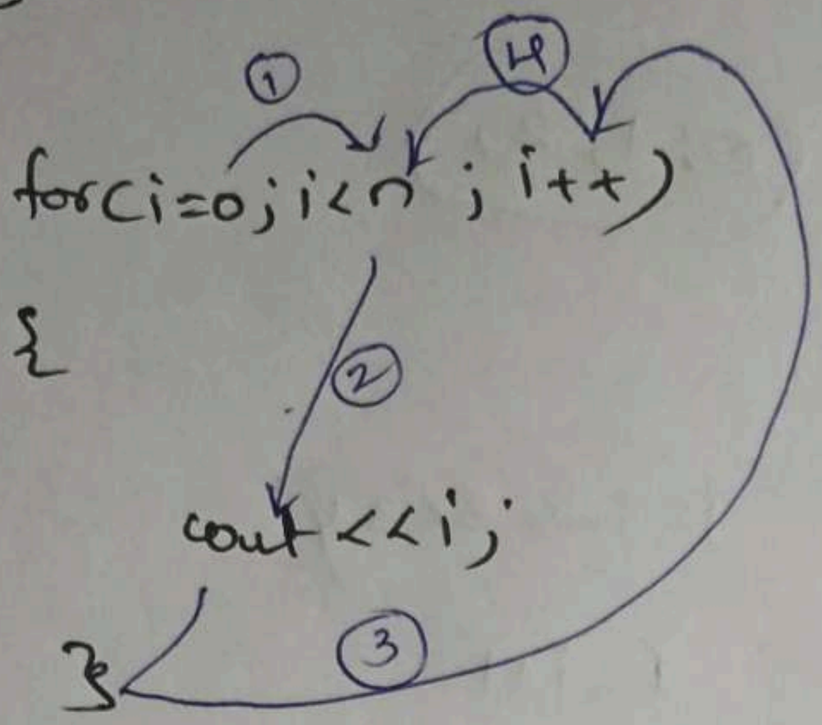
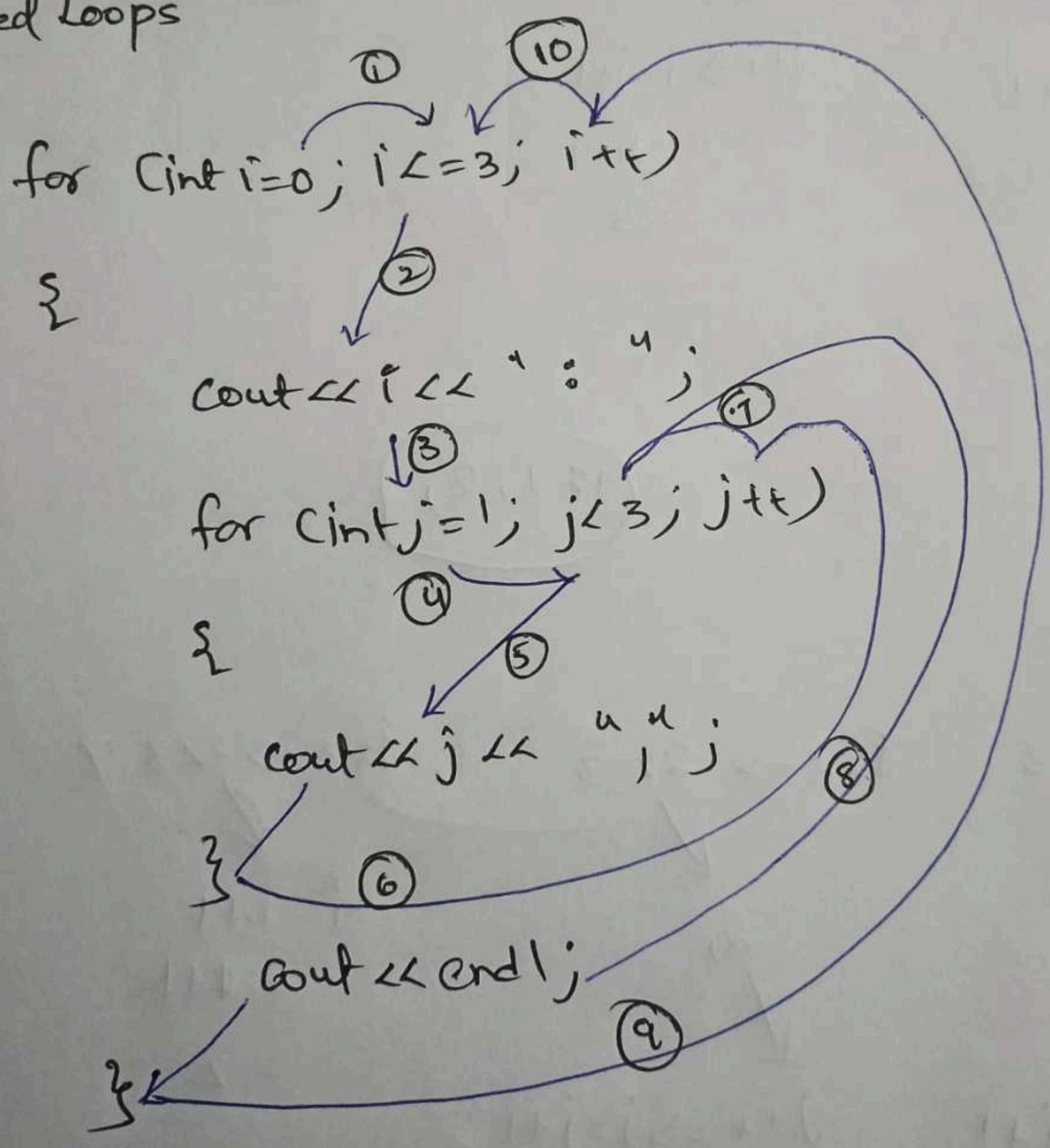
① Loops



② Nested Loops



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i=0 → 0<=3

↓

0:

↓

j=1 → 1<3

↓

1,

↓

j++ ⇒ j=j+1

=1+1=2

j=2 → 2<3

↓

2,

↓

j++ ⇒ j=j+1

=2+1

=3

j=3 → 3<3 ✗

i=i+1

=0+1

=(1)

(0: 1, 2,)

i=1 → 1<=3

↓

1:

↓

j=1 → 1<3

↓

1,

↓

j++ ⇒ j=j+1

=1+1

=2

j=2 → 2<3

↓

2,

↓

j++ ⇒ j=j+1

=2+1

=3

j=3 → 3<3 ✗

↓

i=i+1

=2+1

=2

(1: 1, 2,)

$i=3 \rightarrow 3i=3$

$3: 1, 2, 3$

$j=1 \rightarrow 1<3$

$1, 2, 3$

$j++ \Rightarrow j=j+1$

$=1+1$

$=2$

$j=2 \rightarrow 2<3$

$2, 3$

$j++ \Rightarrow j=j+1$

$=2+1$

$=3$

$j=3 \rightarrow 3<3$ ✗

$i=i+1$

$=3+1$

$=4$

$2: 1, 2, 3$

$i=2 \rightarrow 2<3$

$2:$

$j=1 \rightarrow 1<3$

$1,$

$j++ \Rightarrow j=j+1$

$=1+1$

$=2$

$j=2 \rightarrow 2<3$

$2, 3$

$j++ \Rightarrow j=j+1$

$=2+1$

$=3$

$j=3 \rightarrow 3<3$ ✗

$i=i+1$

$=4$

$1: 1, 2, 3$

$i=3 \rightarrow 3i=3$

$3:$

$j=1 \rightarrow 1<3$

$1,$

$j++ \Rightarrow j=j+1$

$=1+1$

$=2$

$j=2 \rightarrow 2<3$

$2, 3$

$j++ \Rightarrow j=j+1$

$=2+1$

$=3$

$j=3 \rightarrow 3<3$ ✗

$i=i+1$

$=4$

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(2)

(a) j = j+1 or j+=1 or j++ or ++j } Short Hand Notation

→

```
for (int i=1; i<3; i=(i+1)
{
    cout << i << " ";
for (int j=2; j>=0; j--)
{
    cout << j << " ";
}
    cout << endl;
}
```

Dry Run:

i=1 → 1<3 (1: 2, 1, 0,)

I :

j=2 → 2>=0 → 2, → j=j-1=2-1=1

j=1 → 1>=0 → 1, → j=j-1=1-1=0

j=0 → 0>=0 → 0, → j=0-1=-1

j=-1 → -1<=0 ✓

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(A)

i = i+1
= 1+1
= 2

i = 2 → 2 < 3

↙

2:

↙

j = 2 → 2 >= 0

↙

2,

↓

j = j-1 = 2-1 = 1

j = 1 → 1 >= 0

↙

1,

↙

j = j-1 = 1-1 = 0

j = 0 → 0 >= 0

↙

0,

↙

j = j-1 = 0-1 = -1

-1 >= 0

2: 2, 1, 0,

(B)

i = 1 → 1: 2, 1, 0

i = 2 → 2: 2, 1, 0

→ for (int j = 3; j > 0; j = j-1)

{

for (int i = 0; i < 10; i = i+3)

{

cout << (i+j)

}

cout << endl;

}

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⑥

$j=3 \rightarrow 3>0$

$i=0 \rightarrow 0<10$

$(i+j) = (3+0)$

$= 3,$

$(i++)$

$= i+1 = 0+1$

$= 1$

$i=1 \rightarrow 1<10$

$(3+1) = 4,$

$i++ \Rightarrow i=i+1$

$= 1+1$

$= 2$

$i=2 \rightarrow 2<10$

$(3+2) = 5,$

$i++ \Rightarrow i=i+1$

$= 2+1$

$= 3$

$i=3 \rightarrow 3<10$

$(3+3) = 6,$

$j++ \Rightarrow i=i+1$

$= 3+1$

$= 4$

- - - - - -

$i=9 \rightarrow 9<10$

$(3+9) = 12,$

$i++ \Rightarrow i=i+1$

$= 9+1$

$= 10$

$i=10 \rightarrow 10<10$

$j=3 \rightarrow 3, 4, 5, 6, 7, 8,$

(Dont do this mistake)

Check Incrementation

(here value $i = i+3$ not $i=i+1$

=

)

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①

① j=3 → 3>0 ✓

↙

i=0 → 0<10

↙

(i+j) → (3+0)

= 3,

(i+3)

= i+3 = 0+3 = 3

i=3 → 3<10

↙

(i+j) → (3+3)

= 6,

i+3

= 3+3 = 6

i=6 → 6<10

↙

(i+j) = (3+6)

= 9,

i+3

= 6+3 = 9

i=9 → 9<10

↙

(i+j) = (3+9)

= 12,

↙

i+3 = 9+3 = 12

i=12 → 12<10 ✗

j=j-1

3-1 = 2

j=3

i=0, 3, 6, 9

(3, 6, 9, 12,)

② j=2 → 2<0

i=0, 3, 6, 9.

(2, 5, 8, 11,)

③ j=1 → 1<0

i=0, 3, 6, 9

(1, 4, 7, 10,)

→ final o/p:

3, 6, 9, 12,
2, 5, 8, 11,
1, 4, 7, 10,

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→ Variable Scoping

1. local scope vaeiable

① int main()
{
int a=5; → a can be accessed within
}
the main scope.

② xyz()
{
int a=5; → local vae for xyz() fun
}

- when we declare a vaeiable Inside fun It becomes local to that function.

2. Global Scope Vaeiable.

→ ① #include <iostream>
using namespace std;
int a=5;

xyz()
{
}

int main()
{
}

→ not written in fun() blocks, accessible in the entire prog because it is global vae.

⑨

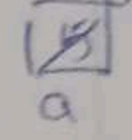
Homework

Q) Why global variable creation is bad?

→ 3. Block Scope Variable

① int main()
{
int b=7; → b can be accessible only inside block.
}

② int main()
{
int a=5;
{
a=6;
}
⑥ ← cout<<a;
}
}



③ int main()
{
Int a=5;
{
int a=6; → accessible only inside block.
}
cout<<a; → ⑤
}

④ {
int a=5;
int a=6;
} Redef of error (Redefination Error)
}

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(10)

(5)

```
int babbae()
{ {
   int a=6;
   cout<<a; ⟶ (6)
 }
}

int main()
{ {
   int a=5;
   cout<<a; ⟶ (5)
 }
}
```

Homework.

Q) what happen when we use sizeof()

Ans. sizeof() → used to verify size of Datatype in memory whether it is 4bytes or 8bytes or any size.

Ex: sizeof(int) → 4bytes is answer.

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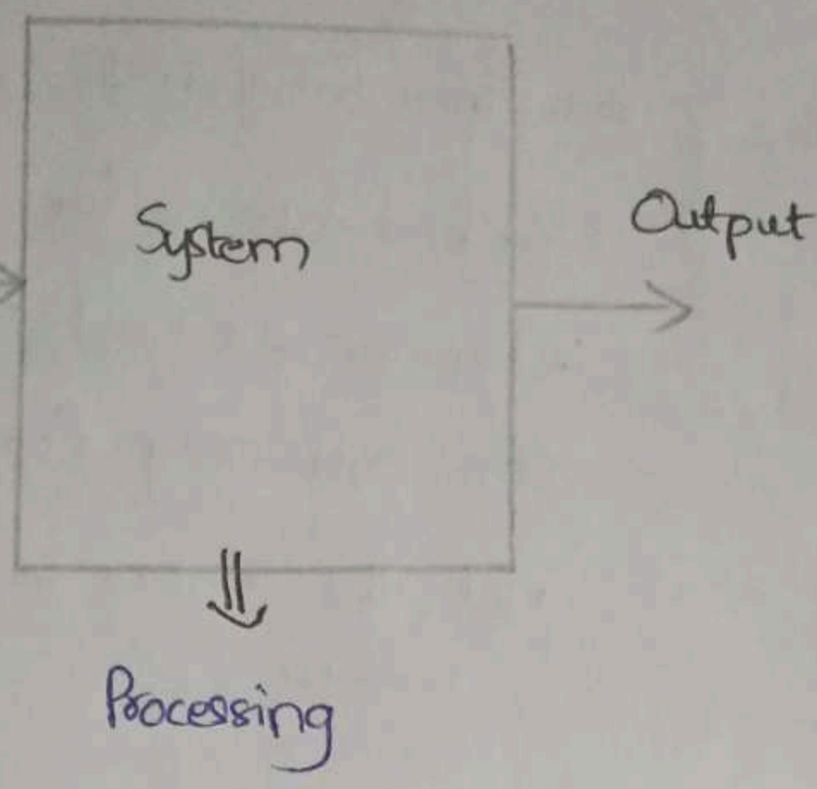
→ Function



① Function is just a block of code that caeries a single Reponsibility.

② It may or maynot take Input, It may or maynot give O/p but It will definately do some sort of processing.

Why we need function

Statement 1
Statement 2
Statement 3
=
=
Statement 1 (copy)
Statement 2 (copy)
statement 3 (copy)
=
Statement1 (copy)
Statement 2 (copy)

- There's a repetetive code here i.e same line of code repeatively appearing. This causes

① Redundancy of Duplicacy.

② Becomes difficult if we get any bug.

③ because we have to visit every line of code & modify

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- This can be solved by Function call

↓

- Advantages of F.C (multiple Set of Instructions clubbed into a function whenever we need we can call only function not the entire code writing)
  - No Redundancy / Duplicacy
  - Easy to debug
  - Reusability of code by call function

→ Syntax: return type function-name ( ) ← Parameters
of function {
≡ } processing logic
return value
}

→ Declaration: Syntax: return-type function-name (para);

- Just like we have declared a variable likewise we can declare a function.

Ex: void printBabbai();

→ I/p parameters in a function declaration

Ex: int sumofNumbe (int a, int b);

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→ Homework: declare one function by own

char ConvertIntoUppercase(char c);

→ Defination: defining the body for the dedaration.

Ex: void printBabbar()

{

}

- Arguments. vs parameters :

```
int printAsif(int a, int b)
{
    return--;
}
```

↳ these are parameters → (actual para declared |def during fun)

```
int main()
{
    printAsif(5,6);
}
```

→ these are arguments

↓

(The values passed during a fun. call)

Note:

```
void printBabbar()
{
}
int main()
{
    printBabbar(); - It is allowed only printBabbar fun defined |declared upper side of it.
}
```

(14)

(2)

```
Int main()
{
   printBabbae();
}

Void printBabbae()
{

}
```

(3) It can be possible but it is not recommended because

```
Void printBabbae();

int main ()
{
   printBabbae();
}
printBabbae()
{
}
```

* why Int main doesnot have any paarmetres (Ask lakshay bhayya in DS)

whenevee we conte the program the memory is alloted/ used in 2ways

① Static - Stack

② Dynamic - Heap x (not discussed now)

- Vac creation, function Creation, function Call Using Stack memory.

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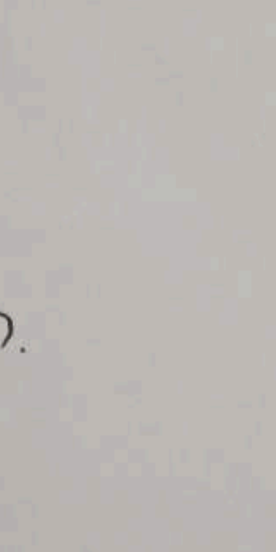
→ Function Tracking Happens in Stack

```
void printBabbarc)
{
    cout<<"13";
}
int main()
{
    printBabbae();
    return 0;
}
```



* main fun call comes from OS & makes Entry in Stack

① When fun call comes there will be an Entry in stack. It will be removed after Execution

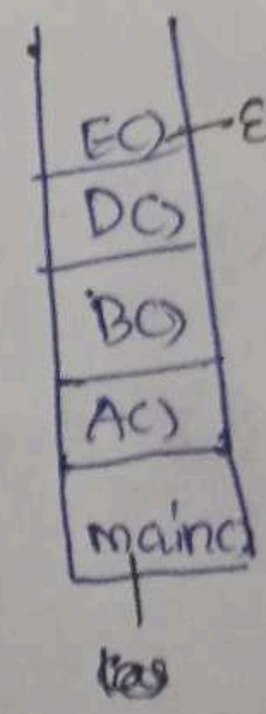
② after Execution It is removed & goes to the next line of fun call in main fun

③ remove printB...() from Stack

④ remove main() from Stack

→ Flow of Execution of function.

Ex:
```
void E()
{
    cout<<"Hi";
}
void D()
{
    E();
}
void B()
{
    D();
}
void A()
{
    B();
}
int main()
{
    A();
}
```



Execute & goto next line from where the function came

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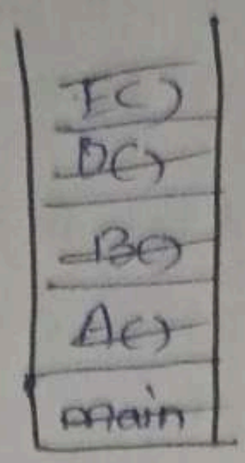

Stack.

Ho

Q) How much memory the function will take?

Q) why function creation is not allowed inside int main()?

Q) Create function

① Number - Even
\ odd

② +ve | -ve | zero

③ 1 -> N Counting

④ 2 Ka table

⑤ Average.

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17

① ConvertToUC

② convertToLC

A = 65 U.C ⟶ L.C

a = 97 L.C ⟶ U.p.C

① A $\xrightarrow{+32}$ a (or) A → a U.pp C to L.C

65 97 A-A+a

② a $\xrightarrow{-32}$ A

97 65

③ U.C ⟶ L.C

A → z a → z

A-A+a a

B-A+a b

C-A+a c

Rule: To convert U.C $\xrightarrow{-A+a}$ L.C

L.C $\xrightarrow[-a+A]{}$ U.C

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(16)

(4) B $\xrightarrow{-A+a}$ b

66 → 98

$-A+a$

65 97

(5) C $\xrightarrow{-A+a}$ c

67 → 99

$\Rightarrow 67-65+97$

$\Rightarrow$ (99)

$66-65+97 \Rightarrow 1+97 = (98)$

(b) A — ~~`A' + a'~~

B — ~~`B' + b'~~

C — ~~`C' + `C'~~

D — `D' + d'

} Yahan galti Kaetahun dhyan rakhiyo

(6) $x \rightarrow y$ $\quad 5 \rightarrow 15$

$(x-x+y)$ $\quad (5-5+15)$

$-A+a \rightarrow 32$
$-B+b \rightarrow 32$
$-C+c \rightarrow 32$
$-D+d \rightarrow 32$

use

} Diff is 32

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→ Important Topic

(Interview point of view mcqs are made on this topic

→ Pass by value: (copy banegi)

(or)

Call by value.

① void print(int a)
{
cout << a;
}
int main()
{
int a=5;
print(a);
a++;
}

The copy of a is made here. Whatever changes I can make on a will not reflect in orginal a

720 | 5 | a

320 | 5 | 6 | a

Output: 6696

② void print(int a)
{
cout << a;
a++;
a++;
a++;
cout << a; - 9
}

8 9 8 | 6 | a

int main()
{
int a=5;
a++;
cout << a; — 6
print(a);
cout << a; 7
}

6 320 | 5 | a

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→ Pass by Reference (copy nahi banegi)

- we have to pass the actual values into the function

Syntax: (int &a)

Ex:
```
void print(int &a)
{
    cout<<a;
    a++;
    a=a*2;   - 14
    a=a*2;   - 28
    a++;     - 29
    return;
}
int main()
{
    int a=5;
    a++;
    print(a);
    cout<<a;
}
```

120 * likha isa x galat hai kyuki ye pass by reference na ki pass by value jo bhi hai actual value hi pass hoti hai

a

return; — we can't return but we no value will be returned.

120 5 6 ~~7~~ ~~14~~ ~~28~~ 29

a

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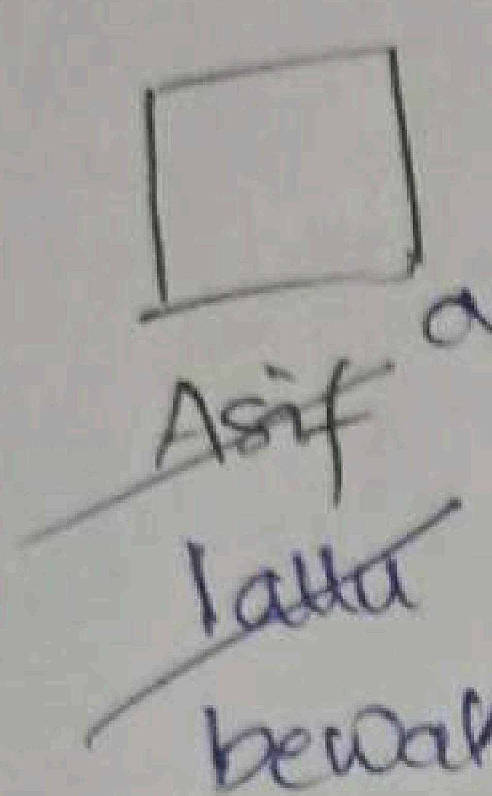
Output:

66.29

Realtime Example



- Naam baldiya par bacha vahi hai

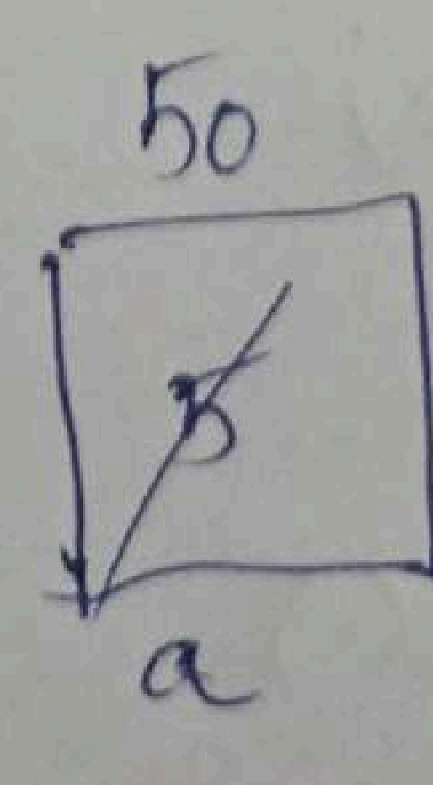
Value vahi hai.

Q)

```
void print (int love)
{
    love=love*10;  — 50
    love++;  — 51
    love++;  — 52
}
int main()
{
    int a=5;
    cout<<a;
    print(a);
    cout<<a;
```

Output

5 52



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Q) Void modify (int a) copy

{

a=a+10;

}

int main()

{

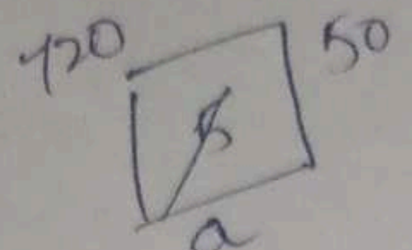
int x=5;

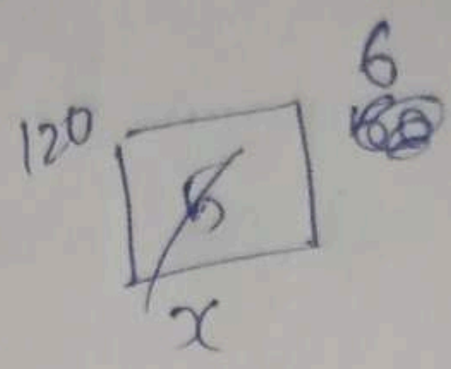
modify(x);

x++;

cout<<x;

}





O/P

6

Q) Pass by value — pass by reference

Void print (int a, int &b)

{

a=a*b;

b=b+10;

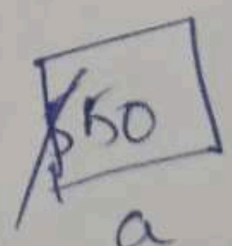
}

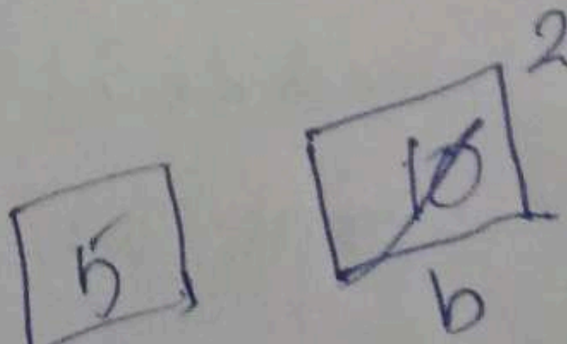
int main()

{

int a=5;

int b=10;





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print (a, b)

cout << a << " " << b;

Output

5 20

→ Home work.

Nested Loops ←

Q) Solve 10 different different problems of different methods of (logic differs) (Using chatgpt or any ai)

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