If statements :-

- Store the absolute difference of x & y in y where the abs diff is (x-y) or (y-x) whichever is Positive (without using abs or fabs functions)

```
#include <stdio.h>
int main ()
{
    int x, y;
    scanf ("%d%d", &x, &y);
    y = y-x;
    if (y<0)
    {
        y = y*-1;
        printf ("%d", y);
    }
    else
        printf ("%d", y);
    return 0;
}
```

Switch

```
#include <stdio.h>
    int main ()
    {
      char Color = 'R';
      switch (Color)
      {
```

Maa Ebaid

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```
Case 'R' : printf ("red");
Case 'B' : Printf ("Blue");
Case 't) : Printf ("blue");
```

- it prints redBlueblue
- to print red put a break;

Common Mistakes

```
If (0<=X<=4)
```

- let's say x=5
  0<=X ⇒ answer is one and 1 is defiatly less than 4

The Right form is :- (0<=X && X<=4)

```
int speed = 75, fee;
```

it printf 20

```
If (speed > 35)
    fee = 20;
else If (speed > 50)
    fee = 40;
else If (speed > 75)
    fee = 60;
printf("%d", fee);
```

it doesn't go to else

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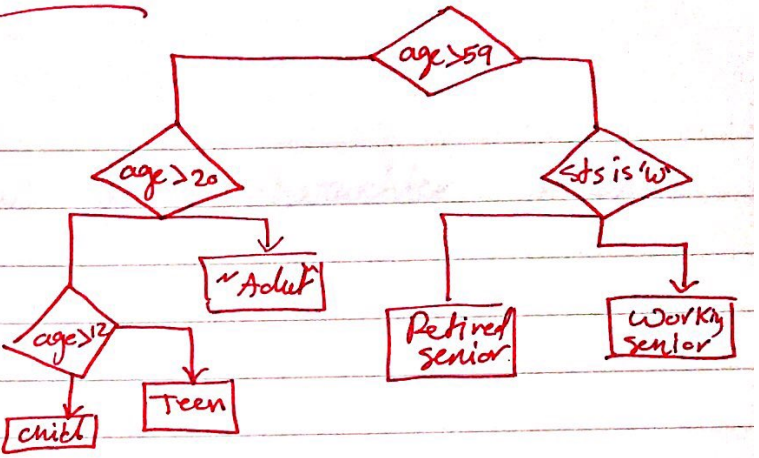


```
#include
int main()
{
    int age;
    char sts;
    printf("Enter age and status");
    scanf("%d", &age);
    if (age > 59)
    {
        printf("status is");
        if (sts = 'W')
            printf("Working Senior");
        else
            printf("Retired Senior");
    }
    else
    {
        if(age > 20)
            printf("Adult");
        else if (age > 12)
            printf("Teen");
        else
            printf("child");
    }
    return 0;
}
```

scanf("%c", &sts);

Hera Ishaiwi

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- A program to know if a charachter is an Alphabet or not

```
:
:
char ch
Printf ("Enter");
Scanf ("%c", &ch);

if ((char >= 'a' && char <= 'z') || (char >= 'A' && char <= 'Z'))
    Printf ("Alphabet");
else
    Printf ("Not Alphabet")
/
!
```

Maa Ebaiwi

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Arrays :-

- A program to find the Mode :-

```
int A[5];
int i, j, maxvalue=0, maxcount=0, count=0
, temp;

Printf (" enter elements\n");
for (i=0; i<5 ; i++)
  Scanf ("%d", &A[i]);

for (i=0 ; i<5; i++)
   for (j=0; j<5; j++)
      if (A[i] == A[j])
      count ++;

   if (count > maxcount)
      {
         temp = maxcount;
         maxcount = count;
         count = temp;
      }

      maxvalue = A[i];
   }
Printf ("%d", maxvalue);
   return 0;
}
```

Alaa Elaiw

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- A program to sum odd numbers of an array

```
int sumofodd (int [] , int );
int main ()
{
  int A [5], i, s;
  for (i=0 ; i<5 ; i++)
     scanf ("%d", &A[i]);

  s = sumofodd (A, 5);
  printf ("%d", s);

  return 0;
  }

int sumofodd ( int X[] , int n)
  {
     int i, sum = 0;
    for (i=0; i<n ; i++)
      {
        if (X[i]%2 != 0)
          {
            sum += X[i];
          }
      }
   return sum;
  }
```

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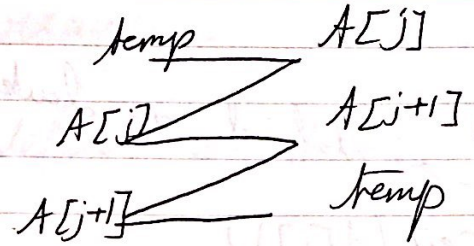
Bubble sort Arrays:-



- A program to find Abs value of an Array's elements

```
int main ():
{
    int i, A[5], x;
    Printf ("  ")

for (i=0; i<5; i++)
 {
    Scanf("%d", & A[i]);
 }

;
/
  for (i=0 ; i<5 ; i++)
   {  x = abs (A[i]);
      Printf("%-2d%4d", A[i], x);
   }
/
```

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- A program that negates doubles :-

```
enter elements
:
for (i=0; i<S; i++)
{
    if ( A[i] != ceil (A[i]))
        Countf++;
}
Printf(" %d is the num of doubls", Countf);
```

defined as doubl

- Multi dimensional Arrays :-

A[R][C]

R: Rows, C: columns

A program that determines Who Won is a tic-tac-toe game

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Revise these :-

The Mode :-

```
int mocounter=0, counter=0, count, i, j;
for (i=0; i<5; i++)
    {
      count = 0;
    for (j=0; j<n; j++)
      {  if (a[j]==a[i])
         count++;
      }

    if ( count > counter
    { counter = count
      mocounter = a[i];
  }
  }
```

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Skills :-

- Define

```
#define S 10
int main()
{
   int A[S];
```

Static A[5] = {0,1,2} - - -

Variable

```
for (i=0; i<S; i++)
{
  scanf("%d", &A[i]);
```

- find max & min :-

```
max = A[0];
for (i=0; i<S; i++)
{
   if (A[i] > max)
      max = A[i]
}
printf("%d", &E max);
```

```
min = A[0];
for (i=0; i<S; i++)
{
   if (A[i] < min)
      min = A[i]
}
printf("%d", min);
```

- How to pass An Array in afunction

```
void Array (int [], int);
```

(int [] : Array, int : size)

```
int main()
{
   Array (A, S);
}
void Array (int X[], int n)
{
}
```

Haa Ebraini

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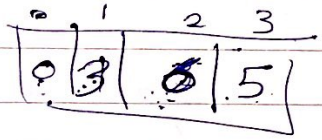
- linear search :-

```
for (i=0; i<S; i++)
  if (A[i] == key)
    printf ("position of key is at %d", i)
  else
  printf ("No such key");
```

- Bubble sort :-




```
for (i=0; i<S; i++)
for (j=0; j<S; j++)
  if ( A[j] > A[j+1])
  {
    temp = A[j];
    A[j] = A[j+1];
    A[j+1] = temp
  }
```

- How to define a Multidimensional array :-

```
int A[S][S]
  for (i=0; i<S; i++)
    for (j=0; j<S; j++)
      scanf("%d", A[i][j]);
```

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- How to sum Columns & Rows

```
Sum [R] = {0};
Rows => for (i=0; i<S; i++)
        {
          for (j=0; j<S; j++)
            Sum[i] = Sum[i] + A[i][j]
          Printf ("%d", Sum[i]);
        }
Columns => for (i=0; i<S; i++)
           {
             for (j=0; j<S; j++)
               sum[j] = sum[j] + A[i][j]
           } printf ("%d", sum[j]);
```

Strings

- How to define strings :

```
Char X[S];
Scanf ("%s", X);
```

- How to know number of letters in a string

```
for (i=0; i<R; i++)
while (X[i] != '\0')
{
  if (X[i] == 'a')
    Count++;
  i++
}
```

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• sorting elements in descending & ascending order

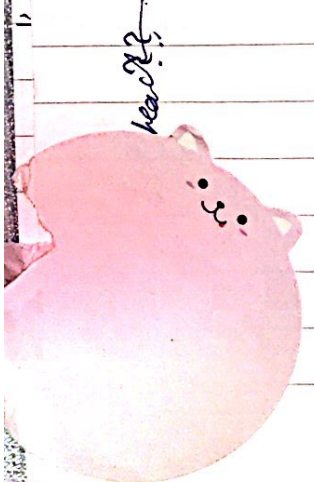
ascending → Bubble sort

descending →

```
for (i=0; i<s; i++)
  for (j=0; j<s; j++)
    if ( A[j] < A[j+1] )
    {
      temp = A[j];
      A[j] = A[j+1];
      A[j+1] = temp;
    }
```

How to check an ending for a group of strings :-

```
for (i=0; i<s; i++)        // s → number of strings
    j=0; j = strlen (word[i]);
    if ( word[i][j-1] == 'l' &&  ——
        printf ——
```



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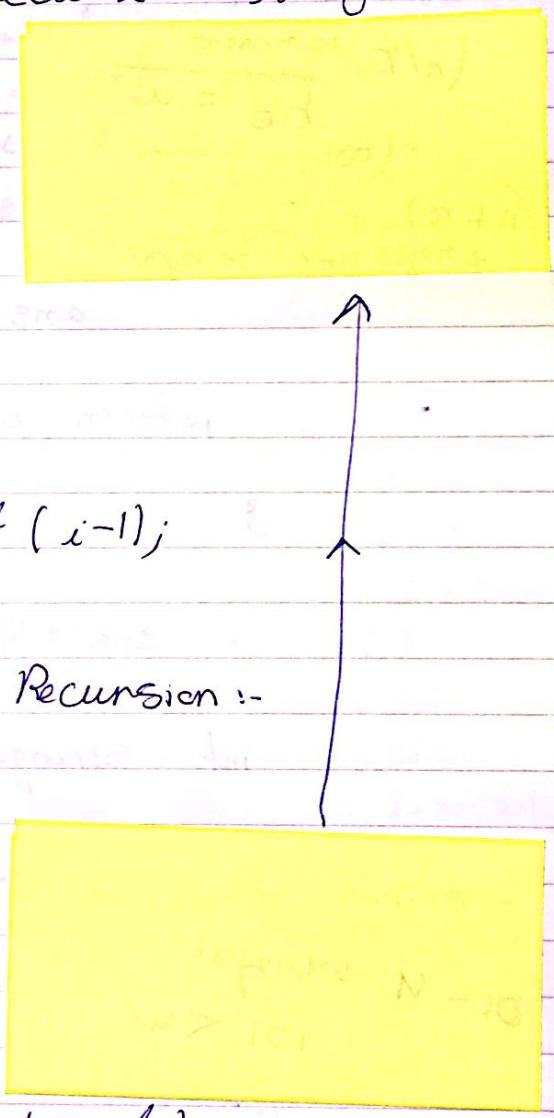
Recursion :-

- you use a function
- Example : using Recursion to find The factorial

```
.
.
int fact (int i)
{
    if (i<=1)
        return 1;
    else
        return i * fact (i-1);
```



Programs to do using Recursion :-

- ✗ Reversing strings
- Multiplying ✓
- dividing ✓
- fibonacci (by heart) ✓
- greatest common divider page (535)

Mera Ethiwi

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• What's the output:- (base)^power.

1-
```
int
power_raiser ( int base , int power)
{
    int ans;
int  base = 2  , power = 3;
 If  (power == 0 )
      ans = 1 ;
 else
      ans = ( base * power_raiser (base, power-1)

 return ans;
}
```

Answer is 100

ans = 8

```
int fun (a[], int n)
{ int x.
 if (n == 1)
  return a[0]
 else
  x = fun ( a, n-1).
  If (X > a [n-1])
    return x;
  else
    return a[n-1];
```

n=5 →

• Assuming n=5
a[] = {12, 10, 30, 50, 100}

2-
```
int strange (int n);
```

~~n=7~~

```
int Strange (int n)
{ n=7.
 int ans
 If (n==1)
 ans = 0;
 else
 ans = 1 + Strange( n/2);
  return ans;
}
```

ans = 2
If n = 9
ans = 3

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work on y

5- • Write a program of multiplying using recursion

```
int find_mult (int, int);

int main ()
{
   int x; int y; ans;
   Prr —
   Sca —
   ans = find_mult (x, y);
}
int find_mult (int x, int y)
{
   if (y==0)
     return 0;
   else
     return (x + find_mult (x, y-1));
```

find $x * y$

2, 3
2 + (2, 2)
2 + 2 + 2 (+2, 1)
2, 3
2 + (2, 2)
2 + 2 (2, 1)
2 + 2 + 2 + (2, 1)
0 = 6

(9, 3)
9 - 3
6 - 3
3 - 3 = 0
9 - 6 = 3
5 - 5 10 - 5
10 - 5 = 5 - 5 = 0
(9, 3)
1 + (6, 3)
(3, 3)

6- • Division :- you change the function to :-

work on x

```
if (x==0)
  return 0;
else
  return 1 + find_mult (x-y, y);
```

7- • greatest common divider

```
gcd (int m, int n)
{
  int ans;
  if (m%n == 0)
    ans = n;
  else
    ans = gcd (n, m%n) → return (ans)
```

16 3
3 (1)
16 3 2
2 1 0
16

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. Write a Program that :-

1- Calculate the sum of successive integers starting at 1 ---> n

```
int finel_sum (int n)
{
    int ans;
    if (n == 0)
        ans = 0;
    else
        ans = n+ finel_sum (n-1);

    return ans;
```

```
void fun (int x)
{ if (x>0)
  { fun (--x);
    printf ("%d \t", x);
    fun (--x);
  }
```

X = 4

output :- 0120301

2- Compute a pair of fibonacci numbers (

F(n+1) , F(n) (one recursive call)

```
int fast_fib (int n, int n+1)
    if (n == 1)
        return 0;
```

Alaa Btaiwi

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3- A program that sorts n elements of an array of integers

```
void Bubblesort (int arr[], int n)
{
  if (n==1);
    return
  printf (n=1 is the);
  else
  { for(i=0; i<n; i++)
      if (arr[i] > arr[i+1])
    temp = arr[i+1];
    arr[i+1] = arr[i];
      arr[i] = temp;

    Bubble sort (arr, n-1);
  }
```

1	4	2	0	3

0 1 2 3

1	2	4	0	3

if (n >= 1) set array[0] = 1

solve (4, 2)

```
int fun (int a, int b)
{
  if (b==0)
    return 0;
  if (b % 2 == 0)
    return fun
      (a+a, b/2);
  return fun(a+a, b/2)
      +a;
}
```

fun(4,3) → answer = 12

4- fubonacci :-

1 1 2 3 5 8 13

n = 1 2 3 4 5 6 7

```
if ((n==1) || (n==2))
  return 1;
else
  return (fib(n-1) + fib(n-2));
```

3 2

2 1 1

1 + 1 + 1

Hana Ebaiwi

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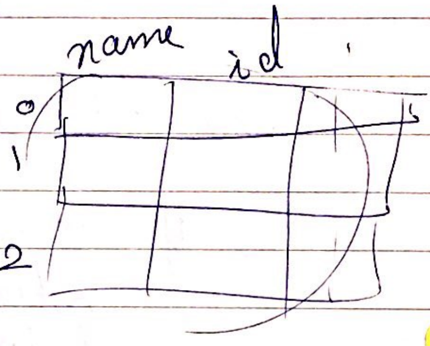
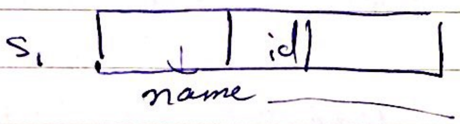
structures:-

- **How to define a structure:**

```
Typedef struct
{
    char name;
    int id;
} student_t; S1;
```



هذه أن Array
كأنها struct



- **How to fill a struct:-**

```
printf ("Enter name & id\n").
scanf ("%s%d", S1.name, &S1.id).
}
```

Treat it as a Type

- **How to pass a Structure to a function**

prototype : Void personStructure (person_t).

```
int main()
    person_structure (P1).
}
```

name of Structure

```
void person_structure (person_t P)
{
    printf (" name = %s
            id = %d ", P.name, P.id).
}
```

Hala Etaiwi

- How to fill info of structure in a function

```
Void  full_info (stud_t);
      :
int main()
 { stud_t S;
   :
   full_info (&S);
   :
 }
Void full_info (student *s1);
 {
    scanf ("%s", (*s1).name);
    scanf ("%d", &(*s1).id);
    scanf ("%d", &(*s1).number);
```

no & sign in string

You can replace them with

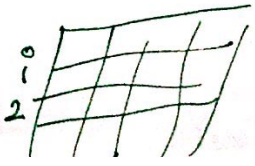
$s_1 \rightarrow$ name
$\&s_1 \rightarrow$ id
$\&s_1 \rightarrow$ number

- How to put a structure inside another structure

```
typedef struct
{
  char instructor[5];
  int name;
  Stud_t Students[20];
} Course_t
```

This a structure that contains info about a 20 students

Course_t Comp 124;



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وتقارن او تبدل int S struct عكن ان تتعامل الـ .
functions الـ داخل

Exercise 4 page 34 laboratory WorkBook

```
#define S 100
Typedef structure
{
  Char name[ ];
  int section;
  float grade;
} Student_t

int main ()
{
  Student_t stud [S], temp;
  int i, j;
  for (i=0; i<S; i++)
    scanf ("%S %d %f", stud[i].name, &stud[i].section
                     , &stud[i].grade);

  for (i=0; i<S; i++)
{ stud[i].grade += stud[i].grade * 0.05;

  If (stud[i].grade >= 100)
    stud[i].grade = 100;
}

for (i=0; i<S; i++)
```

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~~if (name[i]~~

```
if (stud[i].name[0] == 'A' && stud[i].name[1] == 'l')
    stud[i].gpa = 100;
for (j=0; i<s-1; j++)
for (i=0; i<s; i++)
{ if (stud[i].gpa < stud[i+1].gpa)
    { temp = stud[i];
      stud[i] = stud[i+1];
      stud[i+1] = temp;
    }
}

for (i=0; i<s; i++)
  printf("%s \t %d \t %f\n", stud[i].name, stud[i].section, stud[i].gpa);
```

Notes:-

if ($p_1 == p_2$)

structures : you can't do that

function of Type of the structure it self.

stud_t get_person ( ); يرجع ويأخذ

p_1 = get_person( );

stud_t get_person( );

person_t newp

Endl

Scan

return newp; } main الطباعة تم في

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Notes about :-

How to get out a function from a structure function

- Define a function of Type of your Structure And makes it like This :-

for Ex:-

```
Stud_t .get_p ( )
```

يرجع ويأخذ نوع

```
Stud_t P1;

P1 = get_p ( );

Stud_t get_p()
{
    Stud_t newp;
    Printf ("Enter info");
    Scanf ("%s %d %d", newp.name, &newp.id
           &new_p.s);

    return new_p.
}
```

هذا اسم الراجع

Hana Ebaiwi

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Binary files

hi.exe

disadvantages of text files:-
1- processing time
2- precision problem
(في ال float أخذ أرقام قيمة)
3- takes space

Advantages: readable by human

disadvantages of Binary files:-
1- Not readable
2- different between systems

char & int ال تختلف في Binary files .

تم تحول الأرقام إلى decimal

. How to open a Binary file ?

```
int x=7, y;   float a=3.5, b;
FILE *in;
in = fopen ("data.bin", "rb");
```

rb → read Binary

القراءة →

```
fread (&y, sizeof(int), 1, out);
fread (&b, sizeof(float), 1, out);
```

Note : to check if you're file exists or not :-

```
FILE * in
in = fopen ("data.txt", "r");
if (in == NULL)
{ printf (" file does not exist");
  exit(0);
}
```

Note :- You use a loop to keep asking for files :-

```
FILE *in;
char filename [10];
printf ("Enter file name");
for (scanf ("%s", filename)
     ; in = fopen(filename, "r")
       == Null
     ; scanf ("%s", filename))
{
  printf (" cannot open file");
  printf (" Re enter);
}
```

initial value ← scanf ("%s", filename)

final value ← == Null

The change → scanf ("%s", filename)

Alaa Etaiwi

Example

int x=7, y; float a=3.5, b;

اريد ان اخزن قيمة x في y وقيمة a في b .

```
FILE *out;
out = fopen ("data.bin", "wb");
fwrite (&x, sizeof (int), 1, out);
fwrite (&a, sizeof (float), 1, out);
fclose (out);
```

```
out = fopen ("data.bin" "rb");        => 2
fread (&y, sizeof (int), 1, out);
fread (&b, sizeof (float), 1, out);
                                      => 4
```

```
Printf (" x=%d, b=%.2f ", x, b);
```

It Prints :-

x=7 , b=3.50

Note: \r go back to column 1 of current output line

Note :-

char → 4 bytes
int → 2 bytes

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Notes :-

output files → fwrite (&y , sizeof(.), 1 ,)

- to define the size of the parameter
- number of parameters to copy
- name of file
- The address of the first memory cell whose content is about to be copied to the file

input → fread (&a _____)

- The same thing But &a is The address of the first memory cell whose content is about to be read from the file

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size of int = 2
size of float = 4

You need #include <stdlib.h>

Dynamic allocations

returns a void pointer → **malloc** (memory allocate) يعني احجز لـ 10 integers

Type casting

Ex :. iX = (int *) malloc (size of (int)); *10

هنا يعني لحجز مساحة من memory بحجم int (2 byte)

• بأخذ الـ void pointer وحوله لـ int

• لحجز أكثر من مكان

returns a void point → **calloc** But it takes 2 arguments (تستخدم لحجز مستمر)

X = (int *) calloc (10, sizeof (int));

number of elements ↑ ↑ size

• اذا اردنا تعبئة الـ integers مثلاً حجزنا مكان لـ 3 int

X = (int *) malloc (3 * size of (in))

• فاننا نعبئها هكذا

*X = 2

*(X+1) = 3

*(X+2) = 6

• تعبئ تلقائي بأصفار اذا لم تعبئ الكلام calloc

• " " بـ garbage malloc

Dynamically allocated array (when you don't the size)

pri— ("Enter size"

sca— (" , n) size

int *A = (int*) malloc (n* size of (int))

for (int i=0; i<n; i++) - -

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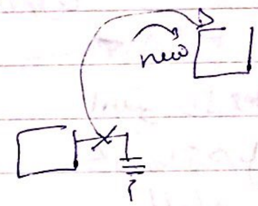
linked lists :- → Data structure

How to define it :-

```
typedef struct stud_a
{ char name [10];
  int id ;
  struct stud_a * next;
}
stud_t
```

next ← يستخدم للإشارة للعنصر التالي




```
stud_t *list;
```

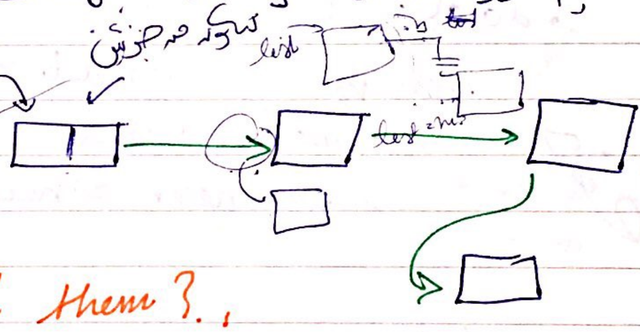
يشير إلى أول عنصر

للوصول إلى العناصر ... نستعمل ← stud_t

```
list = ( stud_t * ) malloc (sizeof (stud_t))
```

• يتم تخزين عناصر الـ Array بشكل منفصل ثم نصل بينهم

Memory:



جزء يحتوي على Data و جزء يحتوي على مؤشر للعنصر التالي

How to fill them ?..

```
list → name = name;
list → id = id;
```

← scanned from user

```
list → next = NULL
```

هذه الخطوة تستعمل لإنهاء الـ list

to Add a new link list

```
new → next = list;
list = new
```

By Alaa Etaiwi

How to search, add, delete, print from a list?

• **Search**

```
student_t *p;
p=list;
while ((p!=NULL) && (p→id != x))
    p = p→next;
if (p!=NULL)
    printf("name=%s", p→name);
else
    prin ( "Na      )
```

(x) ← id to search for — You decided it

الشرح: امشي بالـ pointer لحد ما توصل Null أو الـ id المطلوبة

اذا لم يكن الـ pointer قد وصل الى الـ Null يعني وجدت الـ id اطبعها

• **add**:- (من الوسط)

```
newnode = (stud_t *) malloc (sizeof (stud_t));
newnode → next = p→next
p→next = newnode
```

[illegible] [illegible]

• **delete**:-

```
temp = p→next
p→next = temp→next
free (temp).
```

[illegible] function.

Hala Ebrahim

Errors in C language

Syntax :- أخطاء في الكتابة

logical Errors :- يعمل البرنامج لكن الجواب خاطئ

Compile Error and runtime Errors :

Examples:-

↳ Syntax Error : عندما تنسى (;) بشكل أمر
عندما تضع قوس زائد او ناقص

```
y = (3+5;
y = 3+*5;
```

↳ logical Error : • ان تضع ناقص بدل زائد
عند القيام بعملية جمع

```
int sum                // a program that prints sum
int x,y;
sum = x-y;
avg = a1+a2/2
```

• ان تضع قيم بدون اقواس
↳ الجواب يكون خاطئ

↳ run time Errors :- • Division by Zero

```
y = 5
x = y-5      0
c = 9/(x)
```

. File does not exist
• fopen ---- ("data.txt"
↳ If it does not exist

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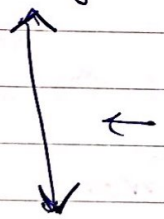
Flag Technique

A flag is an integer / has one of two values :- 1 (true) or 0 (false)

Example:- • flag = 1



← I do a process that if it's true flag will remain 1 but if not it will become zero

• Then I do an if statement

if ..... is 1

Then — —

else

Then — — —

Alaa Eltaiwi

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Format (1)

```
#include <stdio.h>
#define S 10
void inter (int[], int);
int main()
{
  int A[S];
  inter (A, S);
  sort (A, S);
  for (i=0; i<S; i++)
  { count (A, S);
    printf ("%d\n", n);
  }
}

void inter (int x[], int n)
{ int temp;
  A[0] = A[10];
  A[2] = .
  temp = A[0];
  A[0] = A[10];
  A[10] = temp;

  temp = A[2];
  A[2] = A[99];
  A[99] = temp;

  for (i=0; i<S; i++)
    printf ("%d\n", A[i]);
}
```

5 A 9 7
5 B 6 1 7 8 a 11 2

```
void sort (int[], int)
{ int temp, i, j;
  for (i=0; i<S; i++)
    for (j=0; j<S; j++)
      if (A[j+1] > A[j+1])
      { temp = A[j];
        A[j] = A[j+1];
        A[j+1] = temp;
      }
}

void count (A, n)
{ int i, j;
  for (i=0; i<S; i++)
    for (j=0; j<S; j++)
      if (A[j] = A[j])
        count++;
  for (i=0; i<S; i++)
  { for (j=0; j<S; j++)
    { if (A[i] == A[j])
        count++;
    }
  }
  printf ("%d\n", count);
  count = 0;
```

Mehrere Etagen.

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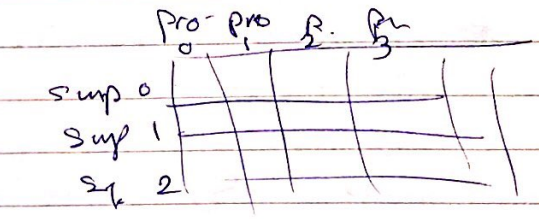
```
#include <stdio.h>
#define R 3
#define C 4
Void F1(int[][C], int);

int main()
{
  int S[R][C];
  F1(S, R);
}

Void F1(int X[][C], int r)
{
  int i, j, sum=0;
  for (i=0; i<R; i++)
    for (j=0; j<C; j++)
      sum += A[i][j];
  Printf("%d\n", sum);
  for (j=0; i<C; j++)
  {for (i=0; j<R; i++)
    Sum += A[i][j];
  pirtf("%d", sum)
  sum=0;
```



	0	1	2	3
0	2	4	5	6
1	7	8	9	10
2	20	38	48	58

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