

# **16.216: ECE Application Programming**

Summer 2015

## Lecture 6: Key Questions

June 4, 2015

1. Explain the use of arrays: what an array represents, how to define an array, and how to access values within the array.

2. Explain how the following example works:

```
int main(void)
{
    int x[8];
    int i;

    // get 8 values into x[]
    for (i=0; i<8; i++)
    {
        printf("Enter test %d:", i+1);
        scanf("%d", &x[i]);
    }
}
```

3. What happens if we change the loop condition to `i <= 8`? How can we avoid this problem?

4. **Example:** What does the following program print?

```
int main() {
    int arr[10];
    int i;

    printf("First loop:\n");
    for (i = 0; i < 10; i++) {
        arr[i] = i * 2;
        printf("arr[%d] = %d\n", i, arr[i]);
    }

    printf("\nSecond loop:\n");
    for (i = 0; i < 9; i++) {
        arr[i] = arr[i] + arr[i + 1];
        printf("arr[%d] = %d\n", i, arr[i]);
    }
    return 0;
}
```

5. Describe how to declare, initialize, and access two-dimensional arrays.

6. **Example:** Complete the following program:

```
#include <stdio.h>
#define NRows 3      // # of rows
#define NCols 4      // # of columns
int main() {
    double x[NRows][NCols] =          // 2-D array
        { { 10, 2.5, 0, 1.5},
          {-2.3, -1.1, -0.2, 0},
          {10.5, -6.1, 23.4, -9.2} };

    int negCnt[NRows] = {0};          // Initialize entire row
                                        // count array to 0
    int i, j;                          // Row and column indices

    /* INSERT CODE HERE--Visit every element in array x and
       count the number of negative values in each row */

    // Now print the row counts
    for (i = 0; i < NRows; i++)
        printf("Row %d has %d negative values.\n",
               i, negCnt[i]);

    return 0;
}
```

7. Explain how to pass arrays to functions.

8. **Example:** Write a function for each of the following:

- Given an array of doubles (`arr`) and the # of elements in the array (`n`), find the average of all array elements

- Given an array of ints and the # of elements, find the largest element in the array

- Given an array of test scores (`tests`), the # of elements in the array (`n`), and an amount to scale those scores by (`s`), add `s` to every element in `tests` and print the scaled scores

9. Explain the relationship between pointers and arrays, as well as the use of pointer arithmetic.

10. Explain how 2-D arrays are passed to functions.



11. **Example:** Say we have a program that stores student exam scores in a 2-D array:

- Each row represents an individual student
- Each column represents one of the 3 exams

Write functions to:

- Calculate the exam average for each student and store it in a 1-D array that is accessible in the main program
  - Assume all exams have equal weight
- Calculate the average for each exam and store it in a 1-D array that is accessible in the main program
- Each function takes the same arguments:
  - The 2-D array
  - The # of students in the class
  - The 1-D array that will be used to hold the averages

11 (cont.) Extra space to write functions