. #include <stdio.h>

```
int fun (int x);
```

```
int f1 (int x) {
```

```
    return x && f1(x-1);
```

```
}
```

```
int fun (int x) {
```

```
    if (x == 0) return 1 ;
```

```
    return fun (x >> f1 (x))
```

```
}
```

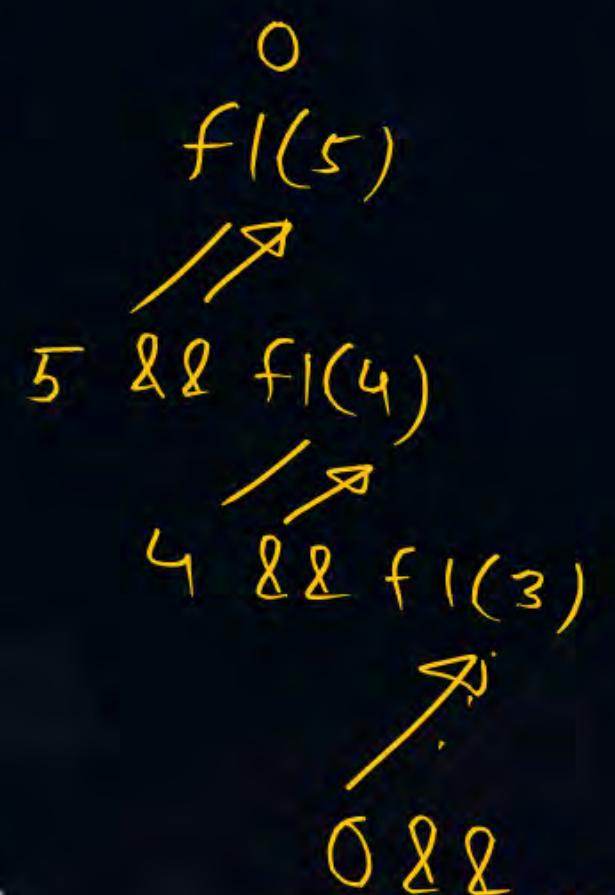
What is the output of fun (5)?

$f1(s) \geq 0$

fun(s)

|

fun(s >> f1(s))



A

Infinite loop

B

Stack over flow

C

0

D

2

[MCQ]



#Q. #include <stdio.h>

```
int fun (int x);
```

```
int f1 (int x) {
```

```
    return x && f1(x-1);
```

```
}
```

```
int fun (int x) {
```

```
    if (x == 0) return 1 ;
```

```
    return fun (x >> f1 (x))
```

```
}
```

What is the output of fun (5)?

$f1(s) \geq 0$

fun(5)
|
fun(5 >> f1(5))

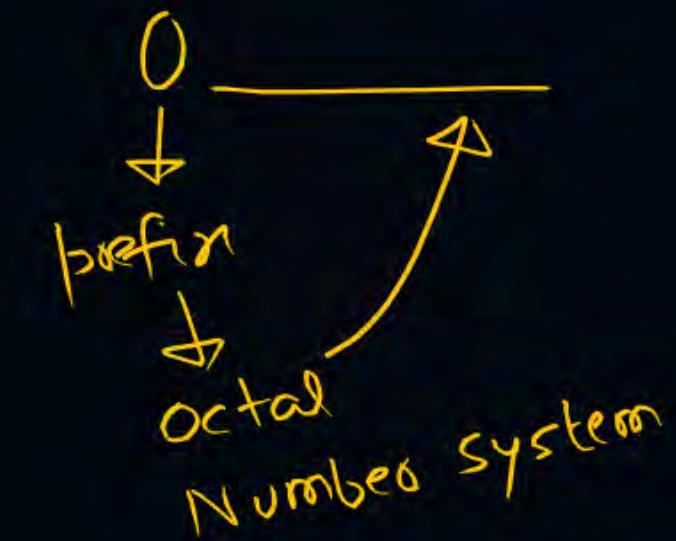
fun(5)
|
fun(5)
|
fun(5)

- A** Infinite loop
- B** Stack over flow
- C** 0
- D** 2



#Q. # include <stdio.h>

```
int main () {
    int x = 0617;
    char *p = & x;
    int ans = size of (p) + x;
    printf ("%d", ans);
    return 0;
}
```



$$n = 0617$$

$$x = (617)_8$$

The output of above code is ____ (consider 64 bit system).

Pointer size : 8 byte

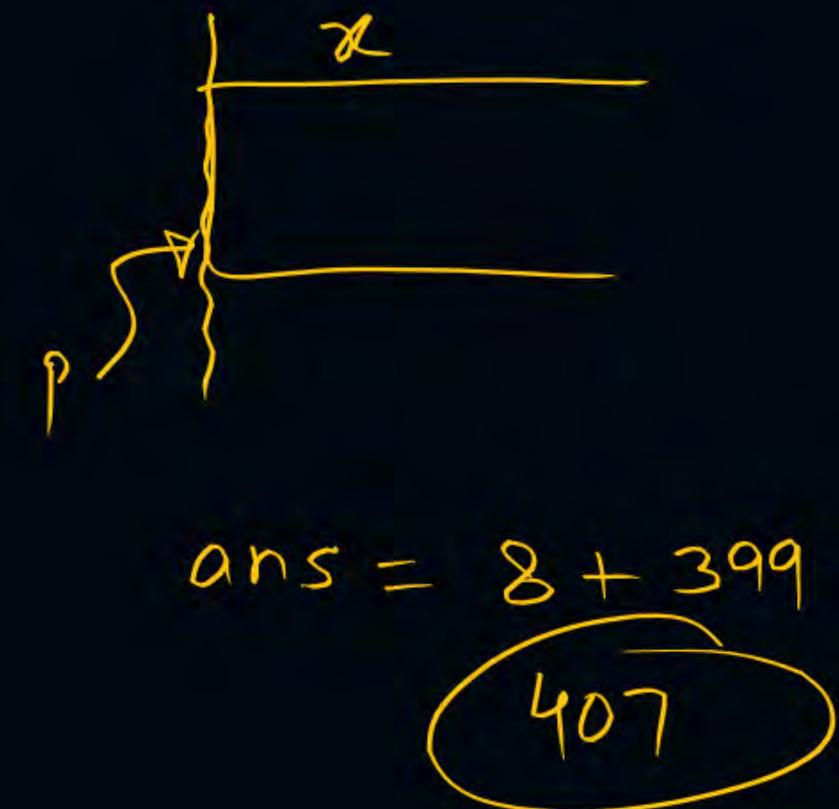
$$\begin{matrix} 617 \\ 8^2 \ 8^1 \ 8^0 \end{matrix}$$

399

$$\begin{aligned} &\Rightarrow 6 \times 8^2 + 1 \times 8^1 + 7 \times 8^0 \\ &\Rightarrow 6 \times 64 + 8 + 7 \\ &\Rightarrow 384 + 15 \end{aligned}$$

#Q. # include <stdio.h>

```
int main () {  
  
    int x = 0617;  
  
    char *p = & x ;  
  
    int ans = size of (p) + x;  
  
    printf ("%d", ans);  
  
    return 0;  
  
}
```



The output of above code is ____ (consider 64 bit system).

[MCQ]

size of op \Rightarrow compile time
 \Rightarrow No Eval.

```
#Q. #include<stdio.h>
int main () {
    int a = 5 ;
    char * b=& a;
    printf ("%d%d, size of (++*b), a);
    return 0;
}
```

Which of the following is the output of above code.

A 45
C 15

B 46
D 16

$\frac{++ * b}{\downarrow}$
sizeof($*b$)
sizeof(char)
 \downarrow
1

#Q. #include <stdio.h>

```
int main () {  
    int arr [ ] = {5,6, 7, 8, 9, 11, 12, 13};  
  
    int sum = 0, *p = arr + 5;  
  
    for (int i = 0; i < 6; i++) {  
  
        sum = sum + * (p-i) - (*p - i);  
    }  
  
    printf ("%d," sum);  
  
    return 0;  
}
```

The output is_____.

Gate Pro

-5

#Q. # include <stdio.h>

```
int main () {  
    int arr [ ] = {1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 21, 22, 23, 24, 25};  
    int * p = & arr [1] + 9;  
    printf ("%d", p [1]);  
    return 0;  
}
```

The output is 22.

$\uparrow \uparrow$
 $P (P+1)$

$P+1 \Rightarrow$ odd. of 22
 $\uparrow (P+1) \Rightarrow 22$
 $P[1]$

21
22

Tomm-



Saturday / sunday / monday





2 mins Summary



Topic One -

Topic Two -

Topic Three

Topic Four

Topic Five



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CS & IT ENGINEERING

Data Structure & Programming

1500 Series

Lecture No.- 0⁵



By- Pankaj Sharma Sir

Recap of Previous Lecture



Topic

Problem Practice Part-04

Topics to be Covered

P
W



Topic

Problem Practice Part-05

[MCQ]



#Q. $a = 5, b = 6, c = 2$; $\sim \sim || 2$
 $a >> c \& b == 5 ^ c || 2$

What does the expression results ?

A 1

B 0

C 5

D 6

binary

↑

Arith ① \times / \cdot

② $+, -$

bitwise LS, ③ $<<, >>$
RS

Rel

④ $<, >, <=, >=$
⑤ $= =, !=$

⑥ &

⑦ ^

⑧ |

⑨ &&

⑩ ||

⑪ ?

⑫ $=, +, -, -, \times, \div, /, \cdot$
 $/, \cdot, \&, ^, \wedge, \vee, \neg$

⑬ ,

<< > <= >= >&

#Q. For the following operators

- (i) <<
- (ii) ==
- (iii) <=
- (iv) & (Bitwise AND)
- (v) (type)



Which one is the precedence order in C

Ex- * > + (Both binary Operators)

A

(i) > (ii) > (iii) > (iv) > (v)

C

(i) > (ii) > (iv) > (iii) > (v)

B

(i) > (ii) > (iii) > (v) > (iv)

D

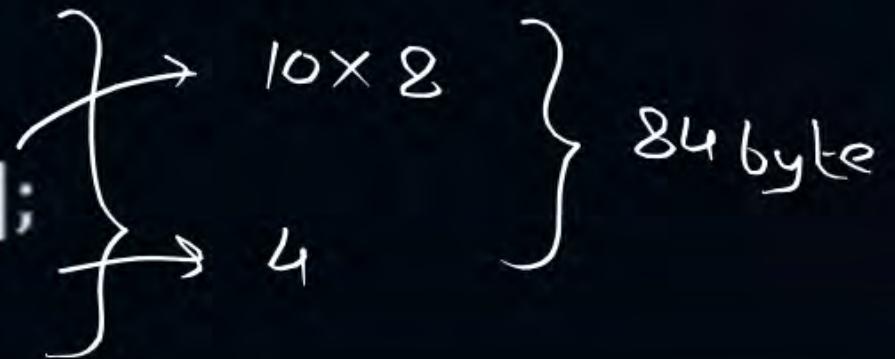
(v) > (i) > (iii) > (ii) > (iv)

[NAT]

Struct \Rightarrow struct



#Q. StructTemp {
 char *strings [10];
 int data;
};



Sizeof (struct Temp)
 \Rightarrow 84 byte

Struct Temp temp [4];
main () {
 temp [1]. strings [3] = "hello world";
 printf("%ld", &(temp[3]. strings[3]));
 print ("%ld", & (temp[3]. strings[4]));
}

If base address of temp is 100, then output of program is _____. (64 bit architecture)

[NAT]

P
W

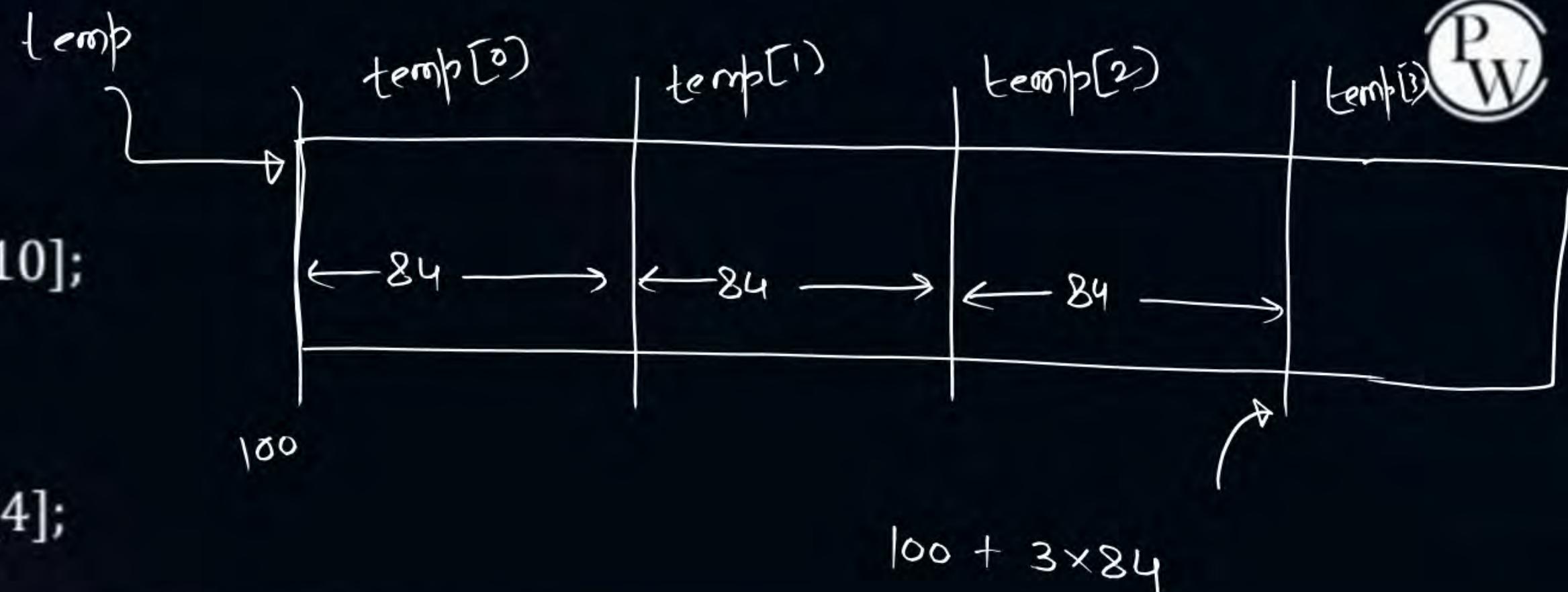
#Q. Struct Temp {
 char *strings [10];
 int data;
};

Struct Temp temp [4];

main () {

X temp [1]. strings [3] = "hello world";
printf("%ld", &(temp[3]. strings[3]));
print ("%ld", & (temp[3]. strings[4]));
}

If base address of temp is 100, then output of program is _____. (64 bit architecture)



[NAT]

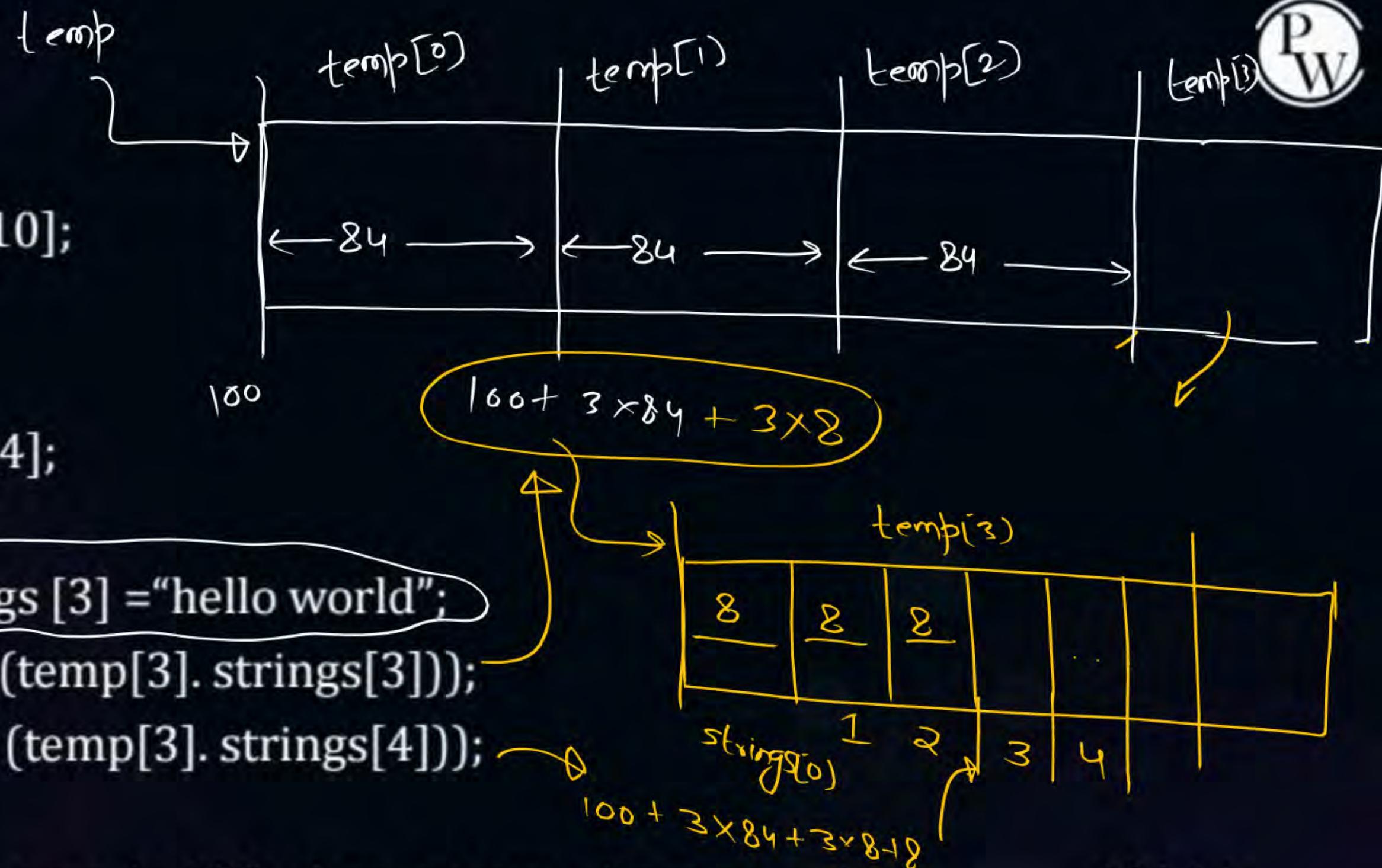
P
W

#Q. Struct Temp {
 char *strings [10];
 int data;
};

Struct Temp temp [4];

main () {

 temp [1]. strings [3] = "hello world";
 printf("%ld", &(temp[3]. strings[3]));
 print ("%ld", & (temp[3]. strings[4]));
}



If base address of temp is 100, then output of program is _____. (64 bit architecture)

#Q. Consider an array A[3][5], the address of A[0][0] is 200 & A[0][1] is 212
then what is the address of A[2][4]

- A 380
- B 368
- C 370
- D 382

R^{AO}

$A_{00} \rightarrow A_{01}$

element size = $212 - 200 = 12 \text{ byte}$

$\text{add}(A_{24})$

$200 + (2 \times 5 + 4) \times 12 \text{ byte}$

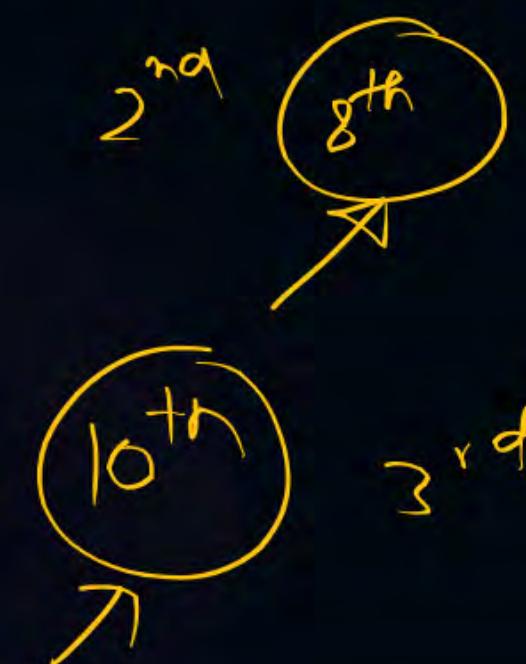
$200 + 14 \times 12$

$200 + 168$

368

#Q. Consider a single linked list of n elements, then the min order of time to interchange m^{th} and l^{th} elements.

- A** $\max(m, l)$
- B** $\max(n, m, l)$
- C** $\min(m, l)$
- D** $l + \min(m, l)$



[NAT]

#Q. Common data for next 2 questions

```
#include <stdio.h>
int main () {
    void print (int x) {
        printf ("%d" x);
    }
    void print square (int x){
        printf ("%d", x*x);
    }
}
print square (x);
void scan (int * a) {
    scanf ("%d", a);
}
```

525

5

525

525

```
int x;
scan(&x);
print(x);
return 0;
```

main

Point(5)
pf(5) /
pf(25)

b) 25

c) 6

d) Errors

a) 525

P
W

[NAT]

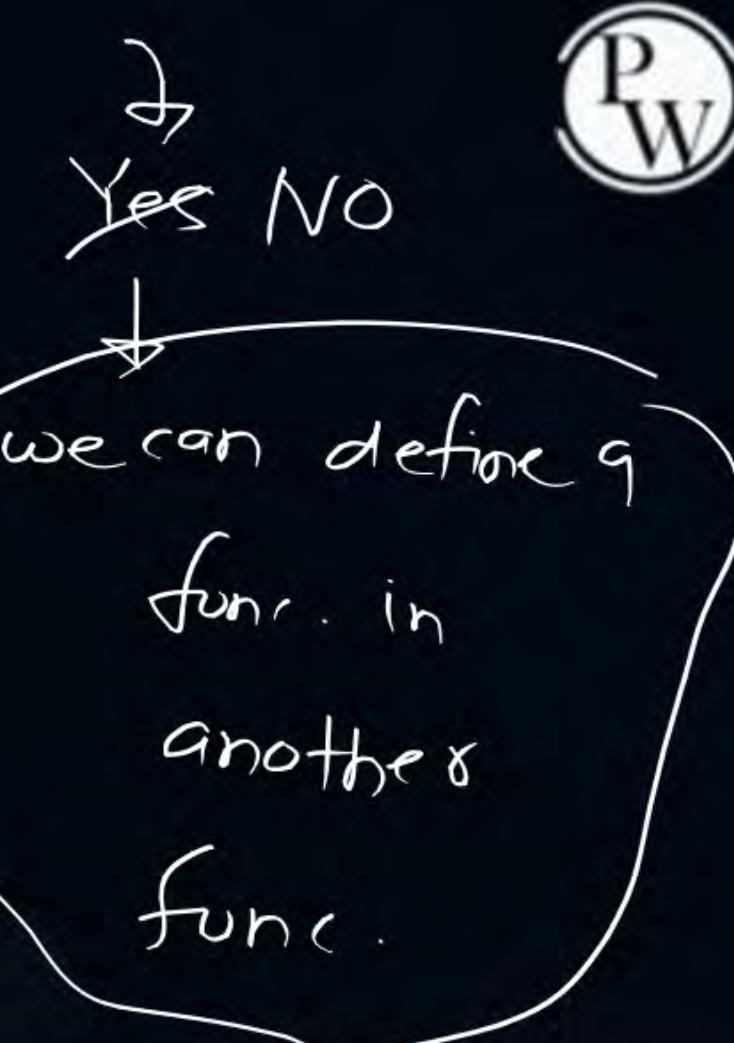
#Q. Common data for next 2 questions

```
#include <stdio.h>
```

```
int main () {  
    void print (int x) {  
        printf ("%d" x);  
    }  
    void print square (int x){  
        printf ("%d", x*x);  
    }  
    print square (x);  
}  
void scan (int * a) {  
    scanf ("%d", a);  
}
```

Standard ✓

```
int x;  
scan(&x);  
print(x);  
return 0;
```



a)

b)

c)

d)

#Q. Output of the program if **input is 5.**

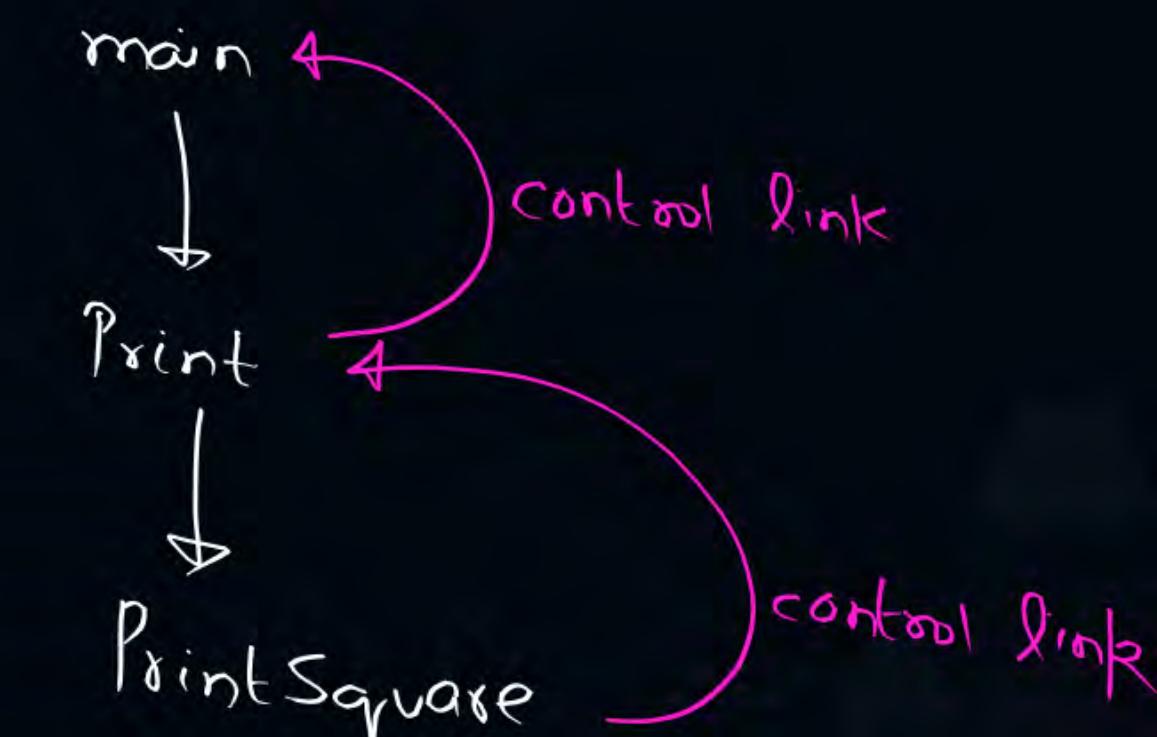
- A** 5 2 5
- B** 2 5
- C** Garbage value
- D** Error at Linking

[MCQ]

#Q. If the calling chain is main → print → printSquare then the **access link** and **control link** of print square is to which function.

Parent function

- A** Main, Print
- B** Print, Print
- C** Main, Main
- D** Null, Main



```
int x = 20;
```

```
f() {
```

```
    int x ; } non-local  
    x++; data
```

```
pf —
```

```
{  
    int y=20;  
    pf("d",x);  
}
```

```
}
```

static
scoping

dynamic
scoping

[MCQ]

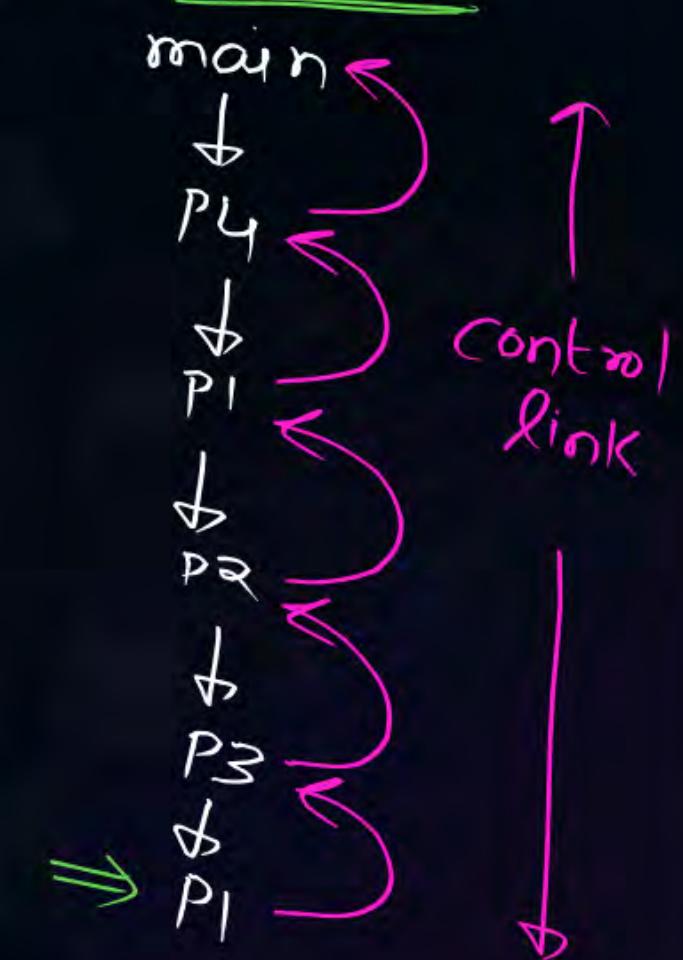
P
W

```
#Q. int main () {  
    void P1() {  
        printf ("Hello");  
        P2();  
    }  
    void P2 () {  
        void P3 () {  
            P1();  
        }  
        P3 ();  
    }  
    void P4() {  
        P1();  
    }  
    P4 ();  
}
```

For the given program the call link is
main → P4 → P1 → P2 → P3 → P1

What is the access link & control link
of the P1 function which is at the top
of control stack.

-  P3 , P4
-  main , P4
-  P3 , P3
-  main , P3



#Q. Struct Temp {
 char * strings [10];
 int data;
};
struct Temp temp [4];
main () {
 temp[3].strings[3] = "hello world";
 printf ("%d", & (temp [3]. strings[3][0]));
}

Hω

The output of program if base address of temp is 100 in a 64 bit architecture computer.

A

292

B

300

C

284

D

None of these

[MCQ]

def. —
#Q. #include <stdio.h>
int main () {
 void print (int x){
 printf ("%d",x) → 5
 }
 }
 → int x = 5 ;
 → print (x);
 → printSquare (x);
}

#define printSquare (x) printf("%d", x*x),



525



Error at load time



Error at linking



Compilation error

Assume
No
Yes

compilation
Execution

#Q. #include <stdio.h>
#define temp(x) printf("%d",x); ~~X~~
#define temp(x) printf("%d", x*x); /*line 1*/
int main () {
 temp(5) /*line 2*/
}

Tellegxam
Lo 4 to 5

✓
⇒ f (" /d ", s + c),

A This program runs perfectly output 5

B Program runs perfectly output 25

C Error of double declaration at line 1

D Missing semicolon at line 2.



2 mins Summary



Topic One -

Topic Two -

Topic Three

Topic Four

Topic Five



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CS & IT ENGINEERING

Data Structure & Programmingg

1500 Series

Lecture No.- 06

By- Pankaj Sharma Sir



Recap of Previous Lecture



Topic

Problem Practice Part-05

Topics to be Covered



Topic

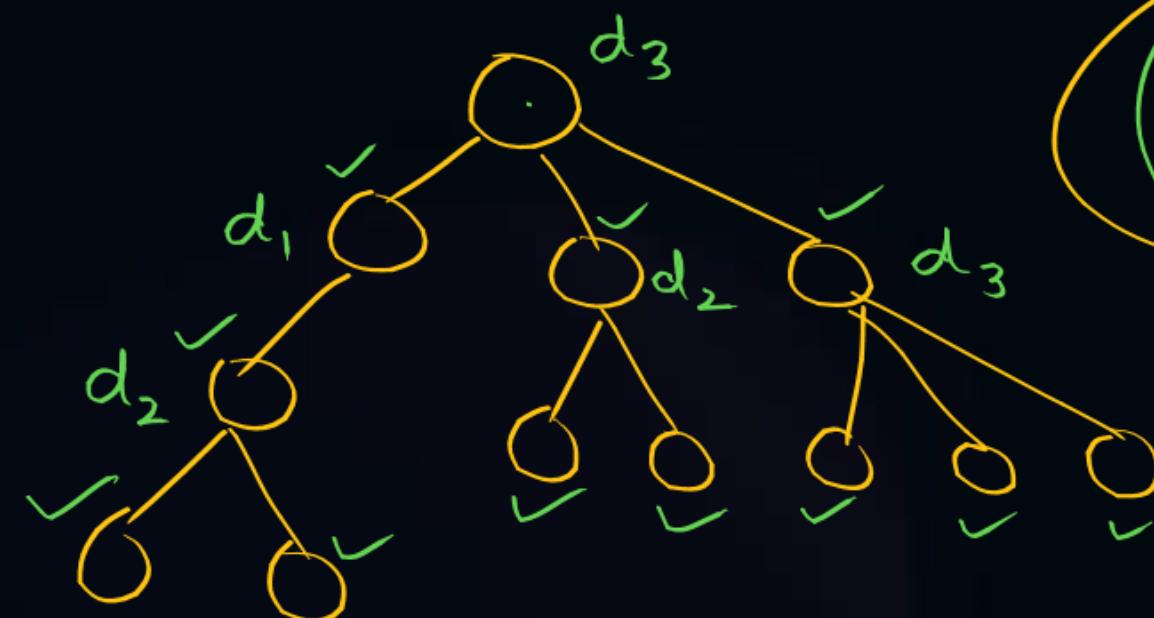
Problem Practice Part-06

[NAT]

P
W



#Q. In a ternary tree, the number of internal nodes of degree 1, 2 and 3 are 3, 5 and 4 respectively. The number of leaf nodes in the given tree is _____



$$(3 + 3 + 2 + 2 + 1) + \text{root}$$

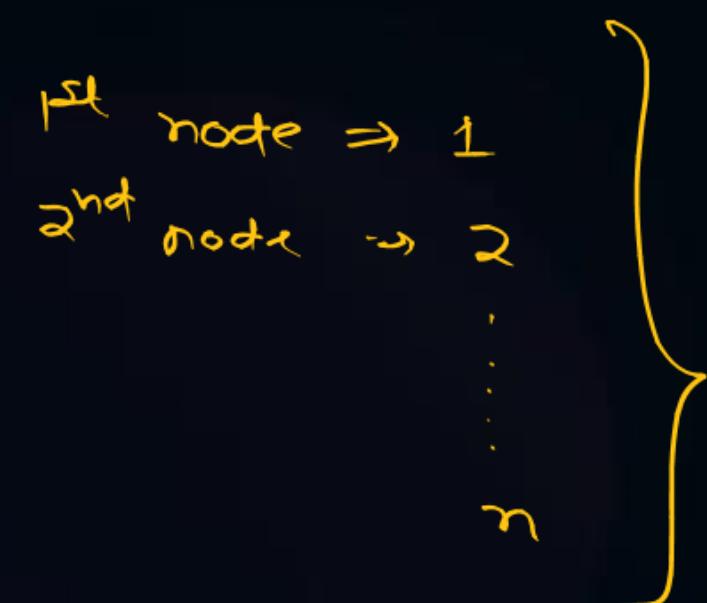
$$N = (3 \times 1) + (5 \times 2) + (4 \times 3) + 1$$
$$= 3 + 10 + 12 + 1$$

$$\boxed{N = 26}$$

$$(3 + 5 + 4 + \text{leaf_nodes}) = 26$$
$$\text{leaf_nodes} = 26 - 12 = 14$$

#Q. The average number of key comparisons required for a successful search in a singly linked list with 50 elements is _____.

Consider elements are in sorted order and traversal of element without comparison is not allowed.



$$\frac{1+2+3+\dots+n}{n} = \frac{n(n+1)}{2}$$

~~= $\frac{n+1}{2}$ - $\left\lceil \frac{51}{2} \right\rceil$~~
~~= 26~~

#Q.

```
# include <stdio.h>
int i; global → 0
int func();
int main() {
    if (i) {
        int i = func();
        main();
    }
    printf("IISC");
    return 0;
}
```

```
int func(){
    return printf("GATE 2024");
}
```

Which of the following is correct output?

- A** GATE 2024 IISC
- B** IISC
- C** Infinite loop
- D** Compile error

#Q. #include <stdio.h>

int a; → static (class)

main () {

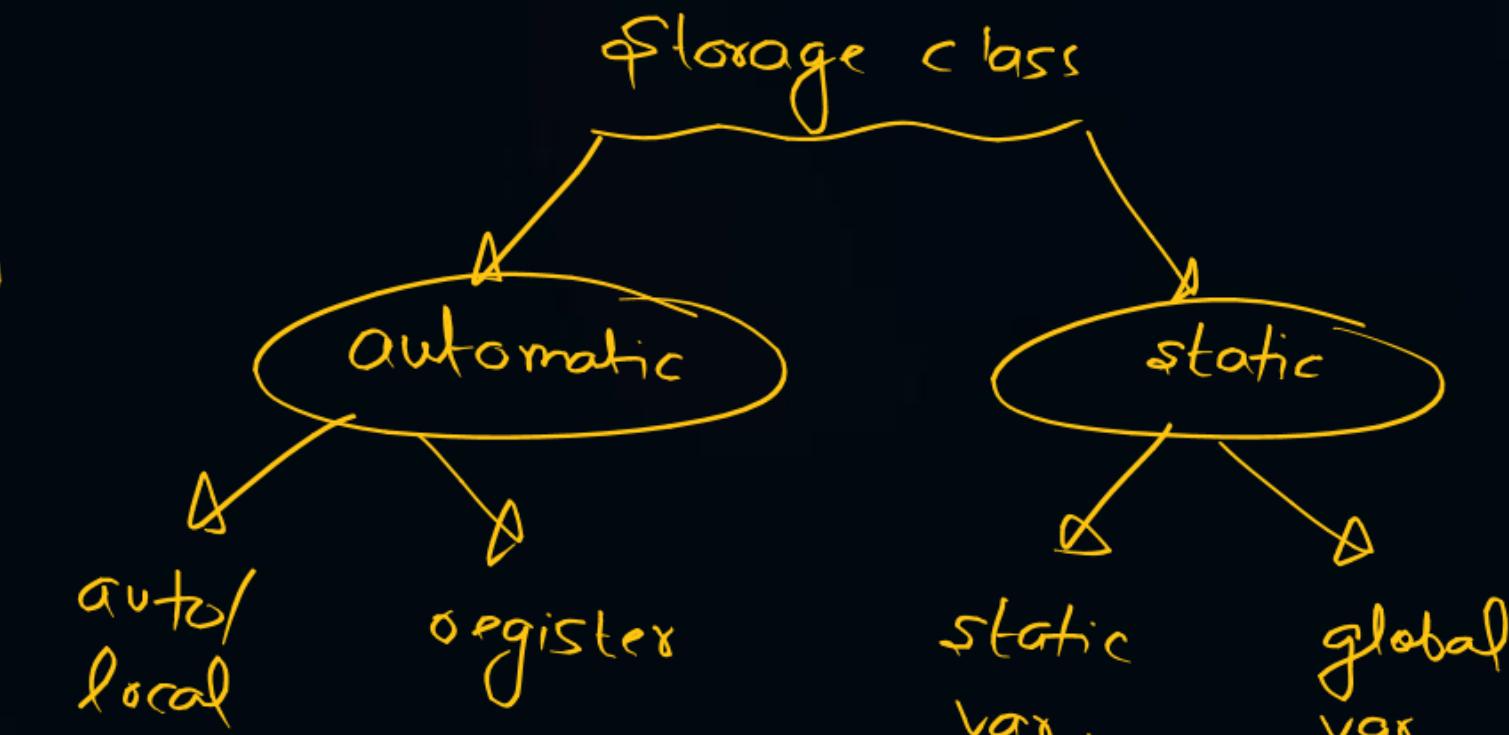
int b; → auto

{

int c; → auto

}

}

Storage class of a, b, c is

A

auto, auto, auto

C

static, auto, extern

B

static, auto, auto

D

auto, static, extern

Logic

#Q. Match the following.

Storage specifier	Storage
(i) Auto	1. CPU Register
(ii) Extern	2. Stack
(iii) Static	3. Data segment
(iv) Register	4. Queue

A

i-1, ii -3, iii-4, iv -2

B

i-2, ii -3, iii-3, iv -1 ✓

C

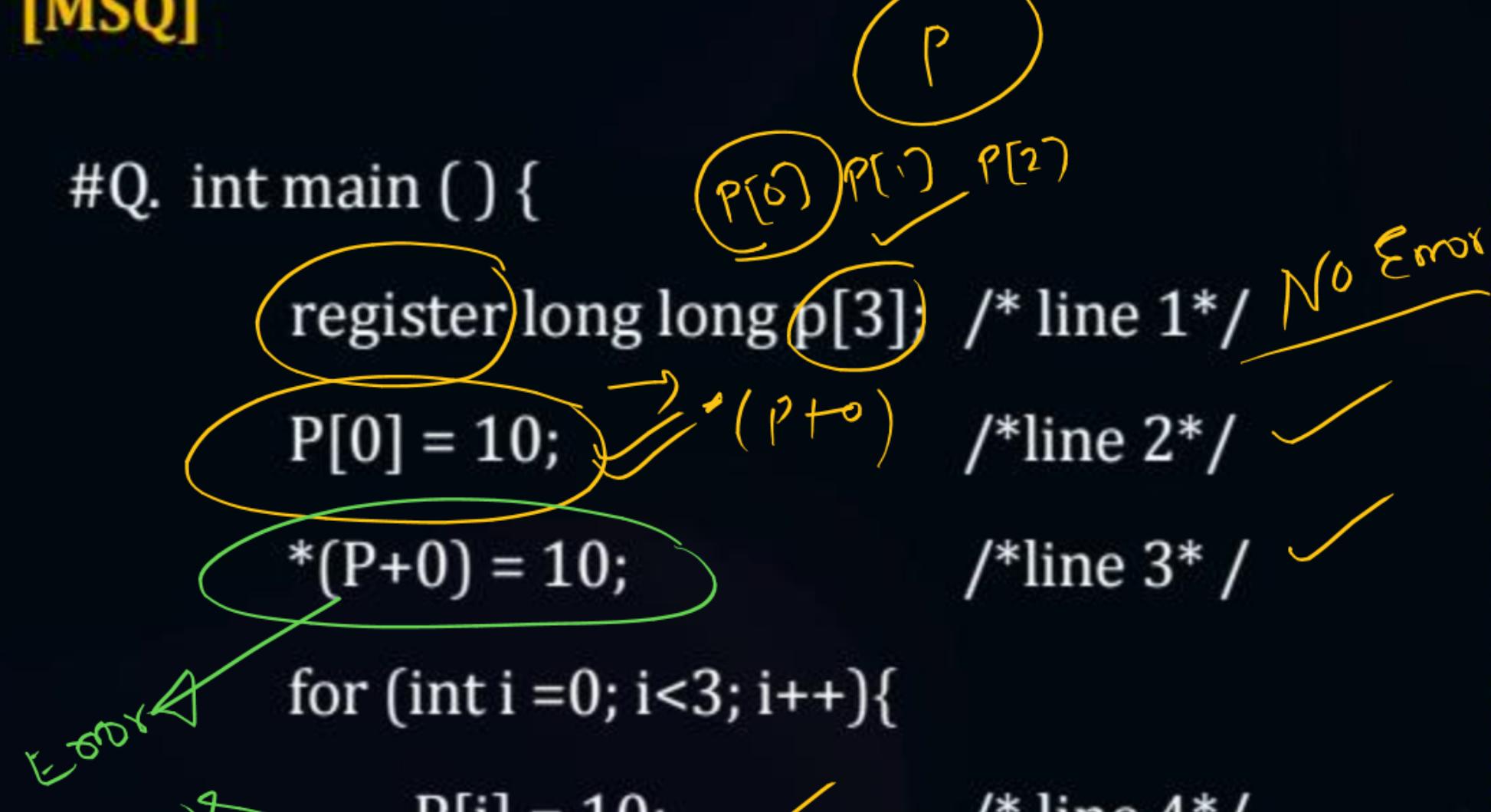
i-3, ii -4, iii-3, iv -3

D

i-4, ii -4, iii-4, iv -4

[MSQ]

```
#Q. int main () {  
    register long long p[3]; /* line 1*/  
    P[0] = 10; /*line 2*/  
    *(P+0) = 10; /*line 3*/  
    for (int i=0; i<3; i++){  
        P[i] = 10; /* line 4*/  
    }  
}
```

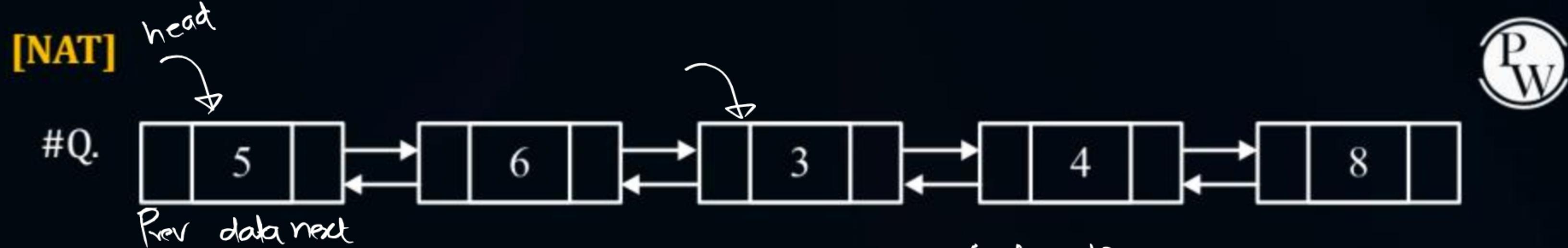


Which of these lines cause compilation error?

2, 3, 4
3, 4 → Aman Gupta

- A 1
- B 2
- C 3
- D 4





head is pointing to
of $(\text{head} \rightarrow \text{next} \rightarrow \text{prev}) \rightarrow \text{next} \rightarrow \text{next}$ 3.
 \nwarrow first node
 the linked list. What is the value

$\underbrace{\text{head} \rightarrow \text{next} \rightarrow \text{next}}$: 3rd node

#Q. $a = 6, b = 2$:

$a >> 8$ || $b >> 2 \&\& 6 \& a | b ^ b$

What is the output after solving the expression is 0.

$0 || (b >> 2 \&\& 6) \& a | b ^ b$

Priority

$0 \&\& 6$
 $0 || (0 \& a) | b ^ b$
 $0 || 0 | b ^ b$

→ LS, RS
 $<, <=, >, >=$
 $=, !=$
&
^
|

→ &&
|| ✓
P:
Assignment,
, ,

[MCQ]



```
#Q. #include<stdio.h>
struct new {
    int data;
    int (*getData) (struct new*);
```

};

```
int newGetData (struct new * self){5000
    printf ("%d", self →data)
}
```

int main () {
 struct new temp;^{var. of type}
 temp.data = 5;
 temp.getData = newGetData;
 temp.getData (&temp);
 return 0;

newGetData(⁵⁰⁰⁰)

Output of the program is.

- A** Compilation error
- B** Garbage value
- C** Segmentation fault
- D** 5 ✓

```
#Q. struct new {
    int *data;
};

main () {
    struct new a, * b;
    a.data = (int *) malloc (size of (int));
    * (a.data) =5;
    b = &a;
    printf ("%d", ____);
}
```

Which of the following will print 5?

A

$*b \rightarrow \text{data}$

C

$*(*b) . \text{data}$

B

$(*b) \rightarrow \text{data}$

D

$*(\mathbf{b} \rightarrow \text{data})$

A, D \Rightarrow same

* $b \rightarrow \text{data}$

* $(\mathbf{b} \rightarrow \text{data})$

* $(^*b) . \text{data}$

* $((^*b) . \text{data})$

* $(\mathbf{b} \rightarrow \text{data})$

#Q. int total;

int fun(int x) {

if (x == 1)

return (3);

 total = fun ($\frac{x}{2}$) + 3 * (x % 2);

return (total);

}

$$\text{fun}(1) = 3$$

$$\text{fun}(2) = \text{fun}(1) + 3 * (0) \Rightarrow 3 + 3 * 0 = 3$$

$$\text{fun}(3) = \text{fun}(1) + 3 * 1 \Rightarrow 3 + 3 = 6$$

$$\text{fun}(4) = \text{fun}(2) + 3 * 0 \Rightarrow 3$$

$$\text{fun}(5) = \text{fun}(2) + 3 * 1 \Rightarrow 3 + 3 = 6$$

$$\text{fun}(6) = \text{fun}(3) + 3 * 0 = 6$$

$$\boxed{\text{fun}(7) = \text{fun}(3) + 3 * 1 = 3 + 3 = 9}$$

$$\text{fun}(8) = \text{fun}(4) + 3 * 0 = 3$$

$$\text{fun}(9) = \text{fun}(4) + 3 * 1 = 3 + 3 = 3 \cdot 2 = 6$$

Between 1 to 100 the maximum return value of fun (x) is 9.

$$\begin{array}{c} \text{fun}(6) \rightarrow 110 \\ \text{fun}(110) \Rightarrow \text{fun}(11) + 3 \\ \quad \quad \quad + 3 \end{array}$$

#Q. int total;

```
int fun(int x) {  
    if (x == 1)  
        return (3);  
  
    total = fun ( $\frac{x}{2}$ ) + 3 * (x % 2);  
    return (total);  
}
```

18

111
25-1
63

Between 1 to 10, the maximum return value of fun (x) is ____.

[MCQ]

P
W

#Q. int fun(int x, int n) {

int total = 0;

base case

if ($x < n$)
 return (n);

total = fun ($\underline{x/n}$, n) $\times \underline{n}$;

return (total);

}

A) 14 X

B) 2 X

C)

D)

n^n

$$\text{fun}(7, 2) = 8$$

time / PWpankajsip

$$\text{fun}(7, 2)^8$$

\downarrow
 $\text{fun}(3, 2) \times 2$

\downarrow
 $\text{fun}(1, 2)^2 \times 2$

$\log_2 7$

\downarrow
 $\log_2 x$

$2^{\log_2 7}$

\downarrow
 n

B x

D $n^{\lceil \log_n x \rceil}$

What value this function return ($x, n > 0$) ;

A

$n \times x$

$\Rightarrow \lfloor \log_n x \rfloor$

C

$n^{\lfloor \log_n x \rfloor} \rightarrow n$

$$2^{\lfloor \log_2 7 \rfloor} = 2^2 = 4$$

#Q. int i;

```
void main () {  
    for (i = 0; i < 10; i++) {  
        int i;  
        i = i-1;  
    }  
}
```

What is result of code ?

A

Compile error : redeclaration of ;

B

Code never terminates

C

For loop executed 10 time

D

Runtime error: redeclaration of ;



2 mins Summary



Topic One -

Topic Two -

Topic Three

Topic Four

Topic Five



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CS & IT ENGINEERING

Data Structure & Programming

1500 Series

Lecture No.- 07

By- Pankaj Sharma Sir



Recap of Previous Lecture



Topic

Problem Practice Part-06

Topics to be Covered



Topic

Problem Practice Part-07

[MCQ]

#Q. int i;

```
void main () {  
    for (i = 0; i < 10; i++) {  
        int i = i;  
        i = i - 1;  
        printf ("%d", i);  
    }  
}
```

What will code print.

int i = i; 

more local scope

- A** 0 1 2 3 4 5 6 7 8 9
- B** -1 0 1 2 3 4 5 6 7 8
- C** Complie error at int i = i
- D** Printed all garbage values

#Q. int * give_addr(int x){
 return (& x); }
void main (){
 int x = 10 , y = 20;
 int * x1 = give_addr (x);
 int* y1 = give_addr(y);
 int c;
 c = *x1;
 *x1 = *y1;
 *y1 = c;
 printf("%d %d", x, y);
}

Activation record
(local var.)
addr. of local var.

A

10 20

B

20 10

C

Compile error



Runtime error

What will code print

[NAT]

P
W

#Q. void util (int*p) {

p = p + 1;

}

int main () {

int a = 5;

int*p = &a;

util (²⁰³⁶p);

⇒ printf("%d", *p);

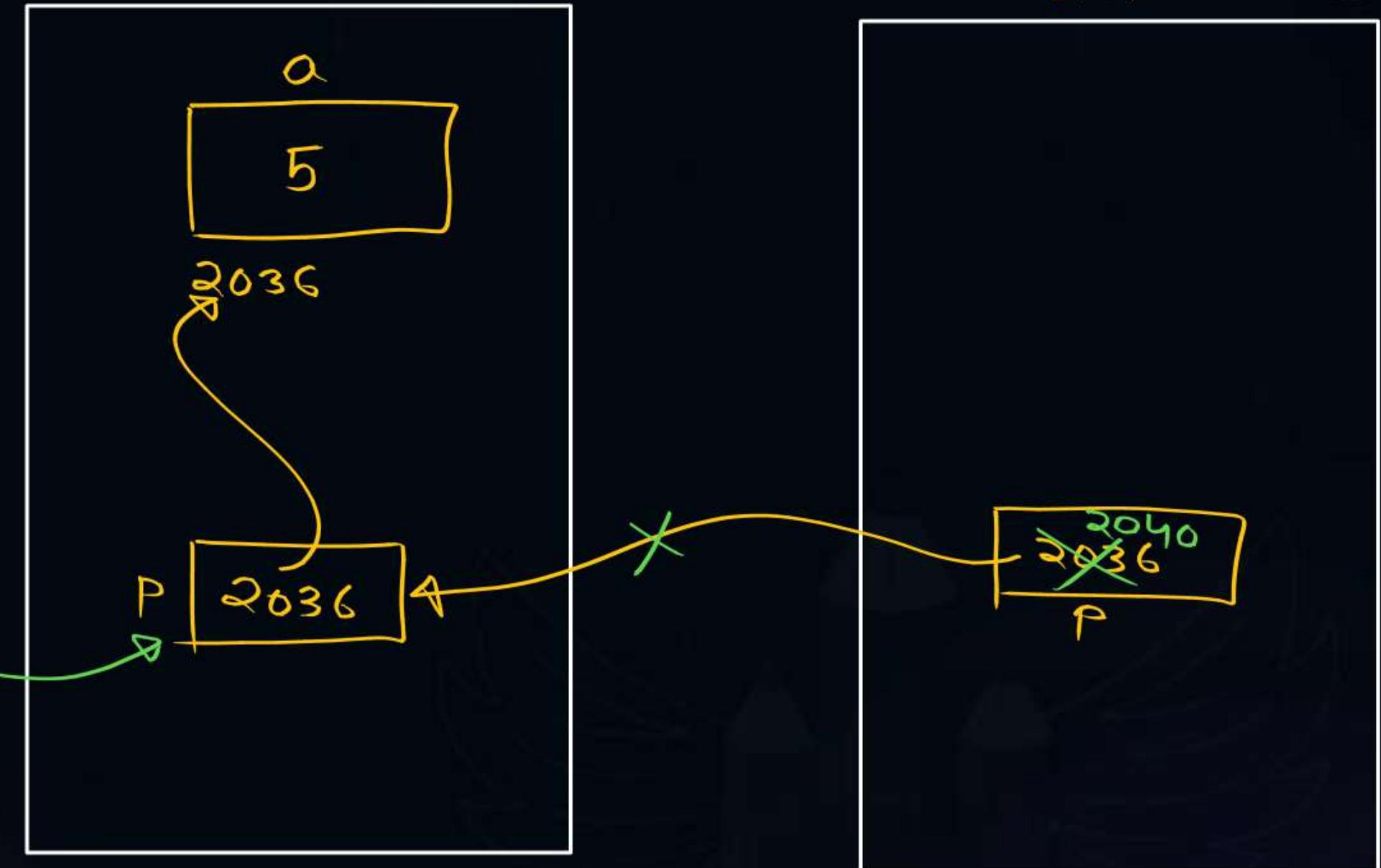
return 0; 5

}

The output of above given code snippet is ____.

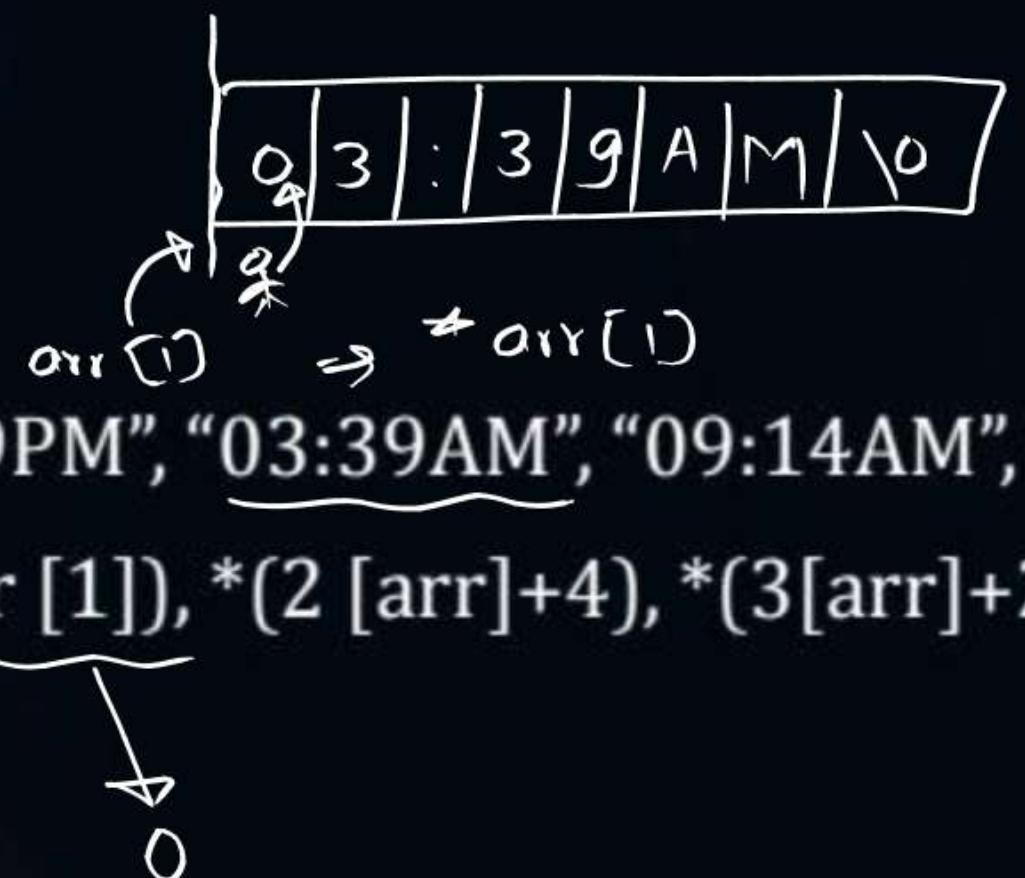
main

util



[MCQ]

arr[0]
arr[1]



```
#Q. int main () {  
    char * arr [4] = { "11:59PM", "03:39AM", "09:14AM", "00:01PM" };  
    printf("%c%c%c", *(arr [1]), *(2 [arr]+4), *(3[arr]+2));  
    print("%s", arr [2]+3);  
    return 0 ;  
}
```

Which of the following is the output of the above code.

A

03 : 04AM

B

15:09AM

C

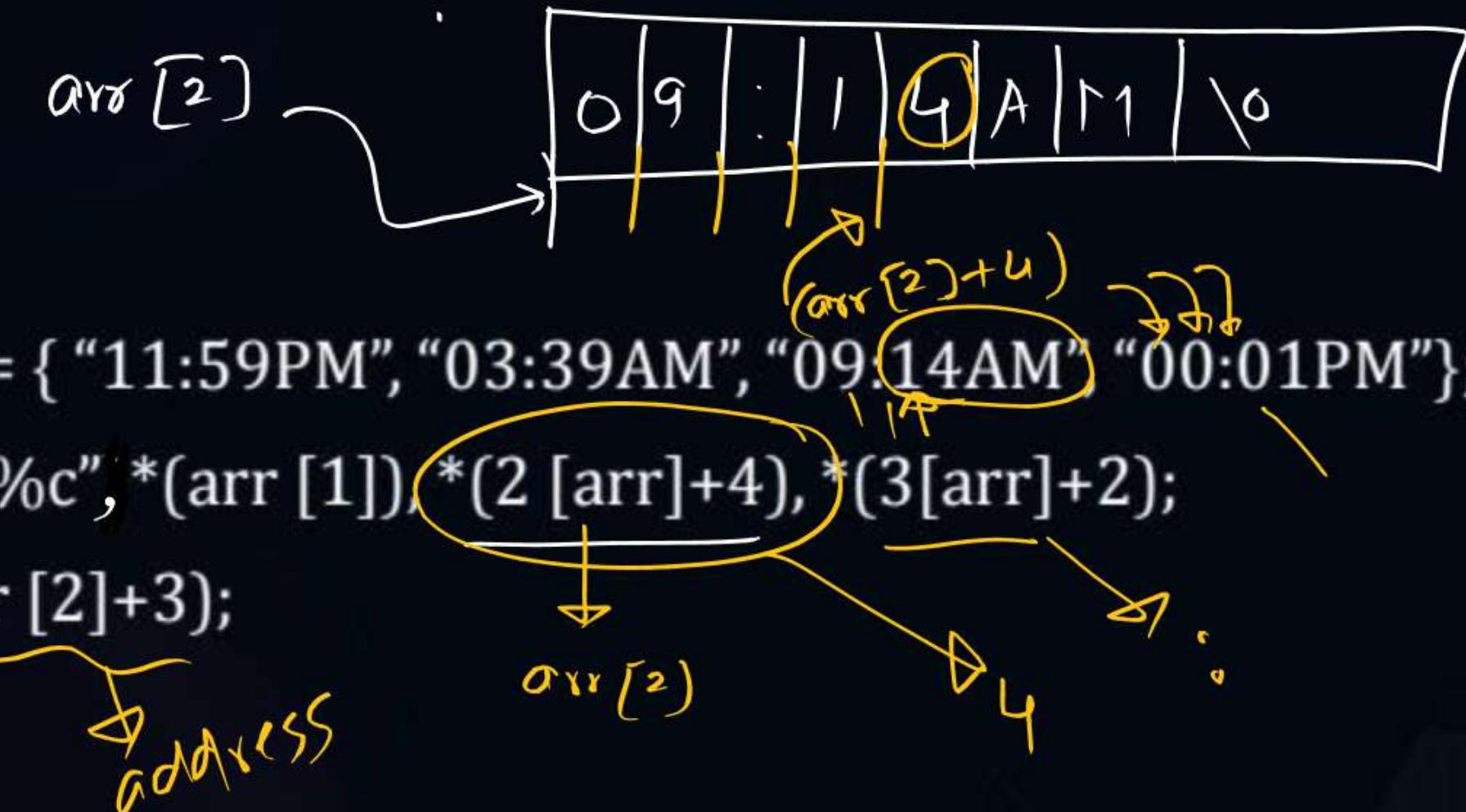
04:14 AM

D

03:14 PM

[MCQ]

```
#Q. int main () {  
    char * arr [4] = { "11:59PM", "03:39AM", "09:14AM", "00:01PM";  
    printf("%c%c%c", *(arr [1]), *(2 [arr]+4), *(3[arr]+2));  
    print("%S", arr [2]+3);  
    return 0 ;  
}
```



Which of the following is the output of the above code.

- A** 03 : 04AM
- C** 04:14 AM

- B** 15:09AM
- D** 03:14 PM

#Q. Which of the following is correct matching.

- (a) Null pointer
- (b) Void pointer
- (c) Dangling pointer
- (d) Wild pointer

A

a - r, b-q, c-s, d-p

B

a-r, b-s, c-p, d-q

C

a-p, b-s, c-r, d-q

D

a -r, b-s, c-q, d-p

wild pointer (uninitialized)

p: int * a;
 $*a = 10;$

q: void main () {
 int *a;
 int func () {
 int q = 5; *local*
 a = & q;
 } *local*
 } *local*

r: int*a = (int*) 0; *Null pointer*

s: void *a;
 int s = 15 *Void pointer*
 a = & s;
 printf ("%d", *(int*)a);

[NAT]

P
W

```
#Q. int main () {  
    int count = 0;  
    for (int k = 1; k <= n; k ++ ) {  
        for (int i= k; i <= 2 * k; i ++ ) {  
            count++;  
        }  
    }  
    printf("GATE %d", count);  
    return 0;  
}
```

$$\sum_{k=1}^n \left[\sum_{i=k}^{2k} (1) \right]$$

$k+2k \rightarrow 2k-k+1$
 $\Rightarrow (k+1)$
1 + 1 + 1 + ...
Times

$$\sum_{k=1}^n (k+1)$$

$$\left(\sum_{k=1}^n k \right) + \sum_{k=1}^n 1$$
$$(1+2+3+\dots+n) + (n)$$
$$\frac{n(n+1)}{2} + n$$

The output of above is GATEx, x = _____ consider n = 62.

```
#Q. int main () {
    int count = 0;
    for (int k = 1; k <= n; k ++ ){
        for (int i= k; i <= 2 * k; i ++ ) {
            count++;
        }
    }
    printf("GATE %d", count);
    return 0;
}
```

GATE 2015

The output of above is GATEx, x = _____ consider n = 62.

$$\sum_{k=1}^n \left[\sum_{i=k}^{2k} (1) \right]$$

$K \rightarrow 2K \rightarrow 2k - k + 1 \rightarrow (k+1)$
 $1 + 1 + 1 + \dots$ times

$$\sum_{k=1}^n (k+1)$$

$$\text{count} = \frac{62 \times 63}{2} = 1953$$

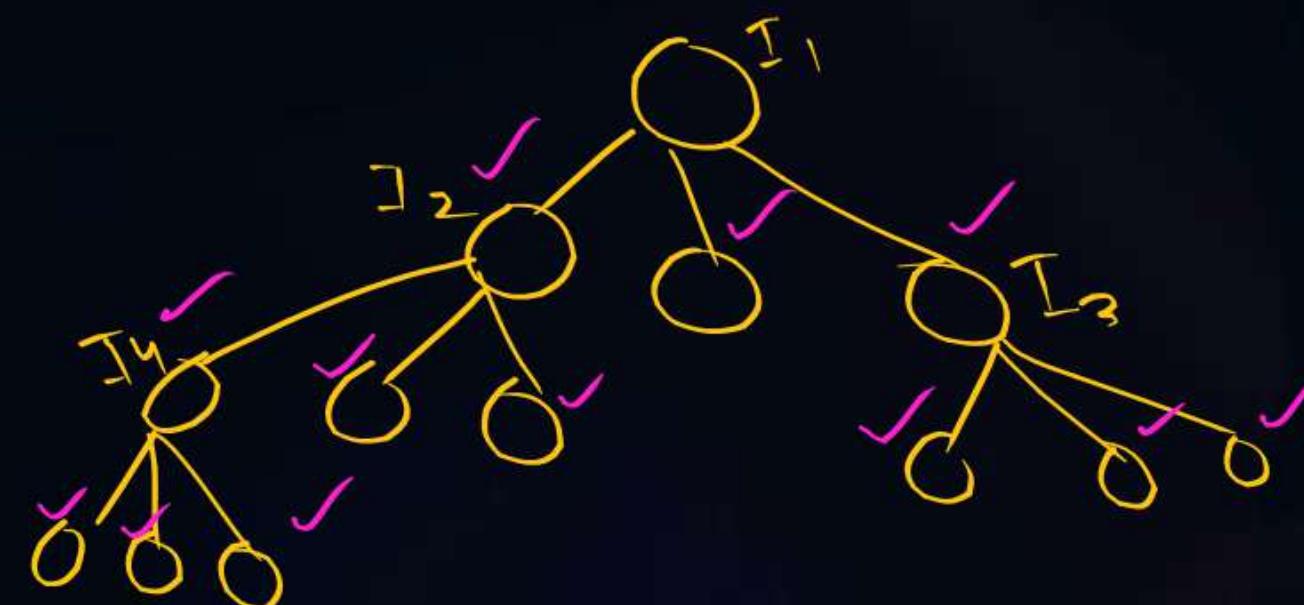
$$(1 + 2 + 3 + \dots + n) + (n) = \frac{n(n+1)}{2} + n \Rightarrow 1953$$

$$\frac{62}{2015}$$

#Q. A complete n-ary tree is a tree in which each node has n children or no children (leaf node). Let, I be the number of internal nodes and L be the number of leaf nodes. If $L = 1027$, $I = 54$ then $n = \underline{\hspace{2cm}}$.

Complete 3-ary

4 internal nodes $\Rightarrow 4 \times 3$



$$\text{Total} = 4 \times 3 + 1$$

n-ary tree

$$\text{Total} = n \times I + 1$$

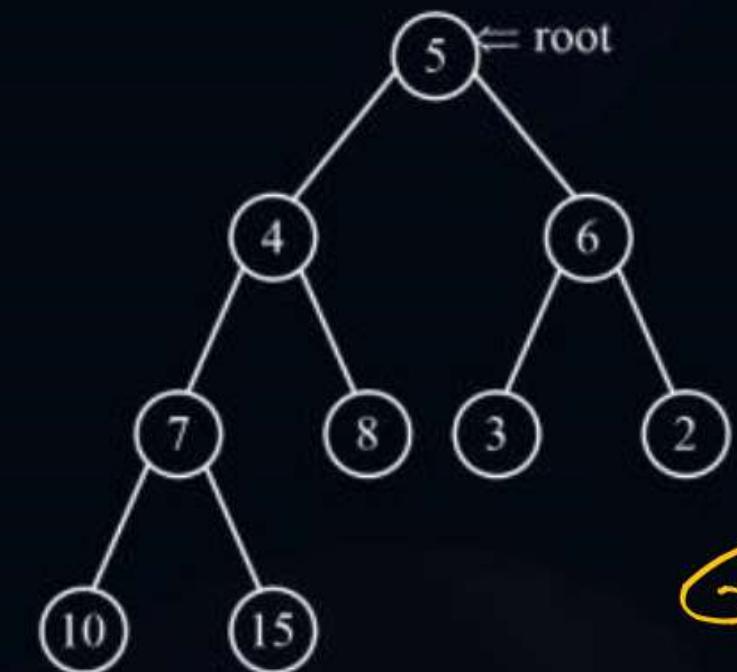
$$n \times 54 = 1080$$

$$n = \frac{1080}{54} \Leftrightarrow 20$$

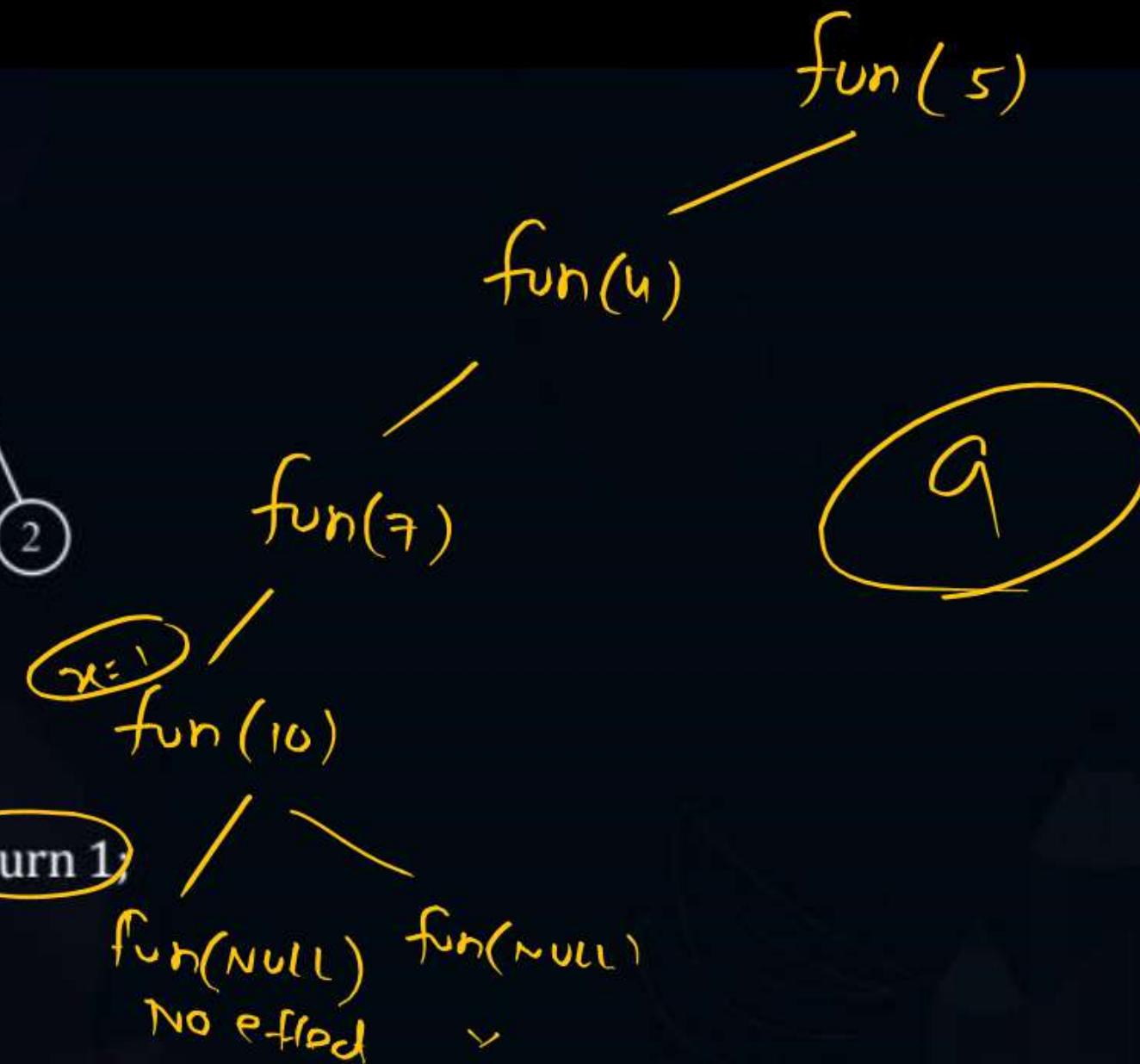
$$\begin{aligned} L + I &= n \times I + 1 \\ 1027 + 54 &= n \times 54 + 1 \\ 1081 &= n \times 54 + 1 \end{aligned}$$

[NAT]

#Q.



```
int fun (root) {  
    if (root == NULL) return 1;  
    static int x = 0;  
    ✓ fun (root → left);  
    fun (root → right);  
    x += 1;  
    return x;  
}
```



What is the output of the function for the given tree is _____.



[MCQ]



```
#Q. int fun1 (int n){  
    if (n == 1) return n;  
    fun2 (n - -);  
    return n;  
}
```

```
int fun2 (int n){  
    if (n == 0) return n;  
    fun1 (n - -);  
    return n;  
}
```

fun1(5)
|
fun2(5)
|
fun1(5)
|
fun2(5)

What is the output of fun1 (5) ?

A

4

C

infinite loop

B

1

D

stack overflow

#Q. Which of the following permutation can be obtained in the same order using a stack assuming that input is the p, q, r, s, t in that order ?

A ~~r, s, t, p, q~~

Push p, q, r
Pop()

C r, s, t, q, p

Push(s)
Pop()
Push(t)
Pop()

B p, t, q, r, s

D t, s, r, p, q



#Q. Which of the following permutation can be obtained in the same order using a stack assuming that input is the p, q, r, s, t in that order ?



Push P, q, r

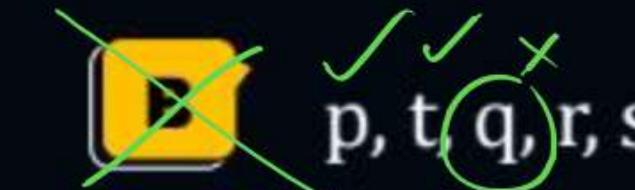
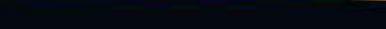
Pop()

Push(s)

Pop()

Push(t)

Pop()



Push(P)

Pop()

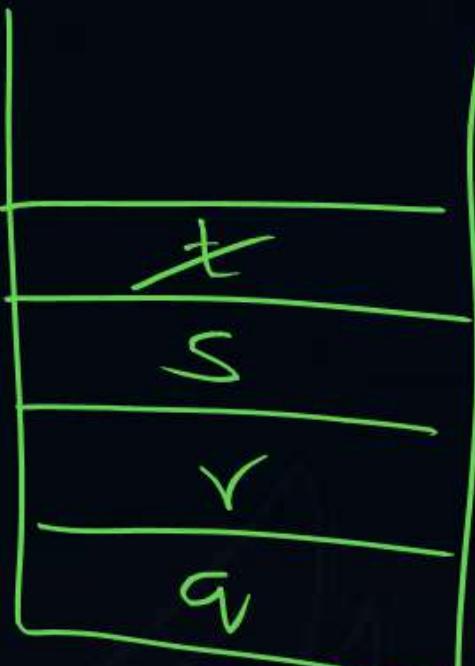
Push q

↑

Push s

↓

Pop()



#Q. Which of the following permutation can be obtained in the same order using a stack assuming that input is the p, q, r, s, t in that order ?

- A r, s, t, p, q
~~C~~ r, s, t, q, p

- B p, t, q, r, s
D t, s, r, p, q

Push P

↓ q

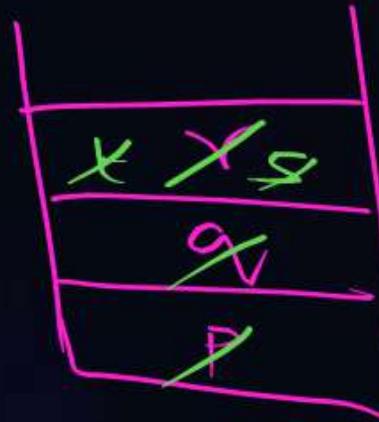
Pop()

Push(s)

Pop()

Push(t)

Pop()



```
#Q. void func (int n, int* ptr) {
    if (n <=1) {
        if (n ==1)
            (*ptr)++;
        return;
    }
    func (n n/2, ptr);
    if (n%2 == 1)
        (*ptr)++;
    func (n n/4, ptr);
}
```

int main () {

int count = 0;

func(255, & count);

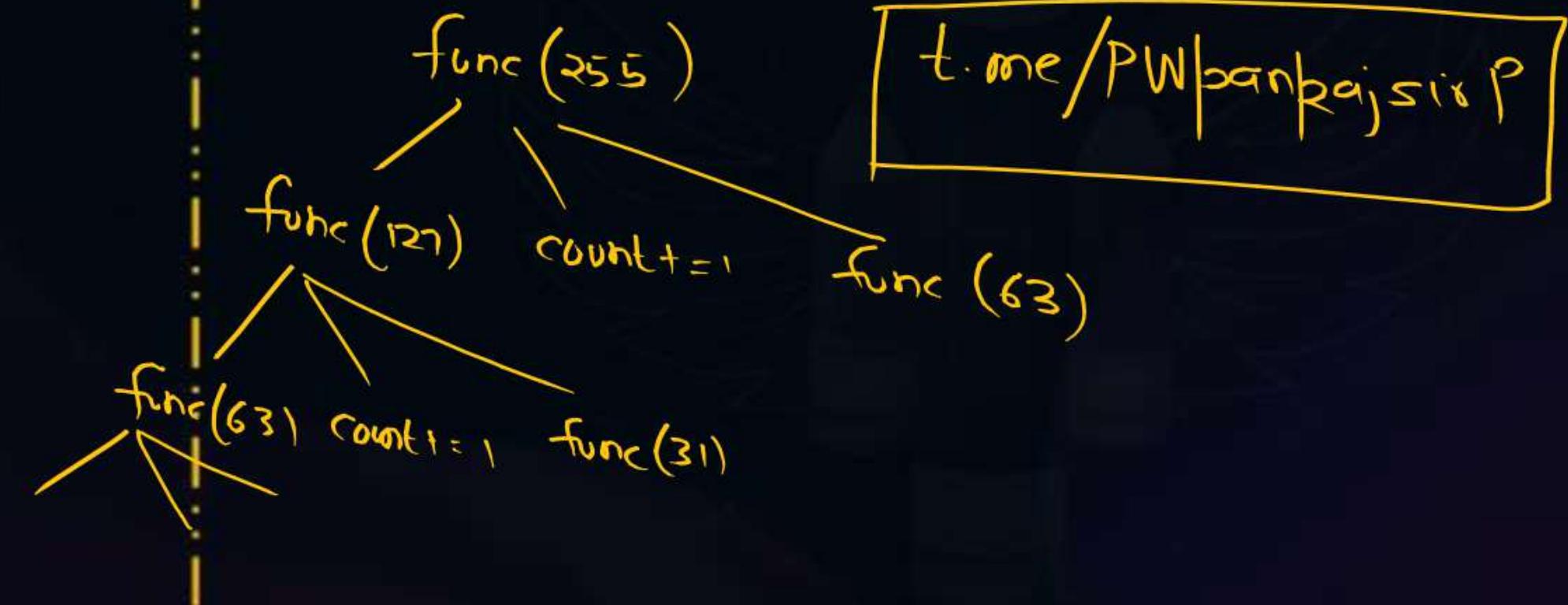
printf ("%d", count);

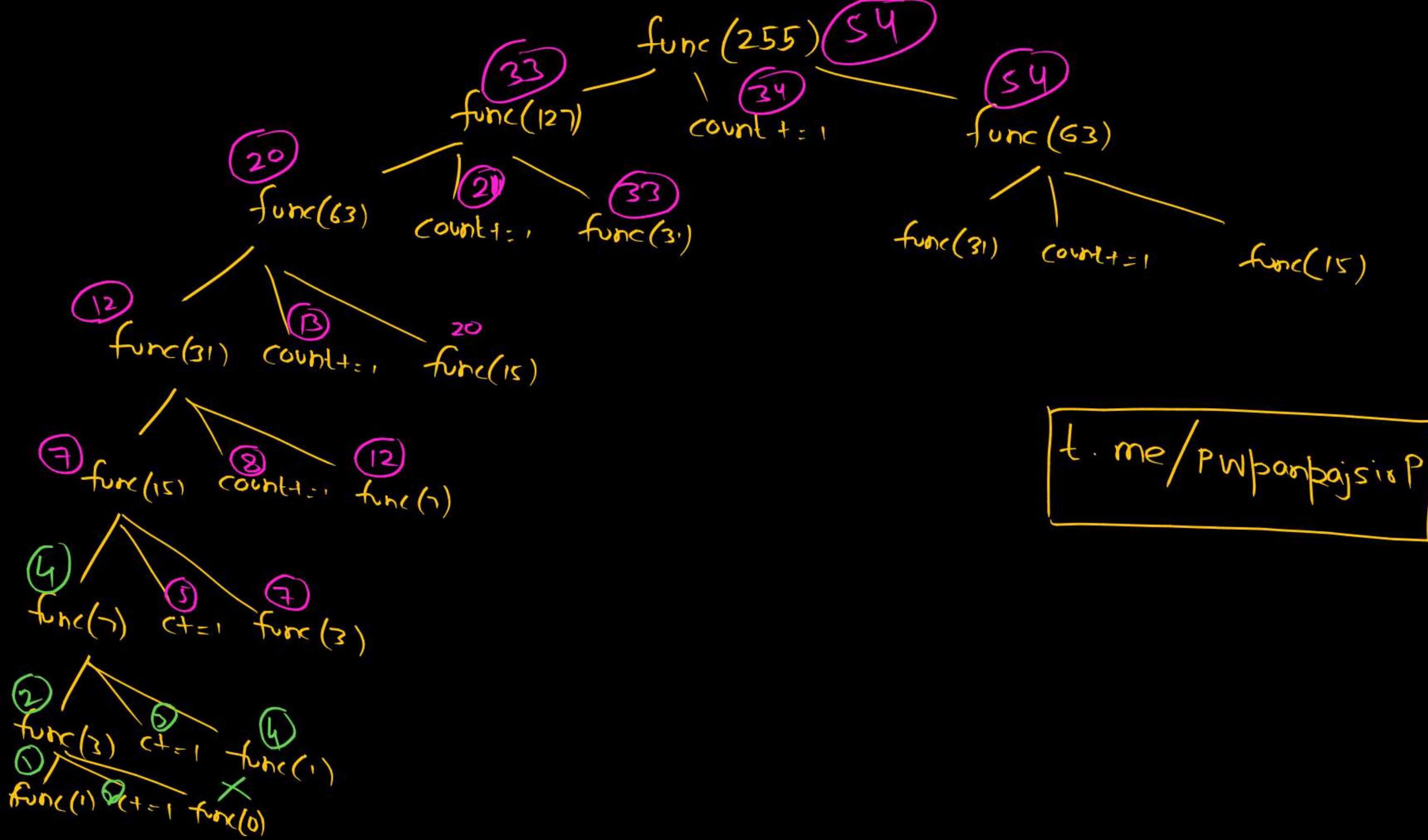
}

54

lengthy

The output of above code is_____.







2 mins Summary



Topic

One -

Topic

Two -

Topic

Three

Topic

Four

Topic

Five



THANK - YOU