CS 161
Intro to CS I

Begin Structs vs. Classes
Odds and Ends

• Demo Assignment #5 this week!!!
• Assignment #6 due Sunday
  – This assignment is not demoed!!!
• Final Exam next Thursday, 9:30am!

• Any questions on Assignment 6 or arrays?
int main() {
    int **array;
    ...
    array = create_2darray(rows, cols);
    ...
}

int **create_2darray(int r, int c) {
    int **a;
    a = new int*[r];
    for(int i=0; i<r; i++)
        a[i] = new int[c];
    return a;
}
int main() {
    int **array;
    ...
    create_2darray(&array, rows, cols);
    ...
}
void create_2darray(int ***a, int r, int c) {
    *a = new int*[r];
    for(int i=0; i<r; i++)
        (*a)[i] = new int[c];
}
Create 2-D Array in Functions

```cpp
int main() {
    int **array;
    ...
    create_2darray(array, rows, cols);
    ...
}

void create_2darray(int **&a, int r, int c) {
    a = new int*[r];
    for(int i=0; i<r; i++)
        a[i] = new int[c];
}
```
How does freeing memory work?

```c
int *r[5], **s;
for(int i=0; i < 5; i++)
    r[i]=new int;
for(int i=0; i < 5; i++)
    delete r[i];
for(int i=0; i < 5; i++)
    r[i]=new int[5];
for(int i=0; i < 5; i++)
    delete [] r[i];
s=new int*[5];
for(int i=0; i < 5; i++)
    s[i]=new int[5];
for(int i=0; i < 5; i++)
    delete [] s[i];
delete [] s;
```
```c
int main(int argc, char **argv) {
  // how do I create a 2-d array (3 x 3) on stack?
  int array[3][3] = {{1, 2, 3}, {4, 5, 6}, {7, 8, 9}};

  fun(array, 3, 3);
  // how do I print address of pointer to 1st row pointer?
  cout << &array << endl;

  // how do I print address of 1st row pointer?
  cout << array << endl;
  cout << &(array[0]) << endl;

  // how do I print address of the 1st element in 1st row?
  cout << array[0] << endl;
  cout << &(array[0][0]) << endl;

  // how do I print address of the 1st element in 2nd row?
  cout << array[1] << endl;
  cout << &(array[1][0]) << endl;

  // print contents of 2nd element in 2nd row?
  cout << array[1][1] << endl;
  cout << *(*(array+1)+1) << endl; // works on dynamic/static
  cout << *(*array+1*3+1) << endl;

  return 0;
}
```
Structures

• Data Structures So Far...
  – Variables
  – Arrays

• What if we want mixed types?
  – Record: name, age, weight, etc.
  – Use **struct** type
struct doc_record {
    char name[50];
    int age;
    float weight;
};

• What does this do?
• How do we use it?
Struct Type

struct doc_record{
    char name[50];
    int age;
    float weight;
};  //creates a user defined type, doc_record
int main() {
    doc_record garrett;  //use it as a type
...
}