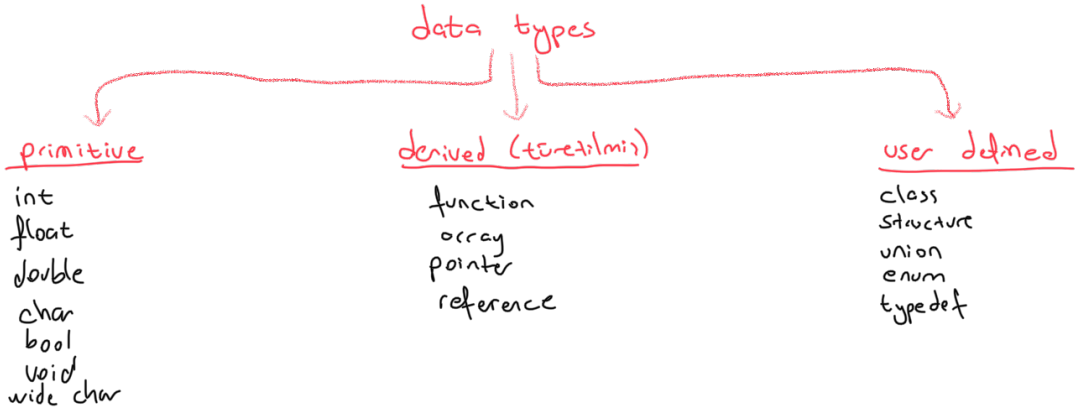
213 mt notes



- references must be initialized during declaration.
- const functions cannot call any other functions which are not const.

heap = segment of the memory where dynamic memory allocation takes place.

delete array ⇒ delete [] arr;

:: scope resolution operator ⇒ can also be used to a global variable which has a local variable with the same name.

the reason of using namespaces in c++

↳ two different libraries might use the same label for a class or varia

struct in c++

- can have private members
- can have member functions
- the default access modifier is public

- the default members of c++ class are private, if you try to access them, you get compile error.

namespace

```
namespace ceng{
    class pair{
        int a,b;
    };
}
```

⇒ ceng::pair p;

"using" keyword is used to indica which namespace to seach to find classes and variable

- std is the namespace of the c++ standard library.

void data type in c++

indicates an absence of data. means "no value" or "nothing"

* if you try to call empty constructors like `class_name obj();` you get a compile error. `class_name obj;` ✓

default methods in c++

1- default constructor

can be called with no arguments (if the user defines a constructor, it is not provid

2- destructor

called automatically when the object goes out of scope:

- the function ends
- the program ends
- a block containing local variables ends
- a delete operator is called

3- copy constructor

called with a reference to a class instance as an argument

4- copy assignment operator

equivalent to an assignment operator that assigns every member of its argument to a corresponding member of this instance

```
myclass a, b;
// copy constructor is called
myclass c = a;
// copy assignment operator is co
b = a;
```

- copy constructor = when new object is created.
- assignment operator = when an existing obj is assigned to a new object

constant variables

- their values never change
- must be initialized when defined

built-in types = fundamental types

$p \to a \equiv (*p).a$

Syntax

- classname(int a) : x(a) {} (no semicolon)

```
class classname {
int x;
};
```

- const classname & operator = (const classname & rhs) {

```
    this->x = rhs.x;
    return *this;
}
```

ambiguity = uncertainty

c++ function overloading

if the number and/or type of arguments passed is different.
* they may or may not have different return types.
(int x) and (int x, int y=0) are same for the compiler (because of initializati

$x[] \equiv *x$

vector declaration

std::vector <int> v;

reverse order with recursion

```
fun (* a) {
    if(a == null)
        return;
    else
        fun(a->next);
    cout << a;
}
```

reverse in queue

```
fun (*q){
 int i;
  if ( not_empty) {
   i= q.deque;
   fun (q);
   q. enque(i);
   }
}
```

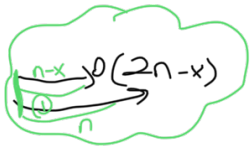
linked list

Singly / without tail pointer

insert = O(n) (at the end)

finding xth element from begining = O(1)

from ending = O(n)



count elements = O(n)

infix

((a*b) + (c/d))

((a* (b+c)) /d)

(a * (b + (c/d)))

postfix

((ab*) (cd/) +) : ab*cd/+

((a (bc+)*) d /) : abc+*d/

(a(b (cd/) +)*) : abcd/+*

prefix

(+(*ab) (/cd)) : +*ab/cd

(/(* a (+bc)) d) : /* a+bc

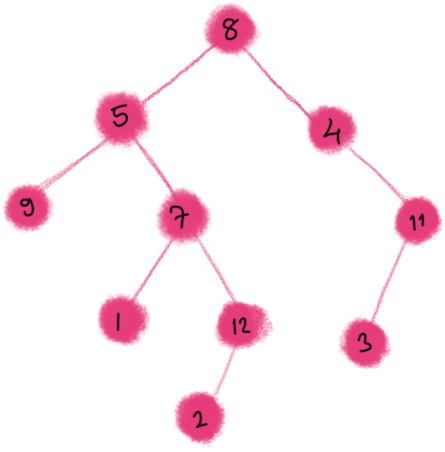
(*a (+b (/cd))) : * a+b/cd

queue

circular array

enqueue = O(1)

tree



preorder: root - left - right

→ 8-5-9-7-1-12-2-4-11-3

inorder: left - root - right

→ 9-5-1-7-2-12-8-4-3-11

postorder: left - right - root

→ 9-1-2-12-7-5-3-11-4-8

binary tree:

find an element: $O(n)$

full binary tree: nodes either have two children or none.

ex.

avl tree:

- we choose avl tree over a binary search tree, to guarantee $O(\log n)$ time operations on the tree
- after any operation, a avl tree can always be balanced

minimum height: $\lfloor \log_2(n) \rfloor$