

Week 10

Quiz 1 Review

Base Number Systems

	Base	'42'
Binary	2	101010
Octal	8	52
Decimal	10	42
Hexadecimal	16	0x2a

Bitwise Operators

& - AND

1100

&1010

1000

| - OR

0011

|1010

1011

^ - XOR

1010

^1100

0110

~ - NOT

$\sim(1010) = 0101$

Asymptotic Runtime

- Big O – Upper bound on runtime.
 - ‘Worst Case’
- Omega – Lower bound on runtime.
 - ‘Best Case’
- If a program takes $6n^2 + 4n + 57$ steps...
 - $O(n^2)$, we ignore constants, lower-order terms.

Stacks

- First in, last out data structure.
- Can 'pop' or 'push' things to the top of the stack.



Top

Queues

- First in, first out data structure.
- “Insert” and “Remove” operations.



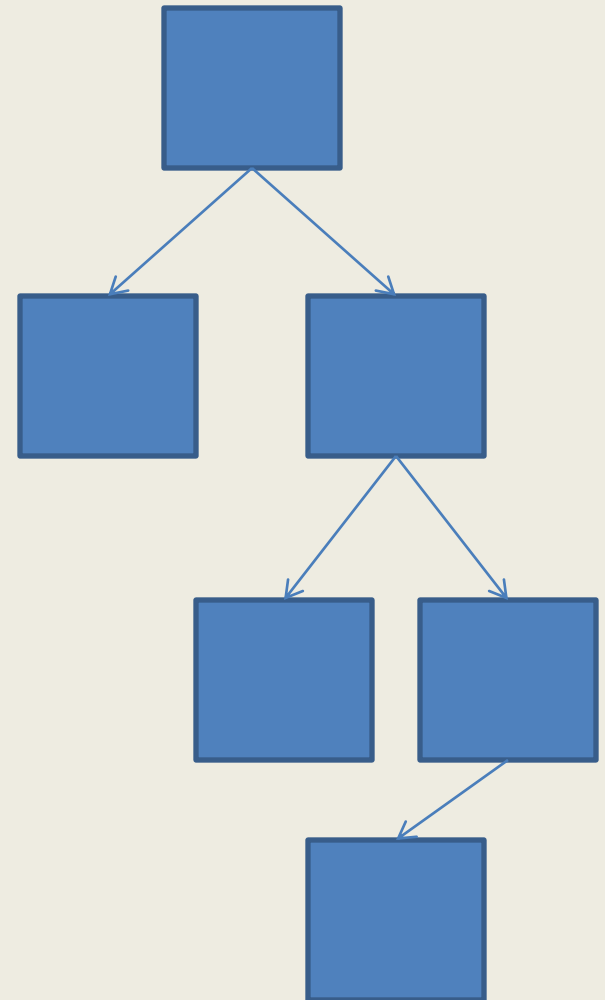
Head

Tail

Trees

- Trees consist of 'branches'.

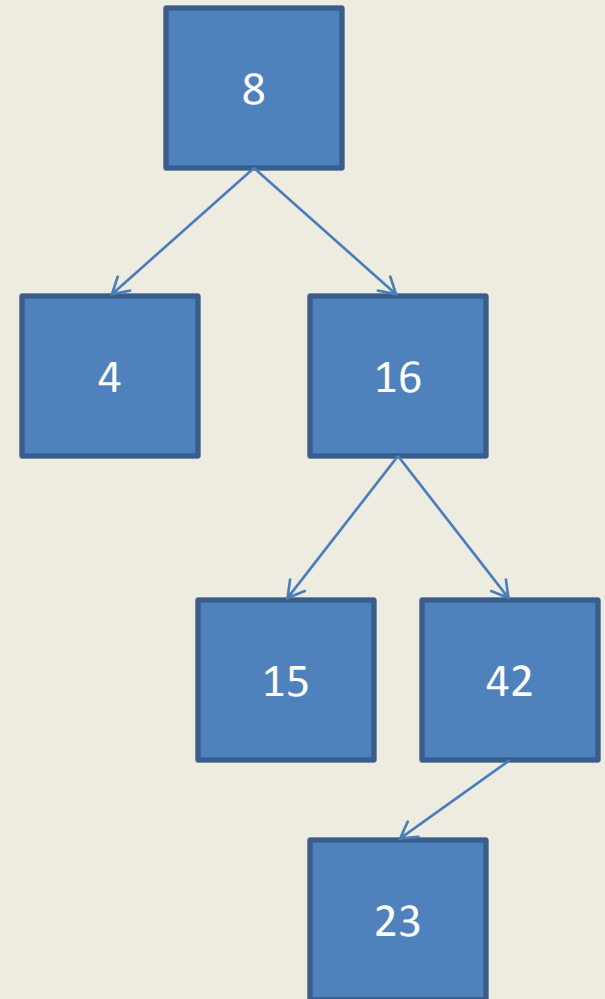
```
struct branch
{
    struct branch* left;
    int val;
    struct branch* right;
}
```



Binary Search Tree

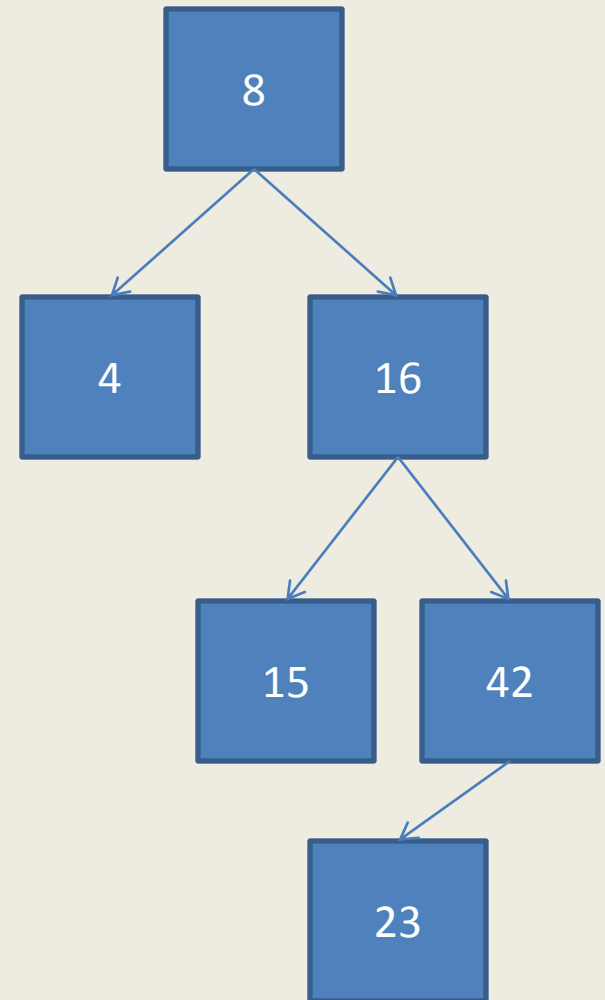
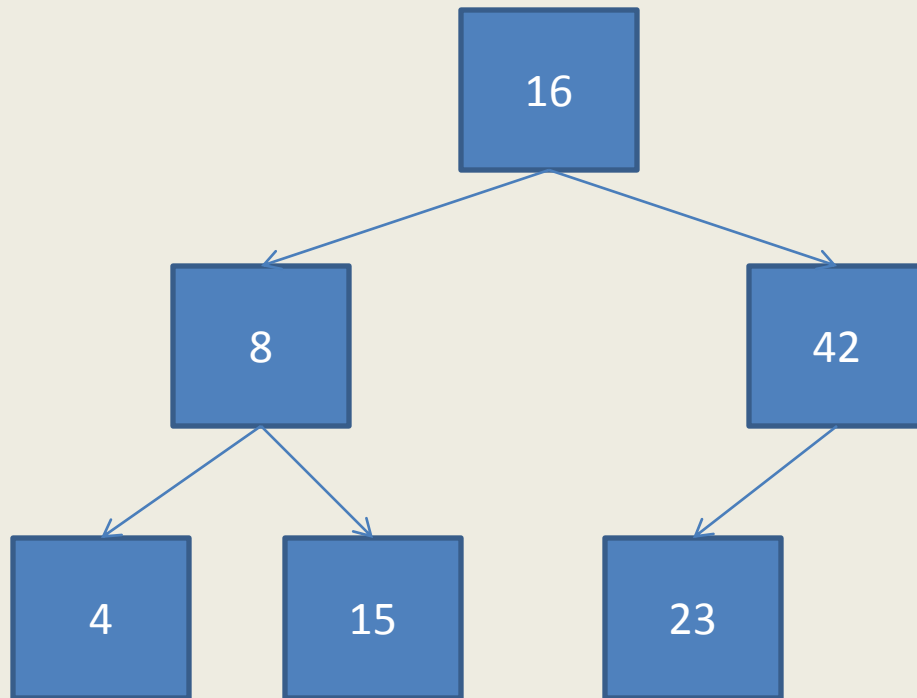
A BST is a special tree such that:

- 1) Left 'sub-tree' of each node contains only lesser nodes.
- 2) Right 'sub-tree' of each node contains only greater nodes.
- 3) Left and right 'sub-trees' of each node are also binary search trees.



Binary Search Tree

Lower bound on depth of tree is $\log(n)$.



Hash Tables

- Consists of an array and a hash function.
- Hash function maps input to an index in the associated array.
- Allows us to check whether something is contained in a data structure without checking through the entire thing.

Hash Tables

Good Hash Functions are:

- Deterministic
- Well-distributed

```
int  
xkcd_hash(char* word)  
{  
    return 4;  
}
```

THIS
IS BAD

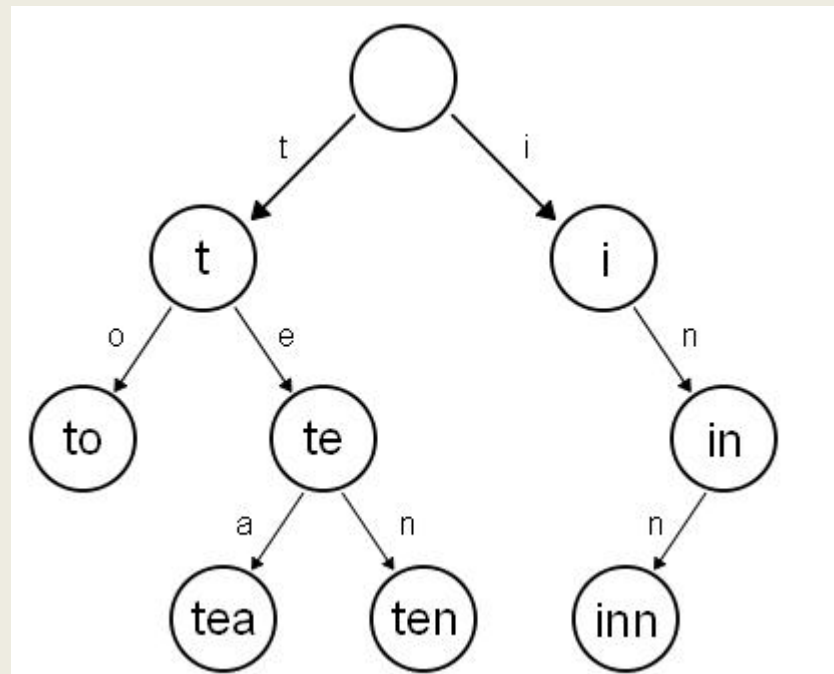


Tries

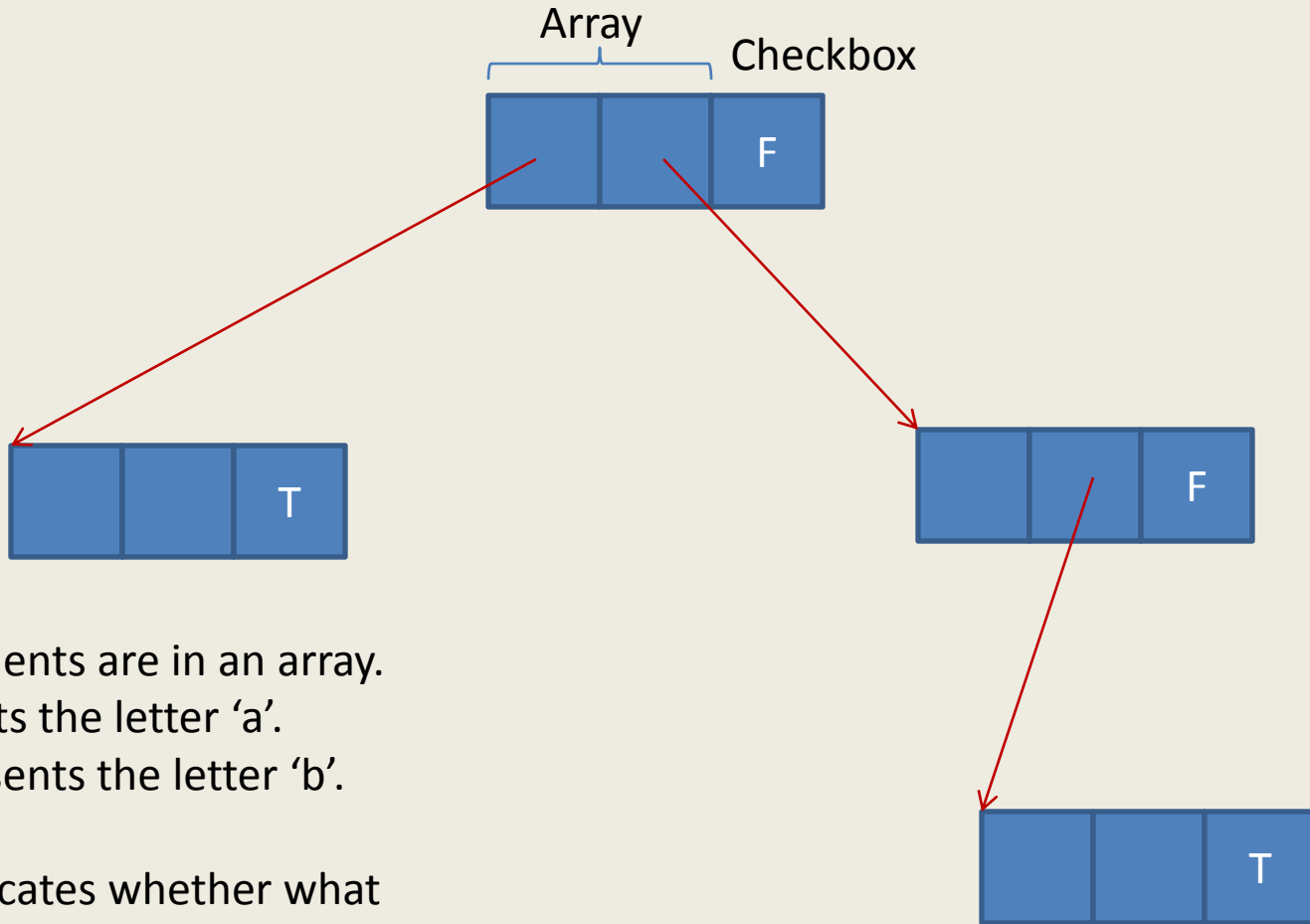
- Tree of Arrays
- Fast Lookup, High Memory Use

```
struct trie_node
{
    struct trie_node* array[N];
    bool checkbox;
}
```

Tries



Tries



First two elements are in an array.
First represents the letter 'a'.
Second represents the letter 'b'.

Checkbox indicates whether what
we've looked at so far is in the data
structure.

"a", "bb" are in this structure.

HTML

- Hypertext Markup Language
- Arranges and formats webpage content
- ‘Tags’ enclose regions of page.
 - Each beginning tag has an ending tag.
 - In general, close most recently opened first.
- ‘Tags’ may have ‘attributes’.
 - Attributes are like parameters for a tag.

CSS

- Cascading Style Sheets
- Specifically used to format the appearance of elements of a webpage
- May be included in a tag's 'style' attribute, or included in a separate .css file

CSS

- 'style' attributes allow for formatting of tag contents using CSS.

- Examples:

align: center

font-size: small

color: blue

display: block

CSS

- Can also define formatting in an external .css file which is linked in.

Format

Selector (name of tag)

```
{  
    declarations;  
}
```

PHP

- PHP: PHP Hypertext Preprocessor
- When accessed, dynamically generates a webpage which it then outputs to browser.
- PHP code enclosed in `<? ?>` tag.

PHP

C	PHP
Compiled	Interpreted
Strongly-typed	Loosely-typed

mySQL

- SQL – Structured Query Language
- Database software which allows us to store a collection of data as ‘entries’ containing a set of distinct ‘fields’ containing values.
- Databases contains tables, which contain rows, which contain fields.

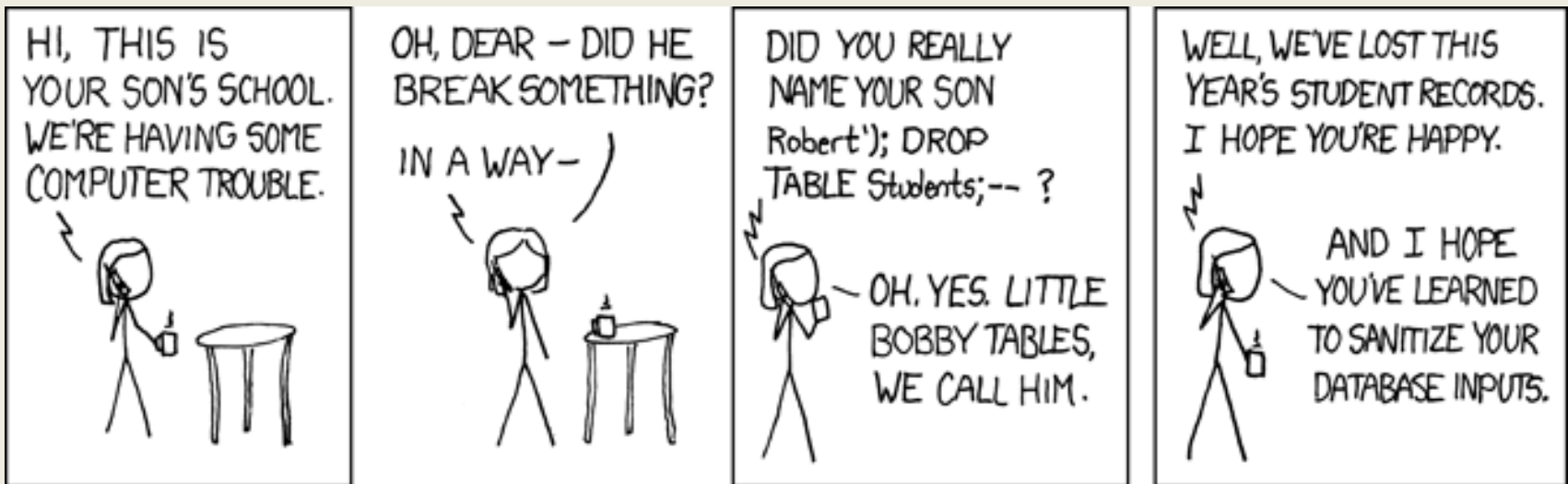
mySQL

- INSERT
 - Insert a new entry.
- DELETE
 - Remove an existing entry.
- SELECT
 - Select one or more entries.
- UPDATE
 - Update the fields of an existing entry.

mysql

Don't forget to escape user input inserted into query strings!

“INSERT INTO students VALUE (<user string>);”



Development of Interactivity

- HTML – static web pages
- PHP – dynamically generated web pages
- Javascript – web pages with dynamic content

Javascript

- Programming Language used in web design
- Unlike PHP, executed client-side!
- Javascript code is included in HTML passed to browser.

Javascript

- Like CSS, may be included either within the HTML page or linked in from external .js file.
- Linking in:

```
<head>  
  <script src="file.js">  
  </script>  
</head>
```

Javascript

PHP	Javascript
Interpreted	
Loosely-typed	
Server-side execution	Client-side execution

Document Object Model

- Contents of web page represented in a structure called the Document Object Model.
- We can access individual elements by Id in Javascript and get their contents!
- Example:
 - `name = document.getElementById('name').value;`

Development of Interactivity

- HTML – static web pages
- PHP – dynamically generated web pages
- Javascript – web pages with dynamic content
- Ajax – dynamically load content from *other pages*

Ajax

- Asynchronous Javascript and XML
- Allows us to send requests to other pages for new content without reloading page!

Questions

?

This Was Section

Good luck and thanks for a great year.