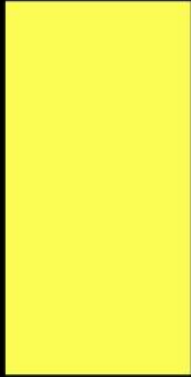
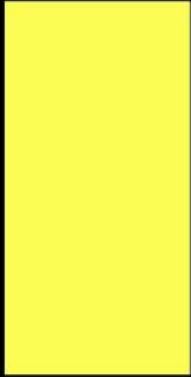
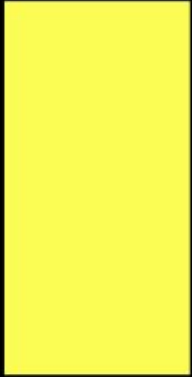
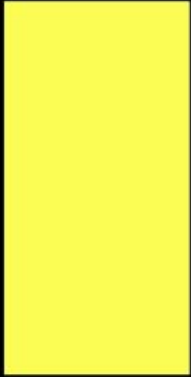
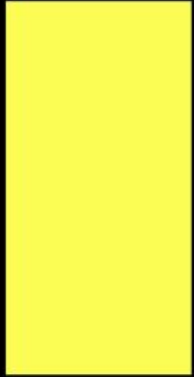
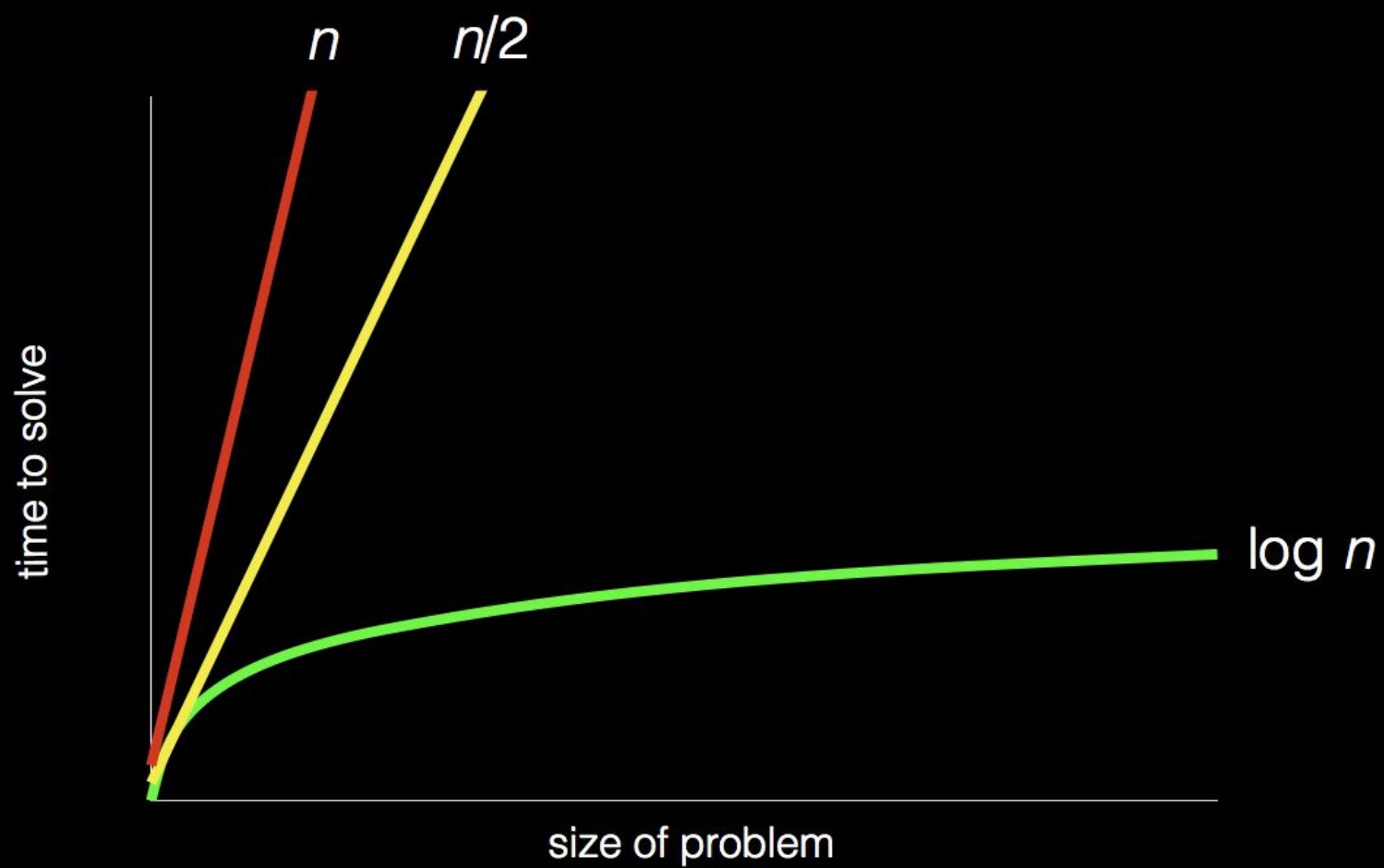


# Algorithms, Data Structures





O

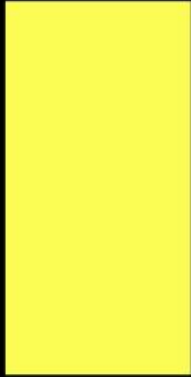
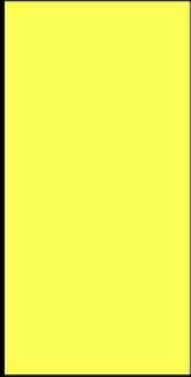
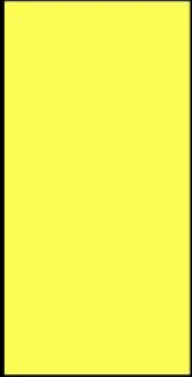
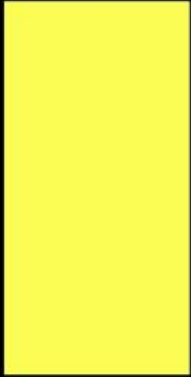
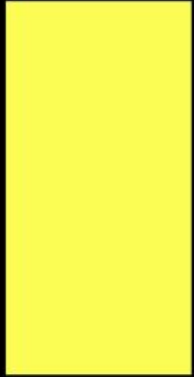
- $O(n^2)$
- $O(n \log n)$
- $O(n)$
- $O(\log n)$
- $O(1)$
- ...

$\Omega$

- $\Omega(n^2)$
- $\Omega(n \log n)$
- $\Omega(n)$
- $\Omega(\log n)$
- $\Omega(1)$
- ...







bubble sort

```
repeat until no swaps
  for i from 0 to n-2
    if i'th and i+1'th elements out of order
      swap them
```

selection sort

```
for i from 0 to n-1
  find smallest element between i'th and n-1'th
  swap smallest with i'th element
```



$$(n - 1) + (n - 2) + \dots + 1$$

$$(n - 1) + (n - 2) + \dots + 1$$

$$n(n - 1)/2$$



$$(n - 1) + (n - 2) + \dots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$(n - 1) + (n - 2) + \dots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$n^2/2 - n/2$$

$$(n - 1) + (n - 2) + \dots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$n^2/2 - n/2$$

$$O(n^2)$$



$$n^2/2 - n/2$$

$$n^2/2 - n/2$$

$$1,000,000^2/2 - 1,000,000/2$$

$$n^2/2 - n/2$$

$$1,000,000^2/2 - 1,000,000/2$$

$$500,000,000,000 - 500,000$$

$$n^2/2 - n/2$$

$$1,000,000^2/2 - 1,000,000/2$$

$$500,000,000,000 - 500,000$$

$$499,999,500,000$$



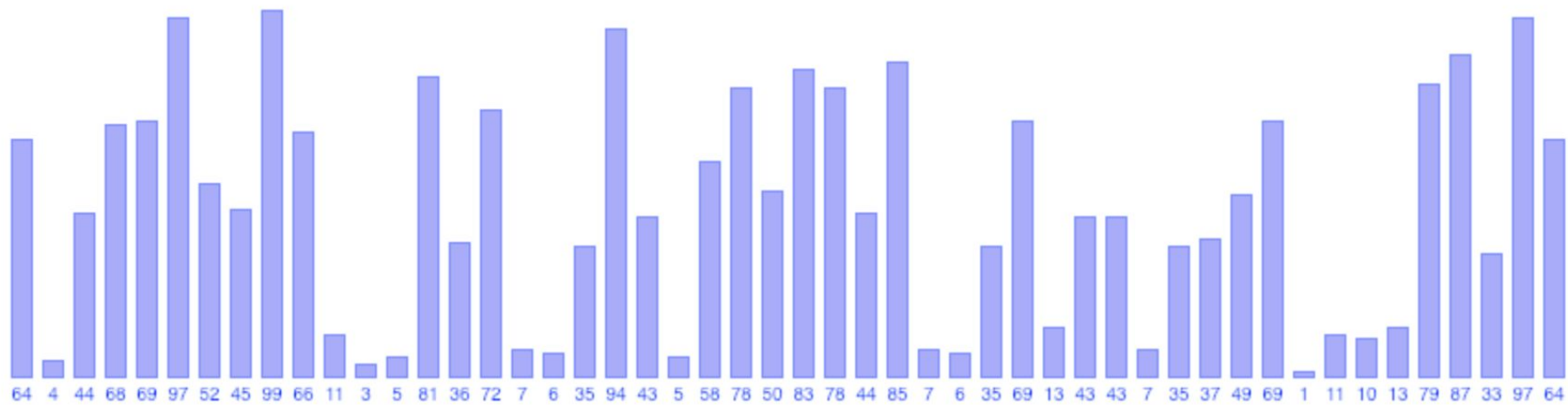
$$n^2/2 - n/2$$

$$1,000,000^2/2 - 1,000,000/2$$

$$500,000,000,000 - 500,000$$

$$499,999,500,000$$

$$O(n^2)$$









al™

4G85

8BB12  
D9HXT

8BB12  
D9HXT

4G85

8BB12  
D9HXT

4G85

4G85

bool

float

int

str

...

bool

float

int

str

...



dict

list

range

set

tuple

...

dict

list

range

set

tuple

...

# Algorithms, Data Structures