CS 161
Intro to CS I
Pointers, 1-D Arrays, & Strings
Chap. 5
C++ Pass by Value

```cpp
void swap(int, int);
int main() {
    int a=5, b=10;
    swap(a, b);
    cout << "a: " << a << "b: " << b;
}
void swap(int x, int y) {
    int temp = x;
    x = y;
    y = temp;
}
• What if we didn’t have temp?
```
C++ Pass by Reference

```cpp
void swap(int &, int &);
int main() {
    int a=5, b=10;
    swap(a, b);
    cout << "a: " << a << "b: " << b;
}
void swap(int &x, int &y) {
    int temp = x;
    x = y;
    y = temp;
}
```

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void swap(int *, int *);

int main()
{
    int a=5, b=10;
    swap(&a, &b);
    cout << "a: " << a << " b: " << b;
}

void swap(int *x, int *y)
{
    int temp = *x;
    *x = *y;
    *y = temp;
}
Variables vs. References

• Value Semantics
  – Values stored directly
  – Copy of value is passed
    int i, j=2;
    i=j;

• Reference Semantics
  – References to the value are stored
  – Copy of address is passed
    int *i, j=2;
    i=&j;
What is an Array?

• **Array (ar·ray) n.** An ordered arrangement of related items.
  – Example: Array of colors in a rainbow.
    • Related items?
    • Ordered arrangement?
  – Class examples?
  – Computer Science
    • Same data type/data structure
    • Contiguous memory locations
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
  
  ```cpp
  for(i=0; i<5; i++) {
    cout << "Enter final grade for student: ";
    cin >> student_grades[i];
  }
  ```

• Print Values
  
  ```cpp
  for (i=0; i<5; i++) {
    cout << "Student\'s final grade is " << student_grades[i] << endl;
  }
  ```
```cpp
#include <iostream>
#include <string>
#include <cstdlib>
using namespace std;

int main() {
    char str[20];     //Create a character array string
    string str_obj;   //Create a string object

    cout << "Enter char string: ";
    cin.getline(str, 20);  //Gets a sentence into char array
    cin >> str;           //Gets a word
    cout << str;
    cout << str[3];       //Print the 4th character

    cout << "Enter string obj: ";
    getline(cin, str_obj); //Gets a sentence into string object
    cout << str_obj;
    cout << str_obj.at(3) << endl; //Print the 4th character
    cout << str_obj[3] << endl;

    return 0;
}
```