BASICS

1. Arrays
2. Structure
3. Pointer
4. Reference
5. Parameter Passing
6. Classes
7. Constructor
8. Templates

ARRAYS

→ Collection of similar datatypes

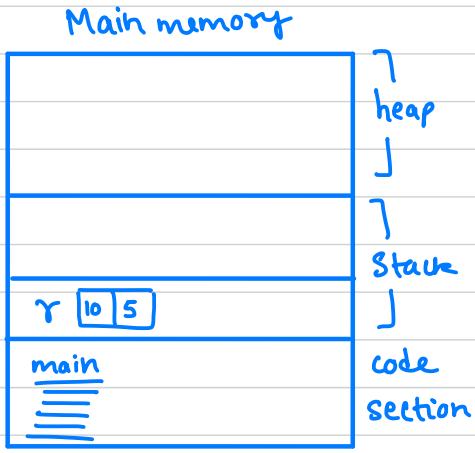
STRUCTURES

→ Collection of different data types

```
Struct rectangle
{
    int length;     — 2
    int bredth;     — 2
};                    4 bytes
```

but till here, it does not occupy any space in memory

```
int main()
{
    Struct rectangle r = {10,5}  → here it occupies memory
    r.length = 10;
    r.bredth = 5;
}
```



```
Struct card
{
    int face;
    int shape;
    int colour;
};

int main()
{
    Struct card deck[52] = {....};
    printf("%d", deck[0].face);
    printf("%d", deck[0].shape);
}
```

POINTERS

↳ address variables

1. Why pointers
2. Decleration
3. Initialization
4. Dereferencing
5. Dynamic allocation

```
int a=10;
int *p; ⟶ decleration
p=&a; ⟶ initialization
printf("%d", a);
printf("%d", *p); ⟶ dereferencing
```

USES OF POINTER

1. Accessing heap
2. Accessing resources like keyboard or mouse.
3. Parameter passing.

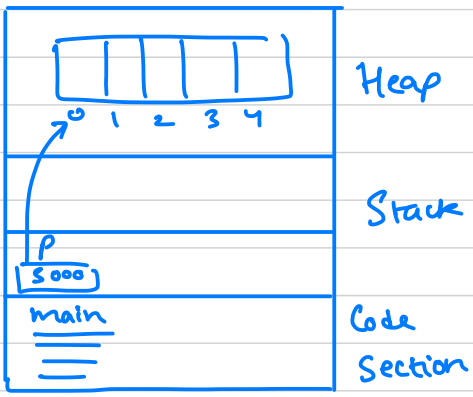
HOW TO USE POINTER FOR ALLOCATING HEAP

```
#include<stdlib.h> ⟶ header file for malloc()

int main()
{
    int *p;
    p=(int*)malloc(5*sizeof(int));
}
```

↳ for returning as malloc function returns void pointer (type casting)

↓ Creating space for 5 integer values in heap.



REFERENCE IN C++

```
int main()
{
    int a=10;
    int &r=a;
    cout<<a;
    cout<<r;
}
```

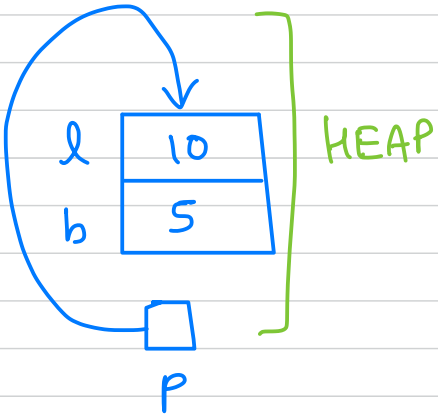
POINTER TO STRUCTURE

```
Struct rectangle
{
    int length;
    int bredth;
};

int main()
{
    struct rectangle r = {10, 5};
    struct rectangle *p = &r;

    r.length = 15;
    (*p).length = 20;
    p -> length = 20;
}
```

doesn't occupy 4 bytes of memory (2 bytes)




```
int main()
{
    struct rectangle *p;

    p = (struct rectangle *)malloc(sizeof(struct rectangle));

    p -> length = 10;
    p -> bredth = 5;
}
```

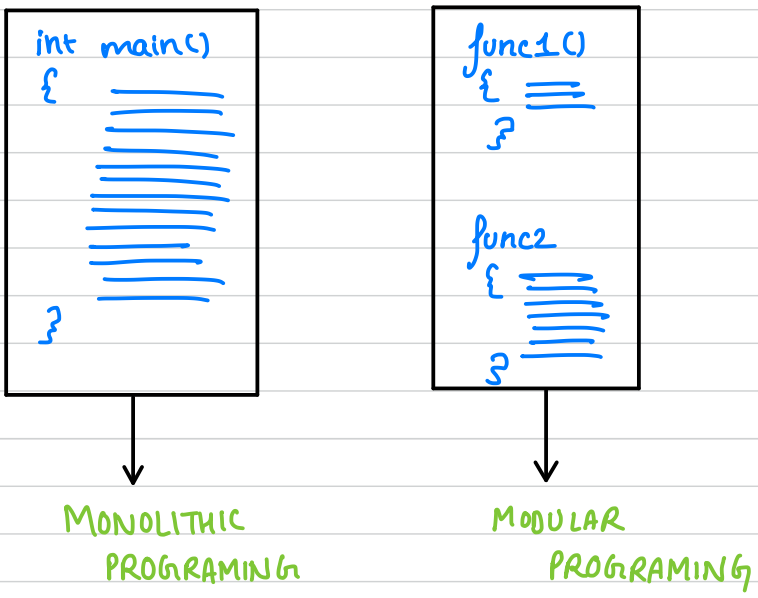
FUNCTIONS

What are functions ⟶ Performs a specific task

Parameters of passing functions
- → Pass by value
- → Pass by address
- → Pass by reference

Only in C

In C++



FUNCTION EXAMPLE

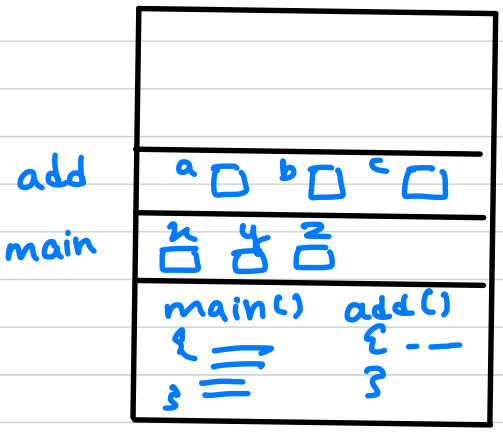
```
prototype
int add (int a , int b)
{
        int c;
        c = a+b;
        return c;
 }

int main()
{
        int x, y, z ;
        x = 10;
        y = 5;
        z = add (x, y);
        printf(" %d", z );
}
```

Formal Parameter

Actual Parameter

15

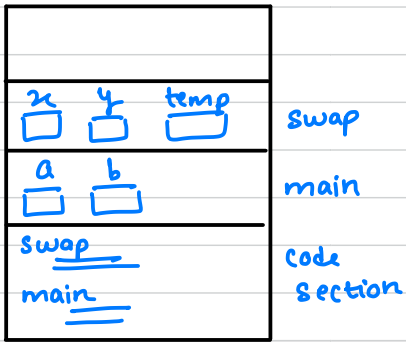


CALL BY VALUE

```
Void swap( int x , int y)
{
    int temp;
    x = y;
    y = temp;
}

int main()
{
    int a, b;
    a = 10;
    b = 20;
    swap(a,b);
    printf("%d %d", a, b);
}
```

10 20

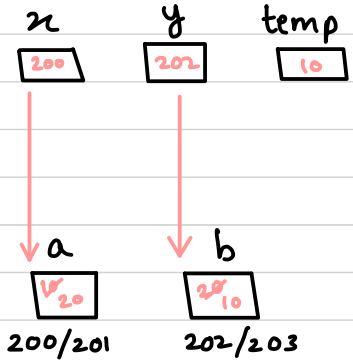


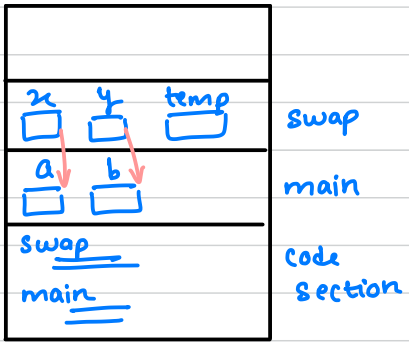
CALL BY ADDRESS

```
Void swap( int *x , int *y)
{
    int temp;
    *x = *y;
    *y = temp;
}

int main()
{
    int a, b;
    a = 10;
    b = 20;
    swap(&a,&b);
    printf("%d %d", a, b);
}
```

20 10

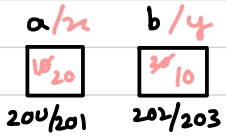


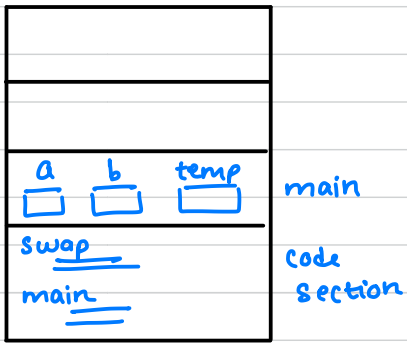


CALL BY REFERENCE (Only in C++)

```
Void swap( int &x , int &y)
{
    int temp;
    x = y;
    y = temp;
}

int main()
{
    int a, b;
    a = 10;
    b = 20;
    swap (a,b);
    printf (" %d %d", a, b);
}
                          20  10
```





Only 2 bytes of memory is used as in reference, only another name is given to the pre-existing variable

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ARRAY AS PARAMETER

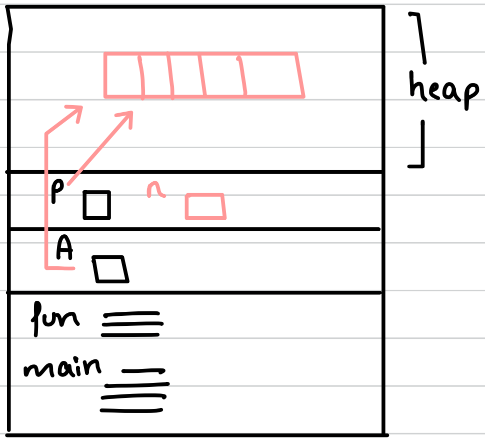
```
void fun (int A[], int n)
{                  ↳ or int *A
    int i;
    for (i=0 ; i<n; i++)
        printf (" %d", A[i]);
}

int main()
{
    int a[5] = {2,4,6,8,10};
    fun ( A, 5);
}
```

as ARRAYS can only be passed as call by address.

```c
int [] fun (int n)      // or int * fun (int n)
{                       // it returns an array
    int *p;
    p = (int *)malloc(n * sizeof(int));
    return p;
}

int main()
{
    int *A;
    A = fun(5);
}
```



STRUCTURE AS PARAMETER

CALL BY VALUE

```c
int area (struct rectangle r1)
{
    r1.length++;
    return r1.length * r1.bredth;
}

struct rectangle
{
    int length;
    int bredth;
};

int main ()
{
    struct rectangle r = {10, 5};
    printf ("%d", area(r));
```

CALL BY REFERENCE

```c
int area (struct rectangle &r1)
```

CALL BY ADDRESS

```c
void changel (struct rectangle *p, int l)
{
    p -> length = l;
}

int main()
{
    struct rectangle r = {10, 5};
    changel (&r, 20);
}
```

PASSING ARRAYS AS CALL BY VALUE USING STRUCTURES

```
Void fun(struct test t1)
{
    t1.A[0] = 10;
}

int main()
{
    struct test t={{2,4,6,8,10}, 5};
    fun(t);
}
```

```
struct test
{
    int A[5];
    int n;
}
```

Changes made in the array in the function will not be reflected as it is call by value

---

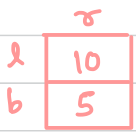
STRUCTURES AND FUNCTIONS

```
struct rectangle
{
    int length;
    int bredth;
}

void initialize (struct rectangle *r, int l, int b)
{
    r -> length = l ;
    r -> bredth = b;
}

int area ( struct rectangle r )
{
    return r.length * r.bredth;
}

void change1 ( struct rectangle *r, int l)
{
    r -> length = l ;
}
```




```
int main()
{
    struct rectangle r ;

    initialize (&r, 10, 5);
    area (r);
    change1 (&r, 20);
}
```

because values need to be changed, so call by address.

CLASS AND CONSTRUCTOR

```
class rectangle
{
    private:
        int length;
        int bredth;
    public:
        rectangle (int l, int b)
        {
            length = l;
            bredth = b;
        }

        int area()
        {
            return length * bredth;
        }

        void changelength (int l)
        {
            length = l;
        }
};
```

```
int main()
{
    rectangle r (10, 5);
    r. area()
    r. changelength (20);
}
```

```
Class rectangle
{
    private:
        int length;
        int bredth;
    public:
        rectangle()
        {
            length = bredth = 1;
        }
        rectangle (int l, int b);
        int area();
        int perimeter();
```

constructors (overloaded)

facilitators (They do operations on data members)

Accessor

```
int getlength
{
    return length;
}
```

Mutator

```
void setlength (int l)
{
    length = l;
}
```

Destructor →

```
~ Rectangle();
};
```

```
rectangle :: rectangle (int l, int b)
{
        length = l;
        bredth = b;
}

int rectangle :: area()
{
        return length * bredth;
}

int rectangle :: perimeter()
{
        return 2* (length + bredth);
}

rectangle :: ~ rectangle ()
{
}



int main()
{
        rectangle r (10, 5);
        cout << r. area;
        cout << r. perimeter;
        r. setlength (20);
        cout << r. getlength();
}
```

TEMPLATE CLASS

→ for using various datatypes. Using the same class for different datatypes.

```
template < class T >
class arithmetic
{
    private :
        T int a;
        T int b;

    public :
                        T     T
            arithmetic (int a, int b)
        T int  add ();
        T int  sub ();
};

template < class T >  ⟶ because effect of previous template has ended
arithmetic <T> :: arithmetic (int a, int b)
                              T     T
{
    this . a = a;
    this . b = b;
}
template <class T>
T int  arithmetic <T> :: add()
{
    T int c;
      c= a+b;
      return c;
}

template < class T >
int  arithmetic <T> :: sub()
{
    T int c;
      c= a-b;
      return c;
}
```

```
int main()
{
    arithmetic < int > ar(10, 5);
    cout << ar. add();
    arithmetic < float > ar1 (1.5, 1.2);
    cout << ar1 . add();
}
```