CPSC 212 – SPRING 2011

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URL: http://andrewd.ces.clemson.edu/courses/cpsc212/s11

DATA STRUCTURES &

ALG. ANALYSIS

LINKED LISTS.
HASH MAPS.
TREES. (AVL, KD-TREES)
HEAPS
GRAPHS (MATRICIES)

} How data is organized

ALG. ANALYSIS:

- how efficient are your algs ?

- ALG. DESIGN

minimal use of: CPU
Disk
RAM

CPU: speed

Alg has to be fast

disk: disk space cheap

RAM: don't use too much memory

soft of right now

the canonical example:

sorting

searching ↴

find item in a list.

given list of int's:

```
for (i=0; i< arr.size(); i++)
    if (arr[i] == target)
        stop!
```

How fast does this run?

O(n): asymptotic function for

run time

$O(n)$ says for input

of size n

(n: 1, 10, 10,000,000)

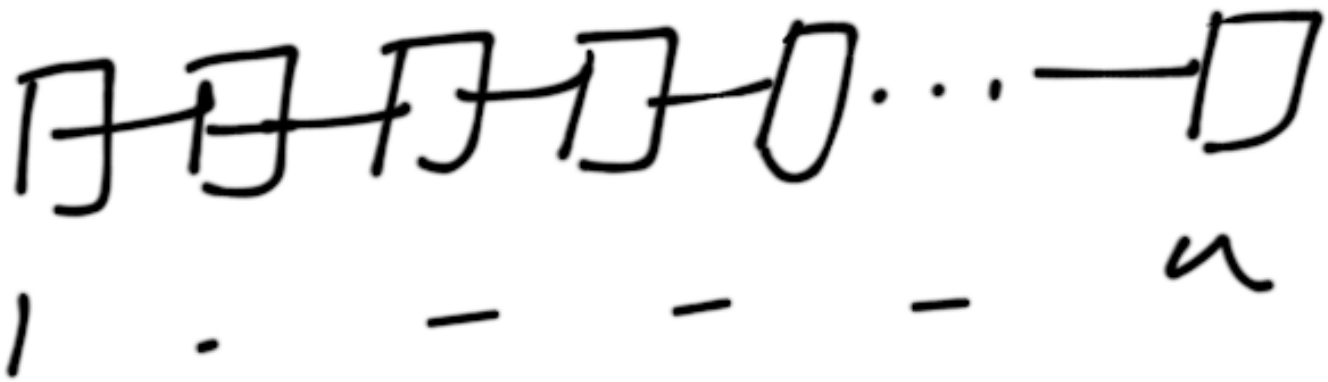
we will need n ops.

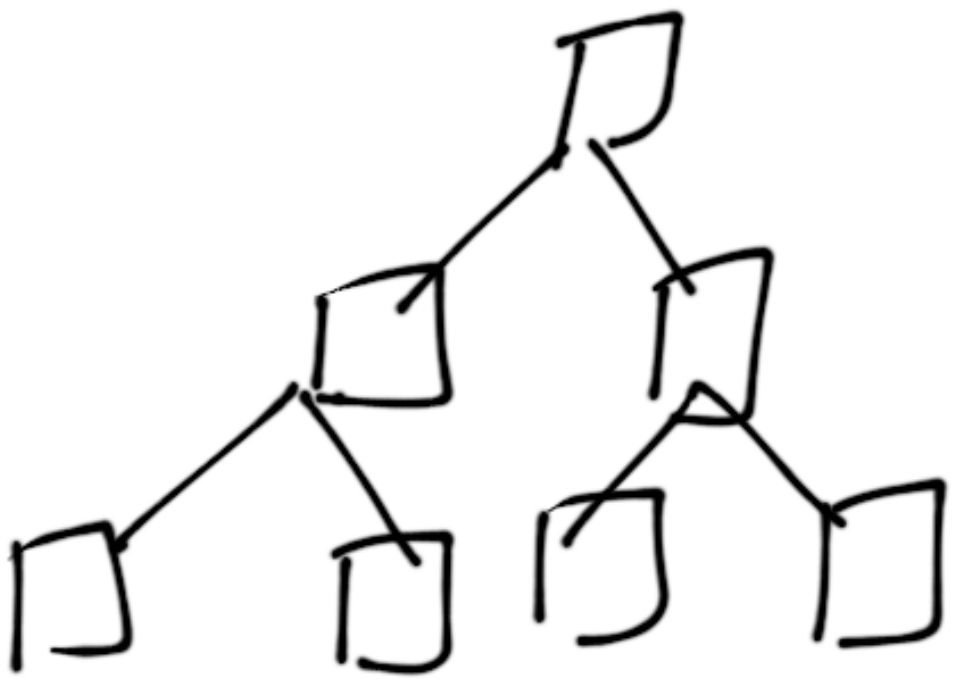
"At worst, n steps to execute"

basic search of list:

linear

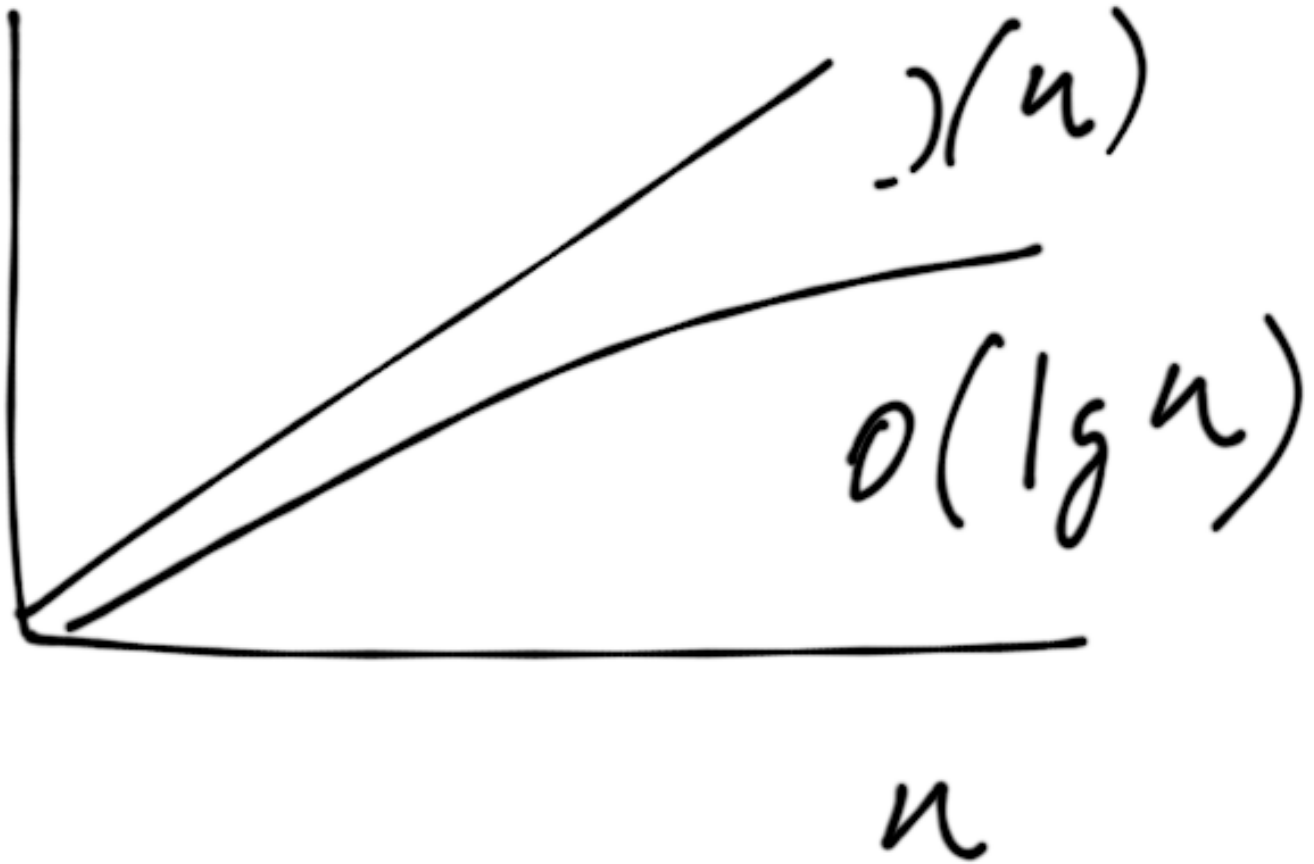
$O(n)$





O(lg n) : tree search is faster than O(n)

$O(\lg n) = O(\log_2 n)$



To get to O() notation:

recurrence relations

1. theory

2. practice: C++, measurement of runtime

to measure runtime:

Timer class

```
class Timer {
    public:
    // constructor
    Timer(double s=0.0,
          double e=0.0,
          double t=0.0)
```

```
        ts(s), \
        te(e), \
        tt(t)      { };
    :
private:
    double ts; // time start
    double te; // time end
    double tt; // time total
                  (te-ts)
```

usage:

```
Timer t1;

t1.start();
// do something
t1.end();

cout << t1.elapsed_s();
                 ||
                 _ms()
```

- timer reports time
  elapsed in sec,
  milliseconds, microseconds

- How to get timestamp?
- Use C library call to
  gettimeofday()
  ↳ see man page for
  usage