Cpts515. 9/25/2020.

Today: 1. go through hw1.

2. Challenge.

Prob1. Size of input $= \log_2 n + \log_2 p + \log_2 q$.

Remark. $\log_2 n$ = the # of bits you need to rep. n in memory.

Be careful:

(1). Sometimes, Engineers don't care. Exple:

```
Fib(int n){                    // Fibonacci.
    ⋮
    return Fib(n-1)+Fib(n-2);
}
```

What's the running time? Let $N = n$. (n not size.)

Then the time is $O(2^N)$.

Actually, (!) Let $N = \log_2 n$. (N size.) The the time is $O(2^{2^N})$.

(2). Problem RSA:

Given: number n

Quest.: $\exists p, q$ s.t. $n = p \cdot q$ & p, q are primes?

Input size $= \log_2 n$. ✓

---

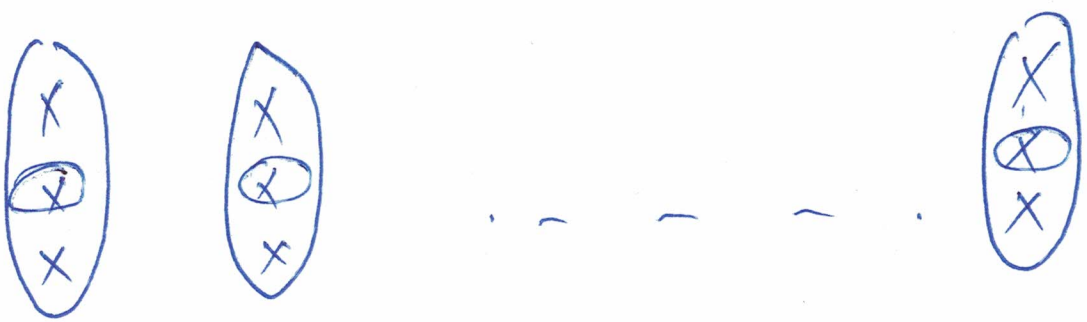
this after noon!

Engineers like to say: input size $= n = N$.

Can you show: we have an alg to solve the RSA problem in poly-time time on N?

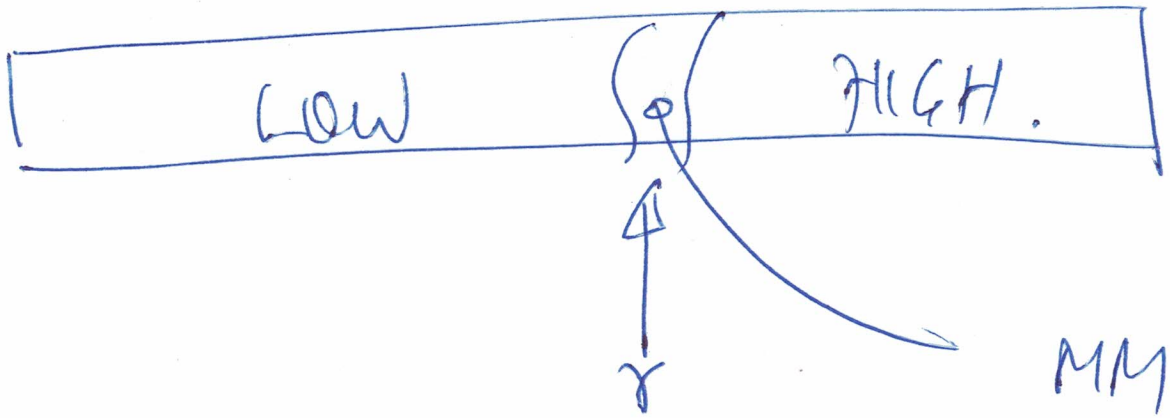
yes.

Prob 2. Group size = 3 and 7.



$\leftarrow$ $n/3$ groups. $\rightarrow$

$n/3$ medians.



we have $\frac{1}{2} \cdot \frac{1}{3} n$ medians $\leq$ MM.

each median is taken from a group of size 3.

so, we have 2 numbers $\leq$ the median.

Therefore, in the original array, we have at least $2 \cdot \frac{1}{2} \cdot \frac{1}{3} n$ numbers $\leq$ MM.

$\Rightarrow$ $|LOW| \geq \frac{n}{3}$ &

$|HIGH| \geq \frac{n}{3}$ &

$|LOW| + |HIGH| = n$

$\Rightarrow$ $|LOW|, |HIGH| \leq \frac{2}{3}n$.

$\Rightarrow$ $\max\{|LOW|, |HIGH|\} \leq \frac{2}{3}n$.

$$T_W(n) = T_W\left(\tfrac{1}{3}n\right) + T_W\left(\tfrac{2}{3}n\right) + O(n)$$

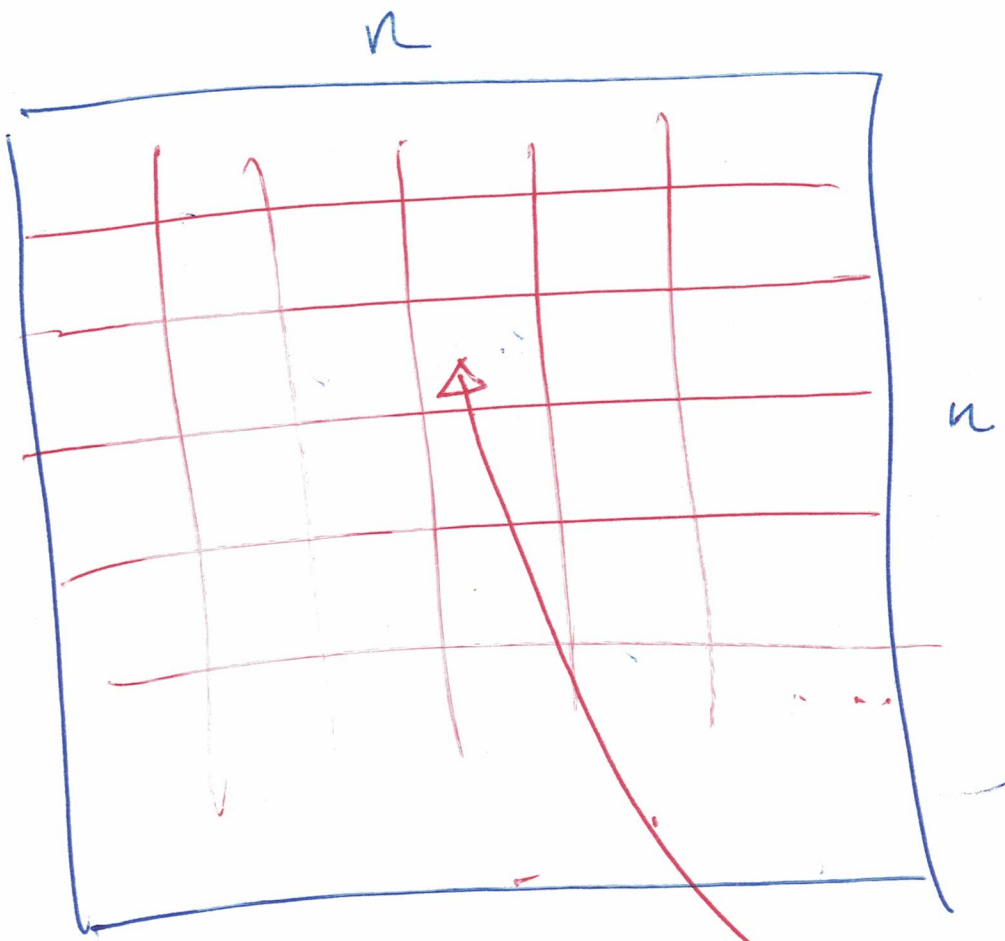
Guess $T_W(n) = O(n) \leq c \cdot n$ for some $c > 0$.

Check: $T_W(n) \leq c \cdot \frac{1}{3}n + c \cdot \frac{2}{3}n + a \cdot n$

$= cn + a \cdot n$

$\leq cn$ ✗

Prob 3.



$N = n^2$ bugs.

any two ≥ 1 unit time (in N) alg for closest pair

unit square

I totally have n^2 unit squares. Given the n^2 bugs, we can see:

(1) each unit square contains exactly 1 bug,

or

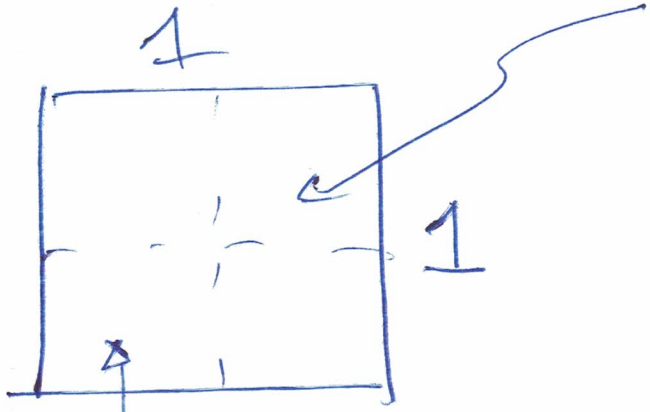
(2) there is at least one unit square containing more than 1 bugs.

For case (1), closest pair can be found in linear time by searching, for each bug, all its neighboring squares.

how big?

→ the bugs in

Case (2):



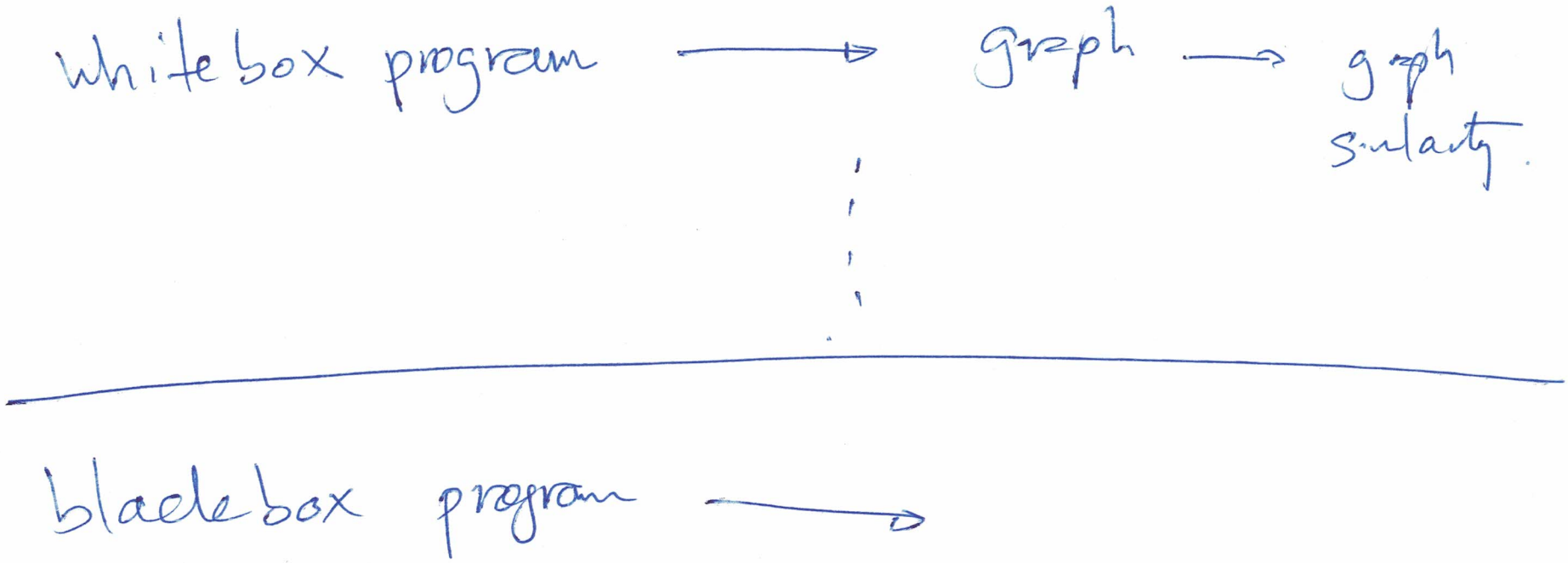
how many bugs you can max. fit in? at most 4.

at most 1 bug in this ~~5~~ half-square.

$\Rightarrow$ you can still search for the closest pair, by searching for each bug, all the bugs in its neighboring squares.

bounded by a fixed number!

Prob 4.


whitebox program
graph
graph similarity
blackbox program

Stop
Input/output.


stock market

given. two sets of strs.

A & B.

---

challenge:

you: abababab

your broker: ddd cd cd cd cd cd

Covert channel.