CS 161
Intro to CS I

1-d Arrays (Static vs. Dynamic)
Odds and Ends

• Last day to demo Assignment 3
• Assignment 4 due Sunday

```python
z = top
if (n == 2):
    print(n/2, col)
else:
    pattern(n/2, col)

print(n, col)
if (n == 2):
    print(n/2, col+n)
else:
    pattern(n/2, col+n)
```

= middle

= bottom

0 1 2
Create 1-D Array

int student_grades[5];

• How do you access each item?
• What does the array name represent?
• Why is the array name the address of 1st element?
• What are the initial values?
Initialize/Assign Values

- **Declaration**
  
  ```
  int student_grades[5] = {0, 0, 0, 0, 0};
  ```

- **Individual Elements**
  
  ```
  student_grades[0]=0;
  ```
  
  ```
  ...  
  ```
  
  ```
  student_grades[4]=0;
  ```

- **Why is this incorrect?**
  
  ```
  student_grades={0, 0, 0, 0, 0};
  ```
Initialize/Assign Values...

• Using a Loop
  While Loop Example:
  ```
  i=0;
  while (i<5) {
    student_grades[i]=0;
    i++;
  }
  ```

  For Loop Example:
  ```
  for(i=0; i<5; i++)
    student_grades[i]=0;
  ```

• Which is better to use with arrays and why?
Read/Print 1-D Array Values

• Read Values From User
  
  for(i=0; i<5; i++)  {
    cout << "Enter final grade for student: ";
    cin >> student_grades[i];
  }

• Print Values
  
  for (i=0; i<5; i++)  {
    cout << "Student\'s final grade is " << student_grades[i] << endl;
  }
Static vs. Dynamic 1-D arrays...

```
int array[3];
```

Constant, self-referential arrays

Stack

Stack

Heap

Stack int *array = new int[3];

0  array[0] 32  array[1] 64  array[2]


0  array 0

256  array

Can't change

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How does creating and freeing memory work?

```c
int *p, *q;
p=new int;
q=new int[5];
delete p;
delete [] q;
```
```cpp
#include <iostream>

using namespace std;

int main() {
    int stack_array[10];
    int heap_array = new int[10];

    // how do I initialize the elements in array

    // how do I print the address of the pointer to the array

    // what is the contents of the pointer, how do I print it

    // how do I print the address of where the array begins in memory

    // how do I print the contents of the first element in the array

    return 0;
}
```
```cpp
#include <iostream>
using namespace std;

int main() {
    int stack_array[10];
    int *heap_array=new int[10];

    //how do I initialize the elements in array
    stack_array[0]=10;
    heap_array[0]=100;

    //how do I print the address of the pointer to the array
    cout << &stack_array << endl;
    cout << &heap_array << endl;

    //what is the contents of the pointer, how do I print it
    cout << stack_array << endl; //address of where array is
    cout << heap_array << endl;

    //how do I print the address of where the array begins in memory
    cout << &(stack_array[0]) << endl; //address of where array is
    cout << &(heap_array[0]) << endl;

    //how do I print the contents of the first element in the array
    cout << *(stack_array+0) << endl; //contents of first element
    cout << heap_array[0] << endl; //[] is address arithmetic and deref

    return 0;
}
```