

CS 105

Week 5, Part 2

Midterm #1

Tuesday, Oct. 7, 2014

8:00pm – 9:30pm

No Lecture

Wednesday, Oct. 8, 2014

MP3

Due: Thursday by 6:00pm

Extra Lab/Office Hours

Thursday, 9-11am in 70B

MPx Session for MP3

Thursday, 7:30pm in 0216 Siebel

TA Review Session

Sunday, Oct. 5th, 2014

103 Mumford Hall

2:00pm – 5:30pm

Running Time
How many steps?

Running Times

- Linear Search:

Running Times

- Linear Search:
 - What is the worst case?

Running Times

- Linear Search:
 - What is the worst case?
 - 1000 pieces of data → 1000 steps

Running Times

- Linear Search:
 - What is the worst case?
 - 1000 pieces of data $\rightarrow$ 1000 steps
 - n pieces of data $\rightarrow$ n steps

Running Times

- Linear Search:
 - What is the worst case?
 - 1000 pieces of data $\rightarrow$ 1000 steps
 - n pieces of data $\rightarrow$ n steps
 - Running time: $O(n)$

Running Times

- Binary Search:
 - What is the worst case?

Running Times

- Binary Search:
 - What is the worst case?
 - 8 pieces of data → 3 steps
 - 16 pieces of data → 4 steps
 - 32 pieces of data → 5 steps

Running Times

- Binary Search:
 - What is the worst case?
 - n pieces of data $\rightarrow \log_2(n)$ steps
 $\rightarrow \lg(n)$ steps

Running Times

- Binary Search:
 - What is the worst case?
 - n pieces of data $\rightarrow \log_2(n)$ steps
 $\rightarrow \lg(n)$ steps
 - Running time: $O(\lg(n))$

4 2 7 1 6 5 3

Running Times

- Selection Sort:
 - First pass:

Running Times

- Selection Sort:
 - First pass: **n steps**

Running Times

- Selection Sort:
 - First pass: **n steps**
 - Second pass:

Running Times

- Selection Sort:
 - First pass: **n steps**
 - Second pass: **$(n-1)$ steps**

Running Times

- Selection Sort:
 - First pass: **n steps**
 - Second pass: **$(n-1)$ steps**
 - Third pass: **$(n-2)$ steps**
 - ...
 - Last pass: **1 step**

Running Times

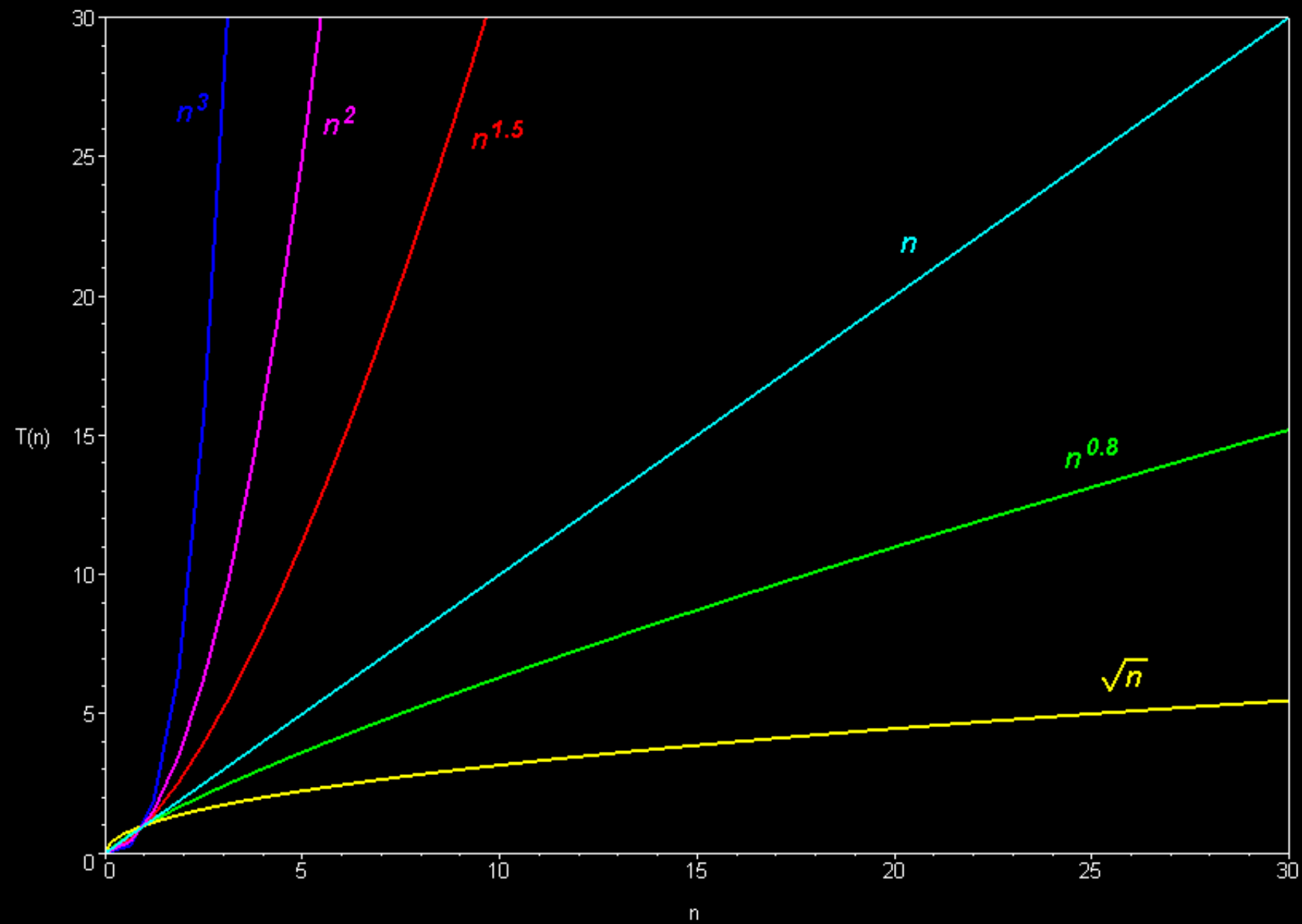
$$n + (n - 1) + (n - 2) + \cdots + 1$$

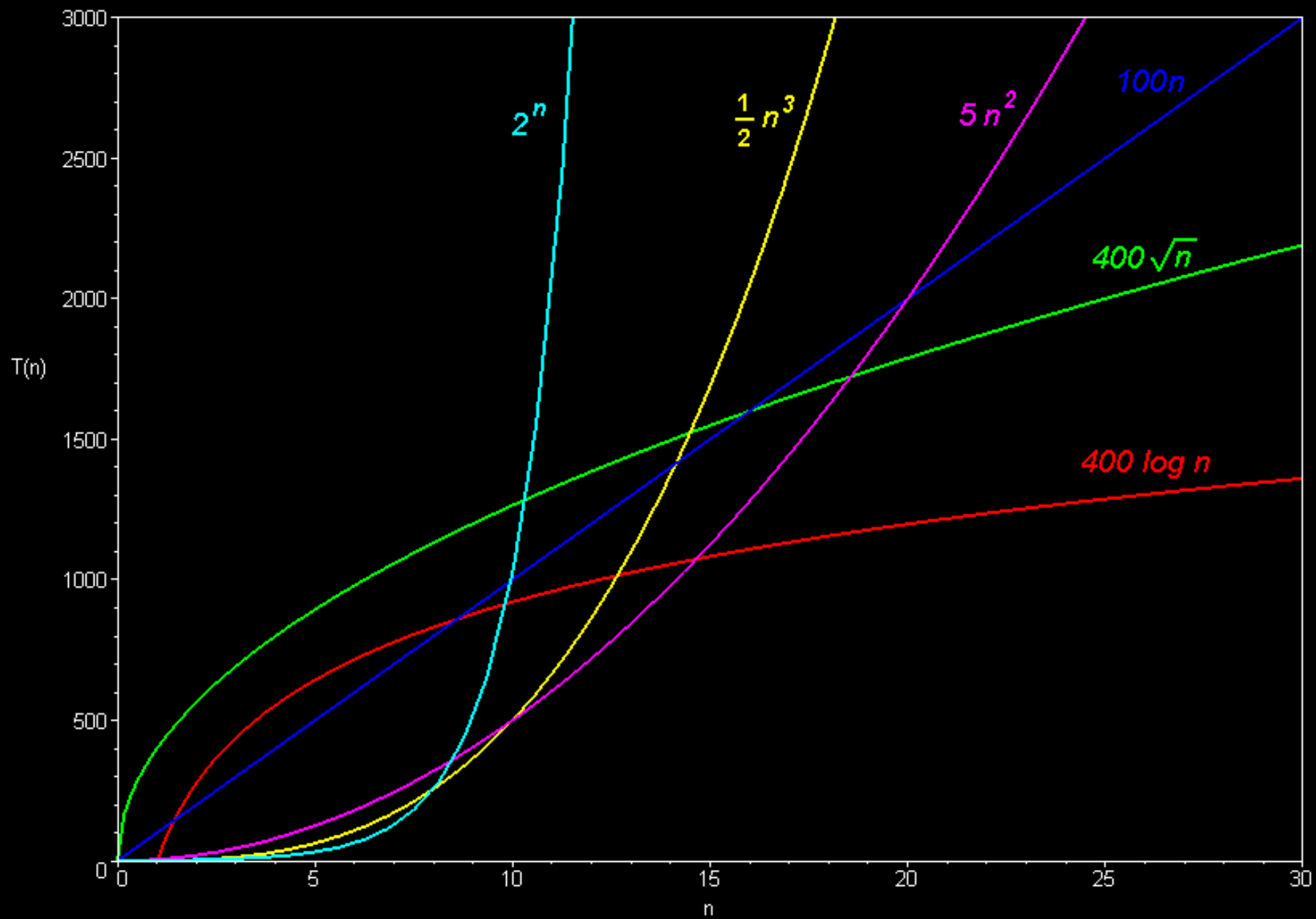
Running Times

$$\sum_{i=0}^n (n - i)$$

Running Times

$$\sum_{i=0}^n (n - i) = \frac{n(n + 1)}{2} = \frac{n^2 + n}{2} \approx n^2$$





Running Times

- Running Times:
 - Binary Search: $O(\lg(n))$
 - Linear Search: $O(n)$
 - Selection Search: $O(n^2)$

Running Times

- Running Times:

- Binary Search: $O(\lg(n))$

FAST

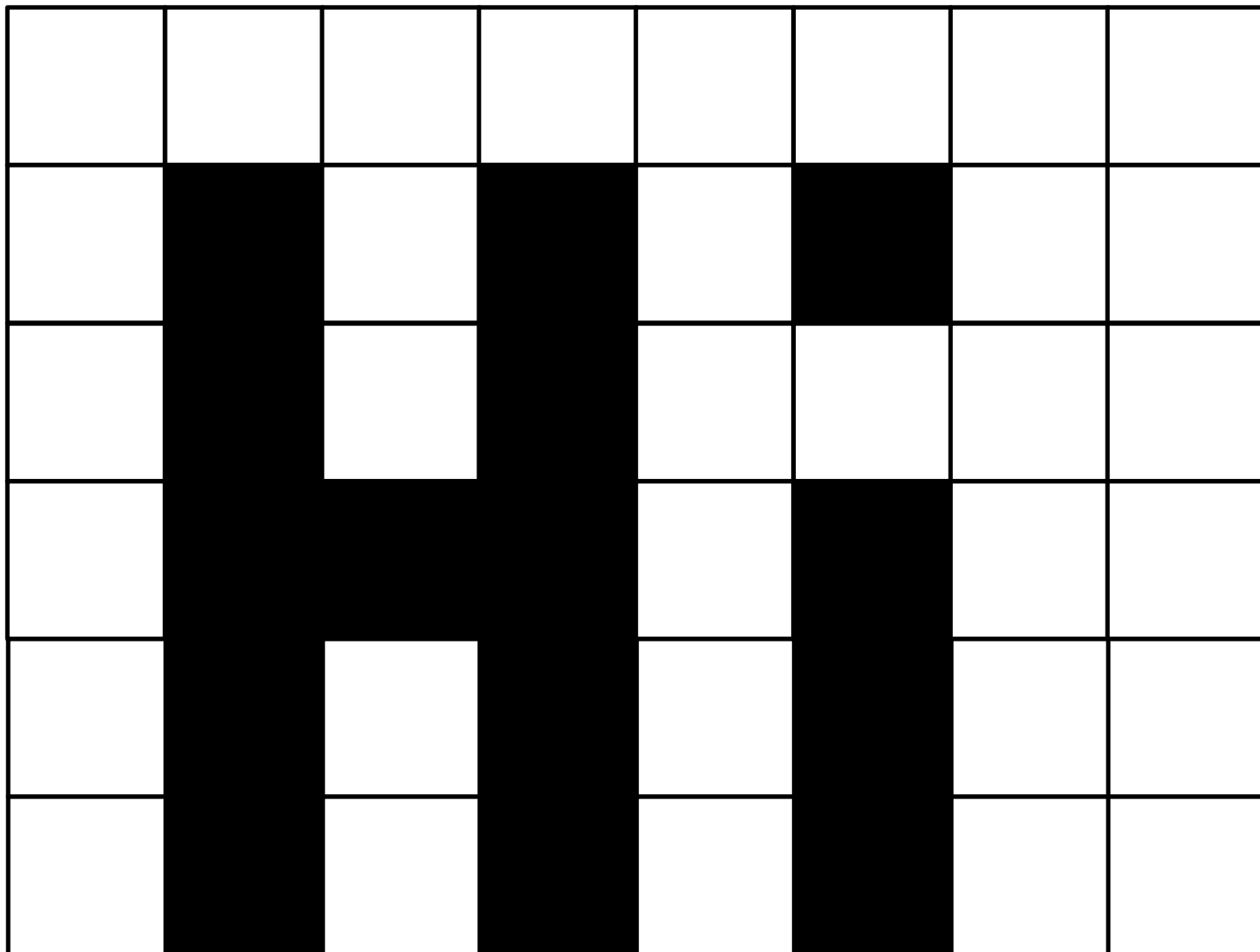
- Linear Search: $O(n)$

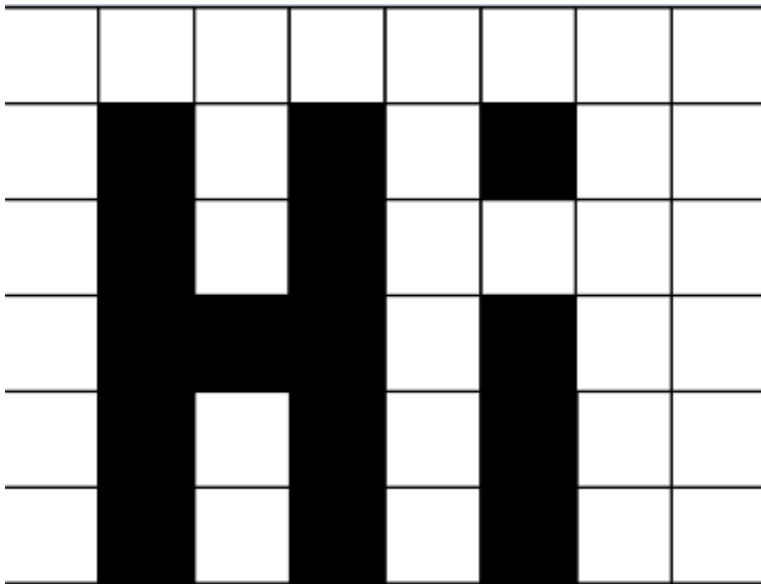
SLOWER

- Selection Search: $O(n^2)$

SLOW

Images





00000000

01010100

01010000

01110100

01010100

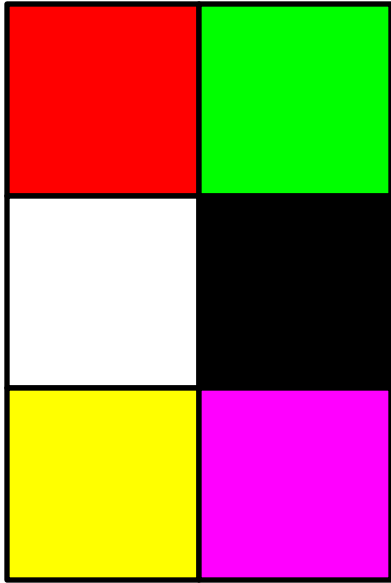
01010100

Color pixel is actually made up of three colors:

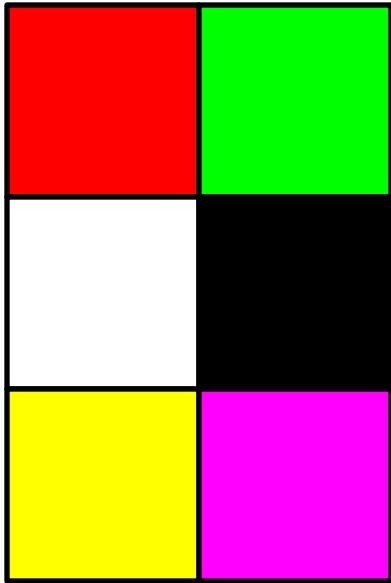
Red

Green

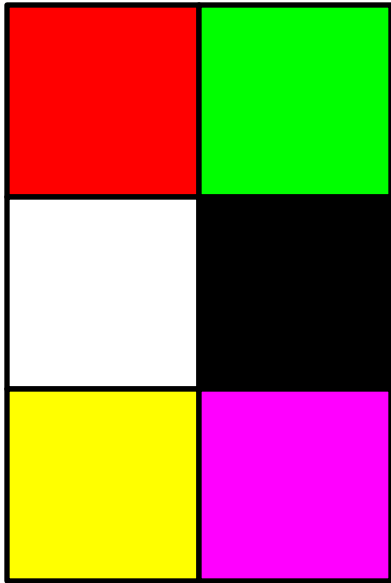
Blue



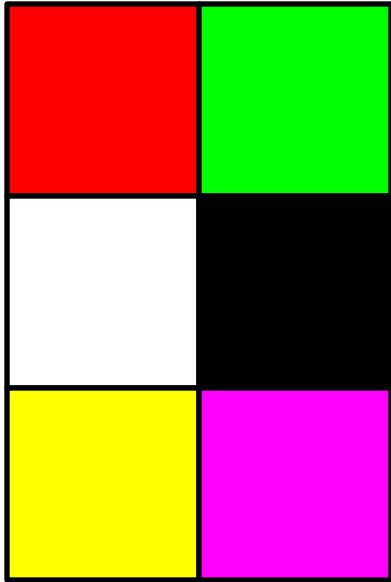
ff0000



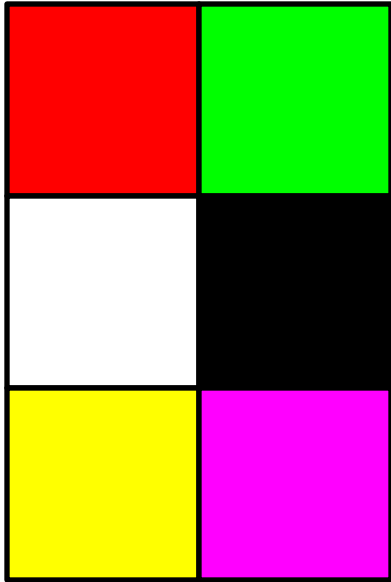
ff0000



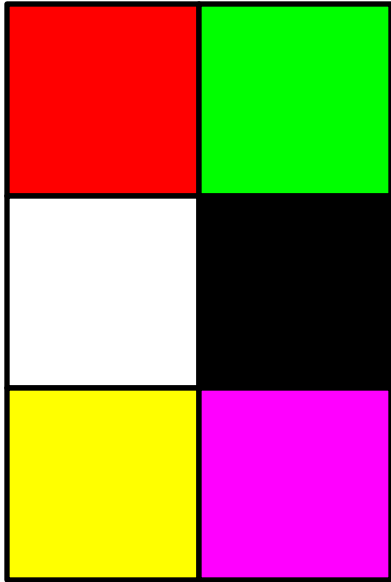
ff0000



ff0000 00ff00



```
ff0000  00ff00  
ffffff  000000
```



ff0000	00ff00
ffffff	000000
ffff00	ff00ff

JavaScript Objects

JavaScript Objects

JSON

JavaScript Object Notation

“D5”

...is a poor way of saying...

“5 of diamonds”

*Sometimes we want more
information in a single variable...*

Card: Rank is 5, Suit is Diamond

*JavaScript objects allow us to place
multiple variables inside of one
variable!*

```
var card = { rank: "5",  
             suit: "Diamond" };
```

```
var card = { rank: "5",  
             suit: "Diamond" };
```

```
var rank = card.rank;
```

```
var card = { rank: "5",  
             suit: "Diamond" };
```

```
var rank = card.rank;    // "5"
```

```
var weather = { high: 72,  
                low: 49 };
```

```
var weather = { high: 72,  
                low : 49 };
```

```
var average = (weather.high +  
              weather.low) / 2;
```

```
var anyVariableName =
```

```
{  key      : variable  ,  
    key      : variable  ,  
    key      : variable  ,  
    ...  
    key      : variable  };
```

```
var anyVariableName =  
  { key : variable ,  
    key : variable ,  
    key : variable ,  
    ...  
    key : variable } ;
```

```
var anyVariableName =  
  { key : variable /  
    key : variable /  
    key : variable /  
    ...  
    key : variable } ;
```

```
var anyVariableName =  
  { key : variable /  
    key : variable /  
    key : variable /  
    ...  
    key : variable } ;
```

```
var anyVariableName =  
    { key : variable /  
      key : variable /  
      key : variable /  
      ...  
      key : variable } ;
```

keys can be any variable name

```
var loc1 = { x: 40, y: 20 };  
var loc2 = { x: 50, y: -30 };  
  
var d = distance(loc1, loc2);
```